

**Combined Feasibility and Impact Study
U2-094, Foul Rift 34.5kV
19 MW Solar Facility
(7.2MW capacity)**

July 2009

Preface

The intent of this Combined Feasibility & System Impact Study is to determine a plan, with 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 Combined Feasibility & 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 Interconnection Customer 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:

PPL Renewable Energy LLC has submitted a "Form of Generation Interconnection Feasibility Study Agreement" which identifies its plan to construct nineteen sets of 1 MW solar arrays at a location near Foul Rift Road in Belvidere, New Jersey. While the total capability of the Foul Rift Project is 19 MW, it will only be considered as a 7.22 MW capacity resource as per the PJM Manuals. Note that the location of the collector substation for the Foul Rift project will be remote from the requested Point of Interconnection to the Jersey Central system. PPL Renewable Energy, LLC will therefore be responsible for constructing a radial line from the project substation to a point along the Pequest River - Washington 34.5 kV (C705) circuit for the project attachment. As shown on Attachments 1a and 1b, a three breaker ring bus substation will be required at the Point of Interconnection with a design that will accommodate future expansion. In accordance with the PJM Tariff, PPL Renewable Energy, LLC has elected the "Option to Build" this substation in compliance with all of the FirstEnergy requirements. As such, PPL Renewable Energy LLC will assume a responsibility for acquiring the easements, properties and permits that will be needed for the construction of this substation. This includes all structures and facilities that may be required for its attachment to the Jersey Central transmission system. Therefore, no estimates for the connection facilities will be provided in this report. Note that once constructed, FirstEnergy will own, operate and maintain the new attachment substation and the FirstEnergy line connections. The only FirstEnergy responsibility for the PPL Renewable Energy LLC Project will therefore be a definition and implementation of the upgrades that are required to its transmission network. This includes the system protection upgrades that will be needed at the FirstEnergy substations to support the Foul Rift Generation Project connection. A summary of the network reinforcements that will be an FirstEnergy responsibility are listed in the Facility Upgrades and Cost section of this report.

The Interconnection Customer has elected not to apply for Qualified Facility status under the FERC guidelines at this time. As this has occurred, the project will receive a Wholesale Market Participation Agreement, and will be required to pursue a two party Interconnection Agreement with FirstEnergy. This will preclude the ability of the Interconnection Customer to continue under the "Option to Build" provisions of the PJM Tariff. FirstEnergy may elect to allow a similar process under the FirstEnergy Interconnection Agreement, but this must be confirmed during negotiations surrounding the provisions of the Interconnection Agreement.

NETWORK IMPACTS

The Queue Position #U2-094 project was studied as a 19MW (7.2MW Capacity Resource) injection at a new 3 breaker ring bus substation along the Pequest River - Washington 34.5 kV (C705) circuit. Queue Position #U2-094 was evaluated for compliance with reliability criteria for summer peak conditions in 2012. Potential network impacts were as follows:

Generator Deliverability – at the 7.2 MW capacity value level

No problems identified

Multiple Facility Contingency – Reliability Requirements at the 19 MW full output level

No problems identified

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)

No problems identified

Short Circuit

A short circuit analysis was conducted by PJM and confirmed by the FirstEnergy Protection staff. This analysis showed that no FirstEnergy circuit breaker will exceed its interrupting capability with the implementation of the Foul Rift project. Therefore no network reinforcements will be required for short circuit considerations.

Stability and Low Voltage Ride Through

This analysis will not be conducted by PJM due to the size of the project.

Protection Requirements

The proposed interconnection facilities must be designed in accordance with the FirstEnergy "Requirements for Transmission Connected Facilities" document. Procedures for gaining access to these standards can be found at the link below.

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

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

Foul Rift 34.5 kV Substation

These requirements are for the new Foul Rift - Washington (C705-1) and Foul Rift - Pequest River (C705-3) 34.5 kV line exits at Foul Rift:

1. PPL Renewable Energy LLC is responsible for relays on the line to Foul Rift Generation.
2. Three-phase, dual-winding potential devices are required for each line exit.
3. Dedicated phone lines needed to Warren County Resource Recovery and Warren County Landfill for transfer trip.
4. All relays are to be connected to SEL-2020, which is to be connected to a GPS time clock.
5. Specific New Facility Requirements

Foul Rift 34.5 kV Substation

Foul Rift - Washington (C705-1) 34.5 kV line

- SEL-321
- SEL-311B
- SATEC meter

Foul Rift - Pequest River (C705-3) 34.5 kV line

- SEL-321
- SEL-311B
- SATEC meter
- RFL-9745 for Transfer Trip to WCRR
- RFL-9745 for Transfer Trip to WCLFG

Foul Rift Breaker Failure Protection

- (2) SEL-501 (one of the SEL-501 relays to be use for 2 breakers)
- (3) Lockout relays

Pequest River 34.5 kV Substation

Remove existing C-705 line relays ((2) KD, TD5, IRP-9) and replace with:

- SEL-321
- SEL-311B
- SATEC meter

Washington 34.5 kV substation

No new facilities required - relay setting changes only.

