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 Churchtown 230kV substation was evaluated for network impacts. The following potential impacts were identified:

Generator Deliverability

1) The Mickleton – Bridgeport 230 kV circuit is overloaded at 145% of the normal rating (643 MVA). The G27 project contributes approximately 540 MW to the loading on this circuit.
2) The Bridgeport -Pedricktown 230 kV circuit is overloaded at 113% of the normal rating (643 MVA). The Bridgeport -Pedricktown 230 kV circuit is also overloaded at 114% of the emergency rating (755 MVA) for the outage of the Churchtown – Cumberland 230 kV circuit. The G27 project contributes approximately 540 MW to the normal overload and 610 MW to the contingency overload.
3) The Pedricktown –Chambers 230kV circuit is contingency overloaded at 101% of the emergency rating (755 MVA) for the outage of the Churchtown – Cumberland 230 kV circuit. The G27 project contributes approximately 612 MW to the loading on this circuit.
4) The Cumberland – Union 138 kV circuit is contingency overloaded at 103% of the emergency rating (331 MVA) for the outage of the Mickleton - Bridgeport 230kV circuit. The G27 project contributes approximately 170 MW to the loading on this circuit.
5) The Cumberland 230/138 kV transformer is overloaded for the following contingencies.
   a) Overloaded at 157% of the emergency rating (370 MVA) for the outage of the Mickleton - Bridgeport 230kV circuit. The G27 project contributes approximately 335 MW to the loading on this circuit.
   b) Overloaded at 130% of the emergency rating (370 MVA) for the outage of the Bridgeport – Pedricktown 230 kV circuit. The G27 project contributes approximately 336 MW to the loading on this circuit.
   c) Overloaded at 118% of the emergency rating (370 MVA) for the outage of the Pedricktown – Chambers 230 kV circuit. The G27 project contributes approximately 337 MW to the loading on this circuit.
6) The Deepwater – Landis 138 kV circuit is contingency overloaded at 116% of the emergency rating (172 MVA) for the outage of the Mickleton - Bridgeport 230kV circuit. The G27 project contributes approximately 94 MW to the loading on this circuit.
7) The Trainer – Delco Tap 230 kV circuit is overloaded at 109% of the normal rating (462 MVA). The Trainer – Delco Tap 230 kV circuit is also contingency overloaded at 129% of the emergency rating (566 MVA) for the outage of Gloucester – Eagle Point 230 kV circuit. The G27 project contributes approximately 320 MW to the normal overload and 364MW to the contingency overload.
8) The Mickleton – Delco Tap 230 kV circuit is contingency overloaded at 120% of the emergency rating (554 MVA) for the outage of Gloucester – Eagle Point 230 kV circuit. The G27 project contributes approximately 365 MW to the loading on this circuit.
9) The Trainer – Chichester 230 kV circuit is contingency overloaded at 112% of the emergency rating (617 MVA) for the outage of Gloucester – Eagle Point 230 kV circuit. The G27 project contributes approximately 364 MW to the loading on this circuit.

10) The Mickleton – Thorofare 230 kV circuit is contingency overloaded at 130% of the emergency rating (556 MVA) for the outage of Mickleton – Delco Tap – Trainer – Chichester 230 kV circuit. The G27 project contributes approximately 240 MW to the loading on this circuit.
11) The Gloucester – Eagle Point 230 kV circuit is contingency overloaded at 102% of the emergency rating (752 MVA) for the outage of Mickleton – Delco Tap – Trainer – Chichester 230 kV circuit. The G27 project contributes approximately 237 MW to the loading on this curcuit.

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

Several circuits that were identified as being overloaded under the Generator Deliverability test were also overloaded for tower line outages. However, the overloads were less severe than the Generator Deliverability overloads.

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

Overloads 1 and 2 can be relieved by rconductoring the Mickleton – Bridgeport - Pedricktown 230 kV circuit with 1590 ACSS. (estimated cost: $1.5 million)

Overloades 3, 4, 5, 6, 7, 8, 9, 10, and 11 can be relieved by constructing a new 230 kV circuit from Churchtown to Red Lion. (estimated cost: $28 million)

The total new Network upgrades are estimated to cost **$29.5 million**.

These costs may be subject to an additional 35% (approx **$10.5M**) for CIAC Tax gross-up.

The estimated time required to construct the new network upgrades is a minimum of **5 years.**

Contribution to Previously Identified System Reinforcements

The G27 project causes increased overloading for facilities which required upgrade by projects earlier in the PJM Interconnection Queues. The overload contribution by Project G27 and the previously identified reinforcement to relieve the overload are listed below.

1. The project contributes approximately 105MW to the overload on the BL England – Scull #2 - Mill # 2 138 kV circuit. The overload can be relieved by reconductoring the BL England – Scull #2 – Mill # 2. (estimated cost: $1.9 million)

2. The project contributes approximately 83MW to the overload on the BL England -Scull # 1 – Mill # 1 - Lewis 138 kV circuit. The overload can be relieved by reconductoring the 138 kV circuit from BL England – Scull # 1 – Mill – Lewis. (estimated cost: $3.2 million)

3. The project contributes approximately 120 MW to the overload on the Graysferry – Parrish 230 kV circuit. The overload can be relieved by reconductoring the 230 kV circuit from Graysferry to Parrish. (estimated cost: $3.444 million)

4. The project contributes approximately 79 MW to the overload on the Eddystone – Morton Tap 230 kV circuit. The overload can be relieved by replacing some (Morton Tap) Ridely terminal equipment. (estimated cost: $0.06 million)

5. The project contributes approximately 71 MW to the A27 – Graysferry 230 kV circuit. The project also contributes approximately 70 MW to the A19 – Morton Tap 230kV circuit. The overloads can be relieved by constructing a new 230kV line from A27 to Parrish. (estimated cost: $65.0 million)

6. The project contributes approximately 44 MW to the B48 – Graceton 230 kV circuit. The overload can be relieved by reconductoring the 230 kV circuit from B48 to Graceton. (estimated cost: $1.8 million)

7. The project contributes approximately 39 MW to the Master – North Phila. 230 kV circuit. The overload can be relieved by reconductoring the 230 kV circuit from Master to North Philadelphia. (estimated cost: $4.68 million)

Except for upgrades 1 and 2, the cost estimates for previously identified reinforcements include a CIAC tax gross-up.

The total cost for previously identified reinforcements is approximately **$80.6 million**.
Project G27 will be assigned a cost allocation responsibility for these reinforcements.

Cost allocation percentages are not provided as part of the Feasibility Study analysis. Cost allocation responsibility will be determined at the conclusion of the Queue D, E & F **Impact Study** evaluations, and will be provided at that time.