



**Generation Interconnection  
Feasibility Study Report  
for  
Queue Project AF1-285  
GUNN ROAD 345 KV  
56 MW Capacity / 100 MW Energy**

January, 2020

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## 1 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.

The Interconnection Customer seeking to interconnect a wind or solar generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per Schedule H to the Interconnection Service Agreement and Section 8 of Manual 14D.

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.

## 2 General

The Interconnection Customer (IC) has proposed a Solar and Storage facility located in Hardin County, Ohio. The AF1-285 installed facilities will have a capability of 100 MW with 56 MW of this output being recognized by PJM as capacity.

Note that this project is an increase to the Interconnection Customer's AE2-306 project, which will share the same main transformer, generator lead and connection point. The AE2-306 queue position requests connection of 30 MW (18 MW capacity) so the combination of the two queue positions will result in an MFO of 130 MW and recognition of 74 MW as capacity.

The proposed in-service date for this project is 8/1/2021. This study does not imply a TO commitment to this in-service date.

The conduct of light load analysis as required under the PJM planning process is not performed during the Generation Interconnection Feasibility Study phase of the PJM study process. Additional reinforcement requirements for this Interconnection Request may be defined during the conduct of the light load analysis which shall be performed following execution of the System Impact Study agreement.

Queue Number	AF1-285
Project Name	GUNN ROAD 345 KV
State	Ohio
County	Hardin
Transmission Owner	AEP
MFO	130
MWE	100
MWC	56
Fuel	Solar; Storage
Basecase Study Year	2023

## 2.1 Point of Interconnection

AF1-285 will interconnect with the AEP transmission system via a direct connection to the Gunn Road 345 kV station (see Figure 1). AF1-285 will be sharing the GSU and gen-tie of the AE2-306 project, with both utilizing the Interconnection station built for U2-072 (see Figure 2).

Note: It is assumed that the 345 kV revenue metering system, gen lead and Protection & Control Equipment that will be installed for AE2-306 will be adequate for the additional solar and storage facility connection requested in AF1-285. Depending on the timing of the completion of the AF1-285 interconnection construction relative to the AE2-306 completion, there may (or may not) be a need to review and revise relay settings for the increased generation of AF1-285.

## 2.2 Cost Summary

The AF1-285 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	\$0
Direct Connection Network Upgrade	\$0
Non Direct Connection Network Upgrades	\$0
Total Costs	\$0

In addition, the AF1-285 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	\$0

Cost allocations for these upgrades will be provided in the System Impact Study Report.

### 3 Transmission Owner Scope of Work

#### 4 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
Total Attachment Facility Costs	\$0

#### 5 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
Total Direct Connection Facility Costs	\$0

#### 6 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
Total Non-Direct Connection Facility Costs	\$0

## 7 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 generally be between 24 to 36 months after Agreement execution.

## 8 Interconnection Customer Requirements

It is understood that the Interconnection Customer is responsible for all costs associated with this interconnection. The costs above are reimbursable to AEP. The cost of the Interconnection Customer's generating plant and the costs for the line connecting the generating plant to the Gunn Road 345 kV station are not included in this report; these are assumed to be the Interconnection Customer's responsibility.

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.

In addition, if the Interconnection Customer considers use of the Option to Build, they should consult the guidance AEP has posted at:

<https://www.aep.com/assets/docs/requiredpostings/TransmissionStudies/docs/2019/MerchantGenerationGuidelinesPJMOptiontoBuild.pdf>

## 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 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>

## 10 Network Impacts

The Queue Project AF1-285 was evaluated as a 100.0 MW (Capacity 56.0 MW) injection at Gunn Road 345 kV substation in the AEP area. Project AF1-285 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-285 was studied with a commercial probability of 0.53. Potential network impacts were as follows:



## Summer Peak Load Flow

## 11 Generation Deliverability

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

None

## 12 Multiple Facility Contingency

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

None

## 13 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

## 14 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.

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC/D C	MW IMPACT
43599417	242935	05E LIMA	345.0	AEP	242945	05SW LIM	345.0	AEP	1	AEP_P1-2_#11144	operation	971.0	97.18	100.19	DC	29.15
43599322	243902	05HARDI N SS	345.0	AEP	242935	05E LIMA	345.0	AEP	1	AEP_P1-2_#11144	operation	1151.0	115.93	124.62	DC	100.0
43599323	243902	05HARDI N SS	345.0	AEP	242935	05E LIMA	345.0	AEP	1	Base Case	operation	897.0	110.17	115.49	DC	47.66
43599317	243903	05GUNN RD SS	345.0	AEP	242939	05MARYS V	345.0	AEP	1	AEP_P1-2_#6496	operation	1151.0	115.93	124.62	DC	100.0

## 15 Flow Gate Details

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact. It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

## Affected Systems

## **16 Affected Systems**

### **16.1 LG&E**

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

### **16.2 MISO**

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

### **16.3 TVA**

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

### **16.4 Duke Energy Progress**

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

### **16.5 NYISO**

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

Contingency Name	Contingency Definition
Base Case	
AEP_P1-2_#11144	CONTINGENCY 'AEP_P1-2_#11144' OPEN BRANCH FROM BUS 243903 TO BUS 242939 CKT 1 / 243903 05GUNN RD SS 345 242939 05MARYSV 345 1 END
AEP_P1-2_#6496	CONTINGENCY 'AEP_P1-2_#6496' OPEN BRANCH FROM BUS 242935 TO BUS 243902 CKT 1 / 242935 05E LIMA 345 243902 05HARDIN SS 345 1 END

## Short Circuit

## 17 Short Circuit

The following Breakers are overduty

Bus Number	Bus Name	BREAKER	Type	Capacity (Amps)	Duty Percentage Post Queue	Duty Percentage Pre Queue