Warren County Resource Recovery 34.5 kV substation

- RFL-9745 for Transfer Trip from Foul Rift

Warren County Landfill 34.5 kV substation

- RFL-9745 for Transfer Trip from Foul Rift

PPL Renewable Energy LLC will be responsible for installing all Foul Rift 34.5 kV substation and project facilities including to the unit over/under voltage protection, over/under frequency protection, zero sequence voltage protection that may be required. PPL Renewable Energy LLC will be responsible for all leasing costs for the communication circuits that will be associated with the transfer trip protection system if implemented. FirstEnergy will be responsible for installing the system protection upgrades at the Pequest River substation. However, the work to install Direct Transfer Trip upgrades at the two Warren County generating facilities connected will be a responsibility of the Plant Owners. FirstEnergy will not provide a cost estimate for these facilities as a part of this report.

Metering

PPL Renewable Energy LLC will be required to comply with all FirstEnergy Revenue Metering Requirements for Generation Interconnection Customers. These FirstEnergy requirements are detailed on Attachment 2 to this report.

Compliance Issues

PPL Renewable Energy LLC will be responsible for meeting all FirstEnergy criteria as defined in the FirstEnergy 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 MVARs) and .90 lagging (producing MVARs). Since the proposed solar generation project will provide no reactive power, PPL Renewable Energy LLC will be required to install a 5.5 MVAR switched capacitor to provide an equivalent amount of reactive compensation. Its operation will be directed by the FirstEnergy Regional System Dispatcher.

PPL Renewable Energy LLC will also be required to meet all PJM, ReliabilityFirst and NERC reliability criteria and operating procedures for standards compliance. For example, the Developer will need to properly locate and report the over and under-voltage and over and under-frequency system protection elements for its units as well as the submission of the generator model and protection data required to satisfy the PJM and ReliabilityFirst audits. Failure to comply with these requirements may result in a disconnection of service if the violation is found to compromise the reliability of the FirstEnergy system.

FirstEnergy Facility Upgrades and Costs

The results of the FirstEnergy analysis shows that no FirstEnergy planning criteria violations are attributable to the addition of the Foul Rift project for the conditions studied. Therefore the conclusion is that no transmission reinforcements will be required to provide the requested service.

The following is a summary of the FirstEnergy facilities that will be required for the Foul Rift Generation Project:

1. Engineering Oversight of Option to Build: This includes project management and oversight of substation and connection facility construction, engineering review of design drawings and equipment specifications, real estate review, contract employee work, site and project meetings, commissioning of facilities, etc. (\$277,000)
2. Install the Pequest River 34.5 kV substation system protection facilities. (\$106,300)

All cost data contained in this document should be considered estimated. The applicant will be responsible for the actual cost of construction. FirstEnergy 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.

PPL Renewable Energy LLC Requirements

In addition to the FirstEnergy facilities, PPL Renewable Energy LLC will also be responsible for meeting all criteria as specified in the applicable sections of the "FirstEnergy Requirements for Transmission Connected Facilities" document including:

1. The purchase and installation of the minimum required FirstEnergy generation interconnection relaying and control facilities.
2. The purchase and installation of a 34.5 kV interconnection metering instrument transformer. FirstEnergy 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 to measure the power delivery from the Foul Rift units at the Foul Rift 34.5 kV attachment substation to measure the power delivered in compliance with the FirstEnergy standards.
4. Since no backup 34.5 kV service has been requested, a reverse power relay must be installed to disconnect the project whenever an energy flow from the Jersey Central 34.5 kV system is detected. As an alternative to this relay, PPL Renewable Energy LLC has the option of executing a tariff agreement with Jersey Central that will specify the charges for any capacity and energy service that is provided.
5. The purchase and installation of supervisory control and data acquisition (SCADA) equipment to provide information in a compatible format to the FirstEnergy Transmission System Control Center.

