Generation Interconnection System Impact Study Report

For

PJM Generation Interconnection Request Queue Position AB2-016

Maddox Creek 345 kV

February 2018

Preface

The intent of the System Impact Study is to determine a plan, with approximate cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by the Interconnection Customer. 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. All facilities required for interconnection of a generation interconnection project must be designed to meet the technical specifications (on PJM web site) for the appropriate transmission owner.

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 or merchant transmission upgrade, 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 System Impact Study is performed.

The System Impact 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

Heartland Wind, LLC proposes to install a 100 MW (13 MW Capacity) wind generating facility adjacent to the existing Blue Creek wind farm in Van Wert County Ohio. The generating facility will consist of fifty (50) Gamesa 2 MW wind turbine generators connected to the existing Blue Creek customer owned generator collector station via a 345 kV generator lead to AEP's Maddox Creek 345 kV substation (see Figure 1).

Note: This project is a reduced version of the S72 project which previously planned to connect to the Maddox Creek 345 kV substation. S72 project was withdrawn from the PJM queue in 2015.

Proposed Backfeed Date: September 30, 2019.

Proposed COD Date: December 31, 2019.

The objective of this System Impact 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 included as part of this study.

Attachment Facilities

Point of Interconnection (Maddox Creek 345 kV substation)

To accommodate the interconnection at the Maddox Creek 345 kV substation an additional 345 kV circuit breaker and associated protection and control equipment will be installed. Installation of associated 345 kV line risers, SCADA, and 345 kV revenue metering will also be required (see Figure 1).

Direct Connection Work and Cost:

- Install a new 345 kV circuit breaker and associated bus work including SCADA and 345 kV revenue metering.
- **Estimated Station Cost: $2,500,000 (Network Upgrade n5415)**

Protection and Relay Work and Cost:

- Upgrade line protection and controls at the Maddox Creek 345 kV substation.
- **Estimated Cost: $600,000 (Network Upgrade n5416)**
- Adjust relay settings at the RP Mone 345 kV substation.
- **Estimated Cost: $25,000 (Network Upgrade n5531)**
- Adjust relay settings at the East Lima 345 kV substation.
- **Estimated Cost: $25,000 (Network Upgrade n5532)**

Local and Network Impacts

The impact of the proposed wind 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 AB2-016 was evaluated as a 100.0 MW (Capacity 13.0 MW) injection into the Maddox 345 kV substation in the AEP area. Project AB2-016 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AB2-016 was studied with a commercial probability of 100%. Potential network impacts were as follows:

Summer Peak Analysis - 2020

Normal System (2020 Summer Conditions Capacity Output)

No problems identified

Single Contingency (2020 Summer Conditions Capacity Output)

No problems identified

Multiple Contingency (2020 Summer Conditions Capacity Output)

No problems identified

Contribution to Previously Identified Overloads (2020 Summer Conditions Capacity Output)

No problems identified

Normal System (2020 Summer Conditions Full Output)

No problems identified

Single Contingency (2020 Summer Conditions Full Output)

No problems identified

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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

Multiple Contingency (2020 Summer Conditions Full Output)

No problems identified

Contribution to Previously Identified Overloads (2020 Summer Conditions Energy Output)

No problems identified

Short Circuit Analysis

No new breakers found to be over-duty

Stability Analysis

No mitigations were found to be required

Voltage Variations

None

Additional Limitations of Concern

None

Light Load Analysis

No light load thermal impacts

System Reinforcements

None

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.

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.

Conclusion

Based upon the results of this System Impact Study, the construction of the100 MW (13 MW Capacity) wind generating facility of Heartland Wind (PJM Project #AB2-016) will require the following additional interconnection charges. This plan of service will interconnect the proposed wind generating facility in a manner that will provide operational reliability and flexibility to both the AEP system and the Heartland Wind generating facility.

