Generation Interconnection System Impact Study Report

For

PJM Generation Interconnection Request Queue Position AC1-001

Delano 138 kV

January 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

Community Energy Solar, LLC (Community Energy) proposes to increase the generation of its previously proposed PJM queue position AB2-083 by 80.0 MW (54.4 MW Capacity) connecting to the Delano 138kV substation in Ross County, Ohio (see Figure 2).

The requested in service date is January 1, 2019.

Attachment Facilities

Point of Interconnection (Delano 138 kV Substation)

PJM Project AB2-083 will pay for the necessary direct connection work required. PJM project AC1-001 will be required to pay for the direct connection work if PJM project AB2-083 withdraws.

- Adjust relay settings at the Delano 138 kV substation
  - **Estimated Cost: $50,000 (Network Upgrade n5512)**

- Upgrade the 138 kV revenue meter if the installed meter for the AB2-083 is not adequate for the additional generation.
  - **Estimated Cost: $100,000 (Network Upgrade n5513)**

Note: The customer should review the capability of the lead from the point of ownership transition into the generating plant to ensure that it is sufficient to accommodate the increase generation output.

Note: An additional 138 kV circuit breaker is recommended to allow for breaker maintenance and inspections. Implicit in acceptance of a single breaker connection is an understanding that the project will be required to be out of service during periodic inspection or maintenance of the circuit breaker. The cost of the additional 138 kV circuit breaker will be approximately $500,000.

Interconnection Customer Requirements

It is understood that Community Energy is responsible for all costs associated with this interconnection. The costs above are reimbursable to AEP. The cost of Community Energy's generating plant and the costs for the line connecting the generating plant to Community Energy's switching station are not included in this report; these are assumed to be Community Energy'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 AC1-001 was evaluated as an 80.0 MW (Capacity 54.4 MW) injection into the Delano 138 kV substation in the AEP area. Project AC1-001 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AC1-001 was studied with a commercial probability of 100%. Potential network impacts were as follows:

Base Case Used

Summer Peak Analysis – 2020 Case

Contingency Descriptions

The following contingencies resulted in overloads:

None

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)

Note: Please see Appendices for projects providing impacts to flowgate violations. The values in the Reference column correspond to the proper table in the Appendix.

None

Steady-State Voltage Requirements

None

Short Circuit

(Summary of impacted circuit breakers)

New circuit breakers found to be over-duty:

None

Stability Analysis

No Mitigations identified in the System Impact Study

Affected System Analysis & Mitigation

LGEE Impacts:

None

MISO Impacts:

MISO Impacts to be determined during later study phases (as applicable).

Duke, Progress & TVA Impacts:

None

OVEC Impacts:

OVEC Impacts to be determined during later study phases (as applicable).

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.

Note: Only the most severely overloaded conditions are listed below. 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 shall study all overload conditions associated with the overloaded element(s) identified.

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.

Note: The time provided between anticipated normal completion of System Impact, Facilities Studies, subsequent execution of ISA and ICSA documents, and the proposed In-Service Date is shorter than usual and may be difficult to achieve.

Conclusion

Based upon the results of this System Impact Study, the increase of 80.0 MW (PJM Project #AC1-001) to the previous 40.0 MW solar generating request (PJM Project #AB2-083) will not require additional interconnection charges. PJM project AB2-083 will pay for the necessary direct connection work required. PJM project AC1-001 will be required to pay for the direct connection work if PJM project AB2-083 withdraws. This plan of service will interconnect the proposed solar generating facility in a manner that will provide operational reliability and flexibility to both the AEP system and the Community Energy generating facility.

