

Facilities Study Report
For
Physical Interconnection of
PJM Generation Interconnection Request
Project ID AF2-132

"Reynolds - Olive #1 345 kV"

November 2024

Introduction

This Facilities Study has been prepared in accordance with the PJM Open Access Transmission Tariff, and, if applicable, the Application and Studies Agreement between the Project Developer and PJM Interconnection, LLC (PJM or Transmission Provider (TP)). The Transmission Owner (TO) is AEP Indiana Michigan Transmission Company Inc. to be abbreviated in the remainder of this report as IMTCo. IMTCo is an affiliate company of American Electric Power Service Corporation (AEP). All references to AEP include IMTCo unless otherwise specified.

A. Transmission Owner Facilities Study Summary

1. PROJECT DESCRIPTION

The Project Developer has proposed a Solar Generating Facility located in Pulaski County, Indiana. The installed facilities for AF2-132 will have a total Maximum Facility Output (MFO) of 300 MW with 180 MW of this output being recognized by PJM as Capacity.

2. POINTS OF INTERCONNECTION AND CHANGE IN OWNERSHIP

The Generating Facility will interconnect with the American Electric Power (AEP) transmission system via a newly constructed IMTCo owned 345 kV station (referred to as “New 345 kV Switching Station” or “the proposed 345 kV switching station”) tapping the Olive - proposed AE2-045 345 kV Switching Station portion of the Olive – Reynolds (NIPSCO) #1 345 kV line, approximately 44 miles from Olive 345 kV Substation and 12.2 miles from proposed AE2-045 345 kV Switching Station.

The Point of Interconnection (POI) is the point where the risers connect the generator lead circuit to the New IMTCo 345 kV Switching Station line termination point. The Point of Change in Ownership (PCO) will be located at the first structure in the generation lead circuit outside of the IMTCo New 345 kV Switching Station fence. IMTCo will own the span from the IMTCo New 345 kV Switching Station to the AEP constructed and owned dead end PCO structure, including the jumpers. The Project Developer will own the other span connecting to the PCO structure, along with the remainder of the 345 kV generator lead transmission line and associated structures back to the AF2-132 generation collector substation.

The construction of the new interconnection substation will split the existing Olive - proposed AE2-045 345 kV Circuit into two lines on the transmission system.

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

3. AMENDMENTS TO THE IMPACT STUDY DATA OR IMPACT STUDY RESULTS

No amendments to the impact study data or impact study results are required by AEP.

4. PROJECT DEVELOPER SCHEDULE

The Project Developer's requested in-service date for the generation facility is December 31, 2026.

This report does not imply a Transmission Owner commitment to this date.

5. SCOPE OF PROJECT DEVELOPER INTERCONNECTION FACILITIES

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

- (2) Two Main Power Transformers (MPTs)
- (1) One 345kV circuit breaker and associated equipment located between the high side of the MPT(s) and the Point of Change in Ownership
- Generator lead line conductors from the Generating Facility to the Point of Change in Ownership
- Relay and protective equipment and Telecommunications Equipment including Supervisory Control and Data Acquisition (SCADA) to comply with the TO's Applicable Technical Requirements and Standards

B. Transmission Owner Facilities Study Results

The following is a description of the Transmission Owner facilities required for physical interconnection of the proposed AF2-132 project to the AEP transmission system. These facilities shall be designed according to AEP Applicable Technical Requirements and Standards. Once built, AEP will own, operate, and maintain these Facilities.

1. INTERCONNECTION SUBSTATION (NEW) (Stand Alone Network Upgrade)

IMTCO will construct a new 345 kV breaker and a half station ("New 345 kV Switching Station" or "the proposed 345 kV Switching Station"); to be operated as a three (3) circuit breaker ring bus, initially expandable to six (6) circuit breakers. This typical arrangement is planned to be designed to accommodate at least 5000A of continuous current. The station will be constructed to the southeast of the Reynolds - Olive #1 circuit to interconnect the project with the AEP transmission system.

