Generation Interconnection Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position W1-129

Cookstown 34.5kV

July 2010

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 (IC), has proposed a 5.0 MW (1.9 MW capacity) solar generating facility. The facility will be located near New Egypt, New Jersey (see Attachments 1 and 2).. The proposed in-service date for this W1-129 Project is April 30, 2011.

The total cost estimate for this connection is:

Attachment Facilities	$330,716
Direct Connection Local Upgrades	0
Non Direct Connection Local Upgrades	0
Total Costs	**$330,716**

Point of Interconnection

W1-129 will interconnect with the Jersey Central Power & Light distribution system at a 34.5kV circuit from the Cookstown substation.

Scope of Work

The proposed tapped connection point for the Jacobstown Road (W1-129) Project will be located about .25 miles north of the Cookstown 34.5 kV substation. Attachment 3 shows a conceptual one-line diagram of the Direct Connection facilities that will be required for the W1-129 Project. As indicated, it will be studied as a 5 MW injection on the Cookstown – Fort Dix (W75) 34.5 kV path. Both line and radial disconnect switches and a fuse will be needed at the point of attachment in addition to a circuit breaker and switch on the system side of the generator step-up transformer. The Interconnection Customer will be responsible for constructing all of the facilities on its side of the point of interconnection including the attachment line. A summary of the FE facilities required for the W1-129 Project Direct Connection and their cost estimate is shown on Attachment 4.

System Protection Analysis

An analysis was conducted to assess the impact of the W1-129 Project on the system protection requirements in the area. The results of this review have identified the following:

Under the assumption that the W1-129 Project generation will not supply fault current to the Jersey Central transmission system, there will be no protection upgrades needed for the Cookstown – Fort Dix 34.5 kV line path. However, the W1-129 Project will be required to have two independent high-speed zones of protection to sense and clear faults on the interconnection transformer.

Fault current on the 34.5kV W75 line, 0.25 miles from Cookstown substation are listed below:

Three phase:	17,267 amperes (X/R Ratio = 11.099)
Line-to Ground:	14,763 amperes (X/R Ratio = 10.243)

These values are for the current system configuration. Any system changes in the area could have a significant impact on these values. It will be the Interconnection Customer's. responsibility to make any protection upgrades required should this occur.

Based on the information provided, an S&C SMD-1A, 100E fuse, standard, will be required on the radial line extension to the W1-129 project site. In addition, an auto-reclosing relay (SEL-351A) on the breaker at the Cookstown 34.5 kV substation will be required.

The cost estimate for the required FE system protection facilities is included on Attachment 4.

Metering

The Interconnection Customer will be required to comply with all FE Revenue Metering Requirements for Generation Interconnection Customers. These FE requirements are detailed on Attachment 5 to this report.

Compliance Issues

The Interconnection Customer will be responsible for meeting all FE criteria as defined in the FE Requirements for Transmission Connected Facilities document.

This includes the provision of a reactive power capability sufficient to maintain a composite power delivery for the facility at the interconnection point at a power factor between .95 leading (absorbing 1.6 MVAR) and .90 lagging (producing 2.4 MVAR). If this capability cannot be provided by the solar units, a STATCOM or SVC device must be installed at the W1-129 Project substation at the Interconnection Customer's cost.

FE Facility Upgrades and Costs

The results of the FE analysis shows that no planning criteria violations are attributable to the addition of the W1-129 Project for the conditions studied. Therefore the conclusion is that no transmission or distribution reinforcements will be required to provide the requested service.

Interconnection Customer Requirements

In addition to the FE facilities, Community Energy, Inc. will also be responsible for meeting all criteria as specified in the applicable sections of the "FE Requirements for Transmission Connected Facilities" document including:

1. The purchase and installation of the minimum required FE generation interconnection relaying and control facilities. This includes over/under voltage protection, over/under frequency protection, and zero sequence voltage protection relays.

2. The purchase and installation of a 34.5 kV interconnection metering instrument transformer. FE will provide the ratio and accuracy specifications based on the customer load and generation levels.

3. The purchase and installation of a revenue class meter for the W1-129 interconnection to measure the power delivered in compliance with the FE standards.

4. A compliance with the FE and PJM generator power factor and voltage control requirements. Note that the W1-129 Project will likely need to absorb reactive power at the point of interconnection to minimize the voltage change should the units rapidly reduce their output or trip off line.

5. The execution of a back-up service agreement to serve the customer load supplied from the Jacobstown Road 34.5 kV substation when the units are out-of-service. This assumes the intent of the Interconnection Customer is to net the generation with the station load.

6. Any complaints from other customers (e.g. flicker complaints) will have to be corrected by the Interconnection Customer. Correction may include changing operation, reducing generation, disconnecting the generators from the Jersey Central system, or other measures.

7. The purchase and installation of supervisory control and data acquisition (SCADA) equipment to provide information in a compatible format to the FE Transmission System Control Center. The RTU, the communications channel and all related equipment will be furnished and maintained by the Interconnection Customer. The RTU must communicate with the FirstEnergy EMS via DNP 3.0 protocol.

