Generation Interconnection

System Impact Study Report

for

Queue Project AE2-254

GARRARD COUNTY-TOMMY-GOOCH 69 KV

30 MW Capacity / 50 MW Energy

February 2020

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: 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, may also contribute to the need for the same network reinforcement. Cost allocation rules for network upgrades can be found in PJM Manual 14A, Attachment B. 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 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.

The Interconnection Customer seeking to interconnect a wind or solar generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per Schedule H to the Interconnection Service Agreement and Section 8 of Manual 14D.

An Interconnection Customer 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.

General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Garrard County, Kentucky. The installed facilities will have a total capability of 50 MW with 30 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is 12/31/2022. This study does not imply a TO commitment to this in-service date.

Queue Number	AE2-254
Project Name	GARRARD COUNTY-TOMMY-GOOCH 69 KV
Interconnection Customer	Carolina Solar Energy III, LLC
State	None
County	Garrard
Transmission Owner	EKPC
MFO	50
MWE	50
MWC	30
Fuel	Solar
Basecase Study Year	2022

Point of Interconnection

AE2-254 will interconnect with the EKPC transmission system tapping the Garrard County to Tommy Gooch 69kV line.

Cost Summary

The AE2-254 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$400,000
Direct Connection Network Upgrade	$2,875,000
Non Direct Connection Network Upgrades	$255,000
Allocation for New System Upgrades	$0
Contribution for Previously Identified Upgrades	$0
Total Costs	$3,530,000

Transmission Owner Scope of Work

Attachment Facilities

The total preliminary cost estimate for the Attachment work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Install necessary equipment (a 69 kV isolation switch structure and associated switch, plus interconnection metering, fiber-optic connection and telecommunications equipment, circuit breaker and associated switches, and relay panel) at the new East Lancaster switching station, to accept the IC generator lead line/bus (Estimated time to implement is 24 months)	$400,000
Total Attachment Facility Costs	$400,000

Direct Connection Cost Estimate

The total preliminary cost estimate for the Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Construct a new 69 kV switching station (East Lancaster Switching) to facilitate connection of the IC solar generation project to the existing Garrard County-Tommy Gooch 69 kV line (Estimated time to implement is 24 months)	$2,875,000
Total Direct Connection Facility Costs	$2,875,000

Non-Direct Connection Cost Estimate

The total preliminary cost estimate for the Non-Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Construct facilities to loop the existing Garrard County-Tommy Gooch 69 kV line into the new East Lancaster switching station (Estimated time to implement is 24 months)	$120,000

Description	Total Cost
Modify relays and/or settings at Garrard County substation for the existing line to the new East Lancaster switching station (Estimated time to implement is 9 months)	$45,000
Modify relays and/or settings at Liberty Junction substation for the existing line to the new East Lancaster switching station (Estimated time to implement is 9 months)	$45,000
Install OPGW on the East Lancaster-Garrard County 69 kV line (0.37 miles) (Estimated time to implement is 9 months)	$45,000
Total Non-Direct Connection Facility Costs	$255,000

Incremental Capacity Transfer Rights (ICTRs)

None

Interconnection Customer Requirements

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.

EKPC Requirements

The Interconnection Customer will be required to comply with all EKPC Revenue Metering Requirements for Generation Interconnection Customers. The Revenue Metering Requirements may be found within the "EKPC Facility Connection Requirements" document located at the following link:

http://www.pjm.com/planning/design-engineering/to-tech-standards/ekpc.aspx

Network Impacts

The Queue Project AE2-254 was evaluated as a 50.0 MW (Capacity 30.0 MW) injection into a tap of the Garrard County – Tommy Gooch 69 kV line in the EKPC area. Project AE2-254 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-254 was studied with a commercial probability of 1.00. Potential network impacts were as follows:

Summer Peak Load Flow

Generation 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

Potential Congestion due to Local Energy Deliverability

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

Steady-State Voltage Requirements

(Summary of the VAR requirements based upon the results of the steady-state voltage studies)

To be evaluated during the Facilities Study Phase

Stability and Reactive Power Requirements for Low Voltage Ride Through

(Summary of the VAR requirements based upon the results of the dynamic studies)

To be evaluated during the Facilities Study Phase

Light Load Analysis

Light Load Studies (applicable to wind, coal, nuclear, and pumped storage projects).

Not required

System Reinforcements

None

Affected Systems

Affected Systems

LG&E

LG&E Impacts to be determined during the Facilities Study.

MISO

MISO Impacts to be determined during the Facilities Study.

TVA

None

Duke Energy Progress

None

NYISO

None

Short Circuit

Short Circuit

None

Attachment 1. Single Line Diagram (Primary POI)