Major IMTCO equipment is expected to include:

- Three (3) 63 kA circuit breakers with associated control relaying.
- One (1) 16' x 48' Drop-In Control Module (DICM).
- Nine (9) motorized disconnect switches.
- One (1) three phase ground switch.
- Six (6) single phase coupling capacitor voltage transformers (CCVT), three (3) each for the line exits to the Olive and proposed AE2-045 345 kV Switching Stations.
- Four (4) single phase line traps, two (2) each for the line exits to the Olive and proposed AE2-045 345 kV Switching Stations.
- Two (2) single phase station service voltage transformers (SSVT).
- Two (2) A-Frame line exit structures, one (1) each for the line exits to the Olive and proposed AE2-045 345 kV Switching Stations.
- A dual Directional Comparison Blocking (DCB) with Direct Transfer Trip (DTT) line protection relay scheme for the line to the Olive 345 kV Station.
- A dual Directional Comparison Blocking (DCB) with Direct Transfer Trip (DTT) line protection relay scheme for the line to the proposed AE2-045 345 kV Switching Station.
- Associated conductors (buswork, ground grid, jumpers), telecom terminal equipment, insulators, arresters, foundations, and structures.

The civil work required to develop a site that accommodates the installation of the above station includes grading of a 520' x 230' pad with an assumed fall across the pad of 4' and approximately 700' x 24' of access road.

2. TRANSMISSION LINE TIE-IN

The AF2-132 New 345 kV Switching Station is designed to be installed on the eastern side of the Olive – Reynolds (NIPSCO) 345 kV Circuit. The Olive – Reynolds 345 kV Circuit is a double circuit tower line (DCTL). The AF2-132 New 345 kV Switching Station will be connected to the western circuit of the DCTL. As such, the eastern circuit will be raised, allowing the western circuit to cross horizontally underneath, cutting in the proposed 345 kV Switching Station in an in-and-out arrangement. **Major IMTCo equipment is expected to include:**

- Two (2) new 130' custom steel, single circuit, three-pole dead end structures on concrete piers with anchor bolt cages.
- One (1) new 140' custom steel, single circuit, single-pole dead end structure on a concrete pier with an anchor bolt cage.
- Two (2) spans of aluminum conductor steel reinforced (ACSR) 2156 (Bluebird) transmission line conductor with ACSR 159 (Guinea) shield wire.

3. TRANSMISSION OWNER INTERCONNECTION FACILITIES:

The IMTCo Interconnection Facilities will include but are not limited to:

- Installation of one (1) new steel, 120', single circuit, single pole dead end structure on a concrete pier foundation with an anchor bolt cage and one span of double bundle ACSR 954 (Cardinal) transmission line conductor with 7#8 Alumoweld shield wire for the generation lead circuit extending from the proposed 345 kV Switching Station.
- One (1) A-Frame line exit structure for the line exit to the AF2-132 generation facilities.
- Dual direct fiber current differential relays for the generation lead to the proposed AF2-132 collector station.
- Installation of a standard revenue metering package, including three (3) single phase current transformers (CT), three (3) single phase coupling capacitor voltage transformers (CCVT), associated structures and foundations, one (1) ethernet switch, and one (1) DICM-installed metering panel, for the generation lead circuit at the proposed 345 kV Switching Station.
- Extension of two (2) underground 48 count all dielectric loose tube (ADLT) fiber optic cables from the proposed 345 kV Switching Station control house to fiber demarcation splice boxes to support direct fiber relaying between the proposed 345 kV Switching Station and Project Developer's collector stations. The Project Developer will be responsible for the fiber extension from the splice boxes to the collector station.

4. UPGRADE TO NEIGHBORING STATIONS

4.1 Olive 345 kV

- IMTCo will review and revise (as needed) the protective relay settings at the Olive 345 kV Substation.

4.2 Proposed AE2-045 345 kV

- IMTCo will review and revise (as needed) the protective relay settings at the proposed AE2-045 345 kV Switching Station.