8. The following status and metering points will be required:

    a. Interconnection breaker position.

    b. Generator real and reactive power output measured at the high-side of the generator step-up transformer.

    c. Generator voltage at the point of interconnection.

9. An installation of two independent high-speed zones of protection to sense and clear faults on the interconnection transformer.

The above requirements are in addition to any metering or other requirements imposed by PJM.

Note that an assumption of this study is that the W1-129 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 Interconnection Customer's cost.

Network Impacts

Queue project W1-129 was studied as a(n) 5.0MW (1.9MW of which was Capacity) injection into JCPL's system at the Cookstown 34.5kV substation. Project W1-129 was evaluated for compliance with reliability criteria for summer peak conditions in 2014. Potential network impacts were as follows:

Generator Deliverability

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

No problems identified.

However, there are voltage regulation issues that may require a curtailment of the energy portion of the project at times.

Multiple Facility Contingency

(Double Circuit Tower Line Contingencies only with full energy output. Stuck Breaker and Bus Fault contingencies will be applied during the Impact Study)

No problems identified.

Contribution to Previously Identified Overloads

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have % allocation of cost responsibility which will be calculated and reported for the Impact Study.)

No problems identified.

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)

None.

Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of the surrounding generation. Any potential 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 Transmission Interconnection request.

Note: 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 analyzes all overload conditions associated with the overloaded element(s) identified. As a result of the aggregate energy resources in the area, the following violations were identified.

No problems identified.

Short Circuit

Not required.

Stability Analysis

Not required.

Summary

The connection of the W1-129 Project to the FE transmission system will require no network upgrades. Therefore the Interconnection Customer will only have a cost responsibility for the Direct Connection of the W1-129 Project to the Jersey Central transmission system. As shown on Attachment 4, the estimated cost of these facilities is $330,716.

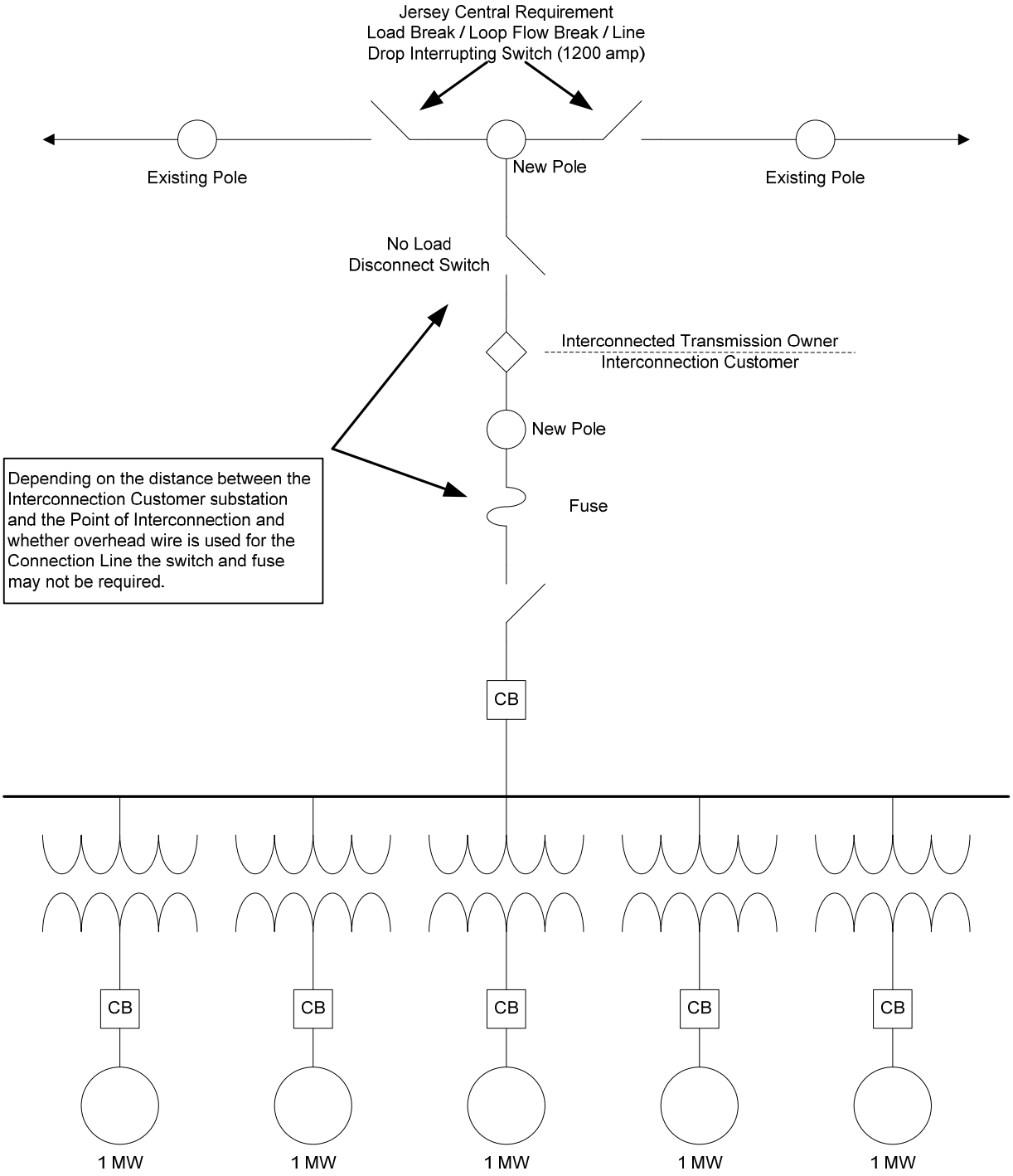
Based on the extent of the FE direct connection and system upgrades required to support this project, it is estimated that it will take one (1) year from the date of a fully executed Interconnection Construction Service Agreement to complete the upgrades required for the W1-129 Project. This includes the requirement for the Interconnection Customer to make a preliminary payment to FE that funds the first three months of engineering design that is related to the construction of the Direct Connection facilities. It further assumes that the Interconnection Customer will provide the property for the attachment and right-of-way facilities that will be needed. A further assumption is that there will be no environmental issues with any of the new properties associated with this project, that there will be no delays in acquiring the necessary permits for implementing the defined direct connection and network upgrades, and that PJM will allow all 34.5 kV transmission system outages when requested.