Cost Breakdown for Point of Interconnection (Desoto – Fall Creek 345 kV)			
	Network Upgrade Number	**Description**	**Estimated Cost**
Non-Direct Connection Network Upgrade	**n5415**	Install a new 345 kV circuit breaker and associated bus work including SCADA and 345 kV revenue metering.	**$2,500,000**
	n5516	Upgrade line protection and controls at the Maddox Creek 345 kV substation	**$600,000**
	n5531	Adjust relay settings at the RP Mone 345 kV substation	**$25,000**
	n5532	Adjust relay settings at the East Lima 345 kV substation	**$25,000**
		Total Estimated Cost for Project AB2-016	**$3,150,000**

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: Single-Line Diagram

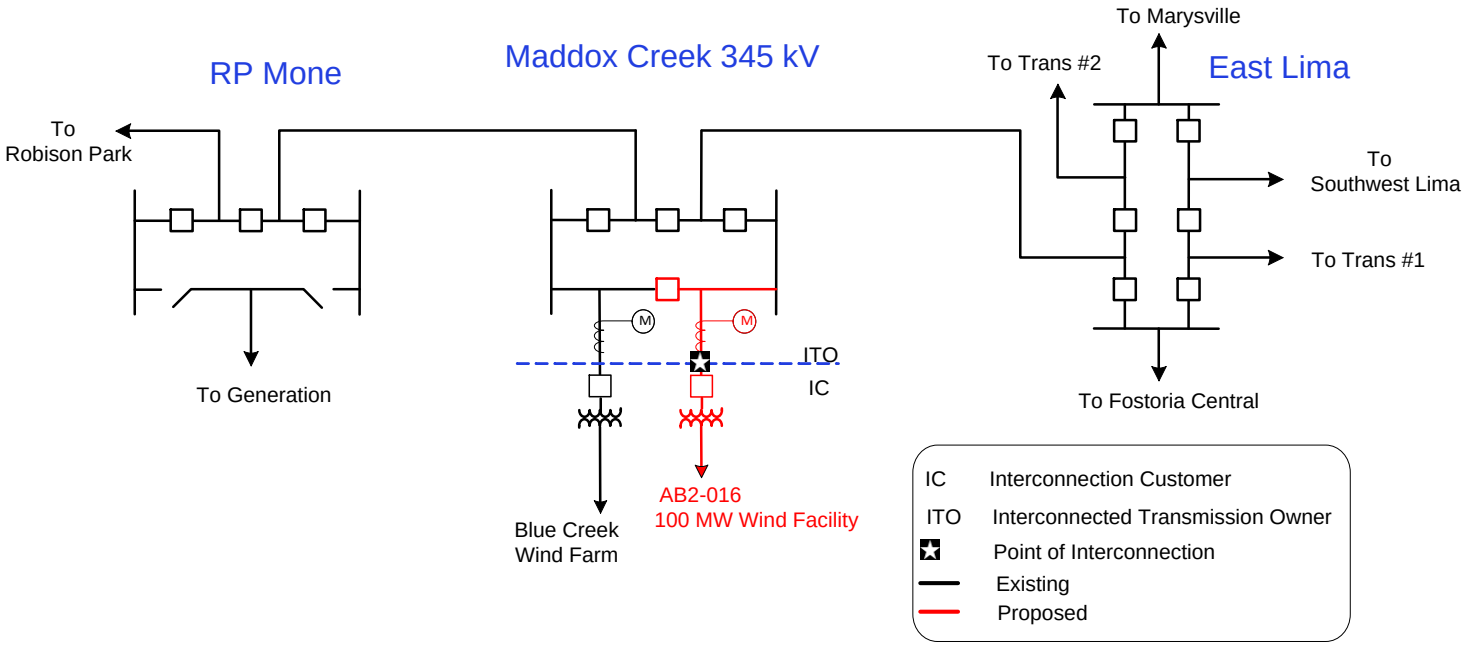

Figure 2: Point of Interconnection (Maddox Creek 345 kV Substation)

