

***Generation Interconnection
Feasibility Study Report***

For

***PJM Generation Interconnection Request
Queue Position X1-108***

Bangor

August 2011

Preface

The intent of the feasibility study is to determine a plan, with ballpark 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 possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

The Feasibility 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 may be included in the study.

General

Queue X1-108 is a request to increase the capacity and energy resources of its existing natural gas combined cycle generation by 33 MW for a total capacity of 584.2 MW. Queue X1-108 is located southeast of Bangor, Pennsylvania. Queue X1-108 has proposed an in-service date of December 31st, 2012.

Summary

The analysis performed by PJM and PPL EU have confirmed that there is no work required to support the additional 30 MW.

Direct Connection

Queue X1-108 is connected as shown on the one line diagram below. No additional interconnection facilities or upgrades are required.

Direct Connection Issues

X1-108 Generator and GSU modeling

Per the X1-108 supplied data, the following was used in modeling the generators and GSUs:

X1-108 Combustion Turbines:

Two units: 378.2 MW gross (370.2 MW net) generation, total for two units, injected into the system with a station service of 8 MW/ 7 Mvar. Generator saturated sub-transient reactance is 0.161 with a base of 235 MVA for each machine. (Provided)

X1-108 Steam Turbine:

One unit: 219.2 MW gross (214 MW net) generation injected into the system with a station service of 5.2 MW/ 4.3 Mvar. Generator saturated sub-transient reactance is 0.191 with a base of 254 MVA for each machine. (Provided)

GSUs:

Generator Step Up Transformers:

Unit 1 (CT): 16.5/235 kV, 230 MVA transformers with a $0.0022+j0.1375$ impedance on a 230 MVA base (Assumed).

Unit 2 (CT): 16.5/235 kV, 230 MVA transformers with a $0.0022+j0.1386$ impedance on a 230 MVA base (Assumed).

Unit 3 (ST): 16.5/235 kV, 260 MVA transformers with a $0.0022+j0.1451$ impedance on a 260 MVA base (Assumed).

Network Impacts

Queue project X1-108 was studied as a(n) 33.0 MW (33.0 MW of which was Capacity) injection into PPL EU's system at the Interconnection Customer's CT1 16.5 kV substation. Project X1-108 was evaluated for compliance with reliability criteria for summer peak conditions in 2015.

Potential transmission network impacts are as follows:

Generator Deliverability

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

No violations identified.

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)

No violations 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 violations identified.

New System Reinforcements

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

None required.

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 required.

Short Circuit

(Report over-dutied breakers.)

None required.

Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of the surrounding generation. Any potential 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 Transmission Interconnection request.

Note: Only the most severely overloaded conditions are listed. 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 analyzes all overload conditions associated with the overloaded element(s) identified. As a result of the aggregate energy resources in the area, the following violations were identified.

No violations identified.