#V2-020 Howard 138kV

Generation Interconnection

This analysis was completed to assess the reliability impact for the new generation interconnecting to the PJM system as a capacity resource.

Local AEP Impacts

Unlike PJM, AEP performs AC analysis for interconnection projects in the feasibility stage. In analyzing the V2-019A Project with all other Wind Interconnection Projects in the AEP's footprint at 13-20% (based on the queue position) of their total capacity, AEP discovered 153 new overloads on the AEP bulk (100 kV and above) system. Furthermore, there were several contingencies that did not converge and the project contributed to several existing overload conditions on the AEP system. A detailed report of the AC Contingency analysis for V2-019A was shared by AEP. PJM, on the other hand, only recognized 3 of the 153 ***new*** overloads on the AEP system. Considering the extensive differences between AEP's and PJM's analyses and methodologies, AEP is unable to verify or confirm PJM's analyses for V2-019A and the subsequent projects, including V2-020.

AEP is providing the requested information for the V2-020 interconnection project without confirming or denying PJM's results to comply with PJM's request on attachment facilities and transmission improvements that address system conditions identified by PJM. Please note that these transmission improvements are based on the information shared by PJM and are therefore preliminary in nature. The extent of improvements needed for the interconnection may vary by type of project and its position in the queue. AEP will work with PJM to resolve the differences in results before these projects enter the Impact Study stage.

Network Impacts

The queue V2-020 project was studied as a 150MW injection (19.5MW of which was capacity) into AEP's system at the Howard 138kV substation. Project V2-020 was evaluated for compliance with reliability criteria for summer peak conditions in 2013. Potential network impacts were as follows:

PJM utilizes a DC analysis to determine thermal overloads in the Feasibility Study stage of a project.

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

No problems identified

Multiple Facility Contingency
(Double Circuit Tower Line, Line with Failed Breaker and Bus Fault contingencies for the full energy output)

No problems identified

Short Circuit
(Summary form of Cost allocation for breakers will be inserted here if any)

1. The addition of the V2-020 project causes the short circuit duty on the Howard "C" 138kV circuit breaker to increase to 113.6% of its rated capability.

2. The addition of the V2-020 project causes the short circuit duty on the Howard "D" 138kV circuit breaker to increase to 113.6% of its rated capability.

3. The addition of the V2-020 project causes the short circuit duty on the Howard "H" 138kV circuit breaker to increase to 113.6% of its rated capability.

4. The addition of the V2-020 project causes the short circuit duty on the Howard "I" 138kV circuit breaker to increase to 113.6% of its rated capability.

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)

None

New System Reinforcements

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

1. The overdutied condition on the Howard "C" 138kV circuit breaker can be alleviated by replacing the circuit breaker with one of higher interrupting rating. The cost of replacement is **$375,000.**

2. The overdutied condition on the Howard "D" 138kV circuit breaker can be alleviated by replacing the circuit breaker with one of higher interrupting rating. The cost of replacement is **$375,000.**

3. The overdutied condition on the Howard "H" 138kV circuit breaker can be alleviated by replacing the circuit breaker with one of higher interrupting rating. The cost of replacement is **$375,000.**

4. The overdutied condition on the Howard "I" 138kV circuit breaker can be alleviated by replacing the circuit breaker with one of higher interrupting rating. The cost of replacement is **$375,000.**

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)
(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

None

Potential Congestion due to Local Energy Deliverability

(PJM also studied the delivery of the energy portion of the surrounding generation. Any potential 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 Transmission Interconnection Request. Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full deliverability for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which analyzes all overload conditions associated with the identified overloaded element(s). As a result of the aggregate energy resources in the area, the following violations were identified:

1. The Howard-Brookside 138kV line (from bus 23158 to bus 238586 ckt 1) loads from 133.22% to 167.19% (DC power flow) of its normal rating (133MVA) during non-contingency conditions as a result of V2-020. This project contributes approximately 45.2MW to cause this thermal violation.

2. The Howard-Brookside 138kV line (from bus 23158 to bus 238586 ckt 1) loads from 119.64% to 145.95% (DC power flow) of its emergency rating (173MVA) for the single line outage (02BEAVER 345 - 02DAV-BE 345 - 1) as a result of V2-020. This project contributes approximately 45.5MW to cause this thermal violation.

MISO IMPACTS

Any impacts on the MISO transmission system will be identified in the Impact Study.