Generation Interconnection Combined Feasibility/System Impact Study Report

For

PJM Generation Interconnection Request Queue Position X4-043

Clinton

May 2012

Preface

The intent of the Combined Feasibility/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 an Interconnection Customer 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, if any, is included in the System Impact Study.

The 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 associated with them will be addressed when seeking an Interconnection Agreement as outlined below. Developer will also be responsible for providing and installing metering equipment in compliance with applicable PJM and Transmission Owner standards.

General

CleanLight Power + Energy, LLC, the Interconnection Customer (IC), has proposed a solar generating facility located in Clinton Township, Hunterdon County, New Jersey. The installed facilities will have a total capability of 8.00 MW with 3.04 MW of this output being recognized by PJM as Capacity. This means that the remaining 4.96 MW will be curtailable should a system reliability constraint occur.

Attachment facilities and local upgrades (if required) along with terms and conditions to interconnect X4-031 will be specified in a separate two party Interconnection Agreement (IA) between FirstEnergy and the Interconnection Customer as this project is considered FERC non-jurisdictional per the PJM Open Access Transmission Tariff (OATT). From the transmission system perspective, no network impacts were identified as detailed below.

Point of Interconnection

X4-043 will interconnect with the Jersey Central Power & Light system tapping the T748 line between Round Valley Pump and Clinton substations approximately 0.6 miles from the Round Valley Pump 34.5kV tap.

Attachment Facilities

To accommodate the interconnection, the following interconnection facilities will have to be built: Construct approximately 300 feet of new overhead 34.5kV line from a point near pole NJ64CTHT748 on the T748-2 34.5kV line (Clinton-Round Valley Pump Tap) and construct a new tap pole, switch on the tap, (single blade disconnects included in estimate), install SCADA controlled motorized load break switches on pole NJ63CTHT748 and pole NJ65CTHT748, necessary guying, etc. and a span of wire to a customer-owned pole beyond the switch pole, along with miscellaneous protection, fuses, metering, RTU, and SCADA installations. The total preliminary cost estimate for the attachment facility/direct connection work is **$227,700**. It is estimated to take one (1) year from the date of a fully executed Construction Agreement with FirstEnergy to complete the upgrades required for project X4-043.

The following assumptions were made with the direct connection cost estimate above:

- *Tax gross-ups are not included in the cost estimate. However, if applicable, apply 32.63% tax gross-up.*
- *The cost estimate includes work expected to be necessary to bring 120/240V power to the motor-operated switches.*
- *The cost estimate includes $23,000 for metering to be mounted in the Interconnection Customer's substation.*
- *Any additional Right of Way necessary to construct the tap line must be obtained by the Interconnection Customer.*
- *A preliminary environmental review was conducted as part of this cost estimate and showed that there are no regulated areas associated with this project. However, if environmental permitting is needed, an additional $50,000 (plus gross-up) will be added to the cost estimate.*
- *The Allerton Road (X4-043) Project generation will automatically be disconnected whenever the local area network is islanded. If this assumption is not correct, a direct transfer trip scheme will need to be implemented for such situations at the Cleanlight Power & Energy, LLC's cost.*
- *The Interconnection Customer is responsible for constructing all of the facilities on the Interconnection Customer's side of the Point of Interconnection (POI).*

