PJM Generator Interconnection
T108 Archbald 69kV 9.2 MW
Feasibility / Impact Study

April 2008

DMS #476762

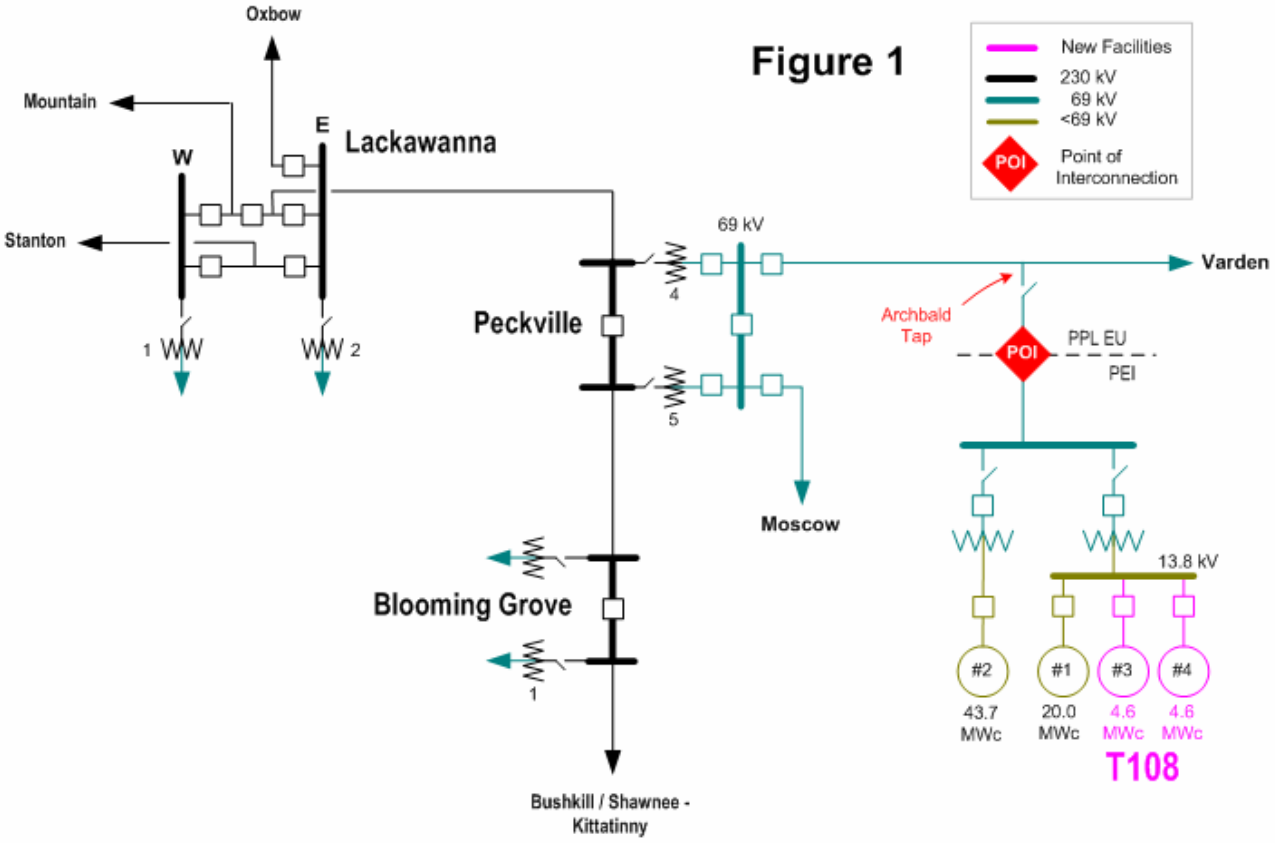
General

Queue T108 is a PEI Power Corporation request to interconnect a 9.2 MW net Capacity addition to the Archbald Tap on the Peckville to Varden 69 kV line in Archbald, Lackawanna County, Pennsylvania. The Capacity addition will consist of two 4.6 MW gas turbines. PEI Power had proposed an in-service date of January 1, 2009.

> ***Note:*** *Due to scheduling and outage requirements, the in-service date must be extended one year, to January 1, 2010.*

Direct Connection Requirements

Queue T108 generation will be connected to the existing PEI Power Archbald generating station as shown on the one line diagram Figure 1 below and described in the text that follows.



