#S22 Peach Bottom 550 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 Queue S22 project was studied as a 550 MW Capacity injection at Peach Bottom 500 kV substation. The project 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 were 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 were identified

Short Circuit

Will be performed for the Queue S22 Impact Study.

Stability Analysis

Will be performed for the Queue S22 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. Contribution of 84 MW further overloads the Three Mile Island 500/230 kV transformer ckt#2 from 110% to 118% of its emergency rating (1077 MVA) for the tower outage of Conastone – Peach Bottom 500 kV line ckt#1 and Conastone – Peach Bottom 500 kV line ckt#2.
2. Contribution of 45 MW further overloads the Northwest – Granite 230 kV line #2311 from 122% to 129% of its emergency rating (641 MVA) for the outage of Kempton – North Northwest 500 kV line (Cont Id. PJM13B_NNWestB).

3. Contribution of 38 MW further overloads the Nottingham to Graceton 230 kV line reactor (in-line series reactor at Nottingham terminal) from 119% to 126% of its emergency rating (627 MVA) for the **tower** outage of Conastone – Peach Bottom 500 kV line ckt#1 and Conastone – Peach Bottom 500 kV line ckt#2.
4. Contribution of 38 MW further overloads the Peach Bottom Tap - Graceton 230 kV line from 119% to 126% of its emergency rating (627 MVA) for the **tower** outage of Conastone – Peach Bottom 500 kV line ckt#1 and Conastone – Peach Bottom 500 kV line ckt#2.
5. Contribution of 38 MW further overloads the Nottingham – Peach Bottom Tap 230 kV line from 119% to 126% of its emergency rating (627 MVA) for the **tower** outage of Conastone – Peach Bottom 500 kV line ckt#1 and Conastone – Peach Bottom 500 kV line ckt#2.
6. Contribution of 170 MW further overloads the Conastone – North Northwest 500 kV line from 114% to 122% of its normal rating (2078 MVA).
7. Contribution of 49 MW further overloads the Conastone – Mt Carmel 230 kV line 2322 from 109% to 115% of its emergency rating (923 MVA) for the outage of Kemptown – North Northwest 500 kV line.
8. Contribution of 49 MW further overloads the Conastone – Mt Carmel 230 kV line 2310 from 110% to 115% of its emergency rating (923 MVA) for the outage of Kemptown – North Northwest 500 kV line.
9. Contribution of 49 MW further overloads the Mt Carmel – North Northwest 230 kV line 2310 from 107% to 112% of its emergency rating (923 MVA) for the outage of Kemptown – North Northwest 500 kV line.
10. Contribution of 49 MW further overloads the Mt Carmel – North Northwest 230 kV line 2322 from 107% to 112% of its emergency rating (923 MVA) for the outage of Kemptown – North Northwest 500 kV line.
11. Contribution of 28 MW further overloads the Graceton – Bagley – Raphael Rd 230 kV line of its emergency rating (659 MVA) for the outage of Conastone – NorthWest – Mt Carmel 230 kV line.

New System Reinforcements

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

None identified.

Contribution to Previously Identified System Reinforcements

(System Upgrades for 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. **TMI 500-230 kV transformer Overload Upgrade**
   Add a second 500-230 kV transformer at TMI. The estimated cost is **$11,800,000** and the time required is approximately 20 months.

2. **Northwest – Granite 230 kV Overload Upgrade**
   Replace a 230 kV breaker at Northwest at an estimated cost of **$383,000**

3. **Nottingham – Peach Bottom – Graceton 230 kV Overload Upgrade**

Replace Nottingham reactor and upgrade substation equipment	$ 4.0M
Reconductor Nottingham to Graceton (220-08 line)	
to obtain a minimum emergency rating of 800 MVA	
20.2 miles @ $400K/mile	$ 8.1M
Contingency for reconductoring the Susquehanna river crossing	$ 1.0M
Total	**$13.1M**

   (Upgrade #3 will also suffice for overloads 4 and 5).

4. Upgrade #3 also satisfies overload #4 upgrade requirements.

5. Upgrade #3 also satisfies overload #5 upgrade requirements.

6. **Conastone to North Northwest 500 kV line Overload Upgrade–** Construct a single circuit 500 kV line from Conastone to North Northwest.

   Assumptions:
   New 200 ft. wide R/W parallels existing Conastone to Northwest R/W
   Total R/W length = 19.6 miles
   3 - bundle 1,590 kcm conductor
   New North Northwest sub will be located 4 mi. north of existing Northwest Sub

   Line work: Estimated cost of **$109,000,000** and estimated time of **10 yrs**.

   Substation Terminations:
   Conastone - Install a 1 breaker bay **$3,200,000**
   North Northwest - Install a 2 breaker bay **$6,400,000**

7. **Northwest - Mt Carmel - Conastone Overload Upgrade**
   Overload #11 requires the construction of a new substation (called "North Northwest") consisting of two 500/230kV transformers, four 500 kV breakers, seven 230 kV breakers, related substation equipment and land at an estimated cost of **$70,000,000**. It also requires reconductor the 1,272 kcmil ACSR conductor on

the Conastone to Northwest #2322 circuit with 1,590 kcmil ACSR conductor. The estimated cost is **$8,210,000.** The substation and line work would take **3-4 years**.

Note: The above #6 & #7 upgrades in addition to the upgrade below (Upgrade 7A) will also suffice for overloads #8, #9 and #10.

7A. **Kemptown to North Northwest 500 kV Upgrade**
Construct two new Kemptown – North Northwest 500 kV single circuit lines.

Assumptions:
New 350 ft. wide R/W parallels existing Northwest to Mt Airy Tap R/W
Total R/W length = 28.3 miles
3 - bundle 1,590 kcm conductor
Kemptown located 1/4 mile west of Mt Airy Tap
New North Northwest Sub will be located 4 mi. north of existing Northwest Sub

Line work: Estimated cost of **$279,000,000** and estimated time of **10 yrs**.

Substation terminations: Estimated cost of **$15,400,000**.
North Northwest - Install a 3 breaker bay **$7,700,000**
Kemptown - Install a 3 breaker bay **$7,700,000**

8. Upgrades #6, #7 and #7A also satisfy Upgrade #8 requirements.

9. Upgrades #6, #7 and #7A also satisfy Upgrade #9 requirements.

10. Upgrades #6, #7 and #7A also satisfy Upgrade #10 requirements.

11. **Graceton - Bagley - Raphael 230 kV Overload Upgrade**
This upgrade requires the addition of six 230kV breakers at Graceton substation at an estimated cost of $**10,000,000** and six 230kV breakers at Raphael Road substation at an estimated cost of **$10,000,000**. It also requires rebuilding the Graceton to Raphael Rd 230 kV circuit to double circuit 2-conductor bundled at an estimated cost of **$30,000,000**. This work is estimated to take **5-6 years.**