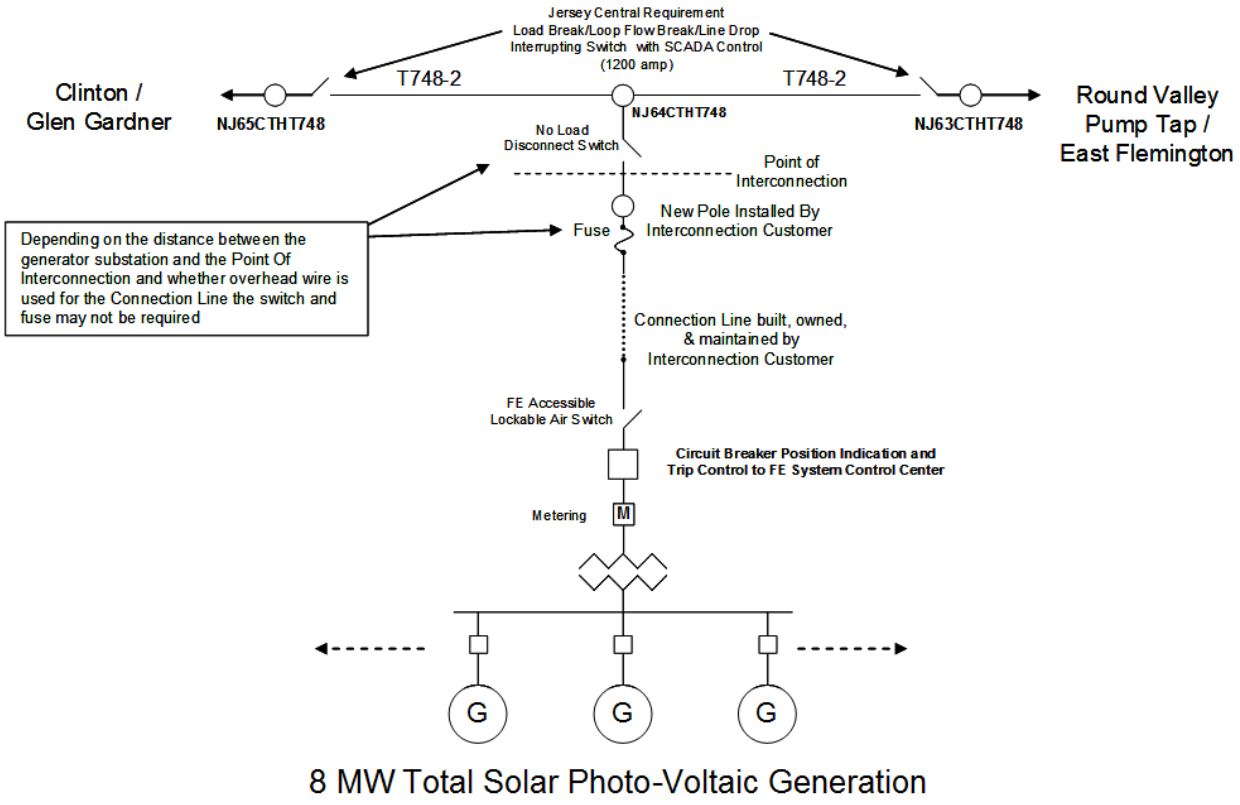

Figure 1. Single Line Diagram

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.

FirstEnergy Requirements

The Interconnection Customer will be required to comply with all FE Revenue Metering Requirements for Generation Interconnection Customers. The Revenue Metering Requirements may be found within the "FirstEnergy Requirements for Transmission Connected Facilities" document located at the following links:

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

Network Impacts

The Queue Project #X4-043 was studied as a(n) 8.0MW(Capacity 3.0MW) injection as a tap into Clinton-RoundValleyTap 34kV station in the JCPL area. Project #X4-043 was evaluated for compliance with reliability criteria for summer peak conditions in 2015. Potential network impacts were as follows:

Generator Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

None.

Multiple Facility Contingency

(Double Circuit Tower Line, Line with Failed Breaker and Bus Fault contingencies for the full energy output)

None.

Short Circuit

(Summary of impacted circuit breakers)

Not required.

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

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

None.

Stability and Reactive Power Requirement

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

None.

FE Reactive Power Requirement: FE study results found that it will be mandatory for X4-043 to have a range of dynamic reactive capability that supports its operation from a 0.95 leading to 0.95 lagging power factor. Without a continuous regulation, the FE studies show that the addition of solar projects can cause voltage swings as their output oscillates with moving clouds and system voltages that can exceed the established limits. Should the Cleanlight Power & Energy, LLC fail to provide a dynamic reactive capability from the Allerton Road (X4-043) Project for any reason once interconnected, the Jersey Central and/or PJM Dispatchers may need to take action to curtail both the energy and capacity portion of its output to prevent a non-compliance with voltage criteria.

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.

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.

As a result of the aggregate energy resources in the area, no violations were identified.