

Queue # Q46 – Curwensville 34.5 kV  
**Generation Interconnection - Revised**

**Network Impacts**

The #Q46 project was studied as an injection of 1 to 5 MW (maximum of 10 MW) into the Curwensville 34.5 kV substation.

The project was studied from two different scenarios:

1. Generator @ 24.7 MW, load of facility @ 23.7 MW – net export of 1 MW to the grid
2. Generator @ 24.7 MW, load of facility @ 19.7 MW – net export of 5 MW to the grid

Project #Q46 was evaluated for compliance with reliability criteria for summer peak conditions in 2011. Potential network impacts were as follows:

**Generator Deliverability**

Scenario #1: No problems identified. This is very similar to the existing system.  
Scenario #2: No problems identified.

**Multiple Facility Contingency**

**Contribution to Previously Identified Overloads**

None.

**New System Reinforcements**

None.

**Contribution to Previously Identified System Reinforcements**

None

**Short Circuit**

None. Further review will take place during the Impact Study.

**Summary**

The 34.5 kV system in the Curwensville area is adequate without change for delivery if 1 MW to 5 MW from the proposed Q46 generation project.

Fiber optic cable would be required to be run to multiple substations from this generation facility. The load in this area can be served from several different substations depending upon the time of the year and system conditions. The ability to trip the generating unit is required for system protection if the customer is served from one of these other sources.

Queue # Q46 – Curwensville 34.5 kV  
**Generation Interconnection**

**Network Impacts**

The #Q46 project was studied as an injection of 10 MW into the Curwensville 34.5 kV substation.

The project was studied from three different scenarios:

1. Generator @ 10 MW, load of facility @ 9 MW – net export of 1 MW to the grid
2. Generator @ 10 MW, load of facility @ 0 MW – net export of 10 MW to the grid
3. Generator @ 0 MW, load of facility @ 10 MW – net load of 10 MW on the grid

Project #Q46 was evaluated for compliance with reliability criteria for summer peak conditions in 2011. Potential network impacts were as follows:

**Generator Deliverability**

Scenario #1: No problems identified. This is very similar to the existing system.

Scenario #2: No problems identified.

Scenario #3: This causes multiple facilities to overload and experience low voltages under certain contingency conditions.

**Multiple Facility Contingency**

**Contribution to Previously Identified Overloads**

None

**New System Reinforcements**

For Scenario #3:

Thermal overloads of:

1. Dubois 115-34.5 kV transformer #1 loads to 149% of its emergency rating of 24 MVA for the outage of the Dubois transformer #2.
  - **To mitigate this overload condition requires the upgrade/replacement of the existing transformer. This is estimated to cost approximately \$1,200,000.**
2. Dubois 115-34.5 kV transformer #99 loads to 115% of its emergency rating of 26 MVA for the outage of the Dubois transformer #99.
  - **To mitigate this overload condition requires the upgrade/replacement of the existing transformer. This is estimated to cost approximately \$1,200,000.**
3. Madera 115-34.5 kV transformer #2 loads to 125% of its emergency rating of 21 MVA for the outage of the Madera 115-34.5 kV transformer #1.
  - **To mitigate this overload condition requires the upgrade/replacement of the existing transformer. This is estimated to cost approximately \$1,200,000.**

4. Shawville 115-34.5 kV transformer #1 loads to 101% of its emergency rating of 46 MVA for the outage of the Shawville 115-34.5 kV transformer #2
  - **To mitigate this overload condition requires the upgrade/replacement of the existing transformer. This is estimated to cost approximately \$1,200,000.**
5. Clearfield-Clark St 34.5 kV loads to 110% of its emergency rating of 21 MVA for the outage of the Shawville 115-34.5 kV transformer #1.
  - **To mitigate this overload condition requires the upgrade/reconductor of approximately 1.57 miles of 34.5 kV transmission line. This is estimated to cost approximately \$283,000.**
6. Clearfield – S6 & 0 GDN 34.5 kV loads to 101% of its emergency rating of 23 MVA for the outage of the Shawville 115-34.5 kV transformer #1.
  - **To mitigate this overload condition requires the upgrade/reconductor of approximately 1.16 miles of 34.5 kV transmission line. This is estimated to cost approximately \$209,000.**
7. Clearfield – Clearfield I80 34.5 kV loads to 117% of its emergency rating of 31 MVA for the outage of the Shawville 115-34.5 kV transformer #1.
  - **To mitigate this overload condition requires the upgrade/reconductor of approximately 2.142 miles of 34.5 kV transmission line. This is estimated to cost approximately \$386,000.**
8. Clearfield VOT – P#Sec153 34.5 kV loads to 114% of its emergency rating of 31 MVA for the outage of the Shawville 115-34.5 kV transformer #1.
  - **To mitigate this overload condition requires the upgrade/reconductor of approximately 0.12 miles of 34.5 kV transmission line. This is estimated to cost approximately \$22,000.**
9. Goshen Tap – Clearfield I80 34.5 kV loads to 120% of its emergency rating of 31 MVA for the outage of the Shawville 115-34.5 kV transformer #1.
  - **To mitigate this overload condition requires the upgrade/reconductor of approximately 1.51 miles of 34.5 kV transmission line. This is estimated to cost approximately \$272,000.**
10. Harbison – Benjamin Alley Tap 34.5 kV loads to 102% of its emergency rating of 31 MVA for the outage of the Shawville 115-34.5 kV transformer #1.
  - **To mitigate this overload condition requires the upgrade/reconductor of approximately 0.37 miles of 34.5 kV transmission line. This is estimated to cost approximately \$67,000.**
11. Harbison – Tile Pla 34.5 kV loads to 105% of its emergency rating of 31 MVA for the outage of the Shawville 115-34.5 kV transformer #1.
  - **To mitigate this overload condition requires the upgrade/reconductor of approximately 0.46 miles of 34.5 kV transmission line. This is estimated to cost approximately \$83,000.**
12. Sand&Lin – OShanter 34.5 kV loads to 121% of its emergency rating of 16 MVA for the outage of the Shawville 115-34.5 kV transformer #2.

