#R53 Stanton - Brookside 60 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

The R53 project was studied as a 60 MW (12 MW of capacity) injection at a tap of the Stanton – Brookside 69 kV line. Project R53 was evaluated for compliance with reliability criteria for summer peak conditions in 2011. Potential network impacts were as follows:

Generator Deliverability
(Single or N-1 contingencies for the Capacity portion of the interconnection)

No problems were identified

Multiple Facility Contingencies
(Double Circuit Towerline contingencies were only checked. Stuck breaker and Bus Fault contingencies will be performed for the Impact Study. Queue R53 and all other wind generation is modeled at 100% energy output for Multiple Facility Contingencies)

No problems were identified

Short Circuit Analysis
The three-phase symmetrical short circuit duty at the 69 kV point-of-connection, with R53 generation out-of-service, is estimated to be approximately 668 MVA. The phase-to-ground symmetrical short circuit duty will be approximately 3,618 Amps. No 69 kV or 230 kV breakers at the Stanton substation were identified as being overdutied. The analysis was based on the assumption that prior queue positions in the "Q" listing are in-service.

Stability Analysis
Will be performed for the Queue R53 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)

No problems were identified

NETWORK UPGRADES

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

No requirements identified.

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)

No requirements identified.

Potential Issues

Potential Overloads

1. The Lackawanna - Peckville 230 kV line is loaded to 99% of its emergency rating (574 MVA) for the **tower** outage of Susquehanna to E. Palmerton 230 kV line and Harwood to Siegfried 230 kV line (Cont Id. 4PPL). The R53 project contributes approximately 10 MW to the overload.

2. The Blooming Grove - Blooming Grove H2 230 kV line is loaded to 99% of its emergency rating (558 MVA) for the **tower** outage of Susquehanna to E. Palmerton 230 kV line and Harwood to Siegfried 230 kV line (Cont Id. 4PPL). The R53 project contributes approximately 10 MW to the overload.

Delivery of Energy Portion of Interconnection Request
PJM also studied the delivery of the energy portion (100% output) of this interconnection request with all other wind generation in the same electrical area also at 100% energy output. Any problems identified below may result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

As a result of the aggregate energy resources in the area, the following violations were identified:

1. The Alburtis – Branchburg 500 kV line is overloaded at 126% of its emergency rating (3734 MVA) for the outage of Hosensack - Elroy 500 kV line (Cont Id: PJM22). The R53 project contributes approximately 5 MW to this overload.

2. The Bushkill – Kittatiny 230 kV line is overloaded to 113% of its emergency rating (813 MVA) for the outage of Portland – Martin Creek 230 kV line (Cont Id. ME13). The R53 contributes approximately 7 MW to this overload.

3. The Hosensack – Elroy 500 kV line is overloaded to 134% of its emergency rating (3734 MVA) for the outage of Alburtis – Branchburg 500 kV line (Cont Id. PJM5). The R53 contributes approximately 8 MW to this overload.

4. The Peckville H5 – Blooming Grove H2 230 kV line is overloaded to 124% of its emergency rating (558 MVA) for the outage of Wescosville – R24 500 kV line (Cont Id. PJM66_WITH_R24_R28A). The R53 contributes approximately 10 MW to this overload.

5. The Peckville - Peckville H5 230 kV line is overloaded to 121% of its emergency rating (558 MVA) for the outage of Wescosville – R24 500 kV line (Cont Id. PJM66_WITH_R24_R28A). The R53 contributes approximately 10 MW to this overload.

6. The Lackawanna - Peckville 230 kV line is overloaded to 116% of its emergency rating (574 MVA) for the outage of Wescosville – R24 500 kV line (Cont Id. PJM66_WITH_R24_R28A). The R53 project contributes approximately 10 MW to the overload.

7. The Blooming Grove - Blooming Grove H2 230 kV line is overloaded to 117% of its emergency rating (558 MVA) for the outage Wescosville – R24 500 kV line (Cont Id. PJM66_WITH_R24_R28A). The R53 project contributes approximately 10 MW to the overload.

