Generation Interconnection Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position AA2-186

Forest 69 kV

October 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.

General

The Interconnection Customer (IC) proposes to interconnect a 20 MW Energy Storage project utilizing battery technology to the American Electric Power (AEP) transmission facility. The primary point of interconnection request is a direct connection to Forest 69/12 kV substation (Figures 1&2). The plant, PJM #AA2-186, consists of a group of battery banks utilizing a 11 x 1.8 MW convertor connected to a parallel group of 11 x 2000 kVA transformers (see Figure 1). Project AA2-186 was studied as a +/- 20 MW (0 MW Capacity) injection at the Forest 69/12 kV substation.

The requested in service date is December 1, 2016.

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

Point of Interconnection (Forest 69/12 kV Substation):

Direct connection of PJM project #AA2-186 to the Forest 69 kV transmission station will require the following minimum work.

Station Cost:

Installation of 69 kV circuit breaker, protection scheme, SCADA system, revenue metering, and associated equipment. Estimated cost: $500,000. The customer is responsible for construction of the lead between their facility and the last structure outside the AEP Forest station. It should be noted that the only open position in the 69 kV portion of the Forest station is located on the east side of the station. To avoid additional costs to relocate existing AEP facilities, the lead from the customer facility will need to approach the station from the east side of County Road 215.

Transmission Line Cost:

None anticipated

Additional Limitations of Concern

None

Conclusion

Based upon the results of this Feasibility Study, the injection of a +/- 20 MW (0 MW Capacity) injection, PJM project #AA2-186, at Forest 69/12 kV transmission facility will require the following interconnection charges.

The Cost for the Primary Point of Interconnection (Forest 69/12 kV Substation):

- Estimated Station cost: $500,000
- Estimated local/network upgrade cost: N/A

Total estimated preliminary cost for project AA2-186: $500,000

Local and Network Impacts

The impact of the proposed generating facility on the AEP Transmission 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 criterion were used to assess the impact of the proposed facility on the AEP System. The IC's project AA2-186 was studied as a +/- 20 MW (0 MW capacity) injection at the Forest 69/12 kV substation consistent with the interconnection application. Project #AA2-186 was evaluated for compliance with reliability criteria for summer peak conditions in 2019.

Potential network impacts were as follows:

Normal System (2019 Summer Conditions Capacity Output)

- No problems identified

Single Contingency (2019 Summer Conditions Capacity Output)

- No problems identified

Multiple Contingency (2019 Summer Conditions Capacity Output)

- Not Applicable

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1 http://www.aep.com/about/codeofconduct/OASIS/TransmissionStudies/GuideLines/2015_AEP_PJM_FERC_715_Final_Part_4.pdf

2 http://www.aep.com/about/codeofconduct/OASIS/TransmissionStudies/Requirements/AEP_Interconnection_Requirements_Rev1.pdf

Contribution to Previously Identified Overloads (2019 Summer Conditions Capacity Output)

- Not Applicable

Normal Sytem (2019 Summer Conditions Full Output)

- No problems identified

Single Contingency (2019 Summer Conditions Full Output)

- No problems identified

Multiple Contingency (2019 Summer Conditions Full Output)

- No problems identified

Contribution to Previously Identified Overloads (2019 Summer Conditions Full Output)

- No problems identified

Short Circuit Analysis

- No Problem identified

Stability Analysis

- Stability studies were not performed as part of this Feasibility Study. The stability assessments will be performed during the System Impact Study.

Voltage Variations

Preliminary analysis indicates that the intended participation in the PJM Ancillary Services Market, which potentially will require the project to rapidly move from maximum charging load to maximum discharge injection and back again, may cause unacceptable levels of voltage flicker. Flicker performance requirements are included in the previously referenced "Connection Requirements for AEP Transmission System". Possible remedies include imposing constraints on the operating range and/or rate of change, and/or providing voltage regulating capability, Mitigating steps will be studied in the System Impact Study.

Additional Limitations of Concern

- None

Local/Network Upgrades

- None necessary

Figure 1. Single Line Diagram

Figure 2. Project Location