# *PJM Generator Interconnection Request*
# *Queue AB2-067*
# *Kammer-Vassell 765 kV*
# *Feasibility Study Report*

**August 2016**

## 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 an 1100.0 MW (1100.0 MW Capacity) 2x1 Combined Cycle Natural Gas generating facility in Guernsey County, OH (see Figure 2). The generating facility will interconnect to a newly proposed three (3) circuit breaker 765 kV switching station connecting to AEP's Kammer – Vassell 765 kV line (See Figure 1).

The requested Backfeed date is September 1, 2019.
The requested in-service date is September 1, 2020.

## Attachment Facilities

### Point of Interconnection (Kammer – Vassell 765 kV Line)

To accommodate the interconnection on the Kammer – Vassell 765 kV line a new three (3) circuit breaker 765 kV switching station physically configured in a breaker and half bus arrangement but operated as a ring-bus will be constructed 40 miles east of the Kammer 765 kV substation (see Figure 1). Installation of associated protection and control equipment, 765 kV line risers, SCADA, and 765 kV revenue metering will also be required. The new interconnection switching station will be expandable to accommodate future projects in the area.

## New Switching Station Work and Cost:

- Construct a new three (3) breaker 765 kV switching station physically configured in a breaker and half bus arrangement but operated as a ring-bus. Installation of associated protection and control equipment, 765 kV line risers, SCADA, and 765 kV revenue metering will also be required.
- **Estimated Station Cost: $30,000,000**

## Protection and Relay Work and Cost:

- Install line protection and controls at the new 765 kV switching station.
- **Estimated Cost: $2,000,000**
- Upgrade line protection and controls at the Kammer 765 kV substation to coordinate with the new 765 kV switching station.
- **Estimated Cost: $1,000,000**
- Upgrade line protection and controls at the Vassell 765 kV substation to coordinate with the new 765 kV switching station.
- **Estimated Cost: $1,000,000**

IC  is expected to obtain, at its cost, a 1200' x 500' station site for the new 765 kV switching station and all necessary permits. Ownership of the new 765 kV switching station and associated equipment shall be transferred from IC  to AEP upon successful completion of the required work.

A 765 kV line extension is required to loop through the proposed 765 kV switching station. The proposed 765 kV switching station is assumed to be located immediately adjacent to the existing transmission lines. A supplemental line easement for the tap structures will be required. It is expected that IC will obtain the supplemental easement when the station property is purchased.

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

**Local and Network Impacts**

The impact of the proposed generating facility on the AEP System was assessed for adherence with applicable reliability criteria.  AEP planning criteria require that the transmission system meet performance parameters prescribed in the AEP FERC Form 715[1] and Connection Requirements for AEP Transmission System[2].  Therefore, these criteria were used to assess the impact of the proposed facility on the AEP System. The Queue Project AB2-067 was evaluated as an 1100.0 MW (Capacity 1100.0 MW) injection on Kammer – Vassell 765 kV line in the AEP area.  Project AB2-067 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AB2-067 was studied with a commercial probability of 53%.

# Potential network impacts were as follows:

# Summer Peak Analysis - 2020

1 https://www.aep.com/about/codeofconduct/OASIS/TransmissionStudies/GuideLines/AEP_East_FERC_715_2016_Final_Part_4.pdf

2 https://www.aep.com/about/codeofconduct/OASIS/TransmissionStudies/Requirements/AEP_Interconnection_Requirements_rev1.pdf

**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

**Short Circuit**
*(Summary of impacted circuit breakers)*

- The 138 kV Circuit Breaker J1 at the South Canton 138 kV substation was found to be over-duty. Duty percent without AB2-067 is 99.90%, duty percent with AB2-067 is 100.07%.

**Stability Analysis**

To be determined in the System Impact Study

**Voltage Variations**

None

**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.

Not Applicable
**Additional Limitations of Concern**

None

**Local/Network Upgrades**

- Replace circuit breaker J1 at the South Canton 138 kV substation with an 80kA breaker.
- **Estimated Cost: $800,000**

**Schedule**

It is anticipated that the time between receipt of executed agreements and Commercial Operation may range from 18 to 24 months if no line work is required. If line work is required, construction time would be between 36 to 48 months after signing an interconnection agreement.

**Conclusion**

Based upon the results of this Feasibility Study, the construction of the 1100.0 MW (1100.0 MW Capacity) natural gas generating facility of IC (PJM Project #AB2-067) will require the following additional interconnection charges. This plan of service will interconnect the proposed generating facility in a manner that will provide operational reliability and flexibility to both the AEP system and the IC generating facility.

**Estimated Cost for the new 765 kV Switching Station: 30,000,000**
**Estimated Protection and Relay Cost: $4,000,000**
**Estimated Local/Network Upgrade Cost: $800,000**

**Total Estimated Cost for Project AB2-067: $34,800,000**

The estimates are preliminary in nature, as they were determined without the benefit of detailed engineering studies. Final estimates will require an on-site review and coordination to determine final construction requirements.

**Additional Interconnection Customer Responsibilities:**

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.

3. The Interconnection Customer seeking to interconnect a wind generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per item 5.iv. of Schedule H to the Interconnection Service Agreement.