W3-085 Howard-Melmore (Honey Creek Wind) 138kV

Generation Interconnection

AEP Local Network Impacts

Contingency Overloads

a. The Howard - W3-085 138 kV line (from bus 243024 to bus 900047 ckt 1) rated 138 MVA loads from 18.0% to 121.0% with an impact of 102.99% for system intact.

b. The Howard – N. Lexington 138 kV line (from bus 243024 to bus 243061 ckt 1) rated 197 MVA loads from 98.4% to 127.5% with an impact of 29.13% for contingency category C1 '7118_C1_05HO'

c. The Apple Valley – N. Lexington 138 kV line (from bus 242955 to bus 243061 ckt 1) rated 205 MVA loads from 82.1% to 107.5% with an impact of 25.37% for contingency category C1 '7118_C1_05HO'

d. The Greenlawn - Tiffin 138 kV line (from bus 243015 to bus 243130 ckt 1) rated 143 MVA loads from 90.1% to 104.9% with an impact of 14.81% for contingency category C2 '517_C2'

e. The Cloverdale - Lexington 500 kV line (from bus 242519 to 314912 ckt 1) rated 1764 MVA loads from 99.8% to 101.1% with an impact of 1.29% for contingency category C2 '5031_C2_05KA

Network Upgrades

a. The risers at the Howard station are the limiting element for the overload on the Howard – W3-085 138 kV line. The cost to replace the risers is **$50,000** (2011 dollars)*.

b. The risers, bus, 600A switch, and the wave trap at the Howard station are the limiting elements along with the 556.5 ACSR conductor for the overload on the Howard – N. Lexington 138 kV line. The cost to replace the risers, bus, switch, and wave trap is **$500,000** (2011 dollars)*. The cost to perform a sag study on 38.29 miles of the conductor is $4,000 per mile for the study only (approximately **$152,000**). The sag study may identify the need for more improvements. The cost of additional improvements is not part of the estimates provided in this report.

c. The 556.5 ACSR conductor is the limiting element for the Apple Valley – N. Lexington 138 kV line. The cost to perform a sag study on 19.35 miles of the conductor is $4,000 per mile for the study only (approximately **$76,000**). The sag study may identify the need

for more improvements. The cost of additional improvements is not part of the estimates provided in this report.

d. The relay thermal limit is the limiting element for the overload on the Greenlawn – Tiffin 138 kV line. The cost to perform an engineering study to determine if the thermal limits can be adjusted is **$10,000** (2011 dollars)*.

e. The 500/345 kV transformers at Cloverdale are the limiting element for the Cloverdale–Lexington 500 kV line. The overload can be mitigated by the addition of a 765/500 kV transformer at Cloverdale. The cost of this upgrade will be approximately **$45 million** (2011 dollars)*.

Network Impacts

Queue project W3-085 was studied as a(n) 185.0 MW (24.0 MW of which was Capacity) injection into AEP's system at the V1-010 TAP 138.0 kV substation. Project W3-085 was evaluated for compliance with reliability criteria for summer peak conditions in 2014.

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 “C” 138kV circuit breaker duty rises from 99.6% to 106.1% due to the installation of the W3-085 project.

2. The “D” 138kV circuit breaker duty rises from 99.6% to 105.4% due to the installation of the W3-085 project.

3. The “I” 138kV circuit breaker duty rises from 99.6% to 106.1% due to the installation of the W3-085 project.

4. The “H” 138kV circuit breaker duty rises from 99.6% to 105.4% due to the installation of the W3-085 project.

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.)

No violations identified.

New System Reinforcements

1. The overdutied condition on the "C" 138kV circuit breaker at Howard can be alleviated by replacing the breaker at an estimated cost of **$300,000**.

2. The overdutied condition on the "D" 138kV circuit breaker at Howard can be alleviated by replacing the breaker at an estimated cost of **$300,000**.

3. The overdutied condition on the "I" 138kV circuit breaker at Howard can be alleviated by replacing the breaker at an estimated cost of **$300,000**.

4. The overdutied condition on the "H" 138kV circuit breaker at Howard can be alleviated by replacing the breaker at an estimated cost of **$300,000**.

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.)

1. (AEP) The V1-010 TAP-Chatfield 138 kV line (from bus 292059 to bus 242984 ckt 1) loads from 140.82% to 182.02% (DC power flow) of its emergency rating (179 MVA) for the operational contingency '5147_B2_TOR707_V1-010A'. This project contributes approximately 73.75 MW to the thermal violation.

2. (AEP) The V1-010 TAP-Chatfield 138 kV line (from bus 292059 to bus 242984 ckt 1) loads from 117.51% to 151.16% (DC power flow) of its normal rating (138 MVA) for non contingency condition. This project contributes approximately 46.43 MW to the thermal violation.

3. (AEP) The W3-011TAP1-Findlay 138 kV line (from bus 903300 to bus 243005 ckt 1) loads from 99.58% to 100.58% (DC power flow) of its normal rating (150 MVA) for non contingency condition. This project contributes approximately 9.27 MW to the thermal violation.

4. (AEP) The Chatfield-South Tiffin 138 kV line (from bus 242984 to bus 243110 ckt 1) loads from 112.59% to 151.0% (DC power flow) of its emergency rating (192 MVA) for the

operational contingency '5147_B2_TOR707_V1-010A'. This project contributes approximately 73.75 MW to the thermal violation.

5. (AEP) The Chatfield-South Tiffin 138 kV line (from bus 242984 to bus 243110 ckt 1) loads from 80.99% to 110.75% (DC power flow) of its normal rating (156 MVA) for non contingency condition. This project contributes approximately 46.43 MW to the thermal violation.

6. (AEP) The V1-010 TAP-Melmore 138 kV line (from bus 292059 to bus 243039 ckt 1) loads from 78.82% to 125.94% (DC power flow) of its emergency rating (179 MVA) for the