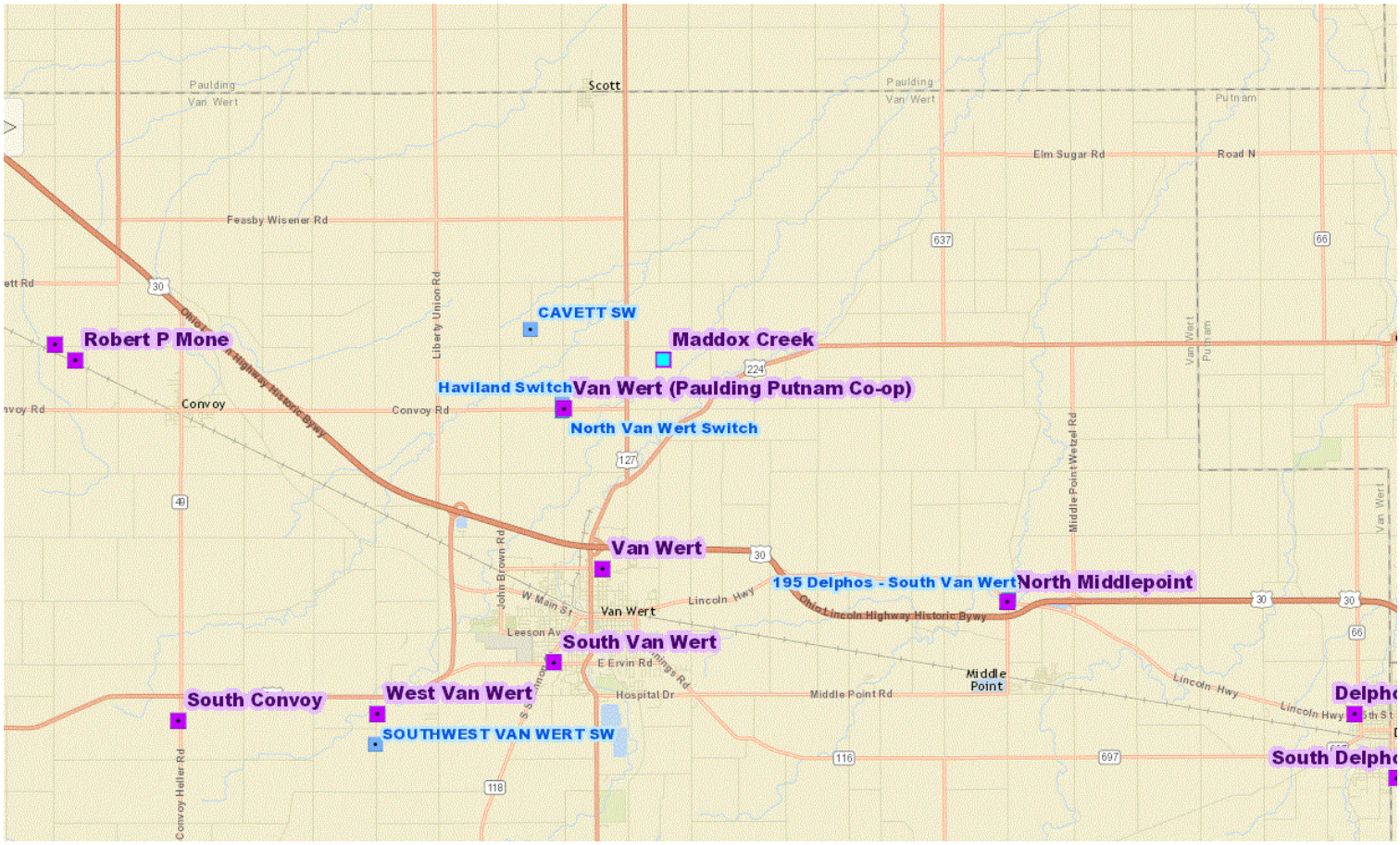

Figure 3: Customer Site Plan