Generation Interconnection Combined Feasibility/System Impact Study Report

For

PJM Generation Interconnection Request Queue Position Y1-027

Belmon 12.5 kV

August 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. The developer will also be responsible for providing and installing metering equipment in compliance with applicable PJM and Transmission Owner standards.

General

Westmoreland Landfill Gas Co., the Interconnection Customer (IC), has proposed a landfill gas generating facility located in Belle Vernon, Pennsylvania. The installed facilities will have a total capability of 4.0 MW with 1.52 MW of this output being recognized by PJM as capacity. This means that the remaining 2.48 MW will be curtailable should a system reliability constraint occur. The proposed in-service date for this project is October 31, 2013. **This study does not imply a First Energy commitment to this in-service date.**

Attachment facilities and local upgrades (if required) along with terms and conditions to interconnect Y1-027 will be specified in a separate two party Interconnection Agreement (IA) between West Penn Power Company, a First Energy company, 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

Y1-027 will interconnect with the West Penn Power Company's distribution system via a tap of the 12 kV line that runs along Conner Road at pole number 550311

Cost Summary

The Y1-027 project will be responsible for the following costs:

Description	Total Cost
Transmission Owner facilities	$ 386,030
Allocation for Transmission Upgrades	$ 0
Total Costs	**$ 386,030**

Transmission Owner Scope of Work

Generator Protective Equipment

The Interconnection Customer shall design a protective scheme that will provide the protective functions compliant with the inverter standard UL1741 and IEEE 1547 "Standard for Interconnecting Distributed resources with Electrical Power Systems", in addition to the power quality standards defined by Reliability First and PJM. The Interconnection Customer shall also submit their protective scheme to West Penn Power ("WPP") Engineering for review & acceptance. The submittal shall include a single line drawing showing the location of instrument transformers (current and voltage), the location of the relays, breakers and fuses and indicate the manufacturer and model number of each type of device. Breaker data shall include continuous and interrupting ampere ratings. If relays are used, they are to indicate function, the tripping source and its voltage.

Point of Interconnection

As defined by Westmoreland Landfill Gas Company and shown on Attachment 1, the connection point for the Belmon 12.5 kV (Y1-027) Project will be from a tap of the WPP 12.5kV distribution line along Conner Lane on the Lynnwood Feeder at location WPP Pole #550311 in Belle Vernon, Westmoreland County, Pennsylvania.

This area is presently served by the Lynnwood distribution circuit - a three phase 12.5 kV grounded wye distribution circuit originating from WPP's Belmon substation located about 1630 feet from the point of interconnection with the Customer's facilities.

Circuit Protection and Coordination

Main Line:
Removal of 900kVAR capacitor on WPP Pole #12178 to eliminate overvoltage.

Remove 3-100A cutouts on WPP Pole #396780 and install 1-600A airswitch on tap going to toward primary POI.

Modify relay settings for the Lynnwood circuit breaker in order to achieve proper coordination of over-current protective devices.

At Substation:
No violations identified.

However, an electromechanical relay will need to be replaced with a microprocessor relay controlling the 138kV/12.5kV bank breaker. This is a result of the modified relays settings on the Lynnwood circuit in order to provide proper coordination of over-current protective devices.

New System Reinforcements

Reconductor 4 spans of #2AAAC with 336 ACSR from WPP Pole #396780 to Pole #550311.

Removal of 1-900kVAR capacitor and installation of 1-600A airswitch.

The Belmon 12.5kV (Y1-027) generation project will be required to have two independent high speed zones of protection to sense and clear faults on the interconnection transformer.

Attachment Facilities

The Primary point of interconnection for the project will be accomplished by a tap of the WPP 12.5kV distribution line along Conner Lane on the Lynnwood Feeder at location WPP Pole #550311 in Belle Vernon, Westmoreland County, Pennsylvania. The Y1-027 project will also require the installation of a 12.5kV net meter facility at WPP Pole #550311 along Conner Lane and DTT facilities at the Belmon substation in addition to other attachment facilities identified on Attachment 3.

Westmoreland Landfill Gas Company will have a total estimated cost responsibility for the direct connection of the Belmon 12 kV (Y1-027) Project to the WPP distribution system of $386,030 as shown in Attachment 2. This cost includes CIAC (Contribution in Aid of Construction) Federal Income Tax Gross Up charge of $99,540.

Compliance Issues

Westmoreland Landfill Gas Company will be responsible for meeting all FE criteria as defined in the FE Requirements for Distribution Connected Facilities document:

www.pjm.com/planning/design-engineering/to-tech-standards/private-firstenergy.aspx

Westmoreland Landfill Gas Company will also be responsible for following the requirements of the "FirstEnergy Wholesale Generation interconnection (WGI) Manual" and the "FE Approved Vendors and Contractors" documents which are also located at the above link.

