

**#X3-030 –Shelby – S.W. Lima 345kV
Generation Interconnection**

General

The Interconnection Customer (IC) is proposing a 245MW (31.85MW Capacity) wind farm to be interconnected to the Dayton transmission system in Marion County, OH. The proposed in-service date for this project is September 30, 2015 and is currently under review.

This Generation Interconnection Feasibility Study provides analysis results to aid the Interconnection Customer in assessing the practicality and cost of incorporating the facility into the PJM system. This study was limited to load flow analyses of probable contingencies. Preliminary estimates of the scope, cost, and lead time for construction of facilities are provided below. If the interconnection customer elects to pursue a System Impact Study, a more comprehensive analysis will be performed.

Direct Connection Cost Estimate

The total preliminary estimate for Direct Connection work performed by Dayton is given in the following table:

Description	Total Cost
Install new 3-breaker 345kV ring bus to support X3-030 interconnection	\$3,564,103
Relaying	\$651,397
Total	\$4,215,499

Table 1. Direct Connection Cost Estimate

Revenue Metering and SCADA Requirements

For PJM: The Interconnection Customer (IC) will install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Sections 24.1 and 24.2.

Network Impacts

The Queue Project X3-030 was studied as a 245MW (31.85MW Capacity) injection tapping the Southwest Lima – Shelby 345kV line in the Dayton area. Project X3-030 was evaluated for compliance with reliability criteria for summer peak conditions in 2015. Potential network impacts were as follows:

Generator Deliverability

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

No violations were identified.

Multiple Facility Contingency

(Double Circuit Tower Line contingencies were studied for the full energy output. The contingencies of Line with Failed Breaker and Bus Fault will be performed for the Impact Study.)

(AEP) The Southwest Lima-West Lima 138 kV line (from bus 243122 to bus 243136 ckt 1) loads from 97.30% to 104.96% (DC power flow) of its emergency rating (388 MVA) for the tower contingency '6533'. This project contributes approximately 29.74 MW to the thermal violation.

CONTINGENCY '6533'

OPEN BRANCH FROM BUS 242935 TO BUS 242945 CKT 1 / 242935 05E LIMA 345 242945 05SW
LIM 345 1

OPEN BRANCH FROM BUS 242935 TO BUS 292959 CKT 1 / 242935 05E LIMA 345 292959 U2-041
TAP 345 1

END

Short Circuit

(Summary of impacted circuit breakers)

PJM has completed the short circuit analysis of the X3-030 queue project Shelby - S.W. Lima 345 kV. One option was considered during this study: the option was a tap of the South West Lima and Shelby 345 kV line. No new breakers were found to be over-duty in the Dayton transmission area.

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)

(FE) The Beaver-Carlisle 345 kV line (from bus 238569 to bus 238607 ckt 1) loads from 117.43% to 117.65% (DC power flow) of its emergency rating (1030 MVA) for the tower contingency '513'. This project contributes approximately 14.03 MW to the thermal violation.

CONTINGENCY '513'

OPEN BRANCH FROM BUS 238551 TO BUS 238569 CKT 1 / 238551 02AVON 345 238569 02BEAVER
345 1

OPEN BRANCH FROM BUS 238551 TO BUS 238569 CKT 2 / 238551 02AVON 345 238569 02BEAVER
345 2

END

New System Reinforcements

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

To mitigate the overload on Southwest Lima – West Lima 138kV line, AEP has proposed the following:

The 1590 ACSR conductor section 1 and the West Lima Bus 1 are the limiting elements for the Southwest Lima - West Lima 138 kV line. A sag check will be required for the 1590 ACSR conductor section 1 to determine if the line section can be operated above its emergency rating of 388 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 3.8 mile section of line would need to be rebuilt. The estimated cost (in 2012 Dollars) for the sag study is \$15,200. The 138 kV Bus 1 at West Lima 138 kV Station will be replaced. The estimated cost (in 2012 Dollars) for the 138 kV bus replacement is \$300,000.

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project.)

To mitigate the overload on Beaver – Carlisle 345kV line, FE has proposed to replace a 1600A wave trap at Beaver substation with a wave trap rated at 3000A or better. The upgrade is estimated to cost \$73,400 (Add 23.98% tax gross-up if applicable). This overload has been caused by a prior project. Cost allocations for this upgrade will be determined during the System Impact Study phase.

Delivery of Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of this interconnection request. Any 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 Merchant Transmission Interconnection request.

Note: Only the most severely overloaded conditions are listed below. 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 shall study 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:

Item 1a. (FE) The Davis-Besse-02HAYES 345 kV line (from bus 238654 to bus 239289 ckt 1) loads from 95.72% to 95.88% (DC power flow) of its emergency rating (1587 MVA) for the operational contingency '911_B2'. This project contributes approximately 15.98 MW to the thermal violation.

CONTINGENCY '911_B2'

OPEN BRANCH FROM BUS 238569 TO BUS 238654 CKT 1

/ 238569 02BEAVER 345 238654

02DAV-BE 345 1

END

Item 1b. (AEP) The Convoy-Robison Park 345 kV line (from bus 242933 to bus 243231 ckt 1) loads from 119.95% to 120.33% (DC power flow) of its emergency rating (897 MVA) for the operational contingency '724_B2_TOR581_WOMOP'. This project contributes approximately 20.72 MW to the thermal violation.

CONTINGENCY '724_B2_TOR581_WOMOP'

OPEN BRANCH FROM BUS 242935 TO BUS 242936 CKT 1

/ 242935 05E LIMA 345 242936

05FOSTOR 345 1

END