Generation Interconnection Combined Feasibility and System Impact Study Report

For

PJM Generation Interconnection Request Queue Position Y1-085

Kings Creek 25kV

August 2012

Preface

The intent of a 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 (cost allocation) with other projects will be identified in the Combined Report.

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 may be 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

ECOCORP, the Interconnection Customer (IC), has proposed a 4.4 MW energy only (0 MWC; 4.4 MW MFO) bio-methane gas fueled reciprocating engine generating facility to be located Somerset County, Maryland. PJM studied Y1-085 project as a 4.4 MW injection into the Delmarva Power and Light (DPL) system at the Kings Creek 25kV substation and evaluated it for compliance with reliability criteria for summer peak conditions in 2015. The planned in-service date, as stated in the Attachment N, is October 1, 2013.

Point of Interconnection

The Interconnection Customer requested a 25kV distribution level interconnection. Y1-085 will interconnect with the DPL transmission system at the Kings Creek 25kV substation as follows (see Attachment 1):

4.4 MWs will connect to the existing 138/25kV T2 transformer at Kings Creek Substation

Direct Connection Requirements

Criteria Limits for Distributed Energy Resource Connections to the ACE, DPL and Pepco Distribution Systems (less than 69kV)

1. Existing Distribution Circuit Capacity Limits

The aggregate limit of large (250 kW and over) generator injection to a single, existing distribution circuit is 0.5 MWs on the 4kV, 3MWs on the 12 kV, 6 MWs on the 25 kV, and 10 MWs on the 34 kV.

2. Express Circuit Capacity Limits

Distributed generation installations which exceed the limit for an existing circuit require an express circuit.

The maximum generator size for express circuits shall be:

- 4 kV 0.5 MW
- 12 – 13.8 kV 10 MWs
- 23 – 25 kV 10 MWs
- 33.26 – 34.5 kV 15 MWs

3. Distribution Power Transformer Limit

The aggregate limit of large (250 kW and over) generator injection to a single distribution transformer of 22.5 MVA nameplate or larger is 10 MWs. Transformers with nameplate ratings lower than 22.5 MVA will be given lower ratings on an individual basis. If the transformer rating is significantly greater than 40 MVA it may be possible to consider a greater amount of injection.

Adding a new transformer will be considered if there is no availability on any of the existing transformers and space is available in an existing substation. Any proposed transformers would be PHI's standard distribution transformer (37 MVA nameplate rating.)

4. Express Circuit Length Limit

If there is no more injection capacity or space for an additional transformer at the closest substation, the next closest substation will be considered. The length of an express circuit is limited to 5 miles, or for the sake of the feasibility study, 3.8 straight line miles. This simplification is used because the feasibility study phase does not allow for the time and resources to examine routes in detail (including existing pole lines, easements, ROW, and environmental issues etc.)

5. When a New Substation is Required

If a distribution express circuit can't be built from an existing substation for a project, it will be necessary to construct a new distribution substation with a standard ring bus design. It will be supplied by extending existing transmission lines. It is the developer's responsibility to verify eligibility of this configuration for solar renewable energy certificates.

All injection limits, given above in MWs, are subject to more detailed study to ensure feasibility.

Transmission Owner Scope of Work

1. One new 25 kV feeder with a combination of 1000 kcmil UG and 954 kcmil All Aluminum Conductor (AAC) will be constructed from Kings Creek Substation to the generating site – a distance of approximately 0.9 miles. An express feeder is needed because the amount of existing generation on the closest distribution feeder exceeds the criteria previously stated, and the location of next closest distribution feeder exceeds the acceptable proximity.
2. Delmarva Power plans to service the express feeder from Kings Creek Substation using the existing pole line then transferring to an underground feeder. The Eastern Correctional

Institute is currently fed underground via a service road (Perry Rd) which is wooded and unpaved. This is the most direct and reliable route, which utilizes the existing pole line until where Delmarva Power stops with three phase overhead facilities. The existing facilities are underground in this area due to extreme vegetation. Considering aerial installation for this portion is not feasible and would be cost prohibitive.

3. One new 12 kV feeder terminal position will be constructed.
4. A utility operated recloser equipped with the proper relaying and communications will be installed for the feeder serving the generating site.
5. Utility grade primary metering will be required for each feeder.
6. Generation telemetry and remote trip capability will be provided to PHI's Energy Management System with future capability to adjust output and power factor if needed.
7. A detailed, time-based study may be performed during later study phases.
8. Protection, Planning, and other engineering departments will perform studies, design work, and prepare engineering estimates.
9. Transfer trip will be required. Approximately 0.9 miles of 48SM ADSS fiber optic cable was estimated for this report to provide the communication channel from Kings Creek substation to the generating site.

The estimated cost to perform this work is as follows:

Estimated Costs			
Kings Creek Substation T2			
954 AAC Express Feeder	0.3	Miles	$789,005
1000 kcmil UG Express Feeder	0.6	Miles	
Fiber Installation	0.9	Miles	$45,000
New Feeder Terminal			$325,000
Recloser w/ Relaying and Communications			$50,000
Utility Grade Metering			$20,000
SCADA Integration into EMS			$10,000
Detailed Time Based Study			$30,000
Various Departments Work			$20,000
Subtotal Cost			$1,289,005
Subtotal Cost with 18% Overheads			$1,521,026
Approximate Total Cost with 15% Contingency			$1,749,180

The estimated time to complete the above work is **12 - 18 months** after receipt of a fully executed interconnection agreement.

Interconnection Customer Scope of Work

The Interconnection Customer assumes full responsibility for design and construction of all facilities associated with the Y1-085 generating station and the direct connection line on the IC side of the Point of Interconnection.

The IC will be required to install metering and telemetry equipment to provide revenue metering and real-time telemetry data to PJM. The requirements for this equipment are listed in Appendix 2, Section 8 of Attachment O to the PJM Tariff, as well as PJM Manuals 01 and 14D. Protective relaying and metering design and installation must comply with DPL applicable standards.

Special Operating Requirements

1. The Company ('Company' referring to ACE, DPL, PEPCO, (PHI)) will require the capability to remotely isolate the generator from the grid from its System Operations facility. Such tripping may be facilitated by either a generator breaker, inverter (if so equipped), or a line recloser, depending upon the specific circumstances and the evaluation of the Company.

2. It is the Interconnection Customer's responsibility to send the data that PJM and the Company requires directly to PJM. The Interconnection Customer will grant permission for PJM to send the Company the following telemetry that the Interconnection Customer sends to PJM: real time MW, MVAR, volts, amperes, generator/status, and interval MWH and MVARH.

3. The Interconnection Customer will be required to make provisions for a voice quality phone line within approximately 3 feet of each Company metering position to facilitate remote interrogation and data collection.

4. A mutually acceptable means of interrupting and disconnecting the generator with a visible break, able to be tagged and locked out, shall be worked out with Company Engineering.

Transmission Network Impacts

Potential transmission network impacts are 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

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

Short Circuit

No issues identified.

Stability Analysis

Not required due to project size.

Other Charges

DPL reserves the right to charge the Interconnection Customer operation and maintenance expenses to maintain the Interconnection Customer attachment facilities, including metering and telecommunications facilities, owned by DPL.

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. The costs identified below represent the total to complete the reinforcement, not necessarily this project's cost. Actual cost allocations will be deferred until the System Impact Study is performed.

None

ATTACHMENT 1

Y1-085
Kings Creek 138/25 kV Substation