# Generation Interconnection

# Feasibility Study Report

# for

# Queue Project AF2-018

# INEZ 138 KV

# 133.9 MW Capacity / 200 MW Energy

July 2020

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# 1 Introduction

This Feasibility Study has been prepared in accordance with the PJM Open Access Transmission Tariff, 36.2, as well as the Feasibility Study Agreement between the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is AEP.

# 2 Preface

The intent of the feasibility study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. Cost allocation rules for network upgrades can be found in PJM Manual 14A, Attachment B. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

An Interconnection Customer with a proposed new Customer 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 Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

## 3 General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Martin County, Kentucky. The installed facilities will have a total capability of 200 MW with 133.9 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is December 01, 2023. This study does not imply a TO commitment to this in-service date.

| **Queue Number** | **AF2-018** |
|---|---|
| **Project Name** | INEZ 138 KV |
| **State** | Kentucky |
| **County** | Martin |
| **Transmission Owner** | AEP |
| **MFO** | 200 |
| **MWE** | 200 |
| **MWC** | 133.9 |
| **Fuel** | Solar |
| **Basecase Study Year** | 2023 |

Any new service customers who can feasibly be commercially operable prior to June 1st of the basecase study year are required to request interim deliverability analysis.

## 4 Point of Interconnection

AF2-018 will interconnect with the AEP transmission system via a direct connection to the Inez 138 kV station.

To accommodate the interconnection at the Inez 138 kV substation, the substation will have to be expanded requiring the installation of one (1) 138 kV circuit breaker (see Figure 1). Installation of associated protection and control equipment, 138 kV line risers, SCADA, and 138 kV revenue metering will also be required.

Installation of the generator lead first span exiting the POI station, including the first structure outside the AEP fence, will also be included in AEP's scope. In the case where the generator lead is a single span, the structure in the customer station will be the customer's responsibility.

## 5 Cost Summary

The AF2-018 project will be responsible for the following costs:

| Description | Total Cost |
|---|---|
| **Total Physical Interconnection Costs** | $1,464,000 |
| **Total System Network Upgrade Costs** | $0 |
| **Total Costs** | $1,464,000 |

The estimates provided in this report are preliminary in nature, as they were determined without the benefit of detailed engineering studies. Final estimates will require an onsite review and coordination to determine final construction requirements. In addition, Stability analysis will be completed during the Facilities Study stage. It is possible that a need for additional upgrades could be identified by these studies.

This cost excludes a Federal Income Tax Gross Up charges. 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 charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

# 6 Transmission Owner Scope of Work

The total physical interconnection costs is given in the tables below:

## 6.1 Attachment Facilities

The total preliminary cost estimate for the Attachment work is given in the table below.  These costs do not include CIAC Tax Gross-up.

| Description | Total Cost |
|---|---|
| 138 kV Revenue Metering | $376,000 |
| Generator lead first span exiting the POI station, including the first structure outside the fence | $400,000 |
| **Total Attachment Facility Costs** | $776,000 |

## 6.2 Direct Connection Cost Estimate

The total preliminary cost estimate for the Direct Connection work is given in the table below.  These costs do not include CIAC Tax Gross-up.

| Description | Total Cost |
|---|---|
| Installation of one (1) circuit breaker and associated protection and control equipment, 138 kV line risers, and SCADA equipment | $643,000 |
| **Total Direct Connection Facility Costs** | $643,000 |

## 6.3 Non-Direct Connection Cost Estimate

The total preliminary cost estimate for the Non-Direct Connection work is given in the table below.  These costs do not include CIAC Tax Gross-up.

| Description | Total Cost |
|---|---|
| Upgrade Line Protections & Controls at the Inez 138 kV Substation | $45,000 |
| **Total Non-Direct Connection Facility Costs** | $45,000 |

# 7 Incremental Capacity Transfer Rights (ICTRs)

None

# 8 Interconnection Customer Requirements

It is understood that the Interconnection Customer (IC) is responsible for all costs associated with this interconnection. The costs above are reimbursable to the Transmission Owner. The cost of the IC's generating plant and the costs for the line connecting the generating plant to the Point of Interconnection are not included in this report; these are assumed to be the IC's responsibility.

The Generation Interconnection Agreement does not in or by itself establish a requirement for the Transmission Owner to provide power for consumption at the developer's facilities. A separate agreement may 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. It is the responsibility of the developer to contact the local service provider to determine if a local service agreement is required.

1. An Interconnection Customer entering the New Services Queue on or after October 1, 2012 with a proposed new Customer 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.

2. The Interconnection Customer may be required to install and/or pay for metering as necessary to properly track real time output of the facility as well as installing metering which shall be used for billing purposes. See Section 8 of Appendix 2 to the Interconnection Service Agreement as well as Section 4 of PJM Manual 14D for additional information.

# 9 Revenue Metering and SCADA Requirements

## 9.1 PJM Requirements

The Interconnection Customer will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Section 8 of Attachment O.

## 9.2 Meteorological Data Reporting Requirements

Solar generation facilities shall provide the Transmission Provider with site-specific meteorological data including:

- Back Panel temperature (Fahrenheit)
- Irradiance (Watts/meter$^2$)
- Ambient air temperature (Fahrenheit) – (Accepted, not required)
- Wind speed (meters/second) – (Accepted, not required)

- Wind direction (decimal degrees from true north) – (Accepted, not required)

## 9.3 Interconnected Transmission Owner Requirements

The IC will be required to comply with all Interconnected Transmission Owner's revenue metering requirements for generation interconnection customers located at the following link:

http://www.pjm.com/planning/design-engineering/to-tech-standards/

## 10 Summer Peak - Load Flow Analysis

The Queue Project AF2-018 was evaluated as a 200.0 MW (Capacity 133.9 MW) injection at the Inez 138 kV substation in the AEP area. Project AF2-018 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-018 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

## 10.1 Generation Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

None

## 10.2 Multiple Facility Contingency

(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies for the full energy output)

None

## 10.3 Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

None

## 10.4 Potential Congestion due to Local Energy Deliverability

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.

None

## 10.5 System Reinforcements - Summer Peak Load Flow

None

# 11 Light Load Analysis

*Light Load Studies (As applicable)*

Not applicable

# 12 Short Circuit Analysis

The following Breakers are overdutied:

To be determined during later study phases.

# 13 Stability and Reactive Power Assessment

*(Summary of the VAR requirements based upon the results of the dynamic studies)*

To be determined during later study phases.

# 14 Affected Systems

## 14.1 TVA

TVA Impacts to be determined during later study phases (as applicable).

## 14.2 Duke Energy Progress

Duke Energy Progress Impacts to be determined during later study phases (as applicable).

## 14.3 MISO

MISO Impacts to be determined during later study phases (as applicable).

## 14.4 LG&E

LG&E Impacts to be determined during later study phases (as applicable).