Queue T108 Interconnection Customer Scope of Direct Connection Work

Queue T108 Interconnection Customer is responsible for design, construction and costs for the T108 generating station and all associated facilities on the Interconnection Customer side of the POI (Point of Interconnection) as shown on the Figure 1 one line diagram.

Interconnected Transmission Owner (PPL EU) Scope of Direct Connection Work

The new generating facilities will be interconnected onto the Peckville-Varden 69 kV transmission line. The PEI Power POI (Point of Interconnection) is near grid 60480-N-48760. Peckville 230-69 kV Substation supplies the Peckville-Varden line. At the PEI Power plant, these two new generating units will be installed on an existing 13.8 kV bus, which is currently connected to the 25.9 MVA Unit 1 generator. See Figure 1 on the previous page.

Transmission Direct Connection Work ($0)
PPL EU transmission facilities (Peckville-Varden) are of sufficient capability to permit connection of an additional 9.2 MW of generation from PEI Power. No transmission line work is required for this new interconnection.

Substation Work ($220,000)
Conductors in Bay 2 and in the Tie Breaker Bay at the Peckville 230-69 kV Substation will likely need to be replaced to carry the additional generation output. Also, the Peckville Bay 2 and the Tie Bay disconnect switches may need to be replaced. The information shown on the Peckville Substation drawings prevented Engineering from making a determination on wire sizes and on the state of the 69 kV disconnect switches. To perform this replacement work will require at least a two-day outage of the Peckville-Varden line and an outage of the operating and inspection busses at the Peckville Substation. **The cost of the substation work will be reduced significantly if, during engineering design and field walkdown, the switches and/or conductor are found to have satisfactory capacity for the additional generation output.**

Regulation Requirements of the Generation Project:

PEI Power has indicated that the two new units will be synchronous generators. The two existing generating units at PEI Power are to operate near unity power factor over all MW output levels. Under normal operating conditions, PEI Power must maintain an MVAR schedule of zero (neither absorbing nor producing VARs) as measured at the 69 kV interconnection point with a tolerance of plus/minus 2.0 MVAR. In the past, PPL EU has directed PEI Power to hold this constant power factor at all MW output levels.

Based on preliminary analysis of data provided for this study, PPL EU calculations indicate that the new units will also need to operate near unity power factor. PPL EU will review the voltage regulation requirements again in future studies should PEI Power choose to proceed with this installation.

Future PPL EU studies will be based on the following data currently on record or provided by PEI Power:

- Two gas turbine-generators, each 5.75 MVA and 4.60 MW, terminal voltage of 13.8 kV, direct axis sub-transient reactance of 22.2%, both generators sharing the same 13.8 kV bus as the existing Unit 1 generator.

- One interconnection power transformer (existing), 18/24/30 MVA, 70.725-13.8 kV, +/- 2.5% high-side taps, impedance of 6.84% on an 18 MVA base.

  If the above data is incorrect, PEI Power is asked to provide updated information on this equipment.

Schedule Requirements for the Generation Project

Activity	Start	Finish
PPL EU Study & Contracts:		
Feasibility/ Impact Study		03/31/08
Interconnection Agreement Complete		04/30/08
PPL EU Engineering:		
IPP Provides Design Drawings for PPL EU Review	05/01/08	05/31/08
PPL Completes Engineering	06/01/08	01/30/09
PPL EU Construction/ Relay Test:	03/01/09	10/31/09
Meter Install		08/01/09
Commercial In-Service Date		01/01/10
Complete As-Built Drawing Review		03/01/10

Notes concerning the Schedule:

- The ISA/CSA or an Interim Agreement must be signed by PEI Power, PJM, and PPL EU before any PPL EU activities may commence.
- The schedule is completely under the control of PEI Power. PPL EU will turn drawings around in a reasonable timeframe, however, PPL cannot start work until the first set of drawings is received.

PPL EU Direct and Indirect Cost Breakdown

Direct Labor	$101,221
Indirect Labor	$87,972
Direct Material	$26,775
Indirect Material	$4,032
Total:	**$220,000**

Note concerning the Costs:

The costs given above are based on the assumption that PEI will use a similar IPR (Interconnection Protective Relay) cabinet design as used previously and that the drawings will be in good order.