6. The establishment of dedicated communication circuits for SCADA report to the FirstEnergy Transmission System Control Center and for dialup access to revenue metering.
7. A compliance with the FE and PJM generator power factor and voltage control requirements. This may include the installation of a switched shunt capacitor bank if the units do not meet the established design criteria.

The above requirements are in addition to any metering required by PJM.

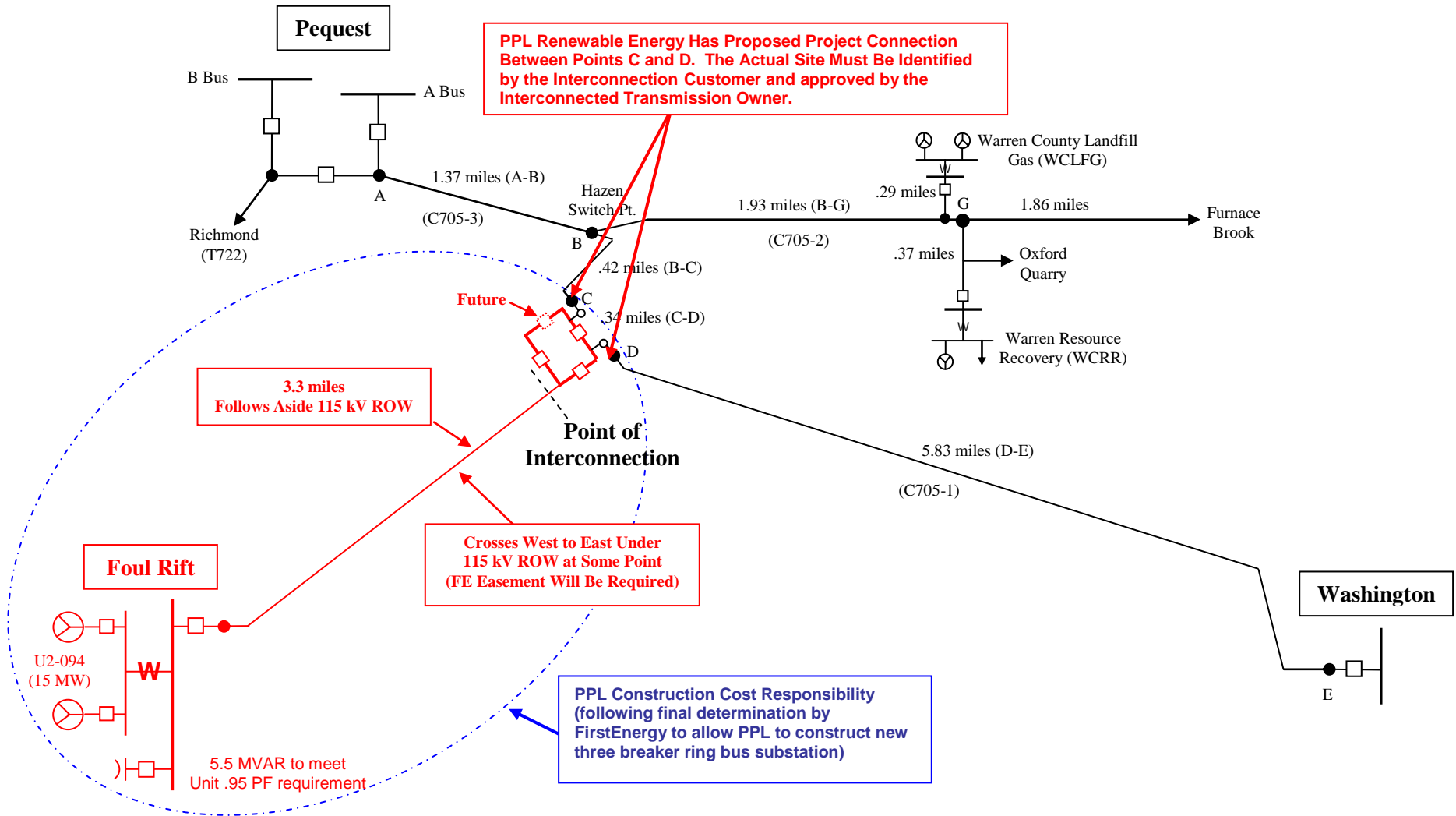
Summary

The connection of the Foul Rift generation project to the FirstEnergy transmission system will require no network upgrades. Since PPL Renewable Energy, LLC is assuming construction responsibility for this project, FirstEnergy has only provided cost estimates for the FirstEnergy facilities and oversight required. PPL Renewable Energy, LLC will be responsible for installing all facilities in compliance with the FirstEnergy Requirements for Transmission Connected Facilities document and construction standards. FirstEnergy staff will provide the oversight and coordination to assure this compliance. All transmission facility outage requests will need to be coordinated with the Jersey Central Regional Dispatch office and PJM as necessary.

