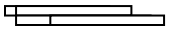
W3-024 Columbia-Sorenson 138kV

Generation Interconnection



Network Impacts

Queue project W3-024 was studied as a(n) 149.4 MW (19.4 MW of which was Capacity) injection into AEP's system. Project W3-024 was evaluated for compliance with reliability criteria for summer peak conditions in 2014. Potential transmission network impacts are as follows:

Option #1 – Columbia-Sorenson 138kV circuit

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)

PJM analysis found eight (8) new circuit breakers to be over-dutied in the AEP transmission area. The new over-dutied circuit breakers are listed below:

BUS_NO	BUS	BREAKER	Rating Type	Duty Percent With w3-024_opt2	Duty Percent Without w3-024_opt2	Duty Percent Difference	Note
0	05SORENS 138.kV	L1	T	101.90%	94.70%	7.20%	New Over-duty
0	05SORENS 138.kV	L2	T	101.90%	94.70%	7.20%	New Over-duty
0	05SORENS 138.kV	M1	T	101.90%	94.70%	7.20%	New Over-duty
0	05SORENS 138.kV	M2	T	101.90%	94.70%	7.20%	New Over-duty
0	05SORENS 138.kV	N1	T	101.90%	94.70%	7.20%	New Over-duty
0	05SORENS 138.kV	N2	T	101.90%	94.70%	7.20%	New Over-duty
0	05SORENS 138.kV	O1	T	101.90%	94.70%	7.20%	New Over-duty
0	05SORENS 138.kV	O2	T	101.90%	94.70%	7.20%	New Over-duty

System Reinforcements

1. The over-dutied condition of the Sorenson 138kV L1 circuit breaker can be alleviated by replacing the circuit breaker with one of higher fault interrupting capability. The estimated cost is **$800,000.**

2. The over-dutied condition of the Sorenson 138kV L2 circuit breaker can be alleviated by replacing the circuit breaker with one of higher fault interrupting capability. The estimated cost is **$800,000.**

3. The over-dutied condition of the Sorenson 138kV M1 circuit breaker can be alleviated by replacing the circuit breaker with one of higher fault interrupting capability. The estimated cost is **$800,000.**

4. The over-dutied condition of the Sorenson 138kV M2 circuit breaker can be alleviated by replacing the circuit breaker with one of higher fault interrupting capability. The estimated cost is **$800,000.**

5. The over-dutied condition of the Sorenson 138kV N1 circuit breaker can be alleviated by replacing the circuit breaker with one of higher fault interrupting capability. The estimated cost is **$800,000.**

6. The over-dutied condition of the Sorenson 138kV N2 circuit breaker can be alleviated by replacing the circuit breaker with one of higher fault interrupting capability. The estimated cost is **$800,000.**

7. The over-dutied condition of the Sorenson 138kV O1 circuit breaker can be alleviated by replacing the circuit breaker with one of higher fault interrupting capability. The estimated cost is **$800,000.**

8. The over-dutied condition of the Sorenson 138kV O2 circuit breaker can be alleviated by replacing the circuit breaker with one of higher fault interrupting capability. The estimated cost is **$800,000.**

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/NIPS) The Columbia-Northeast Substation Bus 138 kV line (from bus 243263 to bus 255163 ckt 1) loads from 30.89% to 114.72% (DC power flow) of its emergency rating (143 MVA) for the operational contingency '5512_B2_TOR1731_W3-024A'. This project contributes approximately 119.87 MW to the thermal violation.

2. (AEP) The W3-024TAP1-Columbia 138 kV line (from bus 903430 to bus 243263 ckt 1) loads from 78.89% to 102.67% (DC power flow) of its emergency rating (179 MVA) for the operational contingency '5601_B2_TOR2641'. This project contributes approximately 42.56 MW to the thermal violation.

3. (AEP) The W3-024TAP1-Columbia 138 kV line (from bus 903430 to bus 243263 ckt 1) loads from 75.92% to 108.12% (DC power flow) of its normal rating (138 MVA) for non contingency condition. This project contributes approximately 44.43 MW to the thermal violation.

Option #2 – Sorenson 138kV Station

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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)

PJM analysis found eight (8) new circuit breakers to be over-dutied in the AEP transmission area. The new over-dutied circuit breakers are listed below:

BUS_NO	BUS	BREAKER	Rating Type	Duty Percent With w3-024_opt2	Duty Percent Without w3-024_opt2	Duty Percent Difference	Note
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0	05SORENS 138.kV	N1	T	101.90%	94.70%	7.20%	New Over-duty
0	05SORENS 138.kV	N2	T	101.90%	94.70%	7.20%	New Over-duty
0	05SORENS 138.kV	O1	T	101.90%	94.70%	7.20%	New Over-duty
0	05SORENS 138.kV	O2	T	101.90%	94.70%	7.20%	New Over-duty

System Reinforcements

9. The over-dutied condition of the Sorenson 138kV L1 circuit breaker can be alleviated by replacing the circuit breaker with one of higher fault interrupting capability. The estimated cost is **$800,000.**

10. The over-dutied condition of the Sorenson 138kV L2 circuit breaker can be alleviated by replacing the circuit breaker with one of higher fault interrupting capability. The estimated cost is **$800,000.**

11. The over-dutied condition of the Sorenson 138kV M1 circuit breaker can be alleviated by replacing the circuit breaker with one of higher fault interrupting capability. The estimated cost is **$800,000.**

12. The over-dutied condition of the Sorenson 138kV M2 circuit breaker can be alleviated by replacing the circuit breaker with one of higher fault interrupting capability. The estimated cost is **$800,000.**

13. The over-dutied condition of the Sorenson 138kV N1 circuit breaker can be alleviated by replacing the circuit breaker with one of higher fault interrupting capability. The estimated cost is **$800,000.**

14. The over-dutied condition of the Sorenson 138kV N2 circuit breaker can be alleviated by replacing the circuit breaker with one of higher fault interrupting capability. The estimated cost is **$800,000.**

15. The over-dutied condition of the Sorenson 138kV O1 circuit breaker can be alleviated by replacing the circuit breaker with one of higher fault interrupting capability. The estimated cost is **$800,000.**

16. The over-dutied condition of the Sorenson 138kV O2 circuit breaker can be alleviated by replacing the circuit breaker with one of higher fault interrupting capability. The estimated cost is **$800,000.**

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.
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None