Generation Interconnection
Facilities Study Report
For
Queue Project AB1-087
Sullivan 345 kV
Sullivan County, Indiana
575 MW Energy / 550 MW Capacity

February 2022

1 Facilities Study Summary

1.1 Project Description

The Interconnection Customer, Invenergy Thermal Development LLC (Invenergy), proposes to install PJM project AB1-087, a 575 MW (550 MW Capacity) Combined Cycle Natural Gas Fired generating facility in Sullivan County, Indiana (Figure 2). The Point of Interconnection (POI) for the generating facility will be a direct connection to the Sullivan 345 kV Station.

1.2 Amendments/Changes to the Impact Study Report

The AB1-087 System Impact Study report was revised to include the results of the Dynamic Simulation Analysis.

1.3 Interconnection Customer Schedule

PJM and AEP understand that the Interconnection Customer has requested the following schedule dates:

Receive back feed power from AEP: October 2023

Generation Commercial Operation Date: June 2024

Acknowledgment of the Interconnection Customer's requested back feed and commercial operation dates does not imply AEP's commitment to or guarantee of these dates.

1.4 AEP's Scope of Work to Facilitate Interconnection

- AEP's Sullivan 345 kV Station will be expanded by installing a new circuit breaker string internal to the 345 kV station assembly and two (2) new 345 kV circuit breakers in the new string. Invenergy requested this interconnection scheme, versus an available single breaker alternative, to facilitate coordination with Invenergy's subsequently proposed AC2-157 generation project also connecting to the Sullivan 345 kV Station.
- Associated protection and control equipment, line risers, switches, jumpers, SCADA, and 345 kV revenue metering will also be installed at the Sullivan 345 kV Station. AEP reserves the right to specify the final acceptable configuration considering design practices, future expansion, and compliance requirements.
- AEP will extend two (2) spans of 345 kV transmission line for the generation lead going to the AB1-087 site. AEP will build and own the first two (2) three pole dead-end transmission line structures outside of the Sullivan 345 kV Station fence. The AEP and AB1-087 transmission line conductors will attach to the final structure.
- Two (2) diverse fiber paths to the AB1-087 collector station are required. AEP will extend two (2) fiber-optic cables from the Sullivan 345 kV Station control house to the POI. The Interconnection Customer will be responsible for the fiber work on the IPP side of the POI.
- It is understood that the Interconnection Customer is responsible for all of the connection costs associated with interconnecting the PJM project AB1-087 to the AEP transmission system. The cost of the Interconnection Customer's generating facility is not included in this report. Those costs are assumed to be the Interconnection Customer's responsibility.

- AEP will install one (1) custom dead end structure in the existing Sullivan - West Casey 345 kV ROW, raising the circuit to accommodate the generation lead line crossing.
- AEP will install one (1) custom dead end structure in the existing Sullivan -Petersburg 345 kV ROW, raising the circuit to accommodate the generation lead line crossing.

1.5 Description of Transmission Owner Facilities Included in the Facilities Study

1.5.1 Direct Connection Work

- No Direct Connection work will be required for this project.

1.5.2 Non-Direct Connection Work

- AEP will install two (2) additional 345 kV circuit breakers and one line connection point for AB1-087 at the Sullivan 345 kV Station.
- AEP will install associated line protection and control equipment, line risers, switches, jumpers, and SCADA at the Sullivan 345 kV Station.
- AEP will review the protection and control settings at the Sullivan 345 kV Station and adjust as needed.
- AEP will install one (1) custom dead end structure in the existing Sullivan - West Casey 345 kV ROW, raising the circuit to accommodate the generation lead line crossing.
- AEP will install one (1) custom dead end structure in the existing Sullivan -Petersburg 345 kV ROW, raising the circuit to accommodate the generation lead line crossing.

