

#P06 Cumberland 366 MW  
**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***

The P06 project was studied as an injection of 366 MW into the Cumberland 230kV substation. Project #P06 was evaluated for compliance with reliability criteria for summer peak conditions in 2010. Potential network impacts were as follows:

**Generator Deliverability**

1. The Sherman #1 138/69 kV transformer is contingency overloaded at **103%** of emergency rating (78 MVA) for the outage of the Sherman #2 138/69 kV transformer. Queue P06 contributes 19 MVA to Sherman #1 transformer contingency loading.

**Multiple Facility Contingency**

No problems identified.

**Short Circuit**

2. The addition of Queue P06 generation interconnection causes the fault current interrupting capability of the following circuit breakers to be exceeded.

Substation	Breaker	% of Rating before P06	% of rating after P06 is added
Mill 69kV	B	99.6%	101.1%
Ontario 69kV	F	99.2%	100.1%
Sherman Ave 69kV	D	82.2%	105.5%

All of the above circuit breakers must be replaced to achieve adequate short circuit current interrupting capability.

Note: The short circuit calculation was performed in accordance with IEEE STD C37.010 – 1999 total current methodology. Separate X and R values were determined to calculate X/R ratios.

**New System Reinforcements**

1. The contingency overload of Sherman #1 138/69kV transformer can be mitigated by the replacement of transformer #1 with a larger 100MVA (nameplate) unit at an estimated cost of \$2,900,000. The transformer replacement can be completed in approximately 27 months from the time “Notice to Proceed” is given after the ISA and CSA are executed.

2. The cost to replace the 69kV circuit breakers at Mill, Ontario and Sherman Avenue is \$275,000 each for a total cost of \$825,000. The circuit breaker replacements can be completed in approximately 18 months from the time “Notice to Proceed” is given after the ISA and CSA are executed.

## **Contribution to Previously Identified Overloads**

The following contingency overloads were identified for prior projects (Queues P04 and/or P05). Queue P06 contributes to the overload and may be responsible for a portion of the upgrade cost. The amount of Queue P06's MVA contribution to the overloads and the amount of Queue P06's cost allocation for the upgrades will be described in more detail for the Impact Study.

- The Graceton – Raphael 230 kV circuit is overloaded at **114%** of its emergency rating (659 MVA) for the tower outage of the Brighton – Doubs 500kV line and Brighton - Conastone 500 kV. The P06 project contributes approximately 26 MW to the contingency facility loading. The total cost to reductor the Graceton – Raphael Rd. 230 kV circuit is estimated to cost \$17,900,000. This work will take approximately 30-36 months to complete.
- The Northwest – Conastone 230 kV (#2322) circuit is overloaded at **104%** of its emergency rating (819 MVA) for the tower outage of the Brighton – Doubs 500kV line and Brighton - Conastone 500 kV. The P06 project contributes approximately 21 MW to the contingency facility loading. The total cost to reductor the Northwest – Conastone 230 kV (#2322) circuit is estimated at \$7,970,000. This work will take approximately 24 - 36 months to complete.
- The Graceton – P05 tap 230 kV circuit is overloaded at around **112%** of its emergency rating (627 MVA) for the outage of the Conastone – Peach Bottom 500 kV circuit. The P06 project contributes approximately 28 MW to the contingency facility loading. The total estimated cost to mitigate this overload is \$1,655,200.

(BGE Portion of the P05 to Graceton line) Reductor 230 kV line 220-08 from Graceton to the Pennsylvania / Maryland state line (220-08). The estimated cost is \$835,200. This work will take approximately 18-36 months to complete depending on whether a CPN filing is required.

(PECO portion of the P05 to Graceton line) Reductor 230kV line 220-08 from the Pennsylvania / Maryland state line to Queue P05 tap point. The estimated cost is \$820,000. This work will take approximately 24 months to complete.

## **Potential Issues**

- The Parrish – Grays Ferry 230 kV line (emergency rating of 874 MVA) may be contingency overloaded for the outage of the East Windsor – Salem 500 kV circuit. The P06 project contributes approximately 21 MW to the contingency facility loading. The cost to reductor the Grays Ferry – Parrish 230kV circuit 220-27 was estimated to be \$2,630,000 per the Queue #A27 Facilities Study performed in 2002. A better estimate will be developed if Queue P06 is found to cause or contribute to this contingency overload during the Impact Study.

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