

#P53 – Bent Mountain **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 #P53 project was studied as a total injection of 81 MW (16.2 MW of Capacity) at three distinct points of interconnection. Option 1 considers the point of interconnection to be a tap of the Matt Funk to Shawsville 138 kV line, option 2 studies it at a tap of the Claytor to Hancock 138 kV line, and option 3 studies it connecting to the Matt Funk 138 kV substation. Project #P53 was evaluated for compliance with reliability criteria for summer peak conditions in 2010. Potential network impacts were as follows:

Option 1: Tapping into the Matt Funk to Sawsville 138 kV line

Generator Deliverability
No problems were identified

Multiple Facility Contingency
No problems were identified

Short Circuit
No problems identified

Contribution to Previously Identified Overloads

Contribution of approximately 4 MW to further overload the Dooms to Lexington 500 kV line, which was first caused by project #P16 for the loss of the Bath Co. to Valley 500 kV line.

New System Reinforcements
None

Contribution to Previously Identified System Reinforcements

The proposed fix to the overload of the Lexington to Dooms 500 kV line is to replace the wave traps at both terminals. The estimated cost is **\$300,000** and the estimated time to completion is 12 to 15 months. The P53 would have a cost share on this upgrade under these conditions.

Energy Output Evaluation

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 approximately 5 MW to further overload the Waterford to Muskingum 345 kV line for normal (N-0) conditions.
2. Contribution of approximately 18 MW to further overload the Dooms to Lexington 500 kV line for the loss of the Bath Co. to Valley 500 kV line.
3. Contribution of approximately 7 MW to further overload the South Bend to Keystone 500 kV line for the loss of the Cabot to Wylie Ridge 500 kV line.
4. Contributes approximately 20 MW to load the Cloverdale to Lexington 500kV circuit to over 99% of its maximum continuous rating (1658 MVA) for the loss of the Mt. Storm to Prunty Town 500 kV line.

Proposed Solutions

1. The overload on the Waterford-Muskingum 345kV circuit can be alleviated by reconductoring approximately 1 mile of the circuit out of Waterford and changing line risers at Muskingum. (Upgrade # n0479) These changes can be accomplished prior to the in-service date of the IGCC in May 2010. The estimated cost is **\$1.2 million**.
2. The overload of the Lexington to Dooms 500 kV line can be alleviated by replacing the wave traps at both terminals. The estimated cost is **\$300,000** and the estimated time to completion is 12 to 15 months.
3. The overload on the south Bend-Keystone circuit can be alleviated by replacing the 3000 amp wave trap at Keystone with a 4000 amp wave trap and upgrade of the current transformer circuit. The estimated cost is **\$125,000**.
4. A solution for the near overload on the Cloverdale-Lexington 500kV circuit has not been developed since an actual overload does not exist. However since your project brings the circuit extremely close to an overload we are listing it as a potential problem.

Option 2: Tapping into the Claytor to Hancock 138 kV line

Generator Deliverability

No problems were identified

Multiple Facility Contingency

No problems were identified

Short Circuit

No problems identified

Contribution to Previously Identified Overloads

Contribution of approximately 3 MW to further overload the Doods to Lexington 500 kV line, which was first caused by project #P16 for the loss of the Bath Co. to Valley 500 kV line.

New System Reinforcements

None

Contribution to Previously Identified System Reinforcements

The proposed fix to the overload of the Lexington to Doods 500 kV line is to replace the wave traps at both terminals. The estimated cost is **\$300,000** and the estimated time to completion is 2 to 15 months. The P53 would have a cost share on this upgrade under these conditions.

Energy Output Evaluation

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 approximately 4 MW to further overload the Waterford to Muskingum 345 kV line for normal (N-0) conditions.
2. Contribution of approximately 7 MW to further overload the South Bend to Keystone 500 kV line for the loss of the Cabot to Wylie Ridge 500 kV line.
3. Contribution of approximately 17 MW to further overload the Doods to Lexington 500 kV line for the loss of the Bath Co. to Valley 500 kV line.
4. Contributes approximately 19 MW to load the Cloverdale to Lexington to over 99% of its maximum continuous rating (1658 MVA) for the loss of the Mt. Storm to Prunty Town 500 kV line.

