

X3-051 Flat Lick 765kV

Generation Interconnection

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 single contingency performance criteria in accordance with the AEP FERC Form 715. Therefore, this criterion was used to assess the impact of the proposed facility on the AEP System. The project was studied as a 610 MW (610 MW capacity) generating facility consistent with the interconnection application. Project #X3-051 was evaluated for compliance with reliability criteria for summer peak conditions in 2015.

Potential network impacts were as follows for the primary point of interconnection:

Normal System (2015 Summer Conditions Full/Capacity Output)

- None

Single Contingency (2015 Summer Conditions Full/Capacity Output)

- None

Multiple Contingency (2015 Summer Conditions Full/Capacity Output)

- Fostoria Central – West End 138 kV line loads from 99.1% to 100.2% of its emergency rating of 296 MVA for contingency 3141_C2
 - Contingency ‘3141’ Breaker Failure of Fostoria Central 345 kV CB ‘B2’ involving the outage of the Fostoria Central – East Lima 345 kV line, Fostoria Central 345 kV – Fostoria Central 138kV transformer (Fostoria Central #1 345/138/13.8 kV transformer).
 - The 1033.5 ACSR conductor section 1 is the limiting element for the Fostoria Central – West End 138 kV line.
- Kammer 345 kV – Kammer #300 138 kV transformer (Kammer #300 345/138/13.8 kV transformer) loads from 98.8% to 101.7% of its emergency rating of 571 MVA for contingency 2933_C2
 - Contingency ‘2933’ Breaker Failure of Kammer 345 kV CB ‘DD1’ involving the outage of the Kammer – West Bellaire 345 kV line, and Tidd – West Bellaire 345 kV line, Kammer 345 kV – Kammer 138 kV transformer (Kammer #100B 345/138/13 kV transformer), West Bellaire

345 kV – West Bellaire 138 kV Transformer (West Bellaire #1 345/138/12 kV transformer).

- The Kammer #300 345/138/13.8 kV transformer is the limiting element for the Kammer 345 kV – Kammer #300 138 kV transformer.

The Kammer 2011 RTEP improvement project will mitigate this overload. The proposed in-service date for the RTEP project is 2014.

Contribution to Previously Identified Overloads (2015 Summer Conditions Full/Capacity Output)

- Belmont 765 kV – Belmont (AP) 500 kV transformer (Belmont (AP) 765/500 kV transformer) loads from 104.5% to 108.7% of its emergency rating of 2094 for contingency 4831_C2
 - PJM needs to contact AP.

Short Circuit Analysis

- No problems identified.

Additional Limitations of Concern

- None

Local/Network Upgrades

- The 1033.5 ACSR conductor section 1 is the limiting element for the Fostoria Central – West End 138 kV line. A sag check will be required for the 1033.5 ACSR conductor section 1 to determine if the line section can be operated above its emergency rating of 296 MVA. The results of the sag study could prove that no additional upgrades are necessary, that some upgrades on the circuit are necessary, or that the entire 1.6 mile section of line would need to be rebuilt. Estimated Cost (2012 Dollars) for the sag study: **\$6,400.**

Contribution to Previously Identified System Reinforcements

- The Belmont transformer is owned by APS, however, the overload was found by AEP during their analysis of the interconnection. The overload can be alleviated by replacing the Belmont transformer. PJM estimates the replacement cost to be **\$20,000,000**. A more accurate estimate will be obtained from APS during the Impact Study.

Network Impacts

Queue project X3-051 was studied as a(n) 610.0 MW (610.0 MW of which was Capacity) injection into AEP's system at the Flatlick 765.0 kV substation. Project X3-051 was evaluated for compliance with reliability criteria for summer peak conditions in 2015.

Potential transmission network impacts are as follows:

Generator Deliverability

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

1. (AEP) The Mountaineer-Belmont 765 kV line (from bus 242516 to bus 242920 ckt 1) loads from 94.54% to 98.91% (DC power flow) of its emergency rating (4055 MVA) for the single contingency 'AMOS_WELTONSP'. This project contributes approximately 177.25 MW to the thermal violation.
2. (PJM) The Emory Grove-Conastone 500 kV line (from bus 200101 to bus 200004 ckt 1) loads from 91.44% to 91.79% (DC power flow) of its emergency rating (2901 MVA) for the single contingency 'PJM67'. This project contributes approximately 63.37 MW to the thermal violation.
3. (PJM) The Emory Grove-Conastone 500 kV line (from bus 200101 to bus 200004 ckt 1) loads from 85.11% to 85.54% (DC power flow) of its normal rating (2338 MVA) for non contingency condition. This project contributes approximately 61.35 MW to the thermal violation.

Multiple Facility Contingency

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

No violations identified.

Short Circuit

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

No problems identified

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.)

4. (PJM) The Conastone-Peach Bottom 500 kV line (from bus 200004 to bus 200013 ckt 1) loads from 137.99% to 138.32% (DC power flow) of its emergency rating (2815 MVA) for the single contingency 'PJM76'. This project contributes approximately 72.72 MW to the thermal violation.
5. (AP/PJM) The Kemptown-Emory Grove 500 kV line (from bus 235632 to bus 200101 ckt 1) loads from 131.48% to 131.76% (DC power flow) of its emergency rating (2901 MVA) for the single contingency 'PJM76'. This project contributes approximately 65.18 MW to the thermal violation.

6. (AP/PJM) The Kemptown-Emory Grove 500 kV line (from bus 235632 to bus 200101 ckt 1) loads from 146.48% to 146.82% (DC power flow) of its normal rating (2338 MVA) for non contingency condition. This project contributes approximately 65.18 MW to the thermal violation.

System Reinforcements

1. The overload on the Belmont-Mountaineer 765 kV line can be alleviated by replacing the wavetrap on the Mountaineer terminal of the line. The approximate cost to replace the wavetrap is **\$250,000**.

2,3,5,6 . The overloads described above can be alleviated by upgrading the two breaker bay at Conastone for the Brighton line with two 4000A breakers, four 4000A breaker disconnects and a 4000 A line switch. The two breaker bay at Conastone for the Brighton line is over the continuous rating. The estimated cost is **\$3,000,000** and will take 24-36 months to complete. The new rating will be 3710 MVA.

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.)

4. The overload on the Conastone-Peach Bottom 500kV line can be alleviated by the upgrade described below.

Upgrade2:

BGE:

- At Conastone construct a new two breaker 4000A bay (breakers D, F) with two 63 kA breakers. Includes line termination structures, allowance for a second line and the relocation of the 500kV cap bank. The estimated cost is **\$14,000,000**. The estimated time to complete is 36 months.
- Construct a new 500kV line from Conastone – Peach Bottom rated for a minimum rating of 2939/3733 SN/SE. The BG&E portion is 9.6 miles from Conastone to the Pennsylvania line. Purchase 150' R/W. Total estimated cost for the project is **\$46.8 million**. It is estimated it will take 5-7 years to complete.

PECO:

- Replace the existing Peach Bottom-Conastone 500kV Line (5012) terminal equipment at Peach Bottom Substation to match the conductor summer normal and emergency rating of 2920 / 3707 MVA (PECO portion only). The estimated cost is **\$5 million** with an estimate of 3 years to complete.
- Build a new second Peach Bottom-Conastone 500kV Line on separate towers from existing 5012 Line with a minimum summer emergency rating of 3510 MVA (PECO

portion only). The estimated cost is **\$20 million** with an estimate of 5 years to complete. [Right-of-way costs are not included]

Total cost: **85.8 million**

Total time: up to 7years