8. The Blooming Grove – Bushkill 230 kV line is overloaded to 112% of its emergency rating (558 MVA) for the outage Wescosville – R24 500 kV line (Cont Id. PJM66_WITH_R24A). The R53 project contributes approximately 10 MW to the overload.

9. The Susquehanna - R24 500 kV line is overloaded to 136% of its emergency rating (3113 MVA) for the outage of Sunbury – R26 500 kV line (Cont Id. PJM69_WITH_R26A). The R53 contributes approximately 20 MW to the overload.

10. The Wescosville – Alburtis 500 kV line is overloaded to 190% of its emergency rating (3015 MVA) for the outage of Sunbury – R26 500 kV line (Cont Id. PJM69_WITH_R26A). The R53 contributes approximately 24 MW to the overload.

11. The Alburtis - Hosensack 500 kV line is overloaded to 128% of its emergency rating (3145 MVA) for the outage of Alburtis – Branchburg 500 kV line (Cont Id. PJM5). The R53 contributes approximately 10 MW to the overload.

12. The R26 - Sunbury 500 kV line is overloaded to 144% of its emergency rating (3015 MVA) for the outage of Wescosville – R24 500 kV line (Cont Id. PJM66_WITH_R24A). The R53 contributes approximately 16 MW to the overload.

13. The Sunbury – Juniata 500 kV line is overloaded to 187% of its emergency rating (3113 MVA) for the outage of Wescosville – R24 500 kV line (Cont Id. PJM66_WITH_R24_R28A). The R53 contributes approximately 26 MW to the overload.

14. The Susquehanna - R26 500 kV line is overloaded to 117% of its emergency rating (3015 MVA) for the outage of Wescosville – R24 500 kV line (Cont Id. PJM66_WITH_R24A). The R53 contributes approximately 16 MW to the overload.

15. The Lackawanna – Oxbow 230 kV line is overloaded to 106% of its normal rating (499 MVA). The R53 contributes approximately 11 MW to the overload.

16. The R24 - Wescosville 500 kV line is overloaded to 185% of its emergency rating (3113 MVA) for the outage of Sunbury – R26 500 kV line (Cont Id. PJM69_WITH_R26A). The R53 contributes approximately 17 MW to the overload.

17. The Lackawanna – Peckville 230 kV line is overloaded to 116% of its emergency rating (574 MVA) for the outage of Wescosville – R24 500 kV line (Cont Id. PJM66_WITH_R24_R28A). The R53 contributes approximately 10 MW to the overload.

18. The Stanton - Lackawanna 230 kV line is overloaded to 118% of its emergency rating (764 MVA) for the outage of Wescosville – R24 500 kV line (Cont Id. PJM66_WITH_R24_R28A). The R53 contributes approximately 7 MW to the overload.

19. <u>Stanton 69 kV Bus Section 3 outage;</u>
    Stanton-Providence #2 69kV line: -- rebuild/reconductor line segment between Keyser Avenue Taps and Providence substation. Operation of R53 causes loading to rise from 99.6% Summer Emergency (S/E) rating to 124% S/E. The project is currently scheduled for year 2011, but would have to be advanced to early 2008. The advancement costs related to completing this project in 2008 would be approximately **$173,000**.

20. Double circuit tower line UGI Mountain-Lackawanna & Stanton-Lackawanna 230 kV outage;
    Stanton-Providence #1, #2, & #3 69kV and Lackawanna-Providence #1 & #2 lines: -- rebuild/reconductor line segment between Keyser Ave Tap and the Tap to Suburban Yard #2 substation; Keyser Ave Tap and Providence; Morgan Tap and Providence; connections at Providence to Transformers T3 & T4; both line segments between Providence and Bellmont substations. Operation of R53 causes loading to exceed 100% S/E. Advance the rebuilding/reconductoring of line segments between Keyser Ave Taps and Providence substation and initiate a new project to rebuild/reconductor line segments #1 & #2 between Providence and Bellmont substations. The costs related to completing these projects in 2008, excluding Stanton - Providence #2 rebuilding/reconductoring (see above), would be approximately **$3,988,000**.

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