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 - 750MW Injection

Injection of 750 MW into the Croydon – Emilie 230kV line was evaluated for network impacts. The following potential impacts were identified:

Generator Deliverability

1. The Eddington – Eddington Tap 230 kV circuit is overloaded at 129% of the normal rating (737 MVA). The Eddington – Eddington Tap 230 kV circuit is also contingency overloaded at 144% of the emergency rating (856 MVA) for the outage of the Croydon – Burlington – Mt. Laurel – Cox's Corner 230 kV circuit. The G41 project contributes approximately 298 MW to the normal and 452 MW to the contingency loading on this circuit.
2. The Eddington – Holmesburg Tap 230 kV circuit is overloaded at 125% of the normal raing (709 MVA). The Eddington – Holmesburg 230 kV circuit is also contingency overloaded at 138% of the emergency rating (853 MVA) for the outage of the Croydon – Burlington – Mt. Laurel – Cox's Corner 230 kV circuit. The G41 project contributes approximately 298 MW to the normal and 452 MW to the contingency loading on this circuit.
3. The Holmesburg Tap – Richmond 230 kV circuit is overloaded at 128% of the normal rating (454 MVA). The Holmesburg Tap – Richmond 230 kV circuit is also contingency overloaded at 152% of the emergency rating (538 MVA) for the outage of the Croydon – Burlington – Mt. Laurel – Cox's Corner 230 kV circuit. The G41 project contributes approximately 237 MW to the normal and 365 MW to the contingency loading on this circuit.
4. The Croydon – Burlington 230 kV circuit is contingency overloaded at 181% of the emergency rating (558 MVA) for the outage of the Croydon – Eddington – Emilie 230 kV circuit. The G41 project contributes approximately 434 MW to the loading on this circuit.
5. The Burlington – Mt. Laurel 230 kV circuit is contingency overloaded at 146% of the emergency rating (844 MVA) for the outage of Croydon – Eddington – Emilie 230 kV circuit. The G41 project contributes approximately 431 MW to the loading on this circuit.
6. The Mt. Laurel – Cox's Corner 230 kV circuit is contingency overloaded at 136% of the emergency rating (873 MVA) for the outage of Croydon – Eddington – Emilie 230 kV circuit. The G41 project contributes approximately 431 MW to the loading on this circuit.
7. The Emilie – Neshaminy 138 kV circuit is contingency overloaded at 111% of the emergency rating (755 MVA) for the outage of the Croydon – Eddington – Emilie 230 kV circuit. The G41 project contributes approximately 218 MW to the loading on this circuit.
8. The two 230/138 kV transformers at Emilie are contingency overloaded at 115% of their emergency rating (451 MVA) for outage of the Croydon – Eddington – Emilie 230 kV circuit. The G41 project contributes approximately 133 MW to the loading on this circuit.
9. The Bluegrass – Byberry 138 kV circuit is contingency overloaded at 121% of the emergency rating (323 MVA) for the outage of the Eddington – Holmesburg Tap – Richmond 230 kV circuit. The G41 project contributes approximately 78 MW to the loading on this circuit.
10. The Richmond – Waneeta 230 kV circuit is contingency overloaded at 117% of the emergency rating (891 MVA) for the outage of the Camden – E21 230 kV circuit. The G41 project contributes approximately 247 MW to the loading on this circuit.
11. The Holmesburg 230/138 kV transformer is contingency overloaded at 110% of the emergency rating (451 MVA) for the outage of the Richmond to Waneeta 230 kV circuit. The G41 project contributes approximately 108 MW to the loading on this circuit.

12. Neshaminy – Byberry 138 kV circuit is contingency overloaded at 101% of the emergency rating (755 MVA) for the outage of the Croydon – Eddington – Emilie 230 kV circuit. The G41 project contributes approximately 218 MW to the loading on this circuit.

Multiple Facility Contingency – Tower Line Outages (MAAC Criteria IIC)

13. The Eddington – Eddington 230kV circuit is contingency overloaded at 137% of the emergency rating (856 MVA) for the Cox's Corner - Camden and Cox's Corner - Burlington tower line outage. The G41 project contributes approximately 449 MW to the loading on this circuit.
14. The Eddington – Holmesburg Tap 230 kV circuit is contingency overloaded at 130% of the emergency rating (853 MVA) for the Cox's Corner - Camden and Cox's Corner - Burlington tower line outage. The G41 project contributes approximately 449 MW to the loading on this circuit.
15. The Holmesburg Tap – Richmond 230 kV circuit is contingency overloaded at 141% of the emergency rating (538 MVA) for the Cox's Corner - Camden and Cox's Corner - Burlington tower line outage. The G41 project contributes approximately 362 MW to the loading on this circuit.

Short Circuit

Short circuit analysis was not performed due to the magnitude of reinforcements required to eliminate the identified overloads. Any required breaker replacements are not expected to materially alter the total network reinforcement cost.

New System Reinforcements

Reconductoring the overloaded circuit with a higher ampacity conductor will eliminate overloads 1, 2, 3, 4, 5, 6, 7, 9, 10, 12, 13, 14, and 15. The addition of a transformer at Emilie and a transformer at Holmesburg will eliminate overloads 8 and 11, respectively. **The total cost for these reinforcements is estimated to exceed $50 million and require a minimum of 7 years to complete. A more detailed cost and time estimate will be provided during the Impact study.**

Contribution to Previously Identified System Reinforcements

The G41 project will contribute to the cost of the following previously identified network reinforcements:

1. The project contributes approximately **281** MW to the Emilie 230/138kV transformer overload. The overload can be eliminated by adding a second transformer and an additional bus section and breaker at Emilie 230kV and 138kV. The cost is estimated at $2.9 million and is expected to take 18 months to complete.
2. The project contributes approximately **173** MW to the Emilie-Neshaminy 138kV circuit overload. The overload can be eliminated by replacing the existing tower line with 1590kcmil ACSS conductor on new single pole towers. The cost is estimated at $5.5 million and is expected to take two years to complete
3. The project contributes approximately **173** MW to the Neshaminy-Byberry 138kV circuit overload. The overload can be eliminated by replacing the existing tower line with 1590kcmil ACSS conductor on new single pole towers. The cost is estimated at $5.4 million and is expected to take two years to complete.
4. The project contributes approximately **66** MW to the Byberry-Bluegrass 138kV circuit overload. The overload can be eliminated by replacing a 3.4 miles portion of the existing conductor with

795kcmil ACSR conductor. The cost is estimated at $3.2 million and is expected to take 18 months to complete.

5. The project contributes approximately **154** MW to the Holmsberg 230/138kV transformer overload and 126 MW to the Holmsberg – Bluegrass 138kV overload. The overload can be eliminated by replacing the Holmsberg 230/138kV transformer with a larger transformer, converting the Richmond-Holmsberg 69kV circuit to 230kV operation, and adding a Richmond 230/69kV transformer as the replacement supply for the converted circuit. The converted circuit will connect Richmond 230kV to Holmsberg Tap 230kV. The total cost of these system reinforcements is estimated at $5.4 million and is expected to take 18 months to complete.

Cost allocation percentages are not provided as part of the Feasibility Study analysis, however, cost allocation will be provided at the conclusion of the Queue D, E, F & G Impact Study evaluations.