5. INSTALLATION OF FIBER CABLE CIRCUITS

No new fiber circuits to facilitate communication with existing AEP equipment will be required for this interconnection.

6. COST ESTIMATE OF AEP FACILITIES FOR PHYSICAL INTERCONNECTION

The following tables summarize the total estimated costs according to FERC criteria. The estimated costs are in 2024 dollars. **This cost excludes Federal Income Tax Gross Up charges on Contributions in Aid of Construction (CIAC).** This tax may or may not be charged based on whether this project meets the eligibility requirements of IRS Notice 88-129. If at a future date it is determined that the Federal Income Tax Gross Up charges are required, the Transmission Owner shall be reimbursed by the Project Developer for such taxes. The estimated reimbursement amount is noted in the table below.

6.1 COST ESTIMATE FOR TRANSMISSION OWNER-BUILD OPTION

Work Description	Type of Upgrade	Direct		Indirect		Total	Tax
		Labor	Material	Labor	Material		
Transmission Owner Interconnection Facilities	TOIF	\$1,602,066	\$869,267	\$304,726	\$153,976	\$2,930,035	\$0
New Interconnection Substation	Stand Alone	\$6,766,070	\$6,917,630	\$611,925	\$631,593	\$14,927,218	\$0
Expansion of existing substation	non-Stand Alone	\$0	\$0	\$0	\$0	\$0	\$0
Interconnection Substation tie-in	non-Stand Alone	\$1,199,106	\$1,238,852	\$147,487	\$152,376	\$2,737,821	\$0
Remote relay at Olive 345 kV	non-Stand Alone	\$43,175	\$8,284	\$16,475	\$3,161	\$71,095	\$0
Remote relay at proposed AE2-045 345 kV	non-Stand Alone	\$43,175	\$8,284	\$16,475	\$3,161	\$71,095	\$0
Fiber Installation in Existing ROW	non-Stand Alone	\$0	\$0	\$0	\$0	\$0	\$0
Fiber Installation in New ROW	Stand Alone	\$0	\$0	\$0	\$0	\$0	\$0
Final Tie in for Fiber installation in New ROW	non-Stand Alone	\$0	\$0	\$0	\$0	\$0	\$0
Total Project Costs		\$9,653,592	\$9,042,317	\$1,097,088	\$944,267	\$20,737,264	\$0

6.2 COST ESTIMATE FOR DEVELOPER-BUILD OPTION

Work Description	Type of Upgrade	Direct		Indirect		Total	Tax
		Labor	Material	Labor	Material		
Transmission Owner Interconnection Facilities (Oversight)	TOIF	\$0	\$0	\$0	\$0	\$0	\$0
New Interconnection Substation (Oversight)	Stand Alone Network Upgrade n.8977.0	\$224,288	\$55,462	\$108,244	\$26,767	\$414,761	\$0
Expansion of existing substation	Network Upgrade	\$0	\$0	\$0	\$0	\$0	\$0
Interconnection Substation tie-in	Network Upgrade n.8978.0	\$1,199,106	\$1,238,852	\$147,487	\$152,376	\$2,737,821	\$0
Remote relay at Olive 345 kV	Network Upgrade n.8979.0	\$43,175	\$8,284	\$16,475	\$3,161	\$71,095	\$0
Remote relay at proposed AE2-045 345 kV	Network Upgrade n.8980.0	\$43,175	\$8,284	\$16,475	\$3,161	\$71,095	\$0
Fiber Installation in Existing ROW	Network Upgrade	\$0	\$0	\$0	\$0	\$0	\$0
Fiber Installation in New ROW (Oversight)	Stand Alone Network Upgrade	\$0	\$0	\$0	\$0	\$0	\$0
Final Tie in for Fiber installation in New ROW	Network Upgrade	\$0	\$0	\$0	\$0	\$0	\$0
Total Project Costs		\$1,509,744	\$1,310,882	\$288,681	\$185,465	\$3,294,772	\$0

