Generation Interconnection System Impact Study Report

For

PJM Generation Interconnection Request Queue Position AC2-044

Maddox Creek 345 kV

February 2019

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 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

Aurora Solar, LLC proposes to install PJM Project #AC2-044, a 20.0 MW (7.6 MW Capacity) solar facility connecting to the Blue Creek Wind Farm collector station constructed by PJM Project #R60 which is connected to AEP's Maddox Creek 345 kV switching station in Van Wert County, Ohio (see Figure 1).

The requested in service date is December 31, 2018.

Attachment Facilities

Point of Interconnection (Blue Creek 34.5 kV Collector Station)

No additional attachment facilities are required to accommodate the interconnection of AC2-044 to the Blue Creek 34.5 kV collector station.

Interconnection Customer Requirements

It is understood that Aurora Solar is responsible for all costs associated with this interconnection. The cost of Aurora Solar's facility is not included in this report; these are assumed to be Aurora Solar'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.

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 AC2-044 was evaluated as a 20.0 MW (Capacity 7.6 MW) injection into the Blue Creek (Maddox Creek) 345 kV substation in the AEP area. Project AC2-044 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AC2-044 was studied with a commercial probability of 100%.

PJM has issued this System Impact Study without ICTR determinations. PJM will work with each customer to identify the Customer-Funded Upgrade(s) and LDAs (no more than three) for which the customer wants PJM to determine ICTRs. PJM will provide that determination as quickly as practicable following issuance of this System Impact Study.

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

Steady-State Voltage Requirements
(Results of the steady-state voltage studies should be inserted here)

None

Short Circuit
(Summary of impacted circuit breakers)

None

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

No mitigation required

Affected System Analysis & Mitigation

LGEE Impacts:

None

MISO Impacts:

None

Duke, Progress & TVA Impacts:

None

OVEC Impacts:

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 - AEP) The 05BLUECK 345/115 kV transformer (from bus 246931 to bus 246930 ckt 1) loads from 101.15% to 106.39% (AC power flow) of its normal rating (350 MVA) for non-contingency condition. This project contributes approximately 19.99 MW to the thermal violation. NOTE: While represented within the AEP Zone in power flow models, the Blue Creek 345/115 kV transformer is part of the Interconnection Customer Interconnection Facilities associated with the R60 queue position. Responsibility for determining its capability, and potential need for upgrade to accommodate the increased output associated with the AC2-044 queue position, rests with the owner.
2. In Addition to No. 1 above Aurora Solar, LLC will need to have a Shared Facilities Study Agreement (SFA) in place with R60 that describes each parties responsibilities for the shared interconnection facilities.

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)

None

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)
(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

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.

Note: 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 System Impact Study, the construction of the 20.0 MW (7.6 MW Capacity) solar facility of Aurora Solar (PJM Project #AC2-044) will not require additional interconnection charges. Note that the additional metering equipment required for the solar facility, since it will be located within the R60 facilities, will be provided by the customer.

Figure 1: Point of Interconnection (Blue Creek 34.5 kV Collector Station)

Single-Line Diagram

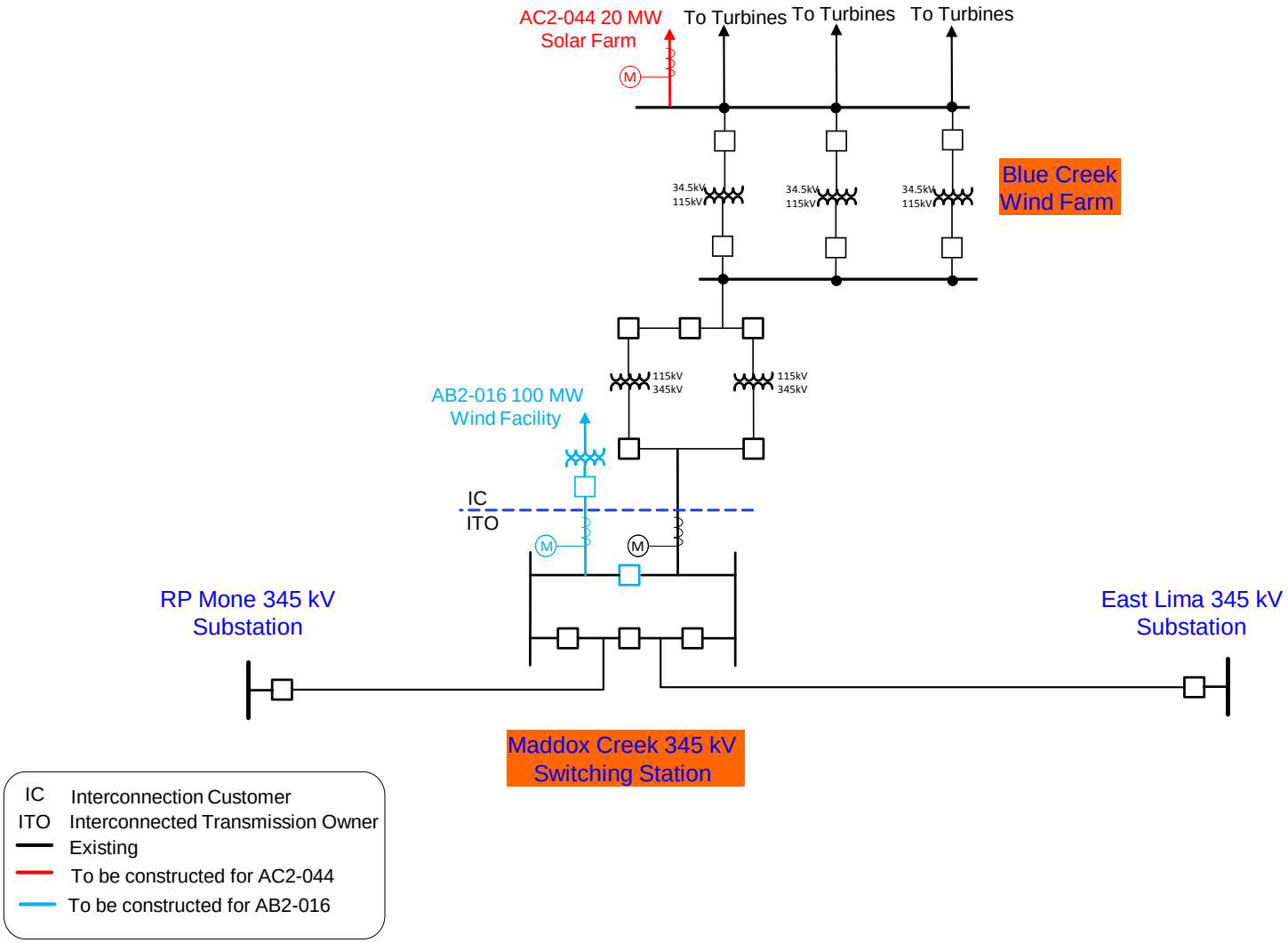

Figure 2: Point of Interconnection (Blue Creek 34.5 kV Collector Station)