1.5.3 Attachment Facilities Work

- Two (2) diverse fiber-optic paths to the AB1-087 collector station are required. AEP will extend two (2) fiber-optic cables from the Sullivan 345 kV Station control house to the POI. The Interconnection Customer will be responsible for the fiber work on the IPP side of the POI.
- AEP will install 345 kV revenue metering at the Sullivan 345 kV Station.
- AEP will extend two (2) spans of 345 kV transmission line for the generation lead going to the AB1-087 site. AEP will build and own the first two (2) three pole dead-end transmission line structures outside of the Sullivan 345 kV Station fence. The AEP and AB1-087 transmission line conductors will attach to the final AEP-owned structure.

1.5.4 Network Upgrade Work

Due to system overloads found during the PJM studies, the following network reinforcements are required:

- None

1.6 Total Cost of Transmission Owner Facilities Included in the Facilities Study:

Attachment Facilities	$2,726,064.99
Direct Connection Facilities	$0.00
Non-Direct Connection Facilities	$4,798,364.02
Network Upgrade Facilities	$0.00
Total Cost	$7,524,429.01

The estimates do not include the impact that delays in obtaining ROW, permits, or other approvals may have.

1.7 Summary of Schedule Milestones for Completion of Transmission Owner Work Included in Facilities Study:

Standard Process: Typical Schedule for Scope Indicated

Task	Dates***
Engineering Start	Day 1*
Material Ordered	Day 132
Construction Start (Grading & Below Grade)	Day 314
Construction Start (Above Grade)	Day 314
Outage Requests Made By	Day 93
Outage (Structure Foundations)**	Starts Day 314
Outage (Cut-in & Testing)**	Starts Day 382
Ready For Back Feed (TO In-Service Date)	Day 420

***Day 1 occurs on the first working day after the ISA/ICSA have been fully executed or a mutually agreed upon start date that is later and meets the requested back feed date.**
****Scheduled Outages are contingent upon outage availability. Longer duration outages are not available during peak load periods.**
*****Significant scope of work changes will impact the above schedule.**

Assumptions

- **Slippage by the customer / developer in executing the ISA and ICSA agreement 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.**
- **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 Interconnection Customer.**
- **System conditions must allow scheduled outages to occur.**
- **All transmission outages are subject to PJM and AEP Operations outage scheduling requirements.**
- **The Interconnection Customer will provide any required additional easements to all facilities and structures.**

- **The Interconnection Customer will have their construction and required checkout completed prior to the start of the interconnection to the Sullivan 345 kV Station and any required testing outages.**
- **P&C coordination with the Interconnection Customer will be required throughout the project. The Functional Scope requires the interconnection customer to install an AEP-compatible line relaying protection panel at the collector station using AEP standards to ensure satisfactory relaying coordination and adequate line protection.**
- **AEP assumes that the Interconnection Customer will install their own RTU and will connect their RTU to AEP's RTU serially via fiber-optic cable.**
- **AEP protection and control engineering has scoped free standing metering CT's 2000/5 with RF 1.5 for adequate metering accuracy. This limits the Sullivan Interconnection Customer's circuit rating to 1790 MVA.**

2 Transmission Owner Facilities Study Results

2.1 Transmission Lines - New

- AEP will extend two (2) spans of 345 kV transmission line for the generation lead going to the AB1-087 site. AEP will build and own the first two (2) three pole dead-end transmission line structures outside of the Sullivan 345 kV Station fence. The AEP and AB1-087 transmission line conductors will attach to the final AEP-owned structure.
- AEP will install one (1) custom dead end structure in the existing Sullivan - West Casey 345 kV ROW, raising the circuit to accommodate the generation lead line crossing.
- AEP will install one (1) custom dead end structure in the existing Sullivan -Petersburg 345 kV ROW, raising the circuit to accommodate the generation lead line crossing.

2.2 Transmission Line - Upgrades

- No transmission line upgrades will be required for this project.

2.3 Station Facilities - New

- No new station facilities will be required for this project.

