#U1-097 Essex 138kV

Generation Interconnection

This analysis was completed to assess the reliability impact for the new generation interconnecting to the PJM system as a capacity resource.

Network Impacts

The queue project U1-097 was studied as a 100MW (capacity) injection into PSEG's system at the Essex 230kV substation. U1-097 was evaluated for compliance with reliability criteria for summer peak conditions in 2012. Potential network impacts were as follows:

Generator Deliverability

(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

The short circuit requirements will be fully defined in the Impact Study.

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)

1. The Essex-Hudson 1-6 230kV circuit 1 line loads from 151.18% to 155.62% (DC power flow) of its emergency rating (826MVA) for the tower line outage (27PS). This project contributes approximately 36.7MW to the thermal violation.

2. The Essex-Hudson 1-6 230kV circuit 2 line loads from 114.44% to 117.62% (DC power flow) of its emergency rating (826MVA) for the single line contingency outage (U_queue_reinforcement_29). This project contributes approximately 26.2MW to the thermal violation.

3. The Hudson 1-6-South Waterfront 230kV line loads from 108.47% to 110.50% (DC power flow) of its normal rating (514MVA) for non-contingency condition. This project contributes approximately 10.4MW to the thermal violation. --

4. The R0seland-Whippany 230kV line loads from 105.73% to 109.03% (DC power flow) of its normal rating (1303MVA) for non-contingency condition. This project contributes approximately 43.1MW to the thermal violation.
5. The Essex-Newark 138kV line loads from 104.86% to 107.37% (DC power flow) of its normal rating (251MVA) for non-contingency condition. This project contributes approximately 6.3MW to the thermal violation.

6. The Roseland-Whippany 230kV line loads from 100.29% to 102.77% (DC power flow) of its emergency rating (1601MVA) for the single line contingency outage (PS44B). This project contributes approximately 39.7MW to the thermal violation.

7. The Hudson1-6-South Waterfront 230kV line loads from 102.47% to 104.37% (DC power flow) of its emergency rating (790MVA) for the tower line outage (24PS_49ST_RACK_A). This project contributes approximately 15.0MW to the thermal violation.

8. The Bergen – 49th St Rack 230kV line, which is part of a proposed future upgrade that was modeled in our case during this study, increased by about 3% (DC power flow) of its emergency rating (873MVA) for the tower line outage (30PS). This project contributes approximately 23.9MW to the thermal violation.

9. The Hudson 1-6- Homestead 230kV line, which is part of a proposed future upgrade that was modeled in our case during this study, increased by about 2% (DC power flow) of its emergency rating (717MVA) for the tower line outage (25PS_with_49st_rack_A). This project contributes approximately 15.9MW to the thermal violation.

10. The Homestead-Bergen 230kV line, which is part of a proposed future upgrade which was modeled in our case during this study, increased by about 2% (DC power flow) of its emergency rating (717MVA) for the tower line outage (25PS_with_49st_rack_A). This project contributes approximately 15.9MW to the thermal violation.

11. The South Waterfront-Newport R 230kV line, which is part of a proposed future upgrade which was modeled in our case during this study, increased by about 2% (DC power flow) of its emergency rating (565MVA) for the tower line outage (PS30_WITH_UpgradeB). This project contributes approximately 11.6MW to the thermal violation.

12. The South Waterfront-Newport Y 230kV line, which is part of a proposed future upgrade which was modeled in our case during this study, increased by about 2% (DC power flow) of its emergency rating (565MVA) for the tower line outage (25PS_with_49st_rack_B). This project contributes approximately 11.4MW to the thermal violation.

New System Reinforcements

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

None.

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)

1. The Essex-Hudson 230kV line overload can be alleviated by constructing a new 230kV line from Hudson to Essex (1590 ACSS). This upgrade will cost approximately **$10M** and take **2-3 years** to complete. This reinforcement will also mitigate Network Impact number 2 and 5.

3. The Hudson-South Waterfront 230kV line overloads can be alleviated by reconductoring the circuit. The estimated cost is **$6M**. This reinforcement will also mitigate Network Impact number 7.

4. Whippany – Roseland 230 kV (A941) Upgrade: This overload requires rebuilding existing Whippany to Roseland line from 1033.5 Kcmil 54/7 ACSR (2) (2.7 mile) to 1590 Kcmil 54/19 ACSS/AW (2) (2.7 mile) and addition of a line trap (4000 amp) (1) and bundled drop loop conductors at Whippany substation at an estimated cost of **$5,580,400**. This reinforcement will also mitigate Network Impact number 6.

8. The Bergen – 49th St RACK 230kV loading contributes to a reinforcement that has already been modeled in the PJM case. The reinforcement involves installing a 4 breaker ring bus at 49th street which taps Hoboken – Bergen. The line from 49th street to Bergen will also need to be reconductored with 1590 ACSS wire. The upgrade will cost approximately **$21.3M**.

9. The Hudson – Homestead 230kV line loading contributes to a reinforcement that has already been modeled in the PJM case. The reinforcement involves constructing a new 230kV circuit along the path Bergen – Homestead – Hudson. The estimated cost of this upgrade is **$33.7M**. This reinforcement will also mitigate Network Impact number 10.

11. The South Waterfront-Newport "R" 230kV line overloads can be alleviated by providing oil circulation to increase the rating. The estimated cost is **$5M**. This upgrade, in conjunction with the 4-breaker ring bus at 49th street (upgrade for Network Impact 8) will alleviate the overload.

12. The South Waterfront-Newport "Y" 230kV line overloads can be alleviated by providing oil circulation to increase the rating. The estimated cost is **$5M**. This upgrade, in conjunction with the 4-breaker ring bus at 49th street (upgrade for Network Impact 8) will alleviate the overload.