Network Impacts

The T108 project was studied as a 9.2 MW Capacity injection into the Peckville – Varden 69 kV line at the Archbald Tap. Project T108 was evaluated for compliance with reliability criteria for summer peak conditions in 2012. Potential network impacts were as follows:

NETWORK IMPACTS

Local Transmission System Impacts

(Normal system conditions with all facilities in service, and contingency analysis per documented Reliability Criteria, generally FERC Form 715, for Transmission Owner's underlying system)

No problems identified.

Generator Deliverability

(Normal System with all facilities in-service and Single, or N-1, contingencies for the Capacity portion only of the interconnection)

No problems identified.

Multiple Facility Contingency

(Double Circuit Tower Line contingencies only for the full energy output. Stuck breaker and bus fault contingencies will be performed for the Impact Study)

No problems identified.

Short Circuit Analysis

No problems identified.

Steady-State Voltage Requirements

(Evaluation of steady-state voltage and reactive requirements)

Local 69 kV system impacts per PPL analysis results:
See "Regulation Requirements of the Generation Project" in the Direct Connection section of this Feasibility / Impact Study report.

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

Stability analysis is not required for a 9.2 MW generation addition.

Queue T108 complies with the PJM Tariff requirement to design the small generator addition to meet the dynamic power factor range of 0.95 lead to 0.90 lag measured at the Point of Interconnection. See Figure 2 (Generator Capability Curve) for Queue T108 (new units #3 and #4).

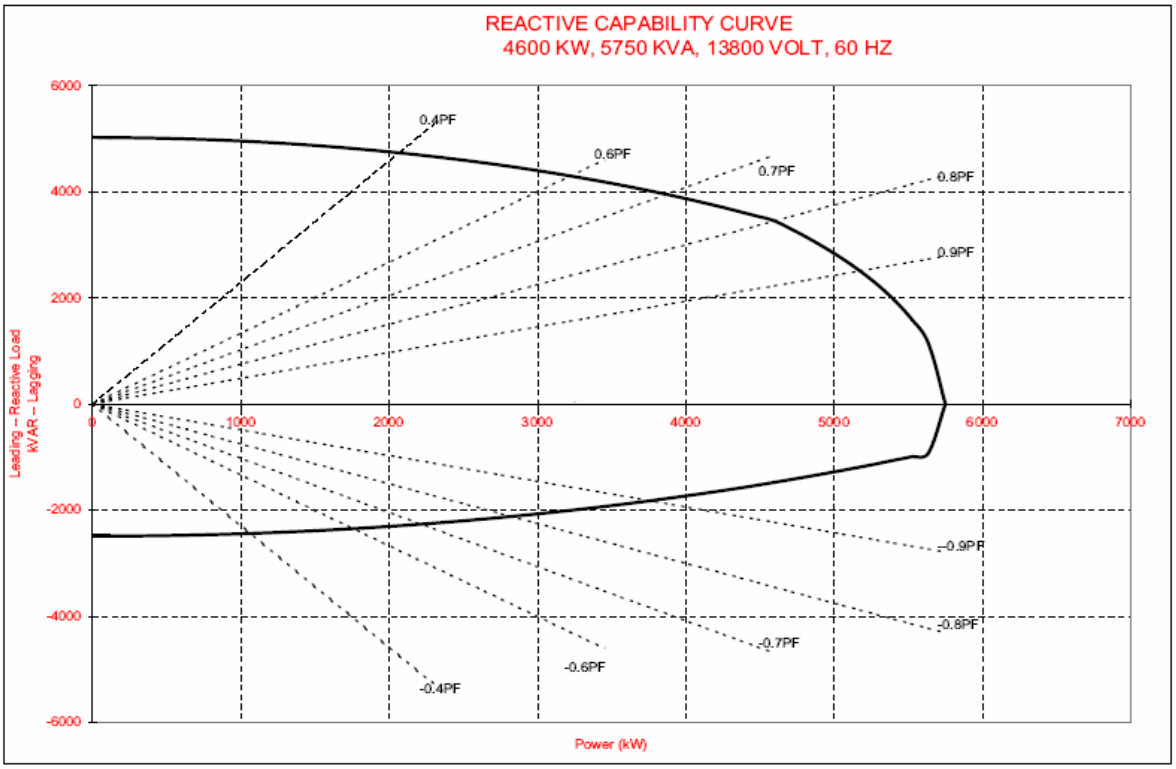


Figure 2

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 identified.

NETWORK UPGRADE REQUIREMENTS

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 *(This project contributes to the Network Impact causing the need for these Network Upgrades. This project will be allocated a cost to be determined during the Impact Study)*

None required.