Proposed Solutions

1. The overload on the Waterford-Muskingum 345kV circuit can be alleviated by reconductoring approximately 1 mile of the circuit out of Waterford and changing line risers at Muskingum. (Upgrade # n0479) These changes can be accomplished prior to the in-service date of the IGCC in May 2010. The estimated cost is **\$1.2 million**.
2. The overload of the Lexington to Doods 500 kV line can be alleviated by replacing the wave traps at both terminals. The estimated cost is **\$300,000** and the estimated time to completion is 12 to 15 months.
3. The overload on the south Bend-Keystone circuit can be alleviated by replacing the 3000 amp wave trap at Keystone with a 4000 amp wave trap and upgrade of the current transformer circuit. The estimated cost is **\$125,000**.

- 4 A solution for the near overload on the Cloverdale-Lexington 500kV circuit has not been developed since an actual overload does not exist. However since your project brings the circuit extremely close to an overload we are listing it as a potential problem.

Option 3: Into the Matt Funk 138 kV substation

Generator Deliverability

No problems were identified

Multiple Facility Contingency

No problems were identified

Short Circuit

No problems identified

Contribution to Previously Identified Overloads

Contribution of approximately 4 MW to further overload the Doods to Lexington 500 kV line, which was first caused by project #P16 for the loss of the Bath Co. to Valley 500 kV line.

New System Reinforcements

None

Contribution to Previously Identified System Reinforcements

The proposed fix to the overload of the Lexington to Doods 500 kV line is to replace the wave traps at both terminals. The estimated cost is **\$300,000** and the estimated time to completion is 2 to 15 months. The P53 would have a cost share on this upgrade under these conditions.

Energy Output Evaluation

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 approximately 5 MW to further overload the Waterford to Muskingum 345 kV line for N-0 conditions.
2. Contribution of approximately 8 MW to further overload the South Bend to Keystone 500 kV line for the loss of the Cabot to Keystone 500 kV line.

3. Contribution of approximately 19 MW to further overload the Doods to Lexington 500 kV line for the loss of the Bath Co. to Valley 500 kV line.
4. Contributes approximately 22 MW to load the Cloverdale to Lexington to over 99% of its maximum continuous rating (1658 MVA) for the loss of the Mt. Storm to Prunty Town 500 kV line.

Proposed Solutions

1. The overload on the Waterford-Muskingum 345kV circuit can be alleviated by reconductoring approximately 1 mile of the circuit out of Waterford and changing line risers at Muskingum. (Upgrade # n0479) These changes can be accomplished prior to the in-service date of the IGCC in May 2010. The estimated cost is **\$1.2 million**.
2. The overload of the Lexington to Doods 500 kV line can be alleviated by replacing the wave traps at both terminals. The estimated cost is **\$300,000** and the estimated time to completion is 12 to 15 months.
3. The overload on the south Bend-Keystone circuit can be alleviated by replacing the 3000 amp wave trap at Keystone with a 4000 amp wave trap and upgrade of the current transformer circuit. The estimated cost is **\$125,000**.
4. A solution for the near overload on the Cloverdale-Lexington 500kV circuit has not been developed since an actual overload does not exist. However since your project brings the circuit extremely close to an overload we are listing it as a potential problem.

Additional Network Concerns

PJM has also identified that there is a potential that this project will contribute to overloads on the following three facilities;

Mahans Lane-Tidd 138kV circuit
Mahans Lane-Weirton 138kV circuit
Sporn 345/138kV transformer #3

The system upgrades that are required to alleviate these overloads have not been finalized. Any requirements that the P53 project would have for upgrades to remediate these overloads will be fully defined in the Impact Study.

The P53 project will impact these three facilities for each of the connection methodologies described in this report.