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 -520 MW Injection into the Milesburg-Moshannon 230kV transmission line (H15)

Network Impacts

The **#H15 project was studied as 520 MW capacity** injection into the Moshannon -Milesburg 230kV circuit. Project # H15 was evaluated for compliance with reliability criteria for summer peak conditions in 2006. Potential network impacts were as follows:

Generator Deliverability

1. The Carlisle Pike – Gardners 115kV circuit is contingency overloaded at **124%** of the emergency rating (109 MVA) for the outage of the Juniata – Lewistown 230 kV circuit. The H15 project contributes approximately **39**MW to the loading on this circuit.
2. The Roxbury – Shade Gap 115kV circuit is contingency overloaded at **119%** of the emergency rating (151 MVA) for the outage of the Juniata – Lewistown 230 kV circuit. The H15 circuit contributes approximately **39**MW to the loading on this circuit.
3. The Carlisle Pike – Roxbury 115kV circuit is contingency overloaded at **107%** of the emergency rating (146 MVA) for the outage of the Juniata – Lewistown 230 kV circuit. The H15 project contributes approximately **38**MW to the loading on this circuit.
4. The Lewistown – Shingletown 230 kV circuit is contingency overloaded at **102%** of the emergency rating (505 MVA) for the outage of the Altoona – Raystown – Lewistown 230 kV circuit. The H15 circuit project contributes approximately **201**MW to the loading on this circuit.
5. The Lewistown – Juniata 230kV circuit is overloaded at **106%** of the normal rating (499 MVA). The Lewistown – Juniata 230 kV circuit is also contingency overloaded at 118% of the emergency rating (617 MVA) for the outage of the Juniata – Keystone 500kV circuit. The H15 circuit project contributes approximately **160**MW to the loading on this circuit.

Note: The following overloads # 6, 7, 8, 9, 10, 11, 12 and 13 were initiated by previous projects. The H15 project will share costs for the reinforcements required to correct the overloads. A specific system reinforcement to resolve each overload was not developed, however, PJM expects that, at minimum, a new 500 kV west to east circuit will be required. The cost estimate to resolve identified problems is expected to **exceed $100 million** with a lead time of over 5 years.

6. The Homer City – Shelocta 230 kV circuit is overloaded at **123%** of the normal rating (294 MVA). The Homer City – Shelocta 230kV circuit is also overloaded for several contingencies and the worst was at **123%** of the emergency rating (854 MVA) for the outage of the Homer City – Watercure Road 345 kV circuit. The H15 project contributes approximately **51**MW to the normal and **204**MW to the contingency loading on this circuit.
7. The Keystone – Shelocta 230 kV circuit is overloaded at **106%** of the normal rating (694 MVA). The Keystone – Shelocta 230 kV circuit is also contingency overloaded at **114%** of the emergency rating (854 MVA) for the outage of Homer City – Watercure Road 345 kV circuit. The H15 project

contributes approximately **71**MW to the normal and **66**MW to the contingency loading on this circuit.

8. Both Keystone 500/230 kV transformers are overloaded for several contingencies the worst is at **117%** of the emergency rating (499 MVA) for the outage of the other Keystone 500/230kV transformer. The H15 project contributes approximately **52**MW to the loading on this circuit.
9. The Keystone – G09 500 kV circuit is contingency overloaded at **106%** of the emergency rating (3013 MVA) for the outage of Juniata – Keystone 500 kV circuit. The H15 project contributes approximately **49**MW to the loading on this circuit.
10. The Conemaugh – G09 500 kV circuit is contingency overloaded at **129%** of the emergency rating (3013 MVA) for the outage of Juniata – Keystone 500 kV circuit. The H15 project contributes approximately **49**MW to the loading on this circuit.
11. The Juniata – Keystone 500 kV circuit is overloaded for several contingencies and the worst is at **114%** of the emergency rating for the outage of the Conemaugh – G09 500 kV circuit. The H15 project contributes approximately **38**MW to the loading on this circuit.

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

12. The Homer City – Shelocta 230 kV circuit is overloaded at **118%** of the emergency rating (854 MVA) for the Juniata – Dauphin and Juniata – Lewistown tower line outage. The H15 project contributes approximately **85**MW to the loading on this circuit.
13. The Keystone - Shelocta 230 kV circuit is overloaded at **105%** of the emergency rating (854 MVA) for the Juniata – Dauphin and Juniata – Lewistown tower line outage. The H15 project contributes approximately **109**MW to the loading on this circuit.

Note: The extent of the network upgrades would be similar for a connection into the Chapman-Moshannon transmission line.

Short Circuit

Short circuit analysis was not performed due to the magnitude of reinforcements required to eliminate the identified problem. Any required breaker replacements are not expected to materially alter the total network reinforcement cost.

New System Reinforcements

Due to the number and severity of the identified overloads this project will share cost allocation for a new 500 kV west to east circuit. The details of the new 500 kV circuit will be identified during Impact studies but the cost is estimated at over **$100 million with a lead-time exceeding 5 years.** Installation of the new 500kV circuit may not resolve every one of the overloads identified above. Any remaining overloads will need to be resolved by individual system upgrades that will be identified in the Impact Study.

Listed below are the facilities overloaded, normal and emergency ratings and potential individual upgrade.

	Contingency Loading (MVA)	Normal/4-Hour Conductor Rating	Resolution
Carlisle Pike – Gardners 115 kV	135	75/109	Rebuild 20.6 mile circuit
Roxbury – Shade Gap 115 kV	180	115/151	Rebuild 13.6 mile circuit
Roxbury – Carlisle Pike 115 kV	156	115/151	Rebuild 9.2 mile circuit
Shingletown – Lewistown 230 kV	515	499/617	Replace 1 circuit breaker, 2 line traps, 4 CTs
Lewistown – Juniata 230 kV	728	499/617	Rebuild 25.8 mile circuit
Homer City – Shelocta 230 kV	1050	718/909	Rebuild 10.7 mile circuit
Shelocta – Keystone 230 kV	974	718/909	Rebuild 2.3 mile circuit
Keystone 500/230 kV banks	584	436/499	Add a third transformer
Keystone – Homer City 500 kV	2842	2842/3548	Add a second circuit
Homer City – Conemaugh 500 kV	3887	2842/3548	Add a second circuit
Keystone – Juniata 500 kV	3435	3004/3733	Add a second circuit

Cost estimates for items #1 through #5 above were not provided since they are not expected to significantly alter the total system reinforcement cost for this project.

A complete analysis of the underlying system was not completed due to the number and severity of the identified bulk system problems.

If this project proceeds to the Impact Study stage, a complete analysis of the underlying system along with all cost estimates will be provided.

Contribution to Previously Identified System Reinforcements

Cost allocation will be completed during the Impact Study.