

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 - 284 MW into the Homer City - Wayne 230 kV Line

Potential network impacts for the injection of 284 MW into the Homer City - Wayne 230 kV line were evaluated for summer peak conditions in 2004.

Network Impacts

Potential network impacts for the injection of 284 MW into the Homer City to Wayne 345 kV line were evaluated for the PJM summer peak conditions of 2004. The analysis performed for this project included upgrades to the Shade Gap - Roxbury 115 kV line, a revised breaker configuration at the Erie West 345 kV substation as shown in Attachment 1, the addition of two line breakers at the Homer City 345 kV substation, an upgraded replacement for the existing Westfall 115/46 kV transformer, a new 350 MVAR SVC at the Juniata 500 kV substation, series reactors on the Blairsville 138/115 kV transformer and the Garrett - Garrett Tap 115 kV line, terminal equipment upgrades on the Homer City - Shelocta 230 kV and Johnstown - Altoona 230 kV lines, and a second Seward 230/115 kV transformer. These enhancements were determined to be necessary for previously queued generator interconnection projects.

A summary of the results follows:

Normal System

- The new generator causes a 10 MW overload on the Eclipse - Clark Summit 115 kV circuit.
- The new generator causes a 75 MW overload on the Homer City - Shelocta 230 kV circuit.
- The new generator contributes 1 MW to the overload on the Westfall 115/46 kV transformer.
- The new generator contributes 10 MW to the overload on the Blairsville 115/138 kV transformer.

Generator Deliverability

- The new generator causes a 65 MW overload on the Keystone 500/230 kV transformer #1 for the loss of Keystone 500/230 kV transformer #2.

- The new generator causes a 100 MW overload on the Homer City - Shelocta 230 kV circuit for the loss of the Erie West - Ashtabula - Perry 345 kV circuit.
- The new generator causes a 35 MW overload on the Utica Junction - Eclipse 115 kV circuit for the loss of the Erie West - Ashtabula - Perry 345 kV circuit.
- The new generator causes a 15 MW overload on the Blairsville 138/115 kV transformer for the loss of the Homer City - Shelocta - Keystone 230 kV circuit.
- The new generator causes a 10 MW overload on the Garrett - Garrett Tap 115 kV circuit for the loss of the Homer City - Shelocta - Keystone 230 kV circuit.
- The new generator causes a 15 MW overload on the Seward - Florence 115 kV circuit for the loss of the Homer City - Shelocta - Keystone 230 kV circuit.
- The new generator contributes 115 MW to the post-contingency voltage drop problem at Juniata 500 kV for the outage of Hunterstown - Conastone 500 kV circuit and Hunterstown 500/230 kV transformer #1.
- The new generator contributes 20 MW to the overload on the Seward 230/115 kV transformer for the loss of the Homer City - Shelocta - Keystone 230 kV circuit.
- The new generator contributes 8 MW to the overload on the Shade Gap - Roxbury 115 kV circuit for the outage of the Lewistown - Juniata 230 kV circuit.
- The new generator contributes 75 MW to the overload on the Erie South 345/230 kV transformer #1 for the outage of the Erie West - Ashtabula - Perry 345 kV circuit and Erie West 345/115 kV transformer #1.

Multiple Facility Contingency (MAAC Criteria IIC)

- The new generator contributes 105 MW to the overload on the Homer City 345/230 kV transformer #2 for the line fault with stuck breaker condition involving the outage of the Homer City - Watercure 345 kV line and Homer City 345/230 kV transformer #1.
- The new generator contributes 100 MW to the overload on the Homer City 345/230 kV transformer #2 for the line fault with stuck breaker condition involving the outage of the Homer City - Stolle Road 345 kV line and Homer City 345/230 kV transformer #1.

Short Circuit Analysis

- Multiple 230 kV circuit breakers at Homer City are close to being overdutied when the required reinforcements at Homer City are installed. The exact number of circuit breakers, which must be replaced, will be dependent upon the 500/345 kV transformer impedances and on more exact generator impedance characteristics. The total cost for replacing nine, 230 kV overdutied circuit breakers at Homer City is not expected to exceed \$3 million.

System Reinforcements

To eliminate the overloads identified above, the following system upgrades are required. The new Homer City 500 kV substation and 500/345 kV transformer reinforcements are required to eliminate the Keystone 500/230 kV transformer and Homer City - Shelocta - Keystone 230 kV circuit overloads. The new generator can expect to either pay a portion or the entire cost for the following system upgrades:

- 1) Build a 500 kV substation at Homer City and install four breakers. Estimated Cost = \$9 million.
- 2) Re-route the Keystone - Conemaugh 500 kV line through Homer City 500 kV substation. Estimated Cost = \$1.8 million.
- 3) Install one 345/500 kV transformer at Homer City with connections. Estimated Cost = \$5 million.
- 4) Upgrade terminal equipment on the Eclipse - Clark Summit 115 kV line. Estimated Cost = \$0.5 million.
- 5) Replace the Westfall 115/46 kV transformer. Estimated Cost = \$0.7 million.
- 6) Install a breaker at the end of the Homer City - Watercure 345 kV line. Estimated Cost = \$1.75 million.
- 7) Install a 350 MVAR SVC at Juniata 500 kV substation. Estimated Cost = \$14.5 million.
- 8) Install a 0.04 pu series reactor for the Blairsville 138/115 kV transformer. Estimated Cost = \$1.5 million.
- 9) Add breakering and reconfigure the Erie West 345 kV substation. Estimated Cost = \$2.978 million.
- 10) Upgrade the Shade Gap to Roxbury 115 kV line. Estimated Cost = \$5.5 million.
- 11) Install a second 230/115 kV transformer at Seward. Estimated Cost = \$4.1 million.
- 12) The 0.05 pu series reactor for the Garrett - Garrett Tap 115 kV line (from B34) is no longer required.
- 13) Upgrade of the 1.2 kA disconnect switch at Shelocta 230 kV (from B34) is no longer required.
- 14) Upgrade of the 1.2 kA line trap at Altoona 230 kV (from B34) is no longer required.
- 15) Upgrade of the series reactor for the Blairsville 138/115 kV transformer to 0.10 pu is no longer required.
- 16) Additional breaker at the end of the Homer City - Stolle Rd. 345 kV line (from B05) is no longer required.

Total cost estimate for network reinforcements = \$50.3 million.

Cost allocation percentages are not provided as part of the Feasibility Study Analysis. Cost allocation will be provided in the Impact Study Report.

Attachment 1

Erie West 345 kV Substation

