W2-068 Bluff Point 138kV

Generation Interconnection

AEP Local Network Impacts

The impact of the proposed generating facility on the AEP System was assessed for adherence with applicable reliability criteria. AEP planning criteria require that the transmission system meet contingency performance criteria in accordance with the AEP FERC Form 715. Therefore, this set of criteria was used to assess the impact of the proposed facility on the AEP System.

Option #1 & Option #2

Normal System (2014 Summer Conditions)

- No problems identified

Single Contingency (2013 Winter Conditions)

- No problems identified

Multiple Contingency (2013 Winter Conditions)

- AEP Huntington Junction – Sorenson 138 kV line[1] gets overloaded to 101% (181 MVA) of its emergency rating for an outage of Greentown 765/138 kV transformer and the Greentown 765/230/138 kV transformer. Without the addition of W2-068 project, the same facilities are loaded to 99% (177 MVA) of emergency rating under the same contingency.

Short Circuit Analysis

- No problems identified

Stability Analysis

- Stability analysis is not done as part of the Feasibility assessment. However, the Impact Study for the S71 project identified stability issues involving the sub-transmission transformer for a direct connection to Bluff Point station. The Impact Study for W2-068 will re-address this concern for option 2 and may make option 2 for W2-068 impractical, unless significant network upgrades are implemented to mitigate the stability issue.

Network Upgrades

[1] The affected facility may appear in additional contingencies that are not mentioned.

The overload on the Huntington Junction – Sorenson 138 kV line can be mitigated by performing a sag study on the Hummel Creek – Sorenson 138 kV circuit to determine if the rating can be increased, replacing bus and risers at Huntington Junction station, and replacing the relays at Sorenson station.

Estimated Cost (2010 Dollars): **$300,000**

Additional Limitations of Concern

- AEP Bluff Point – Jay 138 kV line[1] gets overloaded to 117% (223 MVA) of its normal rating for system normal conditions. Without the addition of W2-068 project, the same facilities are loaded to 69% (132 MVA) of normal rating under the same conditions.

- AEP Bluff Point 138/69 kV transformer[1] gets overloaded to 111% (81 MVA) of its normal rating for system normal conditions. Without the addition of W2-068 project, the same facilities are loaded to 90% (66 MVA) of normal rating under the same conditions.

- AEP College Corner – Ohio Hutchings 138 kV tie-line[1] to Dayton Power and Light gets overloaded to 102% (189 MVA) of its normal rating for system normal conditions. Without the addition of W2-068 project, the same facilities are loaded to 96% (178 MVA) of normal rating under the same conditions.

- AEP Bluff Point – Portland 69 kV line[1] gets overloaded to 107% (74 MVA) of its normal rating for system normal conditions. Without the addition of W2-068 project, the same facilities are loaded to 87% (60 MVA) of normal rating under the same conditions.

- AEP Bluffton – Bluffton 69 kV line[1] gets overloaded to 104% (55 MVA) of its emergency rating for an outage of the AEP R03 – Allen 138 kV circuit. Without the addition of W2-068 project, the same facilities are loaded to 97% (51 MVA) of emergency rating under the same contingency.

- AEP 3-M – Armstrong Cork 69 kV line[1] gets overloaded to 101% (49 MVA) of its emergency rating for an outage of the AEP Adams – Jay 138 kV circuit. Without the addition of W2-068 project, the same facilities are loaded to 83% (40 MVA) of emergency rating under the same contingency.

- AEP Hodgin – Randolph 138 kV line[1] gets overloaded to 110% (211 MVA) of its emergency rating for an outage of the AEP Bluff Point – Jay 138 kV circuit. Without the addition of W2-068 project, the same facilities are loaded to 68% (131 MVA) of emergency rating under the same contingency.

- AEP Randolph 138/69/12 kV transformer[1] gets overloaded to 109% (76 MVA) of its emergency rating for an outage of the AEP Bluff Point – Jay 138 kV circuit. Without the

addition of W2-068 project, the same facilities are loaded to 83% (58 MVA) of emergency rating under the same contingency.

- AEP Antiville – Portland 69 kV line[1] gets overloaded to 138% (50 MVA) of its emergency rating for an outage of the AEP Bluff Point – Jay 138 kV circuit. Without the addition of W2-068 project, the same facilities are loaded to 61% (22 MVA) of emergency rating under the same contingency.

- AEP Marathon – North Portland 69 kV line[1] gets overloaded to 106% (73 MVA) of its emergency rating for an outage of the AEP Bluff Point – Jay 138 kV circuit. Without the addition of W2-068 project, the same facilities are loaded to 72% (50 MVA) of emergency rating under the same contingency.

