

***Revised  
Generation Interconnection  
Combined Feasibility/System Impact  
Study Report***

***For***

***PJM Generation Interconnection Request  
Queue Position V3-011***

***Sussex 12.47kV***

**February 2010**

## **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**

Sussex County Landfill Energy, LLC (SXLE), the Interconnection Customer (IC), has proposed a 3.4 MW (3.4 MW capacity) methane fueled generating facility, consisting of two Caterpillar 3520 reciprocating engine generator sets. The facility will be located on Route 94 just west of Old Beaver Run Road in Lafayette, New Jersey.

Attachment facilities and local upgrades (if required) along with terms and conditions to interconnect V3-011 will be specified in a separate two party Interconnection Agreement (IA) between the Transmission Owner 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**

V3-011 will interconnect with the Jersey Central Power and Light distribution system as a tap of the Distribution Circuit 17547, a 3 phase 12.47 kV grounded wye distribution circuit originating at JCP&L's Woodruffs Gap Substation located 2.5 miles from the proposed sit.

## **Network Impacts**

The queue V3-011 project was studied as a 3.4MW capacity injection into JCP&L's system at the Lime Crest 34.5kV substation. The project was studied on a combined feasibility-impact basis which utilizes an AC analysis, and incorporates all contingency types. Project V3-011 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.

### **Multiple Facility Contingency**

*(Double Circuit Tower Line, Line with Failed Breaker and, Bus Fault contingencies for the Full energy output.*

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**

The available fault current on the 12.5kV distribution system at the proposed interconnection location without proposed generation is 3700 three phase amps and 3200 Line to Ground amps. The existing X1/R1 ratio at the proposed generation site is 3.16. The generator will contribute to the available fault current values experienced on the 12.47KV distribution system; this value will be calculated once the type of generator is defined by the developer.

The above fault current value provided is calculated at the 12.5 kV voltage level and is based on the existing power system configuration. Future upgrades can occur on the JCP&L/FE power delivery system. The fault current can vary based on these modifications.

### **New System Reinforcements**

*(Upgrades required to mitigate reliability criteria violations, i.e. "Network Impacts," initially caused by the addition of this project's generation)*

None

## **Contribution to Previously Identified System Reinforcements**

*(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project.*

None

## **Stability Analysis**

Not required.

## **Equipment Loading:**

The output of the proposed 3.4 MW generation facility represents 50% of the recent summer peak on the Woodruffs Gap 17547 circuit and 200% of the minimum load recently experienced on this distribution circuit. During an outage of the second distribution circuit origination at Woodruffs Gap substation (circuit 17548) the 3.4 MW generation will exceed the recorded minimum load on the Substation Transformer feeding the proposed facility. Direct Transfer Trip will be required with load monitoring and control. Distributed generation must not interfere or degrade the quality of service to any other FirstEnergy Corp. customers (service voltage, voltage flicker, harmonics, service reliability etc).

## **Voltage Study:**

Distribution Line Regulators were not present on the normal configuration of Woodruffs Gap circuit 17547; however, an Automated Transfer Scheme (ATS) between this Woodruffs Gap circuit 17547 and the N. Newton circuit 17508 is proposed in the future. In the event the source for Woodruffs Gap is lost during light load conditions, N. Newton distribution circuit 17508 can be manually reconfigured to serve all of Woodruffs Gap circuit 17547. Under these conditions, voltage regulation will exist between the N. Newton source and the proposed generation site.

## **Circuit protection and co-ordination:**

**Main Line:** To accommodate the proposed 3.4 MW generating capacity, JCP&L will install a set of 200 K protective fuses on the three phase primary line to the facility allowing a primary nominal line current of 160 amps or the equivalent of 3.4 MW of power export. The existing normal line configuration contains a 140K protective fuse along that mainline back to Woodruffs Gap substation. This set of distribution line fuses will be relocated for circuit reliability reasons.

Woodruffs Gap circuit 17547 has an existing 480 amp mainline feeder recloser located beyond the proposed generator site location. This feeder recloser will become part of the ATS scheme with the N. Newton circuit 17508.

**At Substation:** Implement Transfer Trip scheme. Replace existing electro-mechanical relays with SEL-351 electronic relays on 2 distribution circuits and one Transformer Bank at Woodruffs Gap Substation.

Provide wiring, conduit and RTU configuration to tie into customers DTT system at our substation entry point.

**At Generator Facility:** Transfer Trip system will be designed by the customer, and must be approved by JCP&L/FirstEnergy prior to purchase. Typically, these systems utilize fiber optic, leased phone line, or radio communications. The direct transfer trip system must communicate with the distribution circuit breaker located in the JCP&L substation, as well as any in-line fault interrupting devices located between the substation and the point of interconnection (if any). Typically this may involve communication with one or more poletop reclosers.

The customer must install and maintain the direct transfer trip equipment. Equipment needed inside JCP&L facilities may be installed by JCP&L personnel. Periodic testing of the system will be required and the system must be configured to fail in a 'trip' condition- i.e. upon loss of communications, the system must trip the generator off line.

Distributed Generation must not interfere with the proper detection and clearing of faults on the First Energy system.

### **Additional requirements:**

- JCP&L will work with the customer to determine the exact interconnection point, based on existing infrastructure layout.
- The preliminary costs associated with the JCP&L tap line to the interconnection point and manually operated disconnect switches will be identified once the pertaining details are identified.
- Interconnect Customer (IC) will install a pole adjacent to JCP&L's pole as point of interconnection. On this pole the IC will install cutout fuses with load break capability, primary metering transformer bracket per the FE Construction Standards of page# 10-347. IC will also install the revenue metering CTs and PTs, to be supplied by JCP&L.
- IC provides all trenching, cables, riser and conduit to connect the generation facilities to the Point of Interconnection.
- IC must meet all applicable JCP&L/FirstEnergy standards and requirements which are included in the current Tariff for Service.
- The generation facilities must be UL listed or certified to comply with the requirements of IEEE 1547.
- IC's main breaker shall be SEL 351 MF relays (or equivalent) required for interconnection protection.
- The IC's transformer must be grounded wye to grounded wye.

- IC must meet requirements of N.J.A.C. 14:4-9 (“In front of meter” all power sold to PJM and interconnection standards for Class I Renewable Energy Systems), as well as IEEE 1547, and IEEE 1547.1
- IC must meet applicable FE Distributed Generation Technical requirements for the interconnection of generation to the FE Distribution system.

### **Infrastructure Upgrade Costs (By JCP&L):**

- Conceptual cost estimate to extend three spans three phase #2 ACSR conductor (about 250 feet), three 100K fuses, manually operable disconnect switch and Primary metering at the interconnection point is \$120,000.
- Substation upgrade cost is \$160,000
- All JCPL costs are not subject to refundable provisions of the NJ-BPU Tariff for Electric service.

Note- this is an estimate based on similar work orders previously worked by JCP&L for the types of work described in the analysis above. Should the customer want to proceed with the connection of this facility a contract with JCPL will be developed based on these costs and a true-up of actual charges will be made at the completion of the project

### **Timetable for Construction:**

JCP&L estimates 3 months after execution of construction agreement and construction kick off meeting for design work to be completed.

JCP&L estimates it will require an additional 5 months to complete the identified infrastructure upgrades.

**Figure 1: Proposed Interconnection**

