Queue # Q57
Steward-Herman Road (Tower Road) 138 kV
OR
Electric Junction-Herman Road (Walton Road) 345 kV
Wind Generation Interconnection

Network Impacts

The #Q57 project was studied as a total injection of 250 MW (50 MW of Capacity) into (1) Tower Road Wind Farm 138 kV substation, and alternatively (2) into a tap of 345 kV line 18402 from Electric Junction to Walton Road. Project #Q57 was evaluated for compliance with PJM Reliability Criteria for summer peak conditions in 2011. Potential network impacts were as follows:

1. **OPTION 1 – Direct Connection into Tower Road Wind Farm 138 kV substation:**

   Generator Deliverability – at the 50 MW capacity value level

   No problems were identified.

   Multiple Facility Contingency – Reliability Requirements at the 250 MW full output level

   NOTE: *For Feasibility Studies, only double circuit (tower) outages are evaluated – not line fault and stuck breaker.*

   No problems were identified (no facility loading that exceeded the facility's emergency rating).

   Contribution to Previously Identified Overloads

   Contribution of 24 MW further overloads the Kammer 765/500 kV transformer from 107% to 108% for the 345 kV tower outage to Kammer-W. Bellaire and Tidd-W. Bellaire.

   New System Reinforcements

   To be determined in the System Impact Study.

   Contribution to Previously Identified System Reinforcements

   To be determined in the System Impact Study.

   Short Circuit

   One circuit breaker became overdutied at TSS 113 Waterman as a result of the interconnection for option 1 of the #Q57 project. Bus tie 1-2 circuit breaker at TSS 113 Waterman was overdutied at 106.9% of the breaker rating. The short-circuit study for

#Q57 considers the overdutied breakers upgraded for projects ahead of #Q57 in the PJM queue. If projects ahead of #Q57 drop out, the short-circuit analysis will be repeated, and #Q57 may ultimately be responsible for additional breaker upgrades.

Potential Issues

Impacts on the MISO member transmission systems are not included in this analysis, but they will be included in the Impact Study, which may reveal upgrades needed in the MISO system not identified in this Feasibility Study.

During certain maintenance outages the Q57 project may be required to be taken off-line.

Delivery of Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of this Q57 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 105 MW further congests the 138 kV Waterman Bus 2 from 80% to 129% of its **emergency** rating (215 MVA) for the outage of 138 kV line 11301.
2. Contribution of 129 MW further congests the 138 kV Waterman Bus Tie 2-3 from 178% to 238% of its **emergency** rating (215 MVA) for the outage of the Electric Junction-Walton Road (P20) 345 kV line 18402.
3. Contribution of 157 MW further congests the West Dekalb Tap to Tower Road Wind Farm 138 kV line from 149% to 224% of its **normal** rating (209 MVA).
4. Contribution of 159 MW further congests the Waterman to the West Dekalb Tap portion of 138 kV line 11323 from 150% to 212% of its **emergency** rating (255 MVA) for the outage of the Electric Junction-Walton Road (P20) 345 kV line 18402. The congestion was first observed for project #O09.
5. Contribution of 250 MW causes congestion on the 138 kV line 10714 line from Dixon to McGirr Road from 80% to 175% of its **emergency** rating (261 MVA) for the outage of 138 kV line 11323.
6. Contribution of 30 MW further congests the Nelson to Nelson Red Tap portion 138 kV line 15508 from 135% to 145% of its **emergency** rating (280 MVA) for the outage of 138 kV line 13311. The congestion was first observed for project #P37.
7. Contribution of 24 MW further congests the Electric Junction to P20 345 kV line 18402 from 146% to 148% of its **emergency** rating (1234 MVA) for the outage of 345 kV line 0627. The congestion was first observed for project #O09.

8. Contribution of 24 MW further congests the Nelson to P20 345 kV line 15502 from 132% to 134% of its **emergency** rating (1234 MVA) for the outage of 345 kV line 0627. The congestion was first observed for project #O09.
9. Contribution of 104 MW causes congestion on the Waterman to the Glidden tap portion of 138 kV line 11323 from 71% to 117% of its **emergency** rating (224 MVA) for the outage of 138 kV line 11301.
10. Contribution of 31 MW further congests the Stillman Valley Tap to O68 portion of 138 kV line 15621 from 100% to 117% of its **emergency** rating (182 MVA) for the outage of 138 kV line 11323. The congestion was first observed for project #P26.
11. Contribution of 250 MW causes congestion on the Tower Road Wind Farm to Steward 138 kV line from 29% to 125% of its **emergency** rating (261 MVA) for the outage of 138 kV line 11323.
12. Contribution of 33 MW further congests the Cherry Valley to Silver Lake 345 kV line 15616 from 109 % to 111 % of its **emergency** rating (1530 MVA) for the outage of the Electric Junction-Walton Road (P20) 345 kV line 18402. The congestion was first observed for project #P36.

