



Generation Interconnections

This analysis was completed to assess the reliability impact for a new generator interconnecting to the PJM system as a capacity resource.

Network Impacts -258 MW Injection at Camden

Potential network impacts for the injection of an additional 258 MW at the Gloucester 230 kV substation were evaluated for summer peak conditions in 2004. Six cases were developed for the Camden project. Three pre-project cases at a uniform, high east and high west generation scenarios, and post-project at the same generation outage patterns. These cases had all generation, queued prior to the subject project, and the necessary transmission enhancements required for those projects modeled.

A summary of the load flow analysis for addition of the subject project follows:

A) Normal Conditions

- No problems identified.

B) Single Contingency

- Contributes to a contingency overload of 24% on the Mickleton-Delco Tap-Trainer-Chichester 230 kV circuit for the outage of the Keeney-Hope Creek 500 kV circuit.
- Contribute to a contingency overload of 39% on the Monroe-Mickleton 230 kV circuit for outage of the Gloucester-Beaver Brook 230 kV line.

C) Tower Line Contingency

- Contributes to a contingency overload of 20% on the Gloucester 230/138 kV transformer and the Gloucester-Cuthbert Boulevard 138 kV circuit for outage of the Eagle Point-Mickleton, Gloucester Mickleton 230 kV tower line.

Upgrade of the 11.2 mile Mickleton - Delco Tap - Trainer - Chichester 230 kV circuit was also identified as a possible requirement as a result of network impacts associated with Generator Interconnection Request Queue #A13 (Mickleton 230 kV) and Generator Interconnection Request Queue #A16 (Eagle Point 230 kV). In those instances, the upgrade was estimated to cost \$3.3M - \$9M and to take 18-24 months to complete. The uncertainty in those estimates reflected the uncertainty of whether adequate circuit

thermal capability could be obtained without addition or replacement of existing transmission line structures. The most critical structures are those used to cross the Delaware River. The additional overload contributed by this 252 MW project along with the 800 MW project connected to Eagle Point 230 kV will make it less certain that the upgrade can be made without extensive structure replacement which may significantly increase the cost and time estimates listed above. A more detailed evaluation will be required at the impact study level to determine the design limitations to the existing circuit and to explore other alternatives.

The transmission reinforcements needed to alleviate the Gloucester 230/138 kV transformer overload include, removal of the Gloucester transformer, conversion of the Cuthbert Boulevard-Camden 138 kV cable circuit to 230 kV operation, installation of a Phase Angle Regulator in this circuit, terminal facilities at Gloucester and Camden, and conversion of the Cuthbert Boulevard Substation to 230 kV. The estimated costs for these facilities are \$15.0 million for station work and \$10.0 million for the replacement of the 138 kV cable with 230 kV cable. The Phase Angle Regulator in this circuit will be needed to control the contingency loading of one Eagle Point Gloucester 230 kV circuit for the loss of the other Eagle Point Gloucester circuit.

To relieve Mickleton-Monroe 230 kV circuit overloads a second Mickleton-Monroe 230 kV circuit can be constructed by adding a set of conductors to open positions on the existing double circuit tower line. This will also require the addition of circuit breakers and line positions at the Mickleton and Monroe Substations. The estimated cost to construct the second Mickleton-Monroe 230 kV circuit is \$1.5M, and the addition of line positions and circuit breakers at Mickleton and Monroe substations is estimated to cost \$3.9M. It will take approximately 18-24 months to construct these upgrades.

A short circuit analysis was not performed for this project because the results will be highly dependent upon assumptions about connection of nearby projects which are earlier in Generator Interconnection Request Queue A. Many 230 kV circuit breakers in this area of the transmission system may become overdutied and require replacement if several new generators connect. A 230 kV circuit breaker replacement is estimated to cost \$350,000 and take 12-18 months to complete. Replacing multiple circuit breakers can take longer if facility outages can not be obtained to allow for work to be performed concurrently.

It has been identified that this project will contribute to the overduty of Mickleton Substation 230 kV circuit breaker "R" which was identified as a network impact associated with Generator Interconnection Request Queue #A13 (Mickleton 230 kV) and with Generator Interconnection Request Queue #A16 (Eagle Point 230 kV). Replacement of Mickleton Substation 230 kV circuit breaker "R" is estimated to cost \$0.5M and take 12-18 months to complete.