7. MILESTONE SCHEDULES FOR COMPLETION OF AEP WORK

7.1 STANDARD OPTION:

<u>Activity</u>	<u>Number of Days (See Notes)</u>
Project Engagement*	1
Engineering Start	70
Material Ordering	112
Construction (Grading & Below Grade)	457
Construction (Above Grade)	547
Outage Requests Made By	400
Outage (Structure Foundations)**	832
Outage (Cut-in & Testing)**	882
Ready For Back Feed (ITO In-Service Date)	912

***Day 1 will be determined at the PJM construction project kick off meeting.**

****Scheduled Outages are contingent upon outage availability. Longer duration outages are not available during peak load periods.**

The above schedule is based on typical AEP construction timelines, long lead material availability, and common outage constraints. The facilities outlined in this report, as constructed by AEP, are estimated to take 30 months to complete. Given this construction timeline and a typical period for agreement processing, AEP can support a backfeed date of May 10, 2027, subject to change during the tariff defined Final Agreement Negotiation Phase. The Project Developer is expected to have the interconnection facilities constructed and ready to accept backfeed by the business day prior to the final negotiated backfeed date.

7.2 OPTION TO BUILD:

<u>Activity</u>	<u>Dates (See Notes)</u>
Project Engagement*	1
Engineering Start	70
Material Ordering	140
Construction (Grading & Below Grade)	600
Construction (Above Grade)	630
Outage Requests Made By	335
Outage (Structure Foundations)**	650
Outage (Cut-in & Testing)**	700
Ready For Back Feed (ITO In-Service Date)	730

***Day 1 will be determined at the PJM construction project kick off meeting. Scheduled Outages are contingent upon outage availability. Longer duration outages are not available during peak load periods.**

****Coordination with the Project Developer will be required 90 days prior to the start of this task.**

The above schedule is based on typical AEP construction timelines, long lead material availability, and common outage constraints. The facilities related to the cut-in and remote end stations outlined in this report, as constructed by AEP, are estimated to take 24 months to complete. Given this construction timeline and a typical period for agreement processing, AEP can support a backfeed date of November 9, 2026, subject to change during the tariff defined Final Agreement Negotiation Phase. The Project Developer is expected to have the interconnection facilities, including the interconnection station, ready to accept backfeed by the business day prior.

8. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

Note - Any materials purchased, or design decisions made by the Project Developer (relative to any facilities to be owned by AEP) prior to coordination with and approval by the executing AEP team (pursuant to an Engineering and Procurement or Generation Interconnection Agreement) are at the developer's risk and may not meet the specifications required for interconnection with the AEP transmission system.

8.1 SCOPE ASSUMPTIONS:

- Equipment specifications (Breaker ratings, conductor size, etc.) are a result of the desktop functional scoping process observed while conducting this facilities study. These specifications are subject to change based on the results of the detailed scoping efforts that will take place post-interconnection or engineering and procurement agreements.
- Protection and Control (P&C) coordination with the Project Developer will be needed throughout the project. The Project Developer will be required to install an AEP-compatible line relaying protection panel at the collector substation using AEP standards to ensure relay coordination and adequate line protection. The AEP design team will ensure that the firmware at the collector station terminal matches the approved firmware at the AEP terminal. Failure to accept the cost of a matching line relay protection panel may change scoping.
- Scopes provided are based on a table-top process without the benefit of the results of site-specific engineering studies (e.g., soil borings, environmental survey, ground grid, etc.), unless otherwise provided by the Project Developer.
- The Project Developer will obtain, at its cost, all necessary provisions for the AEP direct connection facilities.
- The Project Developer will provide a site acceptable to AEP (for transfer in Fee Simple) and any required easements for the proposed 345 kV Switching Station and associated line work to enable access to all facilities and structures.
- The proposed 345 kV Switching Station interconnecting AF2-132 will be located in close proximity to the existing Reynolds - Olive #1 Transmission Line Right of Way.
- The Project Developer will have their construction and required checkout completed prior to the start of the interconnection to the proposed 345 kV Switching Station and any required testing outages.
- The proposed AE2-045 project will be in service prior to the AF2-132. Should AF2-132 come in service prior to the AE2-045 project, this scope may change.

