Generation Interconnection Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position AC1-044

Kammer-Vassell 765 kV

March 2017

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 utilizes manufacturer models to ensure the performance of turbines is properly captured during the simulations performed for stability verification. Turbine manufacturers provide such models to their customers. The list of manufacturer models PJM has already validated is contained in Attachment G-2 of Manual 14A. Manufacturer models may be updated from time to time, for various reasons such as to reflect changes to the control systems or to more accurately represent the capabilities turbines and controls which are currently available in the field. Additionally, as new turbine models are developed, turbine manufacturers provide such new models which must be used in the conduct of these studies. PJM needs adequate time to evaluate the new models in order to reduce delays to the System Impact Study process timeline for the Interconnection Customer as well as other Interconnection Customers in the study group. Therefore, PJM will require that any Interconnection Customer with a new manufacturer model must supply that model to PJM, along with a $10,000 fully refundable deposit, no later than three (3) months prior to the starting date of the System Impact Study (See Section 2.2.2. of Manual 14A for starting dates) for the Interconnection Request which shall specify the use of the new model. The Interconnection Customer will be required to submit a completed dynamic model study request form (Attachment G-1 of Manual 14A) in order to document the request for the study.

General

The Interconnection Customer (IC) proposes to increase the generation of its previous PJM Project #AB2-067, an 1100.0 MW (1100.0 MW Capacity) natural gas generating facility by 550.0 MW (550.0 MW Capacity) in The IC, Ohio (see Figure 2). The primary point of interconnection is to AEP's Kammer – Vassell 765 kV line (see Figure 1). Both projects will be known as the "The IC Power Station" and are summarized in the table below:

	AB2-067	**AC1-044**
Plant Configuration	1 x 1 CC	1 x 1 CC
Maximum Facility Output (MW)	1,100	550
Capacity (MW)	1,100	550
Planned Backfeed	September 1, 2019	September 1, 2019
Planned In-Service	September 1, 2020	September 1, 2020

Table 1

Attachment Facilities

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

PJM Project AB2-067 will pay for the necessary direct connection work required. Project AC1-044 will share the same Generator lead to the new 765 kV interconnection switching station being constructed by Project AB2-067.

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

Interconnection Customer Requirements

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 AC1-044 was evaluated as a 550.0 MW (Capacity 550.0 MW) injection tapping the Kammer-Vassell 765kV line (AB2-067 Tap) substation in the AEP area. Project AC1-044 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AC1-044 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Base Case Used

Summer Peak Analysis – 2020 Case

Contingency Descriptions

The following contingencies resulted in overloads:

None

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

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

None

Short Circuit

(Summary of impacted circuit breakers)

New circuit breakers found to be over-duty:

#	Over-Duty Circuit Breaker	Duty Percent with AC1-044	Duty Percent without AC1-044	Duty Percent Difference
#1	South Canton 138 kV Circuit Breaker L	100.07%	99.98%	**0.09%**
#2	South Canton 138 kV Circuit Breaker L2	100.07%	99.98%	**0.09%**

Table 2

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.

Not Applicable

New System Reinforcements

#	Over-Duty Circuit Breaker	Upgrade Description	Schedule	Estimated Cost
#1	South Canton 138 kV Circuit Breaker L	Replace 63kA Circuit Breaker with 80kA Circuit Breaker	An approximate construction time would be 12 to 18 months after signing an interconnection agreement.	**$800,000**
#2	South Canton 138 kV Circuit Breaker L2	Replace 63kA Circuit Breaker with 80kA Circuit Breaker	An approximate construction time would be 12 to 18 months after signing an interconnection agreement.	**$800,000**
			Total New Network Upgrades	**$1,600,000**

Table 3

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.

Conclusion

Based upon the results of this Feasibility Study, the increase of 550.0 MW (PJM Project #AC1-044) generation to The IC Power Station's previous request (PJM Project #AB2-067) will require the following additional interconnection charges.

Cost Breakdown for Primary Point of Interconnection (Kammer-Vassell 765 kV Line)		
Attachment Cost	PJM Project AB2-067 will pay for the necessary direct connection work required. Project AC1-044 will share the same Generator lead to the new 765 kV interconnection switching station being constructed for Project AB2-067.	
Non-Direct Connection Cost Estimate	765 kV Revenue Metering may need to be upgraded for the additional generation	**$100,000**
	Replace the South Canton 138 kV Circuit Breaker L	**$800,000**
	Replace the South Canton 138 kV Circuit Breaker L2	**$800,000**
	Total Estimated Cost for Project AC1-044	**$1,700,000**

Table 4

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.

