

**S46 – Mechanicsburg South – Darby 69 kV**  
**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**

The Queue S46 Project was studied as a 200 MW (40 MW Capacity) injection at Givens (tap between Urbana and Mechanicsburg) 138 kV substation. Project S46 was evaluated for compliance with reliability criteria for summer peak conditions in 2012. Potential network impacts were as follows:

**Generator Deliverability**

*(Single or N-1 contingencies for the Capacity portion only of the interconnection)*

No problems were identified.

**Multiple Facility Contingency**

*(Double Circuit Tower Line contingencies only for the full energy output. Stuck breaker and bus fault contingencies will be performed for the Impact Study)*

1. The S46 – Givens 138 kV line is overloaded from 73% to 145% of its emergency rating (274 MVA) for the **tower** outage of Darby – Eagle - Mechanicsburg – R52 138 kV line (Contingency ID DAYTON\_TOWER\_R52\_15A). This project contributes approximately 200 MW to cause the thermal violation.
2. The R52 – Mechanicsburg 138 kV line is overloaded from 73% to 146% of its emergency rating (274 MVA) for the **tower** outage of S46 – Givens – Urbana – Bath 138 kV line (Contingency ID DAYTON\_TOWER\_R52\_15A\_S46B). This project contributes approximately 200 MW to cause the thermal violation.
3. The Givens – Urbana 138 kV line is overloaded from 72% to 144% of its emergency rating (274 MVA) for the **tower** outage of Darby – Eagle – Mechanicsburg – R52 138 kV line (Contingency ID DAYTON\_TOWER\_R52\_15A). This project contributes approximately 200 MW to cause the thermal violation.
4. The Mechanicsburg – Darby 138 kV line is overloaded from 71% to 144% of its emergency rating (274 MVA) for the **tower** outage of S46 – Givens – Urbana – Bath 138 kV line (Contingency ID DAYTON\_TOWER\_R52\_15B\_S46B). This project contributes approximately 200 MW to cause the thermal violation.
5. The Kings Creek – Logan 69 kV line is overloaded from 95% to 112% of its emergency rating (117 MVA) ) for the **tower** outage of Darby – Eagle Mechanicsburg – R52 138 kV line (Contingency ID DAYTON\_TOWER\_R52\_15A). This project contributes approximately 20 MW to cause the thermal violation.
6. The Urbana – Clark 138 kV line is overloaded from 76% to 104% of its emergency rating (309 MVA) for the **tower** outage of Darby – Eagle

Mechanicsburg – R52 138 kV line (Contingency ID DAYTON\_TOWER\_R52\_15A). This project contributes approximately 86 MW to cause the thermal violation.

### **Contribution to Previously Identified Overloads**

*(This project contributes to the following contingency overloads, i.e. “Network Impacts”, identified for earlier generation or transmission interconnection projects in the PJM Queue)*

7. Contribution of 15 MW further overloads to the Kings Creek – Logan 69 kV line from 113% to 126% of its emergency rating (117 MVA) for the **Tower** contingency outage of Miami – Bath 345 kV line and New Carlisle – Miami 138 kV line (Contingency ID: DAYTON\_TOWER\_11).

### **Potential Overloads**

1. The Darby 138/69 kV XFMR is overloaded from 73% to 99.92% of its emergency rating (220 MVA) for the outage of S46 – Givens – Urbana –Bath 138 kV line (Contingency ID DAYTON\_TOWER\_R52\_15B\_S46B). This project contributes approximately 59 MW to cause the thermal violation.

### **New System Reinforcements**

*(Upgrades required to mitigate reliability criteria violations, i.e. “Network Impacts”, initially caused by the addition of this project generation)*

1. Upgrade the Givens – Urbana 138 kV circuit to mitigate the violation identified above.
2. Upgrade the Kingscreek – Logan 69 kV circuit to mitigate the violation identified above.
3. Upgrade Urbana – Clark 138 kV circuit to mitigate the violation identified above.

### **Contribution to Previously Identified System Reinforcements**

*(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)*

3. The Kingscreek-Logan 69 kV Circuit was identified as requiring an upgrade to mitigate reliability criteria violations with the proposed wind farm in place.

### **Short Circuit**

3 of the 4 breakers identified as over-duty as a result of Queue R52 generation will be further overdutied by the S45 & S46 project:

1. Urbana 69kV breakers DB-BH1, DB-BH3E, and DB-BH3W.

### **Delivery of Energy Portion of Interconnection Request**

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

As a result of the aggregate energy resources in the area, the following violations were identified:

1. Contribution of 140 MW further overloads the Darby - Delaware 138 kV line from 47% to 105% of its emergency rating (242 MVA) for the outage of S46 – Givens – Urbana 138 kV line.
2. Contribution of 200 MW further overloads the Givens – Urbana 138 kV line from 72% to 145% of its emergency rating (274 MVA) for the outage of Darby – Mechanicsburg – R52 138 kV line.
3. Contribution of 146 MW further overloads the Givens – Urbana 138 kV line from 52% to 118% of its normal rating (222 MVA).
4. Contribution of 14 MW further overloads the Kingscreek – Logan 69 kV line from 108% to 124% of its normal rating (96 MVA).
5. Contribution of 26 MW further overloads the Kingscreek – Logan 69 kV line from 113% to 136% of its emergency rating (117 MVA) for the outage of Urbana – Clark 138 kV line.
6. Contribution of 200 MW further overloads the Mechanicsburg - Darby 138 kV line from 71% to 144% of its emergency rating (242 MVA) for the outage of S46 – Givens – Urbana 138 kV line.
7. Contribution of 86 MW further overloads the Urbana – Clark 138 kV line from 76% to 104% of its emergency rating (309 MVA) for the outage of Darby – Mechanicsburg – R52 138 kV line.
8. Contribution of 200 MW further overloads the S46 – Givens 138 kV line from 73% to 146% of its emergency rating (274 MVA) for the outage of Darby – Mechanicsburg – R52 138 kV line.
9. Contribution of 140 MW further overloads the S46 – Givens 138 kV line from 54% to 117% of its normal rating (222 MVA).
10. Contribution of 200 MW further overloads the R52 - Mechanicsburg 138 kV line from 73% to 146% of its emergency rating (242 MVA) for the outage of S46 – Givens – Urbana 138 kV line.