2.4 Station Facilities - Upgrades

- AEP will expand the existing Sullivan 345 kV Station to facilitate the connection of the generation lead going to the PJM project AB1-087 by installing a new circuit breaker string and two (2) additional circuit breaker(s) in the new circuit breaker string.
- Installation of associated protection and control equipment, line risers, switches, jumpers, SCADA, and 345 kV revenue metering will be required at the Sullivan 345 kV 345 kV Station. AEP reserves the right to specify the final acceptable configuration considering design practices, future expansion, and compliance requirements.
- The protective relay-settings for the remainder of the Sullivan 345 kV Station will have to be reviewed and updated (as needed) to account for the addition of the AB1-087 generation source.

2.5 Metering & Communications

Standard 345 kV metering will be installed at the Sullivan 345 kV Station. A standard station communication scheme will be used. All metering equipment shall meet the requirements as specified by AEP in the 'AEP Metering and Telemetering Requirements for AEP Transmission Customers' document (SS-490011). Communication requirements are published in the 'AEP SCADA RTU Requirements at Transmission Interconnection Facilities' (SS-500000).

Two (2) diverse fiber-optic paths to the AB1-087 collector station are required. AEP will extend two (2) fiber-optic cables from the Sullivan 345 kV Station control house to the POI. The Interconnection Customer will be responsible for the fiber work on the IPP side of the POI.

The Generation Interconnection Agreement does not in or by itself establish a requirement for American Electric Power to provide power for consumption at the developer's facilities. A separate agreement must be reached with the local utility that provides service in the area to ensure that infrastructure is in place to meet this demand and proper metering equipment is installed. The metering work described above and the cost estimates indicated below do not include any potential work or cost to address metering requirements of the local service provider. It is the responsibility of the developer to contact the local service provider to obtain a local service agreement. This is required prior to energization.

2.6 Environmental, Real Estate, and Permitting Issues

The Interconnection customer is expected to obtain, at its cost, all necessary permits and provisions for the IPP station connecting to the Sullivan 345 kV Station.

2.7 System Modeling and Operating Requirements

In addition to the IPP modeling requirements imposed by PJM as part of the Generation Interconnection process, the following system modeling parameters are required to be supplied by the Interconnection Customer to AEP:

- Modeling parameters are required as outlined in the 'Connection Requirements for the AEP Transmission System.' These requirements can be accessed at: https://aep.com/requiredpostings/AEPTransmissionStudies

2.8 Summary of Results of Study

Task	Network Upgrade Number	Engineering	Material	Construction	Other	TOTAL
Install two (2) breakers, a new breaker string, and associated equipment at Sullivan 345 kV	**n6037.1**	$308,161.00	$1,362,457.00	$1,272,150.00	$631,874.00	$3,574,642.00
Install 345 kV revenue metering at Sullivan	**NA**	$140,913.00	$191,217.00	$240,629.00	$139,200.00	$711,959.00
Install two (2), three pole, dead-end structures for the generation lead circuit.	**NA**	$151,346.00	$709,225.00	$682,930.00	$198,812.00	$1,742,313.00
Install dual direct fiber relaying routes from the Sullivan 345 kV station to the second structure on the generation lead circuit	**NA**	$28,576.33	$45,048.33	$158,979.34	$39,189.00	$271,793.00
Install one (1) custom dead-end structure to raise the Sullivan - West Casey 345 kV circuit	**n6037.2**	$66,423.67	$249,708.67	$211,719.66	$84,009.00	$611,861.00
Install one (1) custom dead-end structure to raise the Sullivan - Petersburg 345 kV circuit	**n6037.3**	$66,423.67	$249,708.67	$211,719.66	$84,009.00	$611,861.00
TOTAL		$761,843.67	$2,807,364.67	$2,778,127.67	$1,177,093.00	**$7,524,429.00**

2.9 Information Required for Interconnection Service Agreement

Description	DCF Facility	NUF Facility	ATF Facility	TOTAL
Direct Material	$0.00	$1,861,874.34	$945,490.33	$2,807,364.67
Direct Labor	$0.00	$2,136,597.68	$1,403,373.66	$3,539,971.33
Indirect Material	$0.00	$372,031.64	$145,488.79	$517,520.43
Indirect Labor	$0.00	$427,860.36	$231,712.21	$659,572.57
TOTAL	$0.00	$4,798,364.02	$2,726,064.99	**$7,524,429.00**