Figure 1: Primary Point of Interconnection (Kammer - Vassell 765 kV Line)

Single-Line Diagram

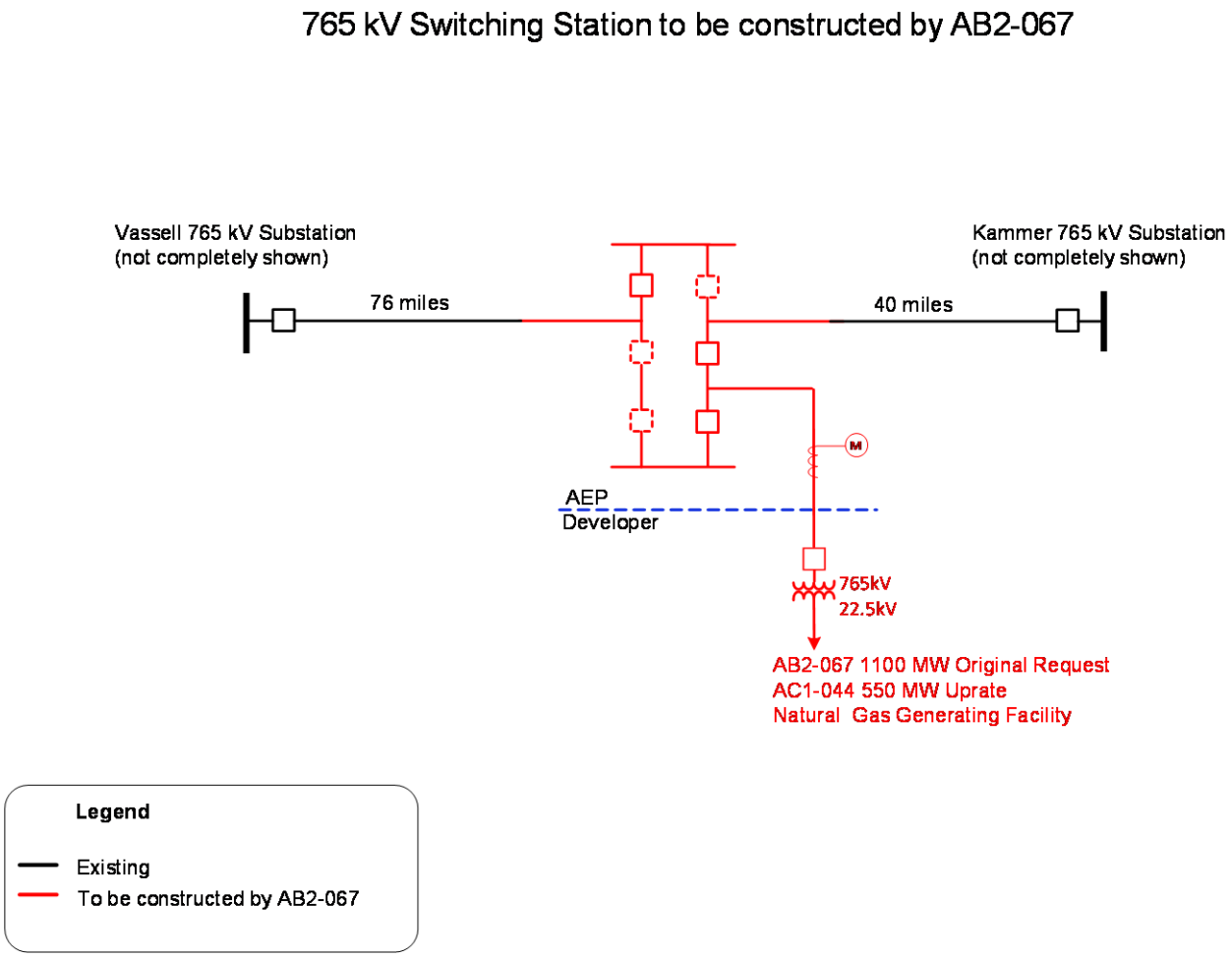

Figure 2: Primary Point of Interconnection (Kammer – Vassell 765 kV Line)