

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

For

***PJM Generation Interconnection Request
Queue Position Z2-004***

“Mantua Township 12 kV”

August 2014

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.

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

BioMass Alternative Power, LLC, the Interconnection Customer (IC), has proposed a 10 MW (10 MWE: 10 MWC) biomass fueled generating facility to be located in Mantua, New Jersey. The facility will consist of a steam boiler with a single steam driven turbine generator. PJM studied Z2-004 as a 10 MW injection into the Atlantic City Electric Company's (ACE) system at the Mantua 12 kV substation and evaluated it for compliance with reliability criteria for summer peak conditions in 2018. The Z2-004 project was studied with a commercial probability of 100%. The planned in-service date, as requested during the project kick-off call, is May 31, 2015.

Point of Interconnection

The Interconnection Customer requested a 12 kV interconnection with the ACE distribution system. As a result, Z2-004 will interconnect with the ACE system as follows (see Attachment 1):

The first 7.2 MWs will connect with the Mantua 69/12 kV substation at the T1 transformer; the remaining 2.8 MWs will connect with the ACE system at a new 69/12 kV substation to be constructed adjacent to the Mickleton-Mantua 69 kV circuit.

Direct Connection Requirements

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

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 4 kV, 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 Interconnection Customer's responsibility to verify eligibility of this configuration for solar renewable energy certificates with New Jersey's Clean Energy Program if desired.

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

Interconnected Transmission Owner Scope of Direct Connection Work

To accommodate the first 7.2 MW of generation

1. Design and construct one new 12 kV feeder with 954 aluminum conductor from Mantua Substation to the generation site – approximately 3 miles
2. A utility operated recloser equipped with the proper relaying and communications will be required for each feeder serving the generator.
3. Utility grade primary metering will be required for each feeder.
4. Generation telemetry and remote trip capability will be provided to the control center.
5. Transfer trip will be required.

To accommodate the remaining 2.8 MW of generation

6. Design and construct a new 69/12 kV substation at the site. This substation will be built to the Company's (the "Company" referring to ACE, DPL, or PEPCO) specifications for a distribution substation and be owned and operated by the Company. *Note: There are no plans to serve load from this substation, however it will be built so that it can serve load in the future. The Interconnection Customer shall supply adequate land for the installation of the substation. The land shall be in close proximity to roads and be on buildable high land.*
7. Create a transmission loop by cutting into the Mickelton – Mantua 69 kV line with an approximate total distance of 2.3 miles to the new substation.
8. Establish one new 12 kV feeder with overhead conductor from the new substation to the generation site.
9. A utility operated recloser equipped with the proper relaying and communications will be required for each feeder serving the generator.
10. Utility grade primary metering will be required for each feeder.
11. Generation telemetry and remote trip capability will be provided to the control center.
12. Protection, Planning, and other engineering departments will perform studies, design work, and prepare engineering estimates.
13. Transfer trip will be required.

Estimated Costs			
Mantua Substation T1			
954 AAC Express Feeder	2.8	Miles	\$1,120,000
Fiber Installation			\$140,000
New Feeder Terminal			\$350,000
Recloser w/ Relaying and Communications			\$50,000
Utility Grade Metering			\$20,000
SCADA Work			\$10,000
Dynamic Study			\$30,000
Various Departments Work			\$15,000
Approximate Total Cost			\$1,735,000
Subtotal Cost with 18% Overheads			\$2,047,300

Estimated Costs			
New Substation			
New Substation			\$5,500,000
400 ft. Express Feeder	1		\$70,000
Transmission Feed 69 kV	2.2	Miles	\$1,430,000
Fiber Installation (5 miles of fiber assumed)			\$250,000
Recloser w/ Relaying and Communications	1		\$50,000
Utility Grade Metering	1		\$20,000
SCADA Integration into EMS	1		\$10,000
Detailed Time Based Study			\$30,000
Various Departments Work			\$20,000
Subtotal Cost			\$7,380,000
Subtotal Cost with 18% Overheads			\$8,708,400

The estimated time to complete this work is **24-36 months** after receipt of a fully executed interconnection agreement.

