Generation Interconnection
Feasibility Study Report

For

PJM Generation Interconnection Request Queue
Position AA1-130

St. Clair 13 kV

July 2015

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.

© PJM Interconnection 2015. All rights reserved.

General

Interconnection Customer proposes to interconnect a Natural Gas Generation Plant at their facilities normally connected to AEP's St. Clair 13.2 kV substation (see Figure 1). The generator capability and requested PJM injection rights are 7.5MW (gross), 5.0 MW (Energy) and 3.0 MW (Capacity.) The location of the generating facility is in Columbus, OH (see Figure 2).

The requested in service date is November 1, 2015.

The objective of this Feasibility study is to determine budgetary cost estimates and approximate construction timelines for identified transmission facilities required to connect the proposed generating facilities to the AEP Transmission System. These reinforcements include the Attachment Facilities, Local Upgrades, and Network Upgrades required to maintain the reliability of the AEP Transmission System. Stability analysis is not included as part of this study.

Attachment Facilities

Attachment Facilities are provided by AEP Distribution at the end of this report in Attachment 1.

Revenue Metering and SCADA Requirements

For PJM: IC 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.

Network Impacts

The Queue Project AA1-130 was studied as a 5.0 MW (Capacity 3.0 MW) injection at the St. Clair 13 kV substation in the AEP area. Project AA1-130 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AA1-130 was studied with a commercial probability of 100%. Potential network impacts were as follows:

Summer Peak Analysis - 2018

Generator Deliverability

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

None

© PJM Interconnection 2015. All rights reserved.

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

(Results of the steady-state voltage studies should be inserted here)

To be determined

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.
Only the most severely overloaded conditions are listed. 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 will study all overload conditions associated with the overloaded element(s) identified.

None

Short Circuit

(Summary of impacted circuit breakers)

PJM has completed the short circuit analysis of the AA1-130 queue project St. Clair 13 kV. PJM analysis found one breaker to be over duty in the AEP transmission area. The breaker is listed in **Table 1** below:

© PJM Interconnection 2015. All rights reserved.

Table 1. Overdutied Breakers						
Bus NO	**BUS**	**BREAKER**	**Duty % with AA1-130**	**Duty % without AA1-130**	**Duty % Difference**	**Notes**
0	05CORRID 138 kV	106N	100.02%	99.95%	0.07%	New Overduty

The following upgrades listed in **Table 2** will mitigate the overdutied breakers listed above:

Table 2. AEP Breaker Replacement Cost Estimate	
Description	**Total Cost**
Replace overdutied 138 kV breaker 106N at Corridor Substation	$500,000
Total	**$ 500,000**

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, i.e. "Network Impacts", initially caused by the addition of this project generation)

None

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)

None

Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of the surrounding generation. Any potential 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 Transmission Interconnection request.

Note: Only the most severely overloaded conditions are listed. 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 analyzes all overload conditions associated with the overloaded element(s) identified. As a result of the aggregate energy resources in the area, the following violations were identified.

As a result of the aggregate energy resources in the area, no violations were identified.

© PJM Interconnection 2015. All rights reserved.