Westmoreland Landfill Gas Company must also meet all PJM, ReliabilityFirst and NERC reliability criteria and operating procedures required for standards compliance. For example, the Westmoreland Landfill Gas Company 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 FE system.

Interconnection Customer Requirements

In addition to the FE Facilities, Westmoreland Landfill Gas Company will also be responsible for meeting all criteria as specified in the applicable sections of the FE "Technical Requirements For The Interconnection of Customer-Owned Generation To The FirstEnergy Distribution System" document including:

1. The purchase and installation of a fully rated circuit breaker on the high side of the Y1-027 step-up transformer.

2. The purchase and installation of a lockable load-break switch at the point of interconnection. This switch must be accessible by FirstEnergy.

3. 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.

4. The purchase and installation of a 25kV interconnection metering instrument transformer. FE will provide the ratio and accuracy specifications based on the customer load and generation levels.

5. The purchase and installation of a revenue class meter for each unit to measure the power delivered in compliance with the FE standards.

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

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 Westmoreland Landfill Gas Company. The RTU must communicate with the FirstEnergy EMS via DNP 3.0 protocol.

8. The following control, status, and metering points will be required:
    a. Interconnection breaker position status and trip control.
    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.
    d. Indication that a direct-transfer trip operation has occurred where DTT is used.

9. The establishment of dedicated communication circuits for SCADA report to the FE Transmission System Control Center.

10. A compliance with the FE and PJM generator power factor and voltage control requirements.

11. The execution of a back-up service agreement to serve the customer load supplied from the Y1-027 12.5kV interconnection substation when the units are out-of-service. This assumes the intent of Westmoreland Landfill Gas Company is to net the generation with the load.

12. A provision of the necessary generator protection, synchronization controls, and fault detection to initiate a trip to protect the Belmon 12.5kV (Y1-027) generation project.

13. A compliance with the PJM Manuals and Operating instructions to have a plant operator on call 24/7 to respond within a minute to reduce the output of the Belmon 12.5kV (Y1-027) generation project when network constraints occur.

14. A compliance with the inverter standard UL1741 and IEEE 1547, "Standard for Interconnecting Distributed Resources with Electrical Power Systems", in addition to the power quality standards defined by ReliabilityFirst and PJM.

15. The rough grade of the property for the Y1-027 12.5kV interconnection substation and an access road for the delivery of equipment to this site.

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

It is very important to establish a reliable communication connection between the generator and FirstEnergy Energy Management System. The generator will be offline whenever there is no communication channel established.

FE requires the installation of a transformer in order for the customer to connect to the 12.5kV system. Since this customer desires to use generators with an output of 12.5kV, FE requires the customer to install an isolation transformer to connect to the system. The connection should be grounded wye on the FE side of the isolation transformer and delta on the customer's side of the isolation transformer.

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.

First Energy 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

Summary

The project direct connection will require the facility upgrades defined in Attachment 3. As shown, the total estimated cost of the Direct Connection facilities is $386,030 as shown in Attachment 3. This cost includes CIAC (Contribution in Aid of Construction) Federal Income

Tax Gross Up charge of $99,540. This tax may or may not be charged based on whether or not the project meets the eligibility requirements of IRS Notice 88-129.

Based on the scope of the direct connection, it is expected to take a minimum of six (6) to seven (7) months from the signing of an Interconnection Agreement/Construction Agreement and full payment of the estimated project costs to complete the installation required for the Project. WPP estimates two (2) months after receipt of the IA/CA and estimated costs for design work to be completed and an additional four (4) to five (5) months to complete the identified infrastructure upgrades. It also assumes that the Westmoreland Landfill Gas Company will provide all right-of-way, permits, easements, etc. that will be needed for the interconnection of project Y1-027. A further assumption is that there will be no environmental issues associated with this project, that there will be no delays in acquiring any necessary permits for implementing the defined direct connection, and that PJM will allow all transmission system outages when requested.

Note that the WPP 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 on this document should be considered only a ballpark estimate since it was produced without a detailed engineering review. Westmoreland Landfill Gas Company will be responsible for the actual cost of construction. WPP 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 distribution system.

Network Impacts

The Queue Project #Y1-027 was studied as a 4.0MW (Capacity 1.5MW) injection at the 01BELMON 138 kV substation in the PENELEC area. Project #Y1-027 was evaluated for compliance with reliability criteria for summer peak conditions in 2015. Potential network impacts were as follows:

Contingency Descriptions

The following contingencies resulted in overloads:

None.

Generator Deliverability

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

None.

Multiple Facility Contingency

(Double Circuit Tower Line contingencies were studied for the full energy output. The contingencies of Line with Failed Breaker and Bus Fault will be performed for the Impact Study.)

None.

Short Circuit

(Summary of impacted circuit breakers)

New circuit breakers found to be over-duty:

None.

Contributions to previously identified circuit breakers found to be over-duty:

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.

Steady-State Voltage Requirements

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

To be determined.

Stability and Reactive Power Requirement for Low Voltage Ride Through

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

To be determined.

