Generation Interconnection
Feasibility Study Report

For

PJM Generation Interconnection Request Queue
Position AA1-118

Picway-Madison 69 kV

May 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 proposes to interconnect a 20 MW Energy Storage project utilizing battery technology to a new in-line 69 kV switching station. The new 69 kV switching station will be connected to Picway – Madison 69 kV line (see Figure 1). The location of the new switching station will be approximately 1 mile from Picway 69 kV station (see Figure 1). The proposed PJM queue #AA1-118 project will consist of 11–1.8 MW Battery units with corresponding inverters and transformers. Project AA1-118 was studied as a 20 MW (0 MW Capacity) injection into Picway – Madison 69 kV line. The location of the proposed generating facility is in Pickaway County, Ohio (see Figure 2).

The requested in service date is June 01, 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

A new in-line 69 kV switching station will be constructed approximately 1 mile from the Picway 69 kV station on the Picway - Madison 69 kV line in Pickaway County, Ohio. This new station is to consist of three 69 kV circuit breakers physically configured in a breaker and half bus arrangement but operated as a ring-bus (Figure 1). The interconnection station will be expandable to accommodate future projects in the area. The station will also include 69 kV metering, SCADA, and associated equipment. Protection relays in the remote terminals (stations) need to be upgraded to coordinate with the addition of the new generation station.

Interconnection Customer is expected to obtain, at its cost, a station site for the AEP facilities and all necessary permits. Ownership of the in-line switching facility and associated equipment shall be transferred from Interconnection Customer to AEP upon successful completion of the required work.

A 69 kV line extension is required to loop through the proposed in-line switching station. The proposed switching station is assumed to be located immediately adjacent to the existing transmission lines. A supplemental line easement for the tap poles will be required. It is expected that Interconnection Customer will obtain the supplemental easement when the station property is purchased.

There are plans to convert the Picway – Madison 69 kV line to 138 kV in the future. To be prepared for this future conversion Interconnection Customer will have to construct the new in-line 69 kV switching station to 138 kV standards.

The following work is required to connect Project AA1-118 to the Picway – Madison 69 kV line:

Station Cost:

- Construct a new three (3) breaker 69 kV switching station laid out in a breaker and half arrangement including associated disconnect switches, bus work, SCADA and 69 kV revenue metering.
- **Estimated Station Cost: $3,500,000**

Protection and Relaying Cost:

- Line protection and controls will need to be installed at the new 69 kV switching station. Estimated Cost: $600,000
- Line protection and controls at the Picway 69 kV Substation will need to be upgraded to coordinate with the new 69 kV switching station. Estimated Cost: $300,000
- Line protection and controls at the Madison 69 kV Substation will need to be upgraded to coordinate with the new 69 kV switching station. Estimated Cost: $300,000
- **Estimated Protection and Relaying Cost: $1,200,000**

It is understood that Interconnection Customeris responsible for all these connection costs associated with interconnecting the PJM project AA1-118 to AEP transmission system. The above costs are reimbursable to AEP. The cost of the battery storage plant and the costs for the line connecting the battery storage plant to the new proposed in-line switching station are not included in this report; these costs are assumed to be the responsibility of Interconnection Customer

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 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

[1] https://www.aep.com/about/codeofconduct/oasis/transmissionstudies/GuideLines/2014%20AEP%20PJM%20FERC%20715_Final_Part%204.pdf

Requirements for AEP Transmission System[2]. Therefore, these criterion were used to assess the impact of the proposed facility on the AEP System. PJM Queue # AA1-118 was studied as a 20 MW (0 MW capacity) injection to AEP system consistent with the interconnection application. PJM Project AA1-118 was evaluated for compliance with reliability criteria for summer peak conditions in 2018.

Potential network impacts were as follows:

Normal System (2018 Summer Conditions Capacity Output)

- Not Applicable

Single Contingency (2018 Summer Conditions Capacity Output)

- Not Applicable

Multiple Contingency (2018 Summer Conditions Capacity Output)

- Not Applicable

Contribution to Previously Identified Overloads (2018 Summer Conditions Capacity Output)

- Not Applicable

Normal System (2018 Summer Conditions Full Output)

- No problems identified

Single Contingency (2018 Summer Conditions Full Output)

- No problems identified

Multiple Contingency (2018 Summer Conditions Full Output)

- No problems identified

Contribution to Previously Identified Overloads (2018 Summer Conditions Full Output)

- No problems identified

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

Short Circuit Analysis

- No problems identified

Stability Analysis

- Not required

Voltage Variations

- No problems identified

Additional Limitations of Concern

- None

Local/Network Upgrades

- None

Schedule

It is anticipated that the time between receipt of executed agreements and Commercial Operation may range from 24 to 36 months.