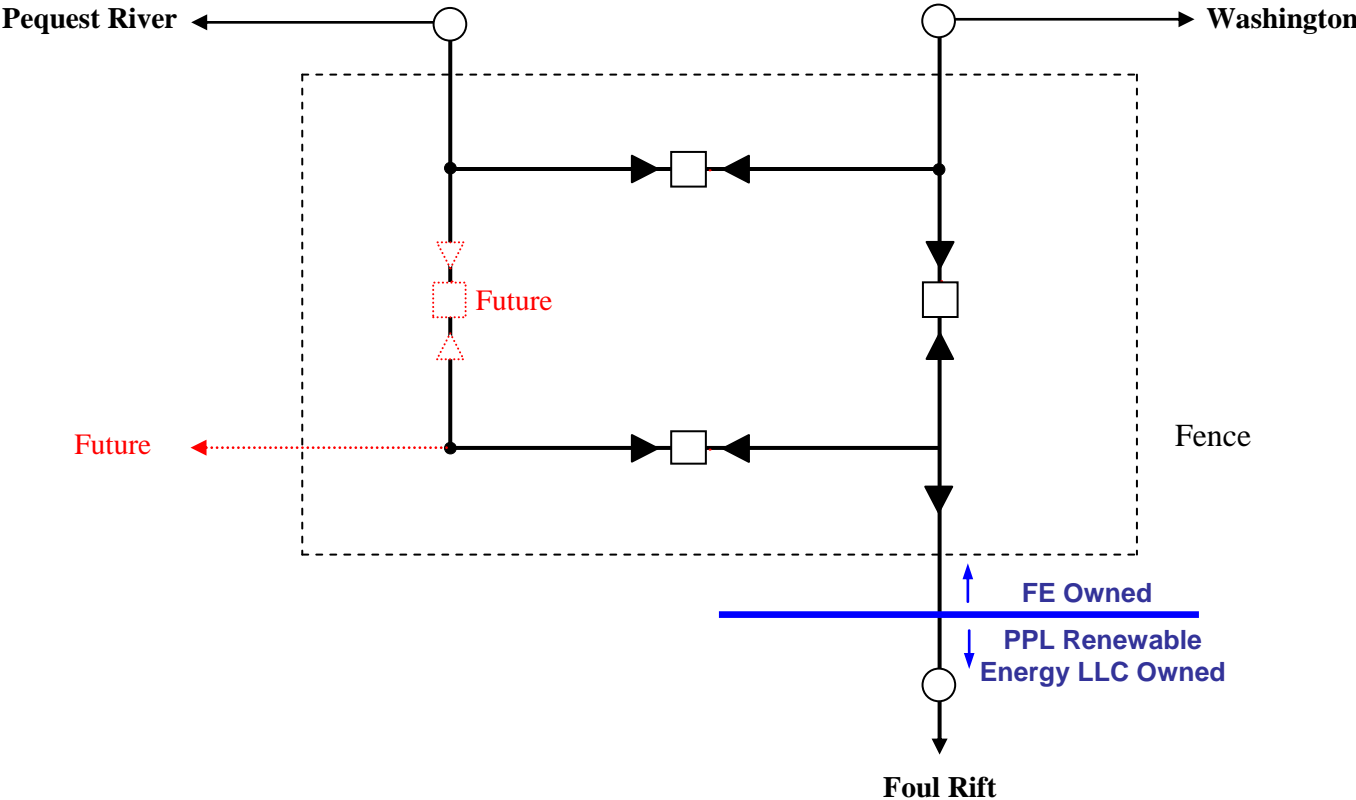
In summary, the total cost estimate of the FirstEnergy facilities required for the Foul Rift project is \$383,300. It is estimated that it will take 9 months to design and install the required FirstEnergy facilities from the execution of a Construction Service Agreement. Note that the FirstEnergy findings 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 when the exact location of the attachment substation is defined.

Attachment 1a

Foul Rift (U2-094) RTEP Project



Attachment 1b
Foul Rift (U2-094) RTEP Project
Conceptual Layout



Attachment 2

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 connection documents. The FirstEnergy “Requirements for Transmission Connected Facilities” are located at: <http://www.pjm.com/planning/design-engineering/to-tech-standards.aspx>

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 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.

FirstEnergy Revenue Metering Requirements for Generation Interconnection Customer 1-21-09.doc