Figure 1: POI One-Line Diagram

The Point of Interconnection (POI) is the second structure in the generation lead circuit outside of AEP's Sullivan 345 kV Station fence. The Interconnected Transmission Owner (AEP) will own the spans from the Sullivan 345 kV Station to the second AEP constructed and owned dead end structure, including the jumpers. The Interconnection Customer, Invenergy Thermal Development LLC (Invenergy), will own the other span connecting to the POI structure from the Collector Substation side, the 345 kV generator lead transmission line, and associated remaining structures back to the AB1-087 generation Collector Substation.

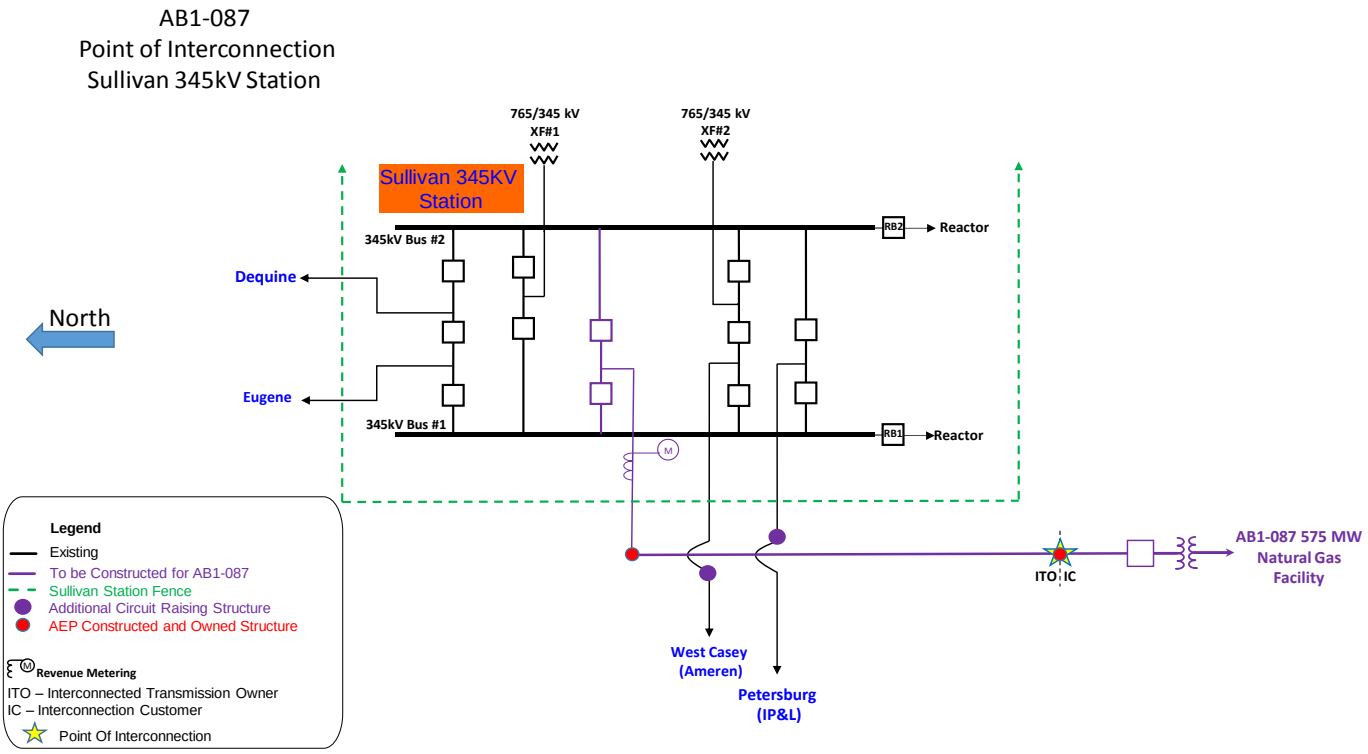

Figure 2: POI Map