#Q89 Eldred 750 MW

Generator Interconnection

This analysis was completed to assess the reliability impact for a new generator interconnecting to the PJM System as a Capacity Resource.

Network Impacts (Option #1)

The **#Q89 project (Option 1) was studied as the injection of 750MW into the tap of the Juniata - Alburtis 500 kV line.** Project #Q89 was evaluated for compliance with reliability criteria for summer peak conditions in 2011. Potential network impacts were as follows:

Generator Deliverability (Single Contingency)

No identified problems

Multiple Facility Contingency

(Double Circuit Tower Line contingencies only, Bus faults and Stuck Breaker operations will be studied during the Imppact Study)

No identified problems

Short Circuit

No overdutied circuit breakers identified by PJM. PPL EU to confirm during the Impact Study.

Stability Analysis

To be performed during the Impact Study.

New System Reinforcements Requirements

None

Q89 Loading Contribution to Previously Identified Overloads

(Queue Q89 contributes to the following contingency overloads identified for earlier generation or transmission interconnection projects in the PJM Queue)

None identified.

Contribution to Previously Identified ReinforcementRequirements

None.

Network Impacts (Option #2)

The **#Q89 project (Option #2) was studied as the injection of 750 MW into the Eldred 230 kV substation.** Project #Q89 was evaluated for compliance with reliability criteria for summer peak conditions in 2011. Potential network impacts were as follows:

Note: After receiving preliminary results for the 230 kV Interconnection (Option #2), Queue Q89 Interconnection Customer decided to drop the 230 kV option and go forward with the 500 kV option. The following Eldred 230 kV (Interconnection Option #2) preliminary information was provided to the Q89 Interconnection Customer.

Generator Deliverability

1. The FRACKVILLE – ELDRED 230 kV line is overloaded at around 138% of its normal rating (349 MVA). The **Q89 project contributes approximately 369 MW** to the normal facility loading.
2. The ELDRED – SUNBURY 230 kV line is overloaded at around 172% of its emergency rating (455 MVA) for the **outage** of the Eldred - Frackville 230KV line. The **Q89 project contributes approximately 750 MW** to the contingency facility loading.
3. The FRACKVILLE – SIEGFRED 230 kV line is overloaded at around 109% of its normal rating (514 MVA). The **Q89 project contributes approximately 194 MW** to the normal facility loading.
4. NORTH MESHOPPEN 230/115 kV Transformer is overloaded at around 103% of its emergency rating (201 MVA) for the **outage** of the N. Meshoppen - E. Towanda 230KV line. The **Q89 project contributes approximately 32 MW** to the contingency facility loading.

Multiple Facility Contingency

(Double Circuit Tower Line contingencies only, Bus faults and Stuck Breaker operations will be studied during the Impact Study)

5. MORRIS PARK – MARTINS CREEK 230 kV line is overloaded at around 102% of its emergency rating (1586 MVA) for the **Double Circuit Tower Line outage** of the Portland – Kittantiny 230KV line and the Portland - Greystone 230KV line. The **Q89 project contributes approximately 65 MW** to the contingency facility loading. (Note: This circuit will not be contingency overloaded if Merchant Transmission projects Queues O66 and Q75 withdraw)
6. The FRACKVILLE – SIEGFRED 230 kV line is overloaded at around 132% of its emergency rating (616 MVA) for the **Double Circuit Tower Line outage** of the Susquehanna - E. Palmerton 230KV line and the Harwood - Siegfried 230KV line. The **Q89 project contributes approximately 198 MW** to the contingency facility loading.
7. The FRACKVILLE – ELDRED 230 kV line is overloaded at around 143% of its emergency rating (455 MVA) for the **Double Circuit Tower Line outage** of the

Susquehanna - E. Palmerton 230KV line and the Harwood - Siegfried 230KV line. The **Q89 project contributes approximately 371 MW** to the contingency facility loading.

Q89 Loading Contribution to Previously Identified Overloads

(Queue Q89 contributes to the following contingency overloads identified for earlier generation or transmission interconnection projects in the PJM Queue)

8. The ROSELAND – WHIPPANY 230 kV line is overloaded at around 106% of its emergency rating (1233 MVA) for the **outage** of the Sayreville – Kilmer - Lake Nelson – Middlesex - Green Brook - Gillette 230KV line and Sayreville – Kilmer – Lake Nelson – Green Brook – Gillette 230KV line. The **Q89 project contributes approximately 44 MW** to the contingency facility loading.

   And,

   The ROSELAND – WHIPPANY 230 kV line is overloaded at around 107% of its emergency rating (1233 MVA) for the **Double Circuit Tower Line outage** of the Sayreville –Kilmer - Lake Nelson – Middlesex - Green Brook - Gillette 230KV line and Sayreville – Kilmer – Lake Nelson – Green Brook – Gillette 230KV line. The **Q89 project contributes approximately 44 MW** to the contingency facility loading.

