#V4-010 Fremont Center-Tiffin Center (Seneca) 138kV

Generation Interconnection

(Revised 04/29/10)

Local AEP Impacts

Unlike PJM, AEP performs AC analysis for interconnection projects in the feasibility stage. In analyzing the V2-019A Merchant Transmission Project with all other Wind Interconnection Projects in the AEP footprint at 13-20% (based on the queue position) of their total capacity, AEP identified numerous (>100) new overloads on the AEP bulk (100 kV and above) system. Furthermore, a number of other contingencies did not converge, and the project contributed to increased flows on several existing overload conditions on the AEP system. The less complete PJM analysis only recognized 3 new overloads on the AEP system. Considering the extensive differences between AEP and PJM analyses and methodologies, until these differences are addressed, AEP will be unable to verify the results of the PJM analyses for V2-019A and subsequent projects, including the subject of this report; V4-010.

While not validating the PJM results by performing any powerflow studies, AEP is complying with the PJM request to provide information for the V4-010 interconnection project regarding 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, were determined without the benefit of detailed engineering studies, 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 during the Impact Study stage.

The overloads foundFor the V2-019A project in the AEP analysis will be alleviated by installing 765kV transmission lines. Since it is likely that the V4-010 project will impact on some of those overloads, the V4-010 may be assigned a cost allocation

Network Impacts

The queue V4-010 project was studied as a 250MW (32.5MW of which was capacity) injection into AEP's system at the Tiffin Center 138kV substation. Project V4-010 was evaluated for compliance with reliability criteria for summer peak conditions in 2014. Potential network impacts were as follows:

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)

No problems identified

Stability

Stability analysis will be completed in the Impact Study

System Reinforcements

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 243024 to bus 238586 ckt 1) loads from 200.14% to 215.58% (DC power flow) of its emergency rating (173MVA) for the operational contingency ('5242_B2_TOR4783B_MOAB') as a result of V4-010. This project contributes approximately 43.2MW to cause this thermal violation.

2. The V1-010TAP - Howard 138kV line (from bus 292059 to bus 243024 ckt 1) loads from 99.07% to 114.36% (DC power flow) of its emergency rating (179MVA) for the operational contingency ('5242_B2_TOR4783B_MOAB') as a result of V4-010. This project contributes approximately 43.2MW to cause this thermal violation.

3. The V1-010TAP - Howard 138kV line (from bus 292059 to bus 243024 ckt 2) loads from 159.53% to 181.39% (DC power flow) of its emergency rating (179MVA) for the operational contingency ('5147_B2_TOR707_V1-010B') as a result of V4-010. This project contributes approximately 43.2MW to cause this thermal violation.

4. The Melmore – V1-010TAP 138kV line (from bus 243039 to bus 292059 ckt 1) loads from 69.97% to 132.77% (DC power flow) of its emergency rating (179MVA) for the operational contingency ('5149_B2_TOR709_WOMOAB') as a result of V4-010. This project contributes approximately 43.2MW to cause this thermal violation.

5. The Melmore – Fostoria Central 138kV line (from bus 243039 to bus 243006 ckt 1) loads from 90.65% to 138.29% (DC power flow) of its emergency rating (245MVA) for the operational contingency ('5149_B2_TOR709_WOMOAB') as a result of V4-010. This project contributes approximately 43.2MW to cause this thermal violation.

6. The Chatfield – S. Tiffin 138kV line (from bus 242984 to bus 243110 ckt 1) loads from 103.53% to 121.14% (DC power flow) of its emergency rating (192MVA) for the operational contingency ('5149_B2_TOR709_WOMOAB') as a result of V4-010. This project contributes approximately 43.2MW to cause this thermal violation.

7. The Tiffin – Green Lawn 138kV line (from bus 243130 to bus 243015 ckt 1) loads from 51% to 109.98% (DC power flow) of its emergency rating (201MVA) for the operational contingency ('744_B3') as a result of V4-010. This project contributes approximately 43.2MW to cause this thermal violation.

8. The Green Lawn - Melmore 138kV line (from bus 243015 to bus 243039 ckt 1) loads from 43.86% to 104.61% (DC power flow) of its emergency rating (201MVA) for the operational contingency ('744_B3') as a result of V4-010. This project contributes approximately 43.2MW to cause this thermal violation.

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(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)

No problems identified

Stability

Not required because the project is less than 30 MW.

System Reinforcements

None.

Potential Congestion due to Local Energy Deliverability

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