

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 -300 MW Injection into the Milesburg-Moshannon 230kV transmission line (H15)

Network Impacts

The #H22 project was studied as total of 300 MW capacity injection into the Erie South – Warren 230kV circuit. Project # H22 was evaluated for compliance with reliability criteria for summer peak conditions in 2006. Potential network impacts were as follows:

Generator Deliverability

1. The Warren – Falconer 115 kV circuit is overloaded at **100%** of its normal rating (82 MVA). It is also contingency overloaded at **135%** of the emergency rating (116 MVA) for the outage of the Erie South – H22 230 kV circuit. The H22 project contributes approximately **20 MW** to the normal and **65 MW** to the contingency loading on this circuit.
2. The Erie South – H22 230 kV circuit is contingency overloaded at **117%** of the emergency rating (554 MVA) for the outage of the Glade – Forest - Lewis Run 230 kV circuit. The H22 project contributes approximately **257 MW** to the loading on this circuit.
3. The Altoona – Raystown 230 kV circuit is contingency overloaded at **100%** of the emergency rating (554 MVA) for the outage of the Lewistown – Shingletown 230 kV circuit. The H22 project contributes approximately **15 MW** to the loading on this circuit.
4. The North Meshoppen 230/115 kV transformer 1 is contingency overloaded at **104%** of the emergency rating (155 MVA) for the outage of the East Towanda – North Meshoppen 230 kV circuit and North Meshoppen 230/115 kV transformer 2. The H22 project contributes approximately **16 MW** to the loading on this circuit.

Note: Problems # 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, and 17 were initiated by previous projects. The H22 project will share costs for the reinforcements required to correct the problems. A specific system reinforcement to resolve all overloads was not developed, however, PJM expects that, at minimum, a new 500 kV west to east circuit will be required.

5. The Homer City – Shelocta 230 kV circuit is overloaded at **128%** of the normal rating (694 MVA). The Homer City – Shelocta 230kV circuit is also overloaded for several contingencies and the worst was at **127%** of the emergency rating (854 MVA) for the outage of the Homer City – Watercure Road 345 kV circuit. The H22 project contributes approximately **38MW** to the normal and **35MW** to the contingency loading on this circuit.
6. The Keystone – Shelocta 230 kV circuit is overloaded at **113%** of the normal rating (694 MVA). The Keystone – Shelocta 230 kV circuit is also contingency overloaded at **118%** of the emergency rating (854 MVA) for the outage of Homer City – Watercure Road 345 kV circuit. The H22 project contributes approximately **44MW** to the normal and **40MW** to the contingency loading on this circuit.

7. Both Keystone 500/230 kV transformers are overloaded for several contingencies the worst is at **123%** of the emergency rating (499 MVA) for the outage of the other Keystone 500/230kV transformer. The H22 project contributes approximately **34MW** to the loading on this circuit.
8. The Keystone – G09 500 kV circuit is contingency overloaded at **109%** of the emergency rating (3013 MVA) for the outage of Juniata – Keystone 500 kV circuit. The H22 project contributes approximately **57MW** to the loading on this circuit.
9. The Conemaugh – G09 500 kV circuit is contingency overloaded at **132%** of the emergency rating (3013 MVA) for the outage of Juniata – Keystone 500 kV circuit. The H22 project contributes approximately **57MW** to the loading on this circuit.
10. The Juniata – Keystone 500 kV circuit is overloaded for several contingencies and the worst is at **117%** of the emergency rating for the outage of the Conemaugh – G09 500 kV circuit. The H22 project contributes approximately **45MW** to the loading on this circuit.
11. The Carlisle Pike – Gardners 115kV circuit is contingency overloaded at **131%** of the emergency rating (109 MVA) for the outage of the Juniata – Lewistown 230 kV circuit. The H22 project contributes approximately **9MW** to the loading on this circuit.
12. The Roxbury – Shade Gap 115kV circuit is contingency overloaded at **124%** of the emergency rating (151 MVA) for the outage of the Juniata – Lewistown 230 kV circuit. The H22 circuit contributes approximately **9MW** to the loading on this circuit.
13. The Carlisle Pike – Roxbury 115kV circuit is contingency overloaded at **111%** of the emergency rating (146 MVA) for the outage of the Juniata – Lewistown 230 kV circuit. The H22 project contributes approximately **9MW** to the loading on this circuit.
14. The Lewistown – Shingletown 230 kV circuit is contingency overloaded at **108%** of the emergency rating (512 MVA) for the outage of the Altoona – Raystown – Lewistown 230 kV circuit. The H22 circuit project contributes approximately **31MW** to the loading on this circuit.
15. The Lewistown – Juniata 230kV circuit is overloaded at **113%** of the normal rating (499 MVA). The Lewistown – Juniata 230 kV circuit is also contingency overloaded at **124%** of the emergency rating (617 MVA) for the outage of the Juniata – Keystone 500kV circuit. The H22 circuit project contributes approximately **36MW** to the normal and **39MW** to the contingency loading on this circuit.