9. The KOONS AB – BERWICK 69 kV line is overloaded at around 128% of its emergency rating (56 MVA) for the **Double Circuit Tower Line outage** of the Susquehanna – Mountain 230KV tower lines. The **Q89 project contributes approximately 10 MW** to the contingency facility loading.
10. The GLENDON – NORTHWOOD 115 kV line is overloaded at around 153% of its emergency rating (125 MVA) for the **outage** of the Martins Creek – Morris Park - Gilbert 230 KV line. The **Q89 project contributes approximately 8 MW** to the contingency facility loading.
11. PORTLAND – MARTINS CREEK 230 kV line is overloaded at around 108% of its emergency rating (1730 MVA) for the **Double Circuit Tower Line outage** of the Gilbert –Morristown 230KV line and the Gilbert – Glen Gardner 230KV line. The **Q89 project contributes approximately 39 MW** to the contingency facility loading.
12. GILBERT – MORRIS PARK 230 kV line is overloaded at around 107% of its emergency rating (1386 MVA) for the **Double Circuit Tower Line outage** of the Portland – Kittantiny 230KV line and the Portland - Greystone 230KV line. The **Q89 project contributes approximately 64 MW** to the contingency facility loading.

Short Circuit

Under study

Stability Analysis

To be performed during the Impact Study.

New System Reinforcements

1. The FRACKVILLE – ELDRED 230 kV line normal System overload requires a second Frackville – Eldred 230 kV line. **This upgrade also mitigates the overload identified as number 7 below.** (see PPL cost estimate below).
2. The ELDRED – SUNBURY 230 kV line contingency overload requires a second Eldred – Sunbury 230 kV line (see PPL cost estimate below).
3. The FRACKVILLE – SIEGFRED 230 kV normal system overload requires a second Frackville – Siegfried 230 kV line. **This upgrade also mitigates the overload identified as number 6 below.** (see PPL cost estimate below).
4. The NORTH MESHOPPEN 230/115kV Transformer contingency overload can be mitigated by ……

   Under Study – Don Morrison (FirstEnergy) to provide info to Wenzheng.

5. The MORRIS PARK – MARTINS CREEK 230 kV line contingency overload requires …….
   Under Study – Don Morrison (FirstEnergy to provide info to Wenzheng.

6. The FRACKVILLE – SIEGFRED 230 kV line contingency overload requires a second Frackville – Siegfried 230 kV line. **Upgrade number 3 above also mitigates this overload.** (see PPL cost estimate below).
7. The FRACKVILLE – ELDRED 230 kV line is overloaded contingency overload requires a second Frackville – Eldred 230kV line. **Upgrade number 1 above also mitigates this overload.** (see PPL cost estimate below).

Network Upgrades for PPL New System Reinforcement Requirements identified as numbers 1, 2, 3, 6 and 7 above.

Transmission Network Upgrade Work

Upgrade Type	Description	Cost
Network Upgrade	Rebuild the Sunbury – Eldred 230kV circuit for double circuit, installing both circuits	$56,300,000
Network Upgrade	Rebuild the Frackville – Eldred 230kV circuit for double circuit, installing both circuits	$27,500,000
Network Upgrade	Rebuild the Frackville – Siegfried 230kV circuit for double circuit, installing both circuits	$92,300,000

Substation Network Upgrade Work

Upgrade Type	Description	Cost
Network Upgrade	Expand Eldred 230kV substation to accommodate the second Sunbury – Eldred 230kV line and second Frackville – Eldred 230kV line, including relay protection requirements	$7,750,000
Network Upgrade	Install the line bay at the Sunbury 230kV substation to accommodate the second Sunbury – Eldred 230kV line, including relay protection requirements	$4,000,000
Network Upgrade	Expand the Frackville 230kV substation to accommodate the second Frackville – Eldred 230kV line and second Frackville – Siegfried 230kV line, including relay protection requirements	$14,500,000
Network Upgrade	Install the line bay at the Siegfried 230kV substation to accommodate the second Frackville – Siegfried 230kV line, including relay protection requirements	$4,000,000

Estimated construction time for PPL Direct Connection and Network Upgrade work

- The estimated time to complete the work necessary for the Q89 is approximately **84 months** after the ISA and CSA has been fully executed.

Previously Identified System Reinforcements for which Q89 will have cost responsibility

(Upgrade plan, cost and time estimate for Previously Identified Overload. Q89 cost allocation will be calculated for the impact Study)

8. The ROSELAND – WHIPPANY 230 kV line contingency overload requires……

   Under Study – First overloaded by Q75, no estimate available yet.

9. The KOONS AB – BERWICK 69 kV line contingency overload requires…

   Under Study

10. The GLENDON – NORTHWOOD 115 kV line contingency overload requires…..

    Under Study – First overloaded by O66, no estimate available yet.

11. The PORTLAND – MARTINS CREEK 230 kV line contingency overload requires….

    Under Study – The following was reported for Queue O66, the first (but not only) interconnection project to cause this contingency line overload. [[[[The Portland-Martins Creek 230kV line loads to 108% of its emergency rating (1410MVA). The load withdrawal of #O66 project contributes approximately 115 MW to the flow on the overloaded facility. *The cost for the following two upgrades is $260,000 total. Because these projects are already identified in the 2011 RTEP to be upgraded by the Transmission Owner, the merchant transmission developer of the O66 project will be responsible for the advancement cost for the projects. The total advancement costs for these projects are **$22,845.** The new summer emergency rating will be 1728 MVA with the upgrade*.]]]]

12. The GILBERT – MORRIS PARK 230 kV line contingency overload requires……..

    Under Study – First overloaded by Q75, no estimate available yet.

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