Cost Breakdown for Point of Interconnection (Delano 138 kV Substation)		
Attachment Cost	Expand Delano 138 kV Substation	PJM Project #AB2-083 to pay for Attachment Facilities
Non-Direct Connection Cost Estimate	Upgrade 138 kV Revenue Metering (n5512)	$100,000
	Adjust relay settings at the Delano 138 kV Substation (n5513)	$50,000
	Total Estimated Cost for Project AC1-001	**$150,000**

Table 1

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: Point of Interconnection (Delano 138 kV Substation)

Single-Line Diagram

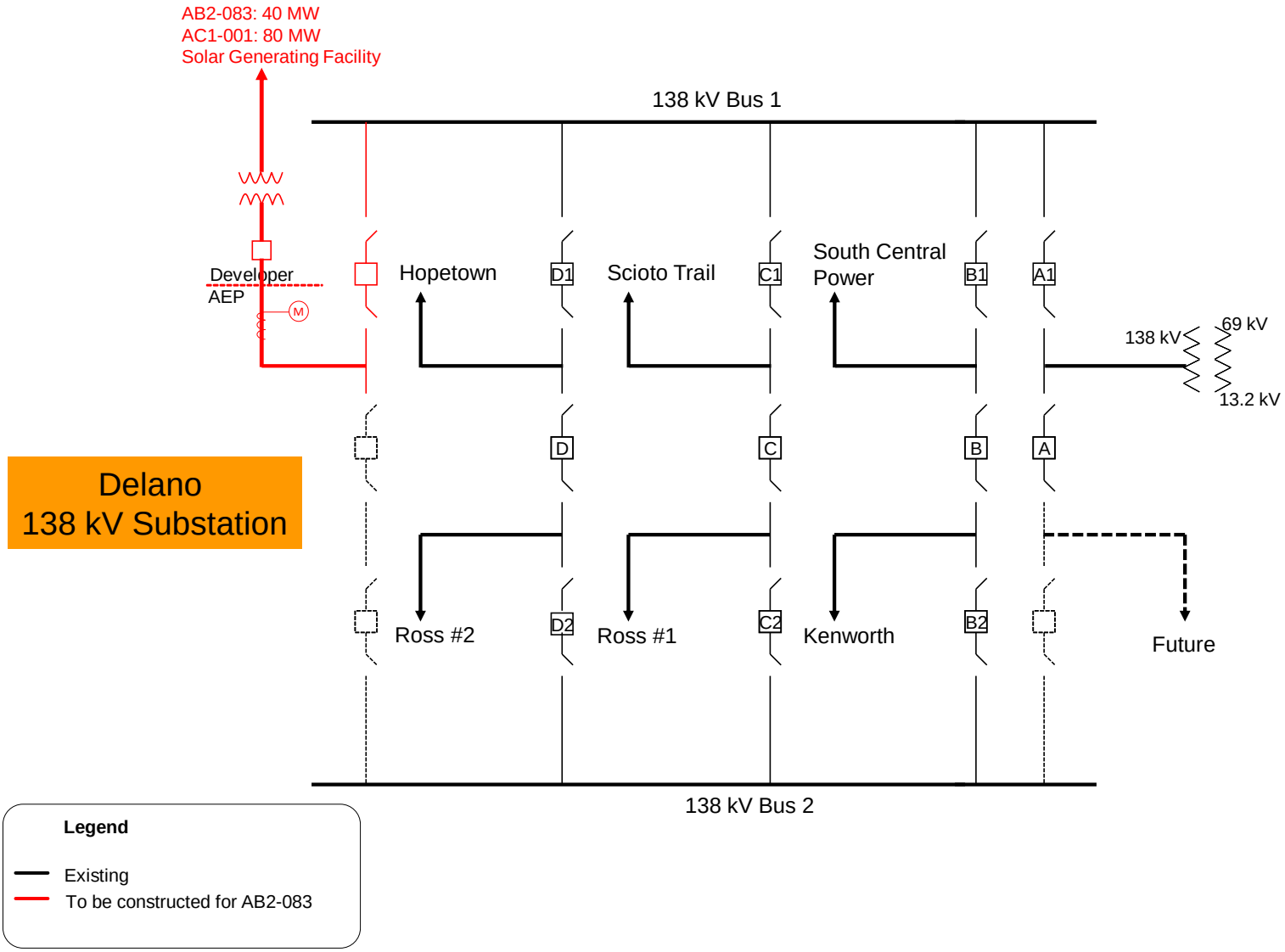

Figure 2: Point of Interconnection (Delano 138 kV Substation)