8.2 SCHEDULE ASSUMPTIONS:

- All transmission outages are subject to PJM and AEP Operations outage scheduling requirements.
- Significant scope of work changes will impact the schedule.
- The above schedule reflects only the work required to interconnect the AF2-132 project. The schedules regarding network upgrades associated with this project, if any, are detailed in the documentation related to the specific network upgrade.

- Slippage by the Project Developer in executing the Generation Interconnection Agreement (GIA) does not equate to a "day for day" slippage in the scheduled back feed and in service dates. Depending on the time of year, planned outages, neighboring projects and maintenance of the grid, outage availability has the potential to shift by weeks or months depending on conditions at the time of the fully executed agreement.

8.3 ESTIMATE ASSUMPTIONS:

- Estimates provided are based on a table-top process without the benefit of the results of site-specific engineering studies (e.g., soil borings, environmental survey, ground grid, etc.), unless otherwise provided by the Project Developer.

8.4 OPTION TO BUILD ASSUMPTIONS:

- The Project Developer will use firms from the AEP approved list that have experience in the transmission region where the POI is located.
- The Project Developer follows the requirements specified in "Independent Power Producers Option to Build Guidelines"(Rev. 4, dated December 11, 2023), available at:

<https://www.aep.com/requiredpostings/AEPTransmissionStudies>

9. METERING REQUIREMENTS

All metering needed for this interconnection project must meet the metering requirements stated in Appendix 2, section 8 of the AF2-132 GIA, and in PJM Manuals M01 and M14D. The details of applicable metering requirements are provided in the "Connection Requirements for the AEP Transmission System" (Rev. 5, dated December 31, 2023) document, found at:

<https://www.aep.com/requiredpostings/AEPTransmissionStudies>

The primary and backup metering will be installed on the Transmission Owner side of the Point of Change in Ownership and will be owned and maintained by the Transmission Owner.

Any additional generation proposed behind an originating project's PCO that differs in either fuel type or corporate entity from the originating project will require the installation of additional submetering for both the originating project and the uprate for the purpose of settlement. Submetering will require additional space within the originating project's facilities. The meters, routers, Ethernet to fiber converters, and telecom switch will be procured and owned by AEP. The revenue quality instrument transformers, fiber-optic cable connecting the submeters, and any other additional hardware for the required submetering will be procured, installed, owned, and maintained by the Project Developer.

10. LAND REQUIREMENTS FOR INTERCONNECTION SUBSTATION

Land requirements for the Interconnection Substation needed for this interconnection project must meet the requirements set forth in "Standards and Expectations for Siting, Real Estate, Right-of-Way, and Environmental Permitting for Transmission Interconnection Projects," Version 3 dated

October 31, 2022 at <https://www.aep.com/requiredpostings/AEPTransmissionStudies> posted on AEP website.