Note that the FE findings were made from a conceptual review of this project. A more detailed review of the connection facilities and their cost will be identified in the Facilities Study. Further note that the cost estimate data contained in this document should be considered as only ballpark since it was produced without a detailed engineering review. The applicant will be responsible for the actual cost of construction. FE herein reserves the right to return to any issues in this document and, upon appropriate justification, request additional monies to complete any connections to the transmission system.

Attachment 1
Local Site Plan

Attachment 2
Aerial View

Attachment 3
Single Line Diagram



Attachment 4
Cost Estimates

Item	Connection Facilities
1	Construct approximately 200 feet of new 34.5kV line.
2	Construct a new tap pole, switch pole on tap (single blade disconnects), installation of 1200 amps load-break switches on poles, necessary guying, etc., and a span of wire to a customer-owned meter pole beyond the switch pole.
3	Install metering to be mounted on the customer owned pole – Estimate at $20,000
4	Miscellaneous protection, fuses, metering, RTU, SCADA.
	Total Estimated Costs: $330,716

Attachment 5

FirstEnergy Revenue Metering Requirements for Generation Interconnection Customer

Interconnection Customer shall install, own, operate, test and maintain the necessary revenue quality Metering Equipment. This includes current transformers, voltage transformers, mounting structures, wiring, meters, communication circuits, and associated devices. The Metering Equipment must meet the specifications listed in the FirstEnergy and regional transmission organization (RTO) connection documents. The FirstEnergy "Requirements for Transmission Connected Facilities" are located at: http://www.firstenergycorp.com/feconnect

The Metering Equipment shall be located at the generation facility on the high voltage side of the generator step-up transformers or facility main step-up transformer and/or station service power transformers. Power flows to and from the facility shall be compensated to the Point of Interconnection.

FirstEnergy will provide revenue quality Metering Equipment for a station service power supply at a generation facility if the supply is from the local FirstEnergy distribution system.

The revenue quality Metering Equipment shall be capable of collecting and storing bidirectional billing data. The billing data shall be stored in intervals specified by FirstEnergy, typically fifteen minutes or thirty minutes. The Interconnection Customer must provide FirstEnergy with remote access to the billing data in the Metering Equipment via a dedicated voice-grade analog telephone circuit. The Interconnection Customer shall provide FirstEnergy with contact information for the person or persons responsible for meter programming and Metering Equipment maintenance.

The Interconnection Customer shall consult with FirstEnergy regarding the revenue quality metering system design and provide the following information:

- Facility one line and revenue metering installation drawings (schematics, wiring diagrams, etc.)
- Estimated power flows to and from the facility at all revenue metering points
- Current transformer and voltage transformer specifications, including manufacturer, type, nameplate drawings, and certified accuracy test reports
- Revenue meter specifications including manufacturer, type, model number, and accuracy
- Revenue meter program information including but not limited to billing data recorder channel assignments, recorder pulse weights (Ke), and read-only password for access to interval data by the FirstEnergy billing data collection system (MV-90)
- Revenue meter telephone number
- Revenue meter loss compensation data (if applicable)

The Interconnection Customer shall provide FirstEnergy with prior notification of any modifications at the facility that will affect the revenue meter measurements, including substation reconfigurations and meter program changes.

The revenue metering system at each location shall be tested for accuracy by the Interconnection Customer once every two years. The Interconnection Customer shall give reasonable notice to FirstEnergy of the time when the testing is scheduled so that FirstEnergy may have representatives present. FirstEnergy and the RTO shall have the right to audit the revenue metering equipment and/or related documents. The Interconnection Customer shall be given a reasonable period of time to comply with any requests associated with an audit.