#Q11 – Red Oak 230kV 300 MW
Generation 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

The #Q11 project was studied as 2 options. Option A considers two new Combustion Turbines of 150 MW each (300 MW total) into a new 3-breaker ring bus to be built to allow connection to the Red Oak-Raritan River T1034 230 kV circuit. Option B considers the expansion of the ring bus described for project Q08 to provide interconnection for two new 150 MW Combustion Turbines (300 MW total).

The analysis included representation of the Parlin generating facility, as required by Tariff, for those generating facilities that have been retired.

Option A:

Generator Deliverability

1. The Atlantic-S.River 230 kV line is overloaded at around 121% of its emergency rating (805 MVA) for the **outage** of the Raritan River-Q08opt2 Tap 230 kV line. The Q11 project contributes approximately 299 MW to the contingency facility loading.

2. The Raritan River-Q08opt2 Tap 230 kV line is overloaded at around 120% of its emergency rating (793 MVA) for the **outage** of the Atlantic-S.River 230 kV line. The Q11 project contributes approximately 299 MW to the contingency facility loading.

3. The Raritan River-Q08opt2 Tap 230 kV line is overloaded at around 116% of its normal rating (653 MVA). The Q11 project contributes approximately 230 MW to the facility loading.

Multiple Facility Contingency

4. The Whippany - Roseland 230 kV line is overloaded at around 101% of its emergency rating (1233 MVA) for the **tower outage** of the Kittatinny – Bushkill Tap 230 kV line and Kittatinny – Newtone DCT15 230 kV line. The Q11 project contributes approximately 32 MW to the contingency facility loading.

Short Circuit

No problems identified.

New System Reinforcements

1. Reconductor the Atlantic - South River (P1030 - 18.7 mile) 230 kV line with 1590 ACSS conductor for 200 degrees centigrade operation. The upgraded normal/4-hour rating is expected to be 946/1093 MVA. The estimated cost of this upgrade is **$11,500,000**.

2. At the Atlantic 230 kV substation, replace one 2000 amp line trap with 3000 amp equipment. At the South River 230 kV substation, replace one 2000 amp line trap with 3000 amp equipment. The estimated cost of these upgrades is **$160,000 (assuming no foundation or structural work is required)**.

3. Reconductor the Raritan River - Red Oak Q08opt2 (T1034 - 2.6 mile) 230 kV line with 1590 ACSS conductor for 200 degrees centigrade operation. The upgraded normal/4-hour rating is expected to be 946/1093 MVA. The estimated cost of this upgrade is **$2,000,000**.

4. Reconductor the Whippany-Roseland 230kV circuit with ACSS-AW wire equivalent to 1033.5 kcmil 54/7 ACSR wire. The upgraded rating of the circuit will be 1219/1386MVA based upon the line trap at Whippany. The estimated cost of the upgrade is **$2,592,000.**

Contribution to Previously Identified System Reinforcements

None

Option B:

Generator Deliverability

1. The Raritan River-Red OakA 230 kV line is overloaded at around 121% of its emergency rating (793 MVA) for the **outage** of the Raritan River-Red OakB 230 kV line. The Q11 project contributes approximately 183 MW to the contingency facility loading.
2. The Whippany - Roseland 230 kV line is overloaded at around 102% of its emergency rating (1233 MVA) for the **outage** of the Kittatinny – Newtone DCT15 230 kV line. The Q11 project contributes approximately 29 MW to the contingency facility loading.

Multiple Facility Contingency

No problems identified.

Short Circuit

No problems identified.

Contribution to Previously Identified System Reinforcements

1. The Raritan River-Red OakB 230 kV line is overloaded at around 128% of its emergency rating (739 MVA) for the **outage** of the Raritan River-Red OakA 230 kV line. The Q11 project contributes approximately 183 MW to the contingency facility loading.

New System Reinforcements

1. Reconductor the Raritan River - Red Oak B (G1047 - 2.6 mile) 230 kV line with 1590 ACSS conductor for 200 degrees centigrade operation. The upgraded normal/4-hour rating is expected to be 946/1093 MVA. The estimated cost of this upgrade is **$2,000,000**.

2. Reconductor the Whippany-Roseland 230kV circuit with ACSS-AW wire equivalent to 1033.5 kcmil 54/7 ACSR wire. The upgraded rating of the circuit will be 1219/1386MVA based upon the line trap at Whippany. The estimated cost of the upgrade is **$2,592,000.**

Previously Identified System Reinforcements

3. Reconductor the Raritan River - Red Oak A (T1034 - 2.6 mile) 230 kV line with 1590 ACSS conductor for 200 degrees centigrade operation. The upgraded normal/4-hour rating is expected to be 946/1093 MVA. The estimated cost of this upgrade is **$2,000,000**.

Local Network Concerns

Option A &B

There is the potential for 34.5 kV constraints near Werner that may be attributable to the Q11 project. These occur due to the stronger Red Oak generation source that circulates flow down the Werner 115/34.5 kV transformers from the north versus flowing from the Atlantic/Red Bank area in the south as today. However, there are reliability improvements being considered at and near Werner that, if implemented, are expected to resolve the constraints that have been identified. While such plans are not firm, an assumption of the Feasibility Study performed is that these improvements will be implemented. As a disclaimer, FirstEnergy reserves the right to revisit the need for 34.5 kV network upgrades as a part of the Impact Study.