- AEP North Portland – Portland 138 kV line[1] gets overloaded to 131% (90 MVA) of its emergency rating for an outage of the AEP Bluff Point – Jay 138 kV circuit. Without the addition of W2-068 project, the same facilities are loaded to 98% (68 MVA) of emergency rating under the same contingency.

- AEP Anchor Hocking – Price 69 kV line[1] gets overloaded to 116% (58 MVA) of its emergency rating for an outage of the AEP Bluff Point – Jay 138 kV circuit. Without the addition of W2-068 project, the same facilities are loaded to 82% (41 MVA) of emergency rating under the same contingency.

Network Impacts

Queue project W2-068 was studied as a(n) 150.0MW (19.5MW of which was Capacity) injection into AEP's system at the Bluff Point 138kV substation. Project W2-068 was evaluated for compliance with reliability criteria for summer peak conditions in 2014. Potential network impacts were as follows:

Option #1 & Option #2

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.

Contribution to Previously Identified Overloads

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

1. The Pennville-Adams 138 kV line (from bus 243358 to bus 243237 ckt 1) loads from 105.83% to 116.64% (DC power flow) of its emergency rating (205 MVA) for the tower line contingency ('444_V4-033'). This project contributes approximately 22.15 MW to cause the thermal violation.

2. The R03-Magley 138 kV line (from bus 295882 to bus 243334 ckt 1) loads from 119.17% to 129.97% (DC power flow) of its emergency rating (205 MVA) for the tower line contingency ('444_V4-033'). This project contributes approximately 22.13 MW to cause the thermal violation.

System Reinforcements

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

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)

1. The equivalized network PJM is using is creating the appearance of overloads for the two “Contribution to Previously Identified Overloads”. The excess generation with this outage passes through the 69 kV network rather than getting on the 138. There is enough capacity between the 69 lines and the 138 exits that the line between Pennville and Adams station does not get overloaded unless it is the ONLY path for the generation. In order for that to happen, though, several breakers would have to fail together to take out all the 69 kV paths and other 138 paths.

2. There are (2) 69 kV circuits from Adam. Both of these circuits are ultimately going to Magley. In the equalized representation, we are taking the equalized load and modeling it at Adams, Magley and Hilcrest. There is nothing wrong with this approach as long as the 99 equalized circuit between Adam and Magley can be modeled to represent the flows on the 69 kV accurately. In a 4-legged configuration such as this, it is not feasible to get accurate modeling, especially under contingency conditions.

In the Impact Study evaluation PJM will include a full representation of the AEP 69kV system to confirm that the overloads listed do not occur.

Energy Portion of Interconnection Request

(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. There is no guarantee of full delivery of energy 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 overloaded element(s) identified. As a result of the aggregate energy resources in the area, the following violations were identified.)

3. The R03-Magley 138 kV line (from bus 295882 to bus 243334 ckt 1) loads from 96.86% to 107.49% (DC power flow) of its normal rating (191 MVA) for non-contingency condition. This project contributes approximately 20.3 MW to cause the thermal violation.

4. The Keystone-05Sorenson 345 kV line (from bus 243225 to bus 243232 ckt 1) loads from 108.79% to 109.99% (DC power flow) of its emergency rating (1301 MVA) for the single line contingency ('4814_B2'). This project contributes approximately 15.54 MW to cause the thermal violation.

5. The Keystone-Sorenson 345 kV line (from bus 243225 to bus 243232 ckt 1) loads from 121.67% to 121.86% (DC power flow) of its normal rating (897 MVA) for non-contingency condition. This project contributes approximately 10.67 MW to cause the thermal violation.

6. The Bluff Point-Jay 138 kV line (from bus 243253 to bus 243319 ckt 1) loads from 109.19% to 161.2% (DC power flow) of its normal rating (191 MVA) for non-contingency condition. This project contributes approximately 99.35 MW to cause the thermal violation.

7. The Bluff Point-Jay 138 kV line (from bus 243253 to bus 243319 ckt 1) loads from 123.34% to 193.58% (DC power flow) of its emergency rating (201 MVA) for the single line contingency ('5541_B2_TOR1747_WOMOAB_B'). This project contributes approximately 141.18 MW to cause the thermal violation.

8. The Bluf Point-Jay 138 kV line (from bus 243253 to bus 243319 ckt 1) loads from 123.34% to 193.58% (DC power flow) of its emergency rating (201 MVA) for the single line contingency ('5542_B2_TOR1747A_MOAB_U1-62B'). This project contributes approximately 141.18 MW to cause the thermal violation.