**- To mitigate this overload condition requires the upgrade/reconductor of approximately 10.25 miles of 34.5 kV transmission line. This is estimated to cost approximately \$1,845,000.**

13. Shawville –Goshen Tap 34.5 kV loads to 123% of its emergency rating of 31 MVA for the outage of the Shawville 115-34.5 kV transformer #1.

**- To mitigate this overload condition requires the upgrade/reconductor of approximately 0.64 miles of 34.5 kV transmission line. This is estimated to cost approximately \$115,000.**

14. Tile Pla – P#Sec153 34.5 kV loads to 105% of its emergency rating of 31 MVA for the outage of the Shawville 115-34.5 kV transformer #1.

**- To mitigate this overload condition requires the upgrade/reconductor of approximately 0.76 miles of 34.5 kV transmission line. This is estimated to cost approximately \$137,000.**

**The 34.5 kV lines that overload are a total of approximately 18.98 miles of 34.5 kV that will require reconductoring (identified above) that totals \$3,419,000.**

Low voltages at:

1. 14&Jacks 34.5 kV for the loss of the Dubois 115-34.5 kV transformer #1
2. Anderson 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1
3. Arcad.JC 34.5 kV for the loss of the Glory 115-34.5 kV transformer
4. Arcadia 34.5 kV for the loss of the Glory 115-34.5 kV transformer
5. Barrett 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1
6. Bells La 34.5 kV for the loss of the Glory 115-34.5 kV transformer
7. Benjamin Alley Tap 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1 or #2
8. Benjamin Alley 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1 or #2
9. Bigler 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1
10. Bloomington 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1
11. Bower Tp 34.5 kV for the loss of the Glory 115-34.5 kV transformer
12. Burnside 34.5 kV for the loss of the Glory 115-34.5 kV transformer
13. Carbon SW 34.5 kV for the loss of the Punxsutawney 115-34.5 kV transformer
14. Carbon 34.5 kV for the loss of the Punxsutawney 115-34.5 kV transformer
15. Chestnt2 34.5 kV for the loss of the Dubois-Hooligan 34.5 kV line
16. CL Chees 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1
17. Clark St 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1
18. Clearhav 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #2
19. Clearfield I-80 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #2
20. Clearfield VOT 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #2
21. Cook.1-C 34.5 kV for the loss of the Glory 115-34.5 kV transformer
22. Cook.2-C 34.5 kV for the loss of the Glory 115-34.5 kV transformer
23. Cook.3-C 34.5 kV for the loss of the Glory 115-34.5 kV transformer
24. Cook.REC 34.5 kV for the loss of the Glory 115-34.5 kV transformer
25. Cookport 34.5 kV for the loss of the Glory 115-34.5 kV transformer
26. Curry Run 34.5 kV for the loss of the Glory 115-34.5 kV transformer
27. Curwensville 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1

