

***PJM Generator Interconnection Request  
Queue AB2-028  
Fall Creek-Desoto 345 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 proposes to install a 200 MW (26 MW Capacity) wind generating facility near Middletown, Henry County, IN (see Figure 2). The generating facility will consist of one hundred (100) 2.0 MW Vesta wind turbine generators connected to a newly proposed three (3) breaker 345 kV switching station connecting to AEP's Desoto – Fall Creek 345 kV Transmission Line via a three mile generator lead (See Figure 1).

Proposed Backfeed Date: April 30, 2018.

Proposed COD Date: October 31, 2018.

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 (Desoto – Fall Creek 345 kV Line)**

To accommodate the interconnection on the Desoto – Fall Creek 345 kV line a new three (3) circuit breaker 345 kV switching station physically configured in a breaker and half bus arrangement but operated as a ring-bus will be constructed 7 miles east of the Fall Creek 345 kV substation (see Figure 1). Installation of associated protection and control equipment, 345 kV line risers, SCADA, and 345 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) circuit breaker 345 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, 345 kV line risers, SCADA, and 345 kV revenue metering will also be required.
- **Estimated Station Cost: \$12,500,000**

### **Protection and Relay Work and Cost:**

- Install line protection and controls at the new 345 kV switching station.
- **Estimated Cost: \$600,000**

- Upgrade line protection and controls at the Desoto 345 kV substation to coordinate with the new 345 kV switching station.
- **Estimated Cost: \$300,000**
- Upgrade line protection and controls at the Fall Creek 345 kV substation to coordinate with the new 345 kV switching station.
- **Estimated Cost: \$300,000**

The Interconnection Customer is expected to obtain, at its cost, an 800' x 300' station site for the AEP facilities and all necessary permits. Ownership of the new 345 kV switching station and associated equipment shall be transferred from The Interconnection Customer to AEP upon successful completion of the required work.

A 345 kV line extension is required to loop through the proposed 345 kV switching station. The proposed 345 kV 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 the Interconnection Customer will obtain the supplemental easement when the station property is purchased.

It is understood that the Interconnection Customer is responsible for all costs associated with this interconnection. The costs above are reimbursable to AEP. The cost of The Interconnection Customer's generating plant and the costs for the line connecting the generating plant to the Interconnection Customer's switching station are not included in this report; these are assumed to be the Interconnection Customer'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 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<sup>1</sup> and Connection Requirements for AEP Transmission System<sup>2</sup>. Therefore, these criteria were used to assess the impact of the proposed facility on the AEP System. PJM project AB2-028 was studied as a 200 MW (26 MW capacity) injection on the Desoto – Fall Creek 345 kV line in the AEP area consistent with the interconnection application.

<sup>1</sup>

[https://www.aep.com/about/codeofconduct/OASIS/TransmissionStudies/GuideLines/AEP\\_East\\_FERC\\_715\\_2016\\_Final\\_Part\\_4.pdf](https://www.aep.com/about/codeofconduct/OASIS/TransmissionStudies/GuideLines/AEP_East_FERC_715_2016_Final_Part_4.pdf)

<sup>2</sup>

[https://www.aep.com/about/codeofconduct/OASIS/TransmissionStudies/Requirements/AEP\\_Interconnection\\_Requirements\\_rev1.pdf](https://www.aep.com/about/codeofconduct/OASIS/TransmissionStudies/Requirements/AEP_Interconnection_Requirements_rev1.pdf)

Project AB2-028 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners) for summer peak conditions in 2020. Project AB2-028 was studied with a commercial probability of 53%.

## **Potential network impacts were as follows:**

### **Summer Peak Analysis - 2020**

#### **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 P at the Delaware 138 kV Substation was found to be over-duty. Duty percent without AB2-028 is 99.73%, duty percent with AB2-028 is 100.1%.

#### **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.

1. (AEP - DEO&K) The 05TANNER-08M.FORT 345 kV line (from bus 243233 to bus 249567 ckt 1) loads from 108.4% to 109.35% (**DC power flow**) of its normal rating (1409 MVA) for the single line contingency outage of 'P1-#..B2 TERMINAL-EAST BEND 4516'. This project contributes approximately 29.81 MW to the thermal violation.

CONTINGENCY 'P1-#..B2 TERMINAL-EAST BEND 4516'  
OPEN BRANCH FROM BUS 249575 TO BUS 249565 CKT 1  
END

2. (OVEC - AEP) The 06KYGER-05SPORN 345 kV line (from bus 248005 to bus 242528 ckt 1) loads from 96.26% to 96.86% (**DC power flow**) of its normal rating (1017 MVA) for the single line contingency outage of '8468\_B2'. This project contributes approximately 13.48 MW to the thermal violation.

CONTINGENCY '8468\_B2'  
OPEN BRANCH FROM BUS 242528 TO BUS 248005 CKT 2 / 242528  
05SPORN 345 248005 06KYGER 345 2  
END

3. (OVEC - AEP) The 06KYGER-05SPORN 345 kV line (from bus 248005 to bus 242528 ckt 2) loads from 100.82% to 101.45% (**DC power flow**) of its normal rating (971 MVA) for the single line contingency outage of '349\_B2\_TOR21'. This project contributes approximately 13.48 MW to the thermal violation.

CONTINGENCY '349\_B2\_TOR21'  
OPEN BRANCH FROM BUS 242528 TO BUS 248005 CKT 1 / 242528  
05SPORN 345 248005 06KYGER 345 1  
END

4. (AEP - AEP) The AB2-028 TAP-05DESOTO 345 kV line (from bus 923880 to bus 243218 ckt 1) loads from 93.99% to 105.28% (**DC power flow**) of its normal rating (1016 MVA) for the single line contingency outage of '363\_B2\_TOR1682'. This project contributes approximately 114.74 MW to the thermal violation.

CONTINGENCY '363\_B2\_TOR1682'

OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1

/ 243208

05JEFRSO 765 243209 05ROCKPT 765 1

END

### **Additional Limitations of Concern**

None

### **Local/Network Upgrades**

- Replace circuit breaker P at the Delaware 138 kV substation.
- **Estimated Cost: \$800,000**

### **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. Note that the time between the Backfeed Date and Commercial Operation Date requested is longer than AEP has normally experienced for similar queue requests. Also, the time provided between anticipated normal completion of System Impact, Facilities Studies, subsequent execution of ISA and ICSA documents, and the proposed Backfeed Date is shorter than usual and may be difficult to achieve.

### **Conclusion**

Based upon the results of this Feasibility Study, the construction of the 200 MW (26 MW Capacity) wind generating facility of The Interconnection Customer (PJM Project #AB2-028) 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 the Interconnection Customer wind generating facility.

**Estimated 345 kV Switching Station Cost: 12,500,000**

**Estimated Protection and Relay Cost: \$1,200,000**

**Estimated Local/Network Upgrade Cost: \$800,000**

**Total Estimated Cost for Project AB2-028: \$14,500,000**

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.

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### **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.