

***Generation Interconnection  
Feasibility Study Report***

***For***

***PJM Generation Interconnection Request  
Queue Position AD1-130***

***Hardin Switch 345 kV***

**May 2018**

## 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. 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.

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.

## General

The Interconnection Customer (IC) proposes to install PJM Project #AD1-130, a 170.0 MW (115.0 MW Capacity) solar generating facility in Hardin County, OH. The point of interconnection for the generating facility will be to interconnect to the proposed Hardin Switch 345 kV switching station connecting to AEP's East Lima – Marysville 345 kV line being built for PJM Project #U2-041 (See Figure 1).

The requested in service date is December 31, 2019.

## Attachment Facilities

### Point of Interconnection (Hardin Switch 345 kV)

To be constructed by PJM Project #U2-041.

**Note:** It is assumed that the 345 kV revenue metering and gen lead installed for #U2-041 will be adequate for the additional generation.

## Interconnection Customer Requirements

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 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.

### Requirement from the PJM Open Access Transmission Tariff:

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.

# Revenue Metering and SCADA Requirements

## 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 Sections 24.1 and 24.2.

## AEP Requirements

The Interconnection Customer will be required to comply with all AEP Revenue Metering Requirements for Generation Interconnection Customers. The Revenue Metering Requirements may be found within the "Requirements for Connection of New Facilities or Changes to Existing Facilities Connected to the AEP Transmission System" document located at the following link:

<http://www.pjm.com/~media/planning/plan-standards/private-aep/aep-interconnection-requirements.ashx>

## Network Impacts

The Queue Project AD1-130 was evaluated as a 170.0 MW (Capacity 115.0 MW) injection to the U2-041 345kV switching station in the AEP area. Project AD1-130 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD1-130 was studied with a commercial probability of 53%. Potential network impacts were as follows:

## Summer Peak Analysis – 2021

## Contingency Descriptions

The following contingencies resulted in overloads:

Contingency Name	Description
AEP_P1-2_#6497	CONTINGENCY 'AEP_P1-2_#6497' OPEN BRANCH FROM BUS 242939 TO BUS 247540 CKT 1 / 242939 05MARYSV 345 247506 U2-072 C 345 1 END
AEP_P1-2_#6496	CONTINGENCY 'AEP_P1-2_#6496' OPEN BRANCH FROM BUS 242935 TO BUS 247506 CKT 1 / 242935 05E LIMA 345 247506 U2-041 C 345 1 END

**Table 1**

## **Generator Deliverability**

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

None

## **Multiple Facility Contingency**

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

None

## **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

## **Steady-State Voltage Requirements**

None

## **Short Circuit**

*(Summary of impacted circuit breakers)*

New circuit breakers found to be over-duty:

None

## **Affected System Analysis & Mitigation**

### **LGEE Impacts:**

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

### **MISO Impacts:**

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

### **Duke, Progress & TVA Impacts:**

Duke Carolina, Progress, & TVA Impacts to be determined during later study phases (as applicable).

### **OVEC Impacts:**

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

## **Delivery of Energy Portion of Interconnection Request**

*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.*

Contingency				Bus		Loading		Rating				
#	Type	Name	Affected Area	Facility Description	From	To	PF	Initial	Final	Type	MVA	MW Con.
1	N-1	AEP_P1-2_#6497	AEP - AEP	U2-041 C-05ELIMA 345 kV line	247506	242935	DC	88.99	107.93	NR	897	169.96
2	N-1	AEP_P1-2_#6496	AEP-AEP	U2-072 C-05MARYSV 345 kV line	247540	242939	DC	88.99	107.93	NR	897	169.96

**Table 2**

### **System Reinforcements**

None

### **Schedule**

It is anticipated that the time between receipt of executed agreements and Commercial Operation may range from 12 to 18 months if no line work is required. If line work is required, construction time would be between 24 to 36 months after signing an interconnection agreement.

**Note:** The time provided between anticipated normal completion of System Impact, Facilities Studies, subsequent execution of ISA and ICSA documents, and the proposed Backfeed Date is shorter than usual and may be difficult to achieve.

### **Conclusion**

Based upon the results of this Feasibility Study, the construction of the IC's 170.0 MW (115.0 MW Capacity) solar generating facility (PJM Project #AD1-130) will not require additional interconnection charges.

**Figure 1: Point of Interconnection (Hardin Switch 345 kV)**

**Single-Line Diagram**