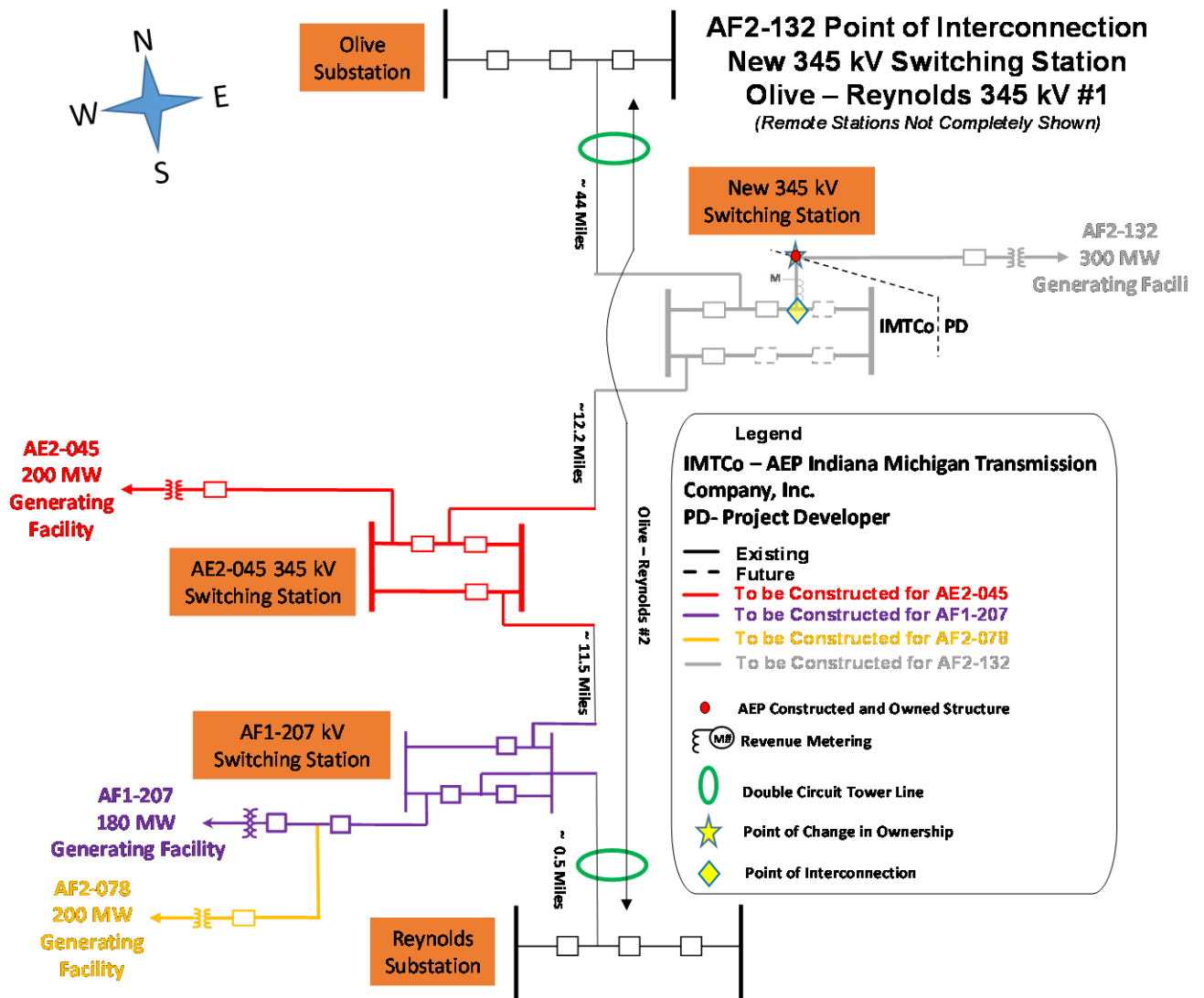
The land footprint required for a typical 345 kV interconnection station is 520' x 230', not accounting for additional retention/detention ponds that may be required. This area is subject to change as result of the detailed engineering processes that take place after interconnection agreement execution.

11. ENVIRONMENTAL AND PERMITTING

The Project Developer is expected to obtain, at its cost, all necessary permits and provisions for the facilities to be constructed for this interconnection. AEP requires that the standards provided in the "Standards and Expectations for Siting, Real Estate, Right-Of-Way, and Environmental Permitting for Transmission Interconnection Projects", Version 3 dated October 31, 2022 found at: <https://www.aep.com/requiredpostings/AEPTransmissionStudies> be adhered to for all facilities interconnecting with the AEP transmission system.

C APPENDICES

Attachment #1: Single line Diagram for the Physical Interconnection



Attachment #2: POI Map

