#T76 South River 230kV

Generation Interconnection

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

Network Impacts

The Queue Project #T76 was studied as a 40MW injection at the South River 230 kV substation in the JCPL area. Project #T75 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)

1. The South River-R39 Option 1 230kV line loads from 96.3% to 101.0% (DC power flow) of its normal rating (653MVA) for the non-contingency condition. This project contributes approximately 30.9MW to cause this thermal violation.

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 were identified

Short Circuit

No problems identified on the transmission system.

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)

2. The Red Oak A-Raritan River 230kV line loads from 197.62% to 200.63% (DC power flow) of its emergency rating (805MVA) for the single line contingency outage of the Red Oak B-Raritan River 230kV line. This project contributes approximately 24.2MW to the thermal violation. Previous project(s) T75 contribute(s) to the loading by 12.1 MW(1.5%). It must be noted that the same thermal violation (DC power flow: 195.7%) already exists in the 2012 base case due to unresolved problems in the R & S queues.

3. The Red Oak B-Raritan River 230kV line loads from 197.30% to 200.30% (DC power flow) of its emergency rating (805MVA) for the single line contingency outage of the Red Oak A-Raritan River 230kV line. This project contributes approximately 24.2MW to the thermal violation. Previous project(s) T75 contribute(s) to the loading by 12.1 MW(1.51%).It must be noted that the same thermal violation (DC power flow: 195.4%) already exists in the 2012 base case due to unresolved problems in the R & S queues.

4. The Red Oak A-Raritan River 230kV line loads from 121.08% to 123.04% (DC power flow) of its normal rating (650MVA) for non-contingency condition. This project contributes approximately 12.7 MW to the thermal violation.

5. The Red Oak B-Raritan River 230kV line loads from 118.30% to 120.20% (DC power flow) of its normal rating (650MVA) for non-contingency condition. This project contributes approximately 12.4MW to the thermal violation.

6. The Raritan River-Kilmer "I" 230kV line loads from 107.69% to 109.85% (DC power flow) of its emergency rating (742MVA) for the single line contingency outage of the Gillette-Raritan River "W" 230kV circuit. This project contributes approximately 16.0MW to the thermal violation. Previous project(s) T75 contribute(s) to the loading by 8MW(1.08%). It must be noted that the same thermal violation (DC power flow: 106.2%) already exists in the 2012 base case due to unresolved problems in the R & S queues.

7. The Parlin-Williams 230kV line loads from 147.16% to 149.34% (DC power flow) of its emergency rating (805MVA) for the tower line outage of the Raritan River-Red Oak "G" and Raritan River-Red Oak "T" circuits. This project contributes approximately 17.6MW to the thermal violation. Previous project(s) T75 contribute(s) to the loading by 8.8MW(1.09%). It must be noted that the same thermal violation (DC power flow: 146.1%) already exists in the 2012 base case due to unresolved problems in the R & S queues.

8. The Williams-Freneau 230kV line loads from 146.49% to 148.67% (DC power flow) of its emergency rating (805MVA) for the tower line outage of the Raritan River-Red Oak "G" and Raritan River-Red Oak "T" circuits. This project contributes approximately 17.6MW to the thermal violation. Previous project(s) T75 contribute(s) to the loading by 8.8MW(1.09%). It must be noted that the same thermal violation (DC power flow: 145.4%) already exists in the 2012 base case due to unresolved problems in the R & S queues.

9.The South River-Atlantic 230kV line loads from 150.38% to 153.13% (DC power flow) of its emergency rating (805MVA) for the tower line outage of the Raritan River-Red Oak "G" and Raritan River-Red Oak "T" circuits. This project contributes approximately 22.2 MW to the thermal violation. Previous project(s) T75 contribute(s) to the loading by 11.1MW(1.38%). It must be noted that the same thermal violation (DC power flow: 149.0%) already exists in the 2012 base case due to unresolved problems in the R & S queues.

10. The South River-Red Oak Q11/R39 230kV line loads from 112.14% to 117.18% (DC power flow) of its emergency rating (793MVA) for the tower line outage of the South River-Atlantic and Parlin-Williams 230kV circuits(30JC). This project contributes approximately 39.9MW to the thermal violation. Previous project(s) T75 contribute(s) to the loading by 20MW(2.52%). It must be noted that the same thermal violation (DC power flow: 109.6%) already exists in the 2012 base case due to unresolved problems in the R & S queues.

11. The Red Oak Q11/R39-Parlin 230kV line loads from 133.79% to 135.97% (DC power flow) of its emergency rating (805MVA) for the tower line outage of the Raritan River-Red Oak "G" and Raritan River-Red Oak "T" circuits. This project contributes approximately 17.5MW to the thermal violation. Previous project(s) T75 contribute(s) to the loading by 8.8MW(1.09%). It must be noted that the same thermal violation (DC power flow: 132.7%) already exists in the 2012 base case due to unresolved problems in the R & S queues.