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.

Potential Congestion due to Local Energy Deliverability

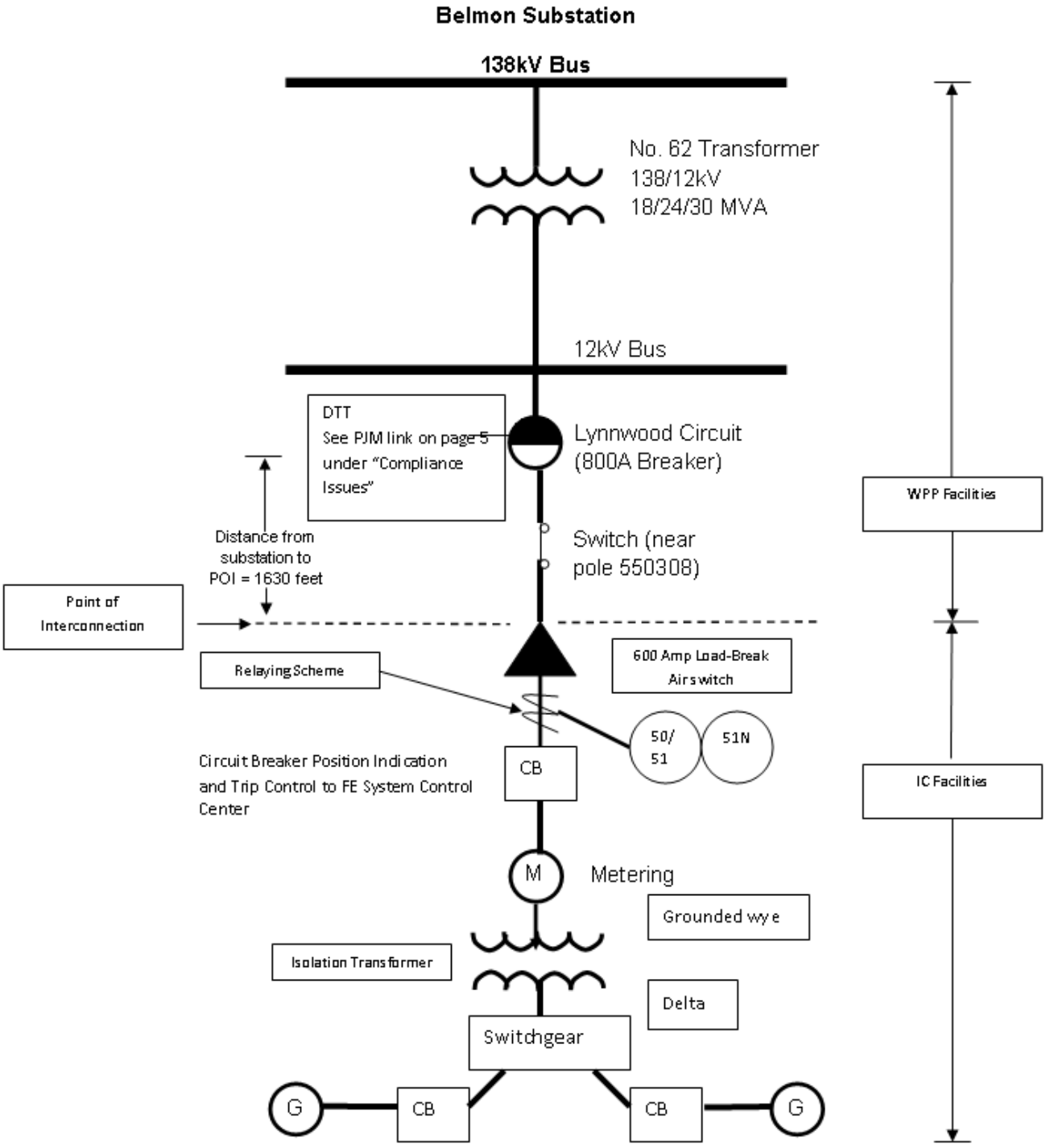
PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion 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.

Attachment 1

System Configuration



Attachment 2

Westmoreland Landfill Gas Company – Belmon 12.5 kV (Y1-027) Project
Aerial View

Attachment 3

Westmoreland Landfill Gas Company – Belmon 12.5 kV (Y1-027) Project
Direct Connection Facilities

Item	Direct Connection Facilities
1.	Reconductor 4 spans of 12.5kV primary, remove 1-900kVAR capacitor bank, and install 1-600A airswitch
2.	Install 12kV net meter facility at/near WPP Pole #550311
3.	Install DTT facilities at Belmon SS and Relay Replacements/Changes
4.	Connect generators to the SCADA system/RTU facilities
5.	Fiber installation from Belmon Substation to Primary POI
6.	Engineering Oversight and Commission
	Direct Connection Costs: $286,490 **Taxes (if applicable): $99,540** **Total Estimated Costs: $386,030**