X1-040 Collingwood-Hiple 345kV Generation

Interconnection

Local Network Impacts

The impact of the proposed transmission facility on the AEP transmission system was assessed according to applicable reliability criteria and AEP planning criteria. The transmission system must meet contingency performance in accordance with AEP FERC Form 715 criteria.

Normal System – Capacity Output

- No problems identified.

Single Contingency – Capacity Output

- No problems identified.

Multiple Contingency – Full Output

- No problems identified.

Short Circuit Analysis

- See below under "Network Impacts"

Contributions to Previously Identified Network Limitations

- No problems identified.

Additional Concerns – Full Output

AEP identified overloads:

- College Corner – Collinsville 138 kV line overloads to 110.6% (198MVA) of its emergency rating (179 MVA) for a category B2 type line contingency involving AEP's Tanners Creek and Dearborn circuit 1. Without the addition of X1-040 the same facility is loaded at 107.7 % (192.8 MVA) of its emergency ratings under the same contingency.

Network Upgrades

- None required.

Network Impacts

Queue project X1-020 was studied as a(n) 1500.0 MW (195.0 MW of which was Capacity) injection into AEP's system at the 50.0% tap between Dumont and Greentown765.0 kV line. Project X1-020 was evaluated for compliance with reliability criteria for summer peak conditions in 2015.

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. A duty increase on Lincoln 138 kV circuit breaker D (between Anthony – Lincoln – Robison Park and the Lincoln 138/34.5 kV transformer) from 99.40% to 100.10% was identified.

BUS_NO	BUS	BREAKER	Rating Type	Duty Percent With x1-040	Duty Percent Without x1-040	Duty Percent Difference	Note
1174	05LINCOL 138.kV	D	T	100.10%	99.40%	0.70%	New Over-duty

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)

1. (AEP) The S-073A-North Delphos 138 kV line (from bus 290794 to bus 243051 ckt 1) loads from 103.21% to 104.15% (DC power flow) of its emergency rating (192 MVA) for the tower contingency '6664' loss of the East Lima-Haviland and East Lima-Northwest Lima 138kV circuits. This project contributes approximately 11.10 MW to the thermal violation.

2. (AEP) The Selma Parker 138/69 kV transformer (from bus 243373 to bus 246901 ckt 1) loads from 146.52% to 148.74% (DC power flow) of its emergency rating (81 MVA) for the tower contingency '444', loss of the Desoto-Keystone, Desoto-Sorenson and Desoto-Tanners Creek 345kV circuits. This project contributes approximately 11.13 MW to the thermal violation.

3. (AEP/FE) The Howard-Brookside 138 kV line (from bus 243024 to bus 238586 ckt 1) loads from 221.45% to 222.56% (DC power flow) of its emergency rating (173 MVA) for the tower

contingency 'C5-TWL-SR063'. This project contributes approximately 11.94 MW to the thermal violation.

New System Reinforcements

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

1. The overload on the Lincoln-Anthony 138kV circuit can be alleviated by replacing 138 kV circuit breaker "D" and associated equipment at Lincoln Station. The control relay for the circuit breaker as well as the control cables will also need to be upgraded as part of this project. (Network Upgrade # n1028)

   Estimated Cost (2009 Dollars)*: **$269,000**

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)
(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

1. The overload on the North Delphos-S73 138kV circuit may be alleviated by a sag check to determine if the line can be operated above its normal rating. PJM estimates the cost of the sag study at **$50,000.**

2. The Selma Parker transformer doesn't exist presently, so when the engineering and construction of the Selma Parker station (in-service date of 2014) is done, the size will be sufficient to accommodate the need of the X1-020 project. The incremental cost of the larger transformer will be borne by project X1-020.

3. The overload on the Howard-Brookside line can be mitigated by reconductoring the 21.73 mile line. The estimated cost of this upgrade is **$21 million**.

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 S-073B-Haviland 138 kV line (from bus 290795 to bus 243017 ckt 1) loads from 156.74% to 157.65% (DC power flow) of its emergency rating (167 MVA) for the operational contingency '6628_B2_TOR4500770C_MOAB', loss of the North Delphos-S73A circuit. This project contributes approximately 9.40 MW to the thermal violation.

2. (AEP) The T-130_TAP-East Lima 345 kV line (from bus 292438 to bus 242935 ckt 1) loads from 98.16% to 104.32% (DC power flow) of its emergency rating (878 MVA) for the operational contingency '676_B3_05ROB PK 345-5_MOAB', loss of the Robison Park 345/138kV transformer. This project contributes approximately 54.06 MW to the thermal violation.

3. (AEP) The R-060 TAP-T-130_TAP 345 kV line (from bus 296566 to bus 292438 ckt 1) loads from 110.06% to 114.83% (DC power flow) of its emergency rating (878 MVA) for the operational contingency '05MARYSV _05DUMONT _118'. This project contributes approximately 53.91 MW to the thermal violation.