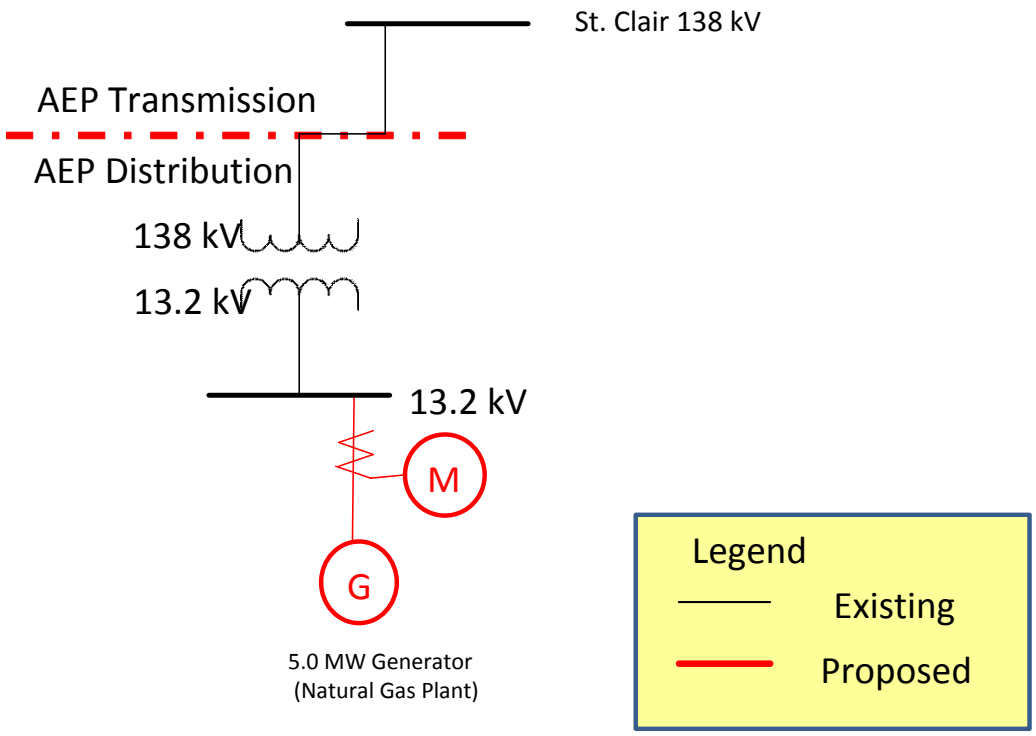

Figure 1 – Single Line Diagram

© PJM Interconnection 2015. All rights reserved.

System Protection

The Generator responsibilities include providing adequate protection to AEP facilities due to events arising from the operation of the Generator under all AEP distribution system and Generator operating conditions. The Generator is responsible for protecting their own facility under all AEP distribution system operating conditions whether the Generator is connected to AEP facilities or not including but not limited to:

1. Abnormal voltage or frequency
2. Loss of a single phase of supply
3. Equipment failure
4. Distribution system faults
5. Lightning
6. Excessive harmonic voltages
7. Excessive negative sequence voltages
8. Separation from supply
9. Loss of synchronization

IEEE Standard 1547-2003 "Standard for Interconnecting Distributed Resources with Electric Power Systems" is the basis for interconnection technical requirements for system protection.

The interconnection system hardware and software used by a Distributed Resource to meet the technical requirements do not have to be located at the Point of Common Coupling. However, the technical requirements shall be met at the Point of Common Coupling. For additional information on interconnection technical requirements please refer to the AEP Interconnection Guide and IEEE 1547-2003.

The cost of any damage resulting from a system condition caused by the installation and/or operation of the DG will be borne by the owner of the DG facility.

Abnormal distribution system events will be addressed on an individual basis through the AEP system operator. Corrective action shall be based on the judgment of the AEP system operator. Possible corrective action can include but is not limited to DG isolation from the distribution system.

This review has been limited to items which may affect the AEP system or to suggestions which may improve operations. The Generator must take all necessary steps to assure compliance with all laws, ordinances, building codes and other applicable regulations. Approval of this connection by AEP, when granted, is not an endorsement of a particular design nor does it assure fitness to accomplish an intended function.

Any additional AEP work to mitigate power quality issues not foreseen by this study but associated with the interconnection will be at the sole cost and expense of the Generator.

© PJM Interconnection 2015. All rights reserved.

Generator Requirements for Interconnection

Cost to the Generator

As a convenience to the customer, a conceptual estimate for distribution system facilities to serve Abbott Labs facilities is approximately $300,000.00. Federal Gross-Up Tax, at the applicable rate, must be added to the total cost of the improvements.

Cost Estimate

The estimate is based upon AEP Ohio installing equipment for SCADA to the existing two primary meters. Each primary meter is considered the point of common coupling (PCC).

Distribution Line

The SCADA connection will cost approximately $79,000. The installation of the fiber optic conductor from the station to the PCC will cost approximately $53,000 in labor and $26,000 in material.

Distribution Station

The station work consists of installing 1- single phase 13 kV potential device and replacement of F-6407 relaying controls. Transformer overcurrent protection and control settings will be revised along with F-6407 and F-220. Distribution station work will cost approximately $185,000 in labor and $36,000 in material for a total of $221,000.

Total Estimated Cost without Federal Gross-Up Tax

$300,000.00

© PJM Interconnection 2015. All rights reserved.