2. OPTION 2 - Tapping the Electric Junction-Walton Rd 345 kV line 18402:

Generator Deliverability – at the 50 MW capacity value level

No problems were identified.

Multiple Facility Contingency – Reliability Requirements at the 250 MW full output level

NOTE: *For Feasibility Studies, only double circuit (tower) outages are evaluated – not line fault and stuck breaker.*

No problems were identified (no facility loading that exceeded the facility's emergency rating).

Contribution to Previously Identified Overloads

No problems were identified.

New System Reinforcements

No problems were identified.

Contribution to Previously Identified System Reinforcements

No problems were identified.

Short Circuit

There were no overdutied circuit breakers due to the interconnection of option 2 for #Q57 identified at this time. The short-circuit study for #Q57 considers the overdutied breakers upgraded for projects ahead of #Q57 in the PJM queue. If projects ahead of #Q57 drop out, the short-circuit analysis will be repeated, and #Q57 may ultimately be responsible for additional breaker upgrades.

Potential Issues

Impacts on the MISO member transmission systems are not included in this analysis, but they will be included in the Impact Study, which may reveal upgrades needed in the MISO system not identified in this Feasibility Study.

During certain maintenance outages the Q57 project may be required to be taken off-line.

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 15 MW increases the loading on the Bus Tie 2-3 Circuit Breaker at TSS 113 Waterman from 178% to 185% of its **emergency** rating (215 MVA) for the outage of the Q57 Option 2-Electric Junction 345 kV line 96102. This constraint does not take into account the reliability reinforcement required to mitigate the overload identified for the P14 project during the P-Queue Feasibility Studies.
2. Contribution of 13 MW increases the loading on the West Dekalb Tap to Tower Road Wind Farm 138 kV line from 154% to 159% of its **emergency** rating (261 MVA) for the outage of the Q57 Option 2-Electric Junction 345 kV line 96102. This constraint does not take into account the reliability reinforcement required to mitigate the overload identified for the O33 project during the O-Queue Feasibility Studies.
3. Contribution of 13 MW increases the loading on the Waterman to West DeKalb Tap portion of 138kV line 11323 from 150% to 155% of its **emergency** rating (255 MVA) for the outage of the Q57 Option 2-Electric Junction 345 kV line 96102. This constraint does not take into account the reliability reinforcement required to mitigate the overload identified for the O29 project during the O-Queue Feasibility Studies.
4. Contribution of 13 MW increases the loading on the McGirr Road to H440 Rochelle portion of 138 kV line 16914 loads from 141% to 146% of its **emergency** rating (261 MVA) for the outage of the Q57 Option 2-Electric Junction 345 kV line 96102. This monitored element was first caused by the P14 project under normal conditions.
5. Contribution of 218 MW increases the loading on the Q57 Option 2 to Electric Junction 345 kV line 96102 from 145% to 163% of its **emergency** rating (1234 MVA) for the outage of 345 kV line 0627 from Lee County to Byron. This constraint does not take into account the reliability reinforcement required to mitigate the overload identified for the P36 project during the P-Queue Feasibility Studies.
6. Contribution of 13 MW increases the loading on the Steward to Tower Road Wind Farm 138 kV line from 136% to 141% of its **emergency** rating (261 MVA) for the outage of

the Q57 Option 2-Electric Junction 345 kV line 96102. This constraint does not take into account the reliability reinforcement required to mitigate the overload identified for the P14 project during the P-Queue Feasibility Studies.

7. Contribution of 13 MW increases the loading on the Dixon to McGirr Road 138 kV line 10714 from 117% to 122% of its **emergency** rating (261 MVA) for the outage of the Q57 Option 2-Electric Junction 345 kV line 96102. This constraint does not take into account the reliability reinforcement required to mitigate the overload identified for the P21 project during the P-Queue Feasibility Studies.
8. Contribution of 24 MW further overloads the Kammer 765/500 kV transformer from 119% to 120% of its **emergency** rating (2094 MVA) for the outage of the 765 kV line from Kammer to South Canton. The congestion constraint starts with queue position P37.
9. Contribution of 55 MW increases the loading on the Cherry Valley to Silver Lake 345 kV line 15616 from 109% to 113% of its **emergency** rating (1530 MVA) for the outage of the Q57 Option 2-Electric Junction 345 kV line 96102.
10. Contribution of 18 MW increases the loading on the Nelson to Nelson Red Tap portion of 138kV line 15508 from 102% to 108% of its **emergency** rating (280 MVA) for the outage of the Q57 Option 2-Electric Junction 345 kV line 96102. A previous congestion constraint on this facility was also observed to be caused by the P37 project for the outage of 138kV line 7411.
11. The Byron to Lee County 345 kV line 0627 loads from 95% to 100% of its **emergency** rating (1739 MVA) for the Q57 Option 2-Electric Junction 345 kV line 96102. The Q57 Option 2 project contributes 101 MW to cause this thermal constraint.