Interconnection Customer Scope of Direct Connection Work

The IC is responsible for all design and construction related to activities on their side of the Point of Interconnection. Site preparation, including grading and an access road, as necessary, is assumed to be by the IC. Route selection, line design, and right-of-way acquisition of the direct connect facilities is not included in this report, and is the responsibility of the IC.

Protective relaying and metering design and installation must comply with PHI’s applicable standards. The IC is also required to provide revenue metering and real-time telemetering data to PJM in conformance with the requirements contained in PJM Manuals M-01 and M-14 and the PJM Tariff.

The IC will purchase and install all metering instrument transformers as well as construct a metering structure per PHI's specifications. The secondary wiring connections at the instrument transformers will be completed by the interconnection customer's contractors and inspected by PHI, while the secondary wiring work at the metering enclosure will be completed by PHI's Meter technicians. The metering control cable and meter cabinets will be supplied by PHI and installed by the interconnection customer's contractors. PHI's meter technicians will program and install two solid state multi-function meters (Primary & Backup) for the new metering position. Each meter will be equipped with load profile, telemetry, and DNP output. The ownership of metering equipment purchased or installed by the IC shall be transferred to the Interconnected Transmission Owner at commercial operation unless the IC asserts its right to install, own, and operate the metering system.

Additional Operating Requirements

1. The Company will require the capability to remotely disconnect the generator from the grid by communication from its System Operations facility. Such disconnection may be facilitated by either a generator breaker, a line recloser, or other method 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 Distribution Engineering.
5. The Company 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 Company.

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

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 problems identified.

Stability Analysis

Not required due to project size.

Light Load Analysis

(Light Load Studies to be conducted during later study phases (applicable to wind, coal, nuclear, and pumped storage projects).

Not required.

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

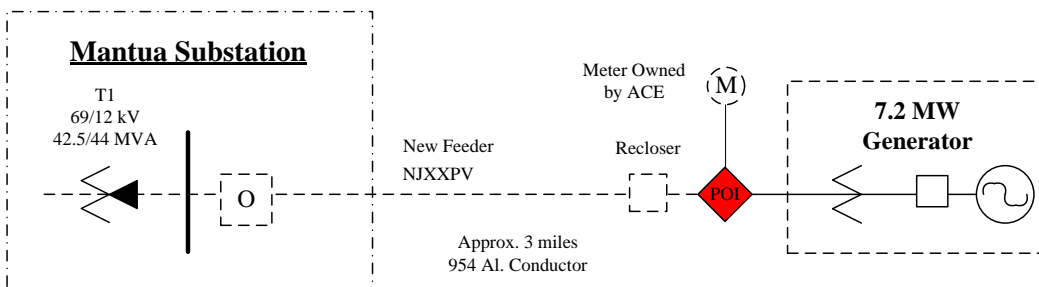
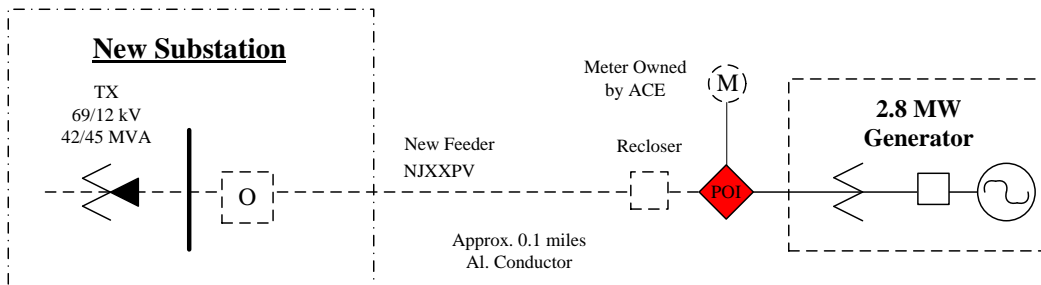
(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project.


None

Z2-004

New 69/12 kV Sub & Mantua 69/12 kV Sub

Biomass Generator 10 MW



 Point of Interconnection