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

16. The Homer City – Shelocta 230 kV circuit is overloaded at **123%** of the emergency rating (854 MVA) for the Juniata – Dauphin and Juniata – Lewistown tower line outage. The H22 project contributes approximately **45MW** to the loading on this circuit.
17. The Keystone - Shelocta 230 kV circuit is overloaded at **110%** of the emergency rating (854 MVA) for the Juniata – Dauphin and Juniata – Lewistown tower line outage. The H22 project contributes approximately **53MW** to the loading on this circuit.

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

Cost estimates for items #1 through #5 above will not be 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.

The following facilities have been identified as requiring reinforcement. The facility loading reported, the conductor rating of the facility, and the likely action to resolve the problem is also indicated.

	<u>Contingency Loading (MVA)</u>	<u>Normal/4-Hour Conductor Rating</u>	<u>Resolution</u>
Warren – Falconer 115 kV	157	82/117	Rebuild 15.6 miles of circuit
Erie South – H22 230 kV	648	499/617	Rebuild 2 mile circuit
Altoona – Raystown 230 kV	554	499/617	Replace 1 line trap
North Meshoppen 230/115 kV Bank	161	136/155	Replace transformer
Shawville – Shingletown 230 kV	554	499/617	Replace 2 line traps, 2 CTs
Homer City – Shelocta 230 kV	1085	718/909	Rebuild 10.7 mile circuit
Shelocta – Keystone 230 kV	1008	718/909	Rebuild 2.3 mile circuit
Keystone 500/230 kV banks	614	436/499	Add a third transformer
Keystone – Homer City 500 kV	3284	2842/3548	Add a 2nd circuit-12.6 miles
Homer City – Conemaugh 500 kV	3977	2842/3548	Add a 2nd circuit-12.6 miles
Keystone – Juniata 500 kV	3525	3004/3733	Add a 2nd circuit-118.4 mi
Carlisle Pike – Gardners 115 kV	143	75/109	Rebuild 20.6 mile circuit
Roxbury – Shade Gap 115 kV	187	115/151	Rebuild 13.6 mile circuit
Roxbury – Carlisle Pike 115 kV	162	115/151	Rebuild 9.2 mile circuit
Shingletown – Lewistown 230 kV	550	499/617	Replace 1 circuit breaker, 2 line traps, 4 CTs
Lewistown – Juniata 230 kV	765	499/617	Rebuild 25.8 mile circuit

Contribution to Previously Identified System Reinforcements

The H22 project will contribute to the cost of the following previously identified network reinforcements:

1. Build a new 500 kV west to east circuit (or comparable alternative). 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.**

There is also a potential that an SVC will be required for voltage support at the Juniata 500kV substation. This will be determined in the Impact Study evaluation. **The cost is estimated at \$24.5 million with a lead-time of 2 years.**

If the developer requests an Impact Study, individual system upgrades will be identified and construction estimates defined. Cost allocation will also be completed during the Impact Study.