Conclusion

Based upon the results of this Feasibility Study, the construction of the 20 MW battery storage facility PJM Project #AA1-118, will require the following additional interconnection charges. This plan of service will interconnect the proposed battery storage facility in a manner that will provide operational reliability and flexibility to both the AEP system and the Interconnection Customer's battery storage facility.

Estimated Interconnection Cost: $3,500,000

Estimated Protection and Relaying Cost: $1,200,000

Total Estimated Cost for Project AA1-118: $4,700,000

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.

Figure 1: PJM Queue #AA1 - 118 POI

(Tapped off between Madison – Picway 69 kV Line*

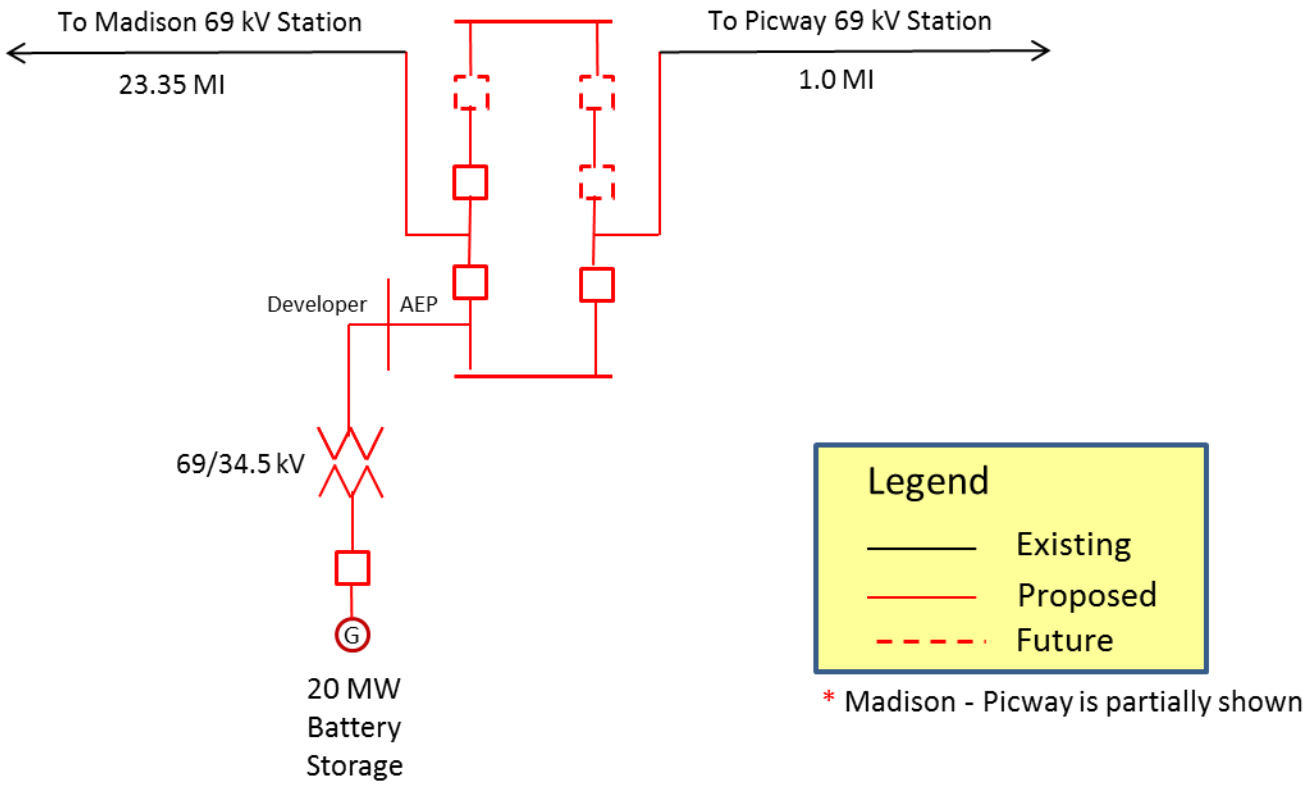

Figure 2: PJM Queue #AA1 - 118 POI

(Tapped off Madison - Picway 69 kV Line)