12. The Red Oak - Red Oak Q11 230kV line loads from 121.70% to 125.17% (DC power flow) of its emergency rating (805MVA) for the tower line outage of the Parlin-Q11 "G" and Red Oak-R39 Option 1 "T" 230kV circuits. This project contributes approximately 27.9MW to the thermal violation. Previous project(s) T75 contribute(s) to the loading by 14.0MW(1.73%). It must be noted that the same thermal violation (DC power flow: 119.8%) already exists in the 2012 base case due to unresolved problems in the R & S queues.

13. The Red Oak - Red Oak R39 230kV line loads from 108.37% to 111.21% (DC power flow) of its emergency rating (793MVA) for the tower line outage of the South River-Atlantic and Parlin-Williams 230kV circuits. This project contributes approximately 22.6MW to the thermal violation. Previous project(s) T75 contribute(s) to the loading by 11.3MW(1.43%). It must be noted that the same thermal violation (DC power flow: 106.9%) already exists in the 2012 base case due to unresolved problems in the R & S queues.

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 & 9. The South River-R39 Option 1 230kV line overload can be alleviated by

2,3,4 & 5. The Red Oak A-Raritan River and the Red Oak B-Raritan River 230kV line overloads can be alleviated by reconductoring of the double circuit tower line from 1590 Kcmil 45/7 ACSR (2.6 mile) to 1590 Kcmil 54/19 ACSS/AW – Bundled (2.6 mile) for 1642/1850 MVA summer normal/emergency ratings. It also requires replacement of bundled drop loop conductors at Raritan River substation and at Red Oak A and B substations. Total estimated cost is **$8,331,000**.

6. The Raritan River-Kilmer "I" 230kV line overload can be alleviated by replacing the 2000 amp wave trap with one rated 3000 amp at Raritan River substation. Total estimated cost is **$117,000**.

7. The Parlin-Williams 230kV line overload can be alleviated by reconductoring the line from 1590 Kcmil 45/7 ACSR (2.9 mile DCT) to 1590 Kcmil 54/19 ACSS/AW -Bundled (1.7 mile DCT) for 1642/1850 MVA summer normal/emergency ratings. It also requires replacement of a 2000 amp disconnect switch with a 4000 ampunit, bundled drop loop conductor at Williams substation and at Parlin substation. Total estimated cost is **$3,860,400**.

8. The Williams-Freneau 230kV line overload can be alleviated by reconductoring the line from 1590 Kcmil 45/7 ACSR (7.77 mile DCT) to 1590 Kcmil 54/19 ACSS/AW-Bundled(7.37 mile DCT) for 1642/1850 MVA summer normal/emergency ratings. It also requires replacement of disconnect switch (4000 amp) (1), bundled drop loop conductor at Freneau substation and at Williams substation. Total estimated cost is **$15,300,000**.

9. The South River-Atlantic 230kV line overload can be alleviated by reconductoring the line from 1590 Kcmil 45/7 ACSR (18.7 mile DCT) to 1590 Kcmil 54/19 ACSS/AW-Bundled(10.03 mile DCT) for 1642/1850 MVA summer normal/emergency ratings. It also requires replacement of disconnect switch (4000 amp) (1), line trap (4000 amp) (1), bundled drop loop conductor at Atlantic substation and replacement of line trap (4000 amp) (1) and bundled drop loop conductor at South River substation. Total estimated cost is **$20,660,800**.

10. The South River-Red Oak Q11/R39 230kV (T1034) line overload can be alleviated by reconductoring the line from 1590 Kcmil 45/7 ACSR (1.91 mile DCT) to 1590 Kcmil 54/19 ACSS/AW-Bundled(1.71 mile DCT) for 869/1068 MVA summer normal/emergency ratings. It also requires replacement bundled drop loop conductors at South River substation. Total estimated cost is **$640,000**.

11. The Red Oak Q11/R39-Parlin 230kV line (G1047) overload can be alleviated by reconductoring the line from 1590 Kcmil 45/7 ACSR (1.91 mile DCT) to 1590 Kcmil 54/19 ACSS/AW-Bundled(1.71 mile DCT) for 1642/1850 MVA summer normal/emergency ratings. It also requires replacement bundled drop loop conductor at Red Oak Q11/R39 and Parlin substations. Total estimated cost is **$3,500,000**.

12. The Red Oak - Red Oak Q11_230kV line (G1047) overload can be alleviated by reconductoring the line from 1590 Kcmil 45/7 ACSR (0.2 mile DCT) to 1590 Kcmil 54/19 ACSS/AW-Bundled(0.2 mile DCT) for 869/1068 MVA summer normal/emergency ratings. It also requires replacement bundled drop loop conductors at Red Oak and Red Oak Q11/R39 substations. Total estimated cost is **$200,000**.

13. The Red Oak - Red Oak R39_ 230kV (T1034) line overload can be alleviated by reconductoring the line from 1590 Kcmil 45/7 ACSR (0.2 mile DCT) to 1590 Kcmil 54/19 ACSS/AW-Bundled(0.2 mile DCT) for 869/1068 MVA summer normal/emergency ratings. It also requires replacement bundled drop loop conductors at Red Oak and Red Oak Q11/R39 substations. Total estimated cost is **$200,000**.