28. Emeigh Tap 34.5 kV for the loss of the Philipsburg-Shawville 115 kV line and the Philipsburg 115-34.5 kV transformer #1
29. G.Camp-C 34.5 kV for the loss of the Glory 115-34.5 kV transformer
30. Glen Cam 34.5 kV for the loss of the Glory 115-34.5 kV transformer
31. GlenGar 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1
32. Glen-Ric 34.5 kV for the loss of the Madera-Sand&Lin 34.5 kV line
33. GInt REC 34.5 kV for the loss of the Dubois-Hooligan 34.5 kV line
34. Glory 34.5 kV for the loss of the Glory 115-34.5 kV transformer
35. Goshen Tap 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #2
36. Graham Tap 34.5 kV for the loss of the Philipsburg-Shawville 115 kV line and the Philipsburg 115-34.5 kV transformer #1
37. Harbison 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1 or #2
38. Hillsdale 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1 or #2
39. Hooligan 34.5 kV for the loss of Dubois-Hooligan 34.5 kV
40. Hughes&C 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1 or #2
41. Hyde Cit 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1 or #2
42. Lansberry 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1
43. Luthersburg 34.5 kV for the loss of Dubois-Hooligan 34.5 kV
44. Luthersburg 34.5 kV for the loss of Dubois-Hooligan 34.5 kV
45. Mahaffey 34.5 kV for the loss of the Glory 115-34.5 kV transformer
46. Martin& 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1 or #2
47. Mcdowell 34.5 kV for the loss of Dubois-Hooligan 34.5 kV
48. McGee Cp 34.5 kV for the loss of the Glory 115-34.5 kV transformer
49. McGee REC 34.5 kV for the loss of the Glory 115-34.5 kV transformer
50. McGee Tap 34.5 kV for the loss of the Glory 115-34.5 kV transformer
51. Mears 34.5 kV for the loss of the Glory 115-34.5 kV transformer
52. N. Amer C 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1 or #2
53. Oklahoma 34.5 kV for the loss of Dubois-Hooligan 34.5 kV
54. OShanter 34.5 kV for the loss of the Madera-Sand&Lin 34.5 kV line
55. P#SBC-97 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1
56. P#SBF106 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1
57. P.72637 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1 or #2
58. P.DC-123 34.5 kV for the loss of Dubois-Hooligan 34.5 kV
59. Pike REC 34.5 kV for the loss of Dubois-Hooligan 34.5 kV
60. Riv & Mea 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1 or #2
61. S 6<sup>th</sup> & Ogden 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1 or #2
62. Sand & Lin 34.5 kV for the loss of the Madera-Sand&Lin 34.5 kV line
63. Shawville No 1 34.5 kV V for the loss of the Shawville 115-34.5 kV transformer #1
64. Shawville No 2 34.5 kV V for the loss of the Shawville 115-34.5 kV transformer #2
65. Smith Tap 34.5 kV for the loss of the Glory 115-34.5 kV transformer
66. Smithport 34.5 kV for the loss of the Glory 115-34.5 kV transformer
67. Speer Cr 34.5 kV for the loss of the Punxsutawney 115-34.5 kV transformer
68. Surveyor 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1
69. Sykes Tap 34.5 kV for the loss of the Punxsutawney 115-34.5 kV transformer
70. Torcey-R 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1
71. UTWN 34.5 kV for the loss of the Glory 115-34.5 kV transformer
72. West Clearfield Tap 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1

- 73. WalMart 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1
- 74. Willamette 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1
- 75. Woodland 34.5 kV for the loss of the Shawville 115-34.5 kV transformer #1
- 76. C. Hill C 23 kV for the loss of the Glory 115-34.5 kV transformer
- 77. Commodore 23 kV for the loss of the Glory 115-34.5 kV transformer
- 78. Diamondville 23 kV for the loss of the Glory 115-34.5 kV transformer
- 79. Glory 23 kV for the loss of the Glory 115-34.5 kV transformer
- 80. Glory Co 23 kV for the loss of the Glory 115-34.5 kV transformer
- 81. Kenwood T 23 kV for the loss of the Glory 115-34.5 kV transformer
- 82. Kenwood 23 kV for the loss of the Glory 115-34.5 kV transformer
- 83. P.GB-51 23 kV for the loss of the Glory 115-34.5 kV transformer
- 84. Pine Flt 23 kV for the loss of the Glory 115-34.5 kV transformer
- 85. Val.Coal 23 kV for the loss of the Glory 115-34.5 kV transformer

There will be a need for approximately 12 – 34.5 kV capacitor installations in order to support the 34.5 kV system to meet voltage planning criteria. The total estimated cost of these installations is approximately \$180,000.

Total upgrade costs:

Transformer upgrades (4)	\$4,800,000
34.5 kV line upgrades (18.98 miles)	\$3,419,000
34.5 kV capacitor installations (12)	\$ 180,000
Total	\$8,399,000

It is estimated that these upgrades would take approximately 2 years to complete.

**Contribution to Previously Identified System Reinforcements**

None

**Short Circuit**

None. Further review will take place during the Impact Study.

**Summary**

It would be better if this customer were to be served from a 115 kV line out of the Shawville area. The 34.5 kV system near Curwensville is not able to adequately serve this customer without substantial improvements. If they have future expansion plans, it is highly likely that we would require recommend an upgrade to the 115 kV system.

Fiber optic cable would is required to be run to multiple substations from this generation facility. The load in this area can be served from several different substations depending upon the time of the year and system conditions. The ability to trip the generating unit is required for system protection if the customer is served from one of these other sources.