

#U1-060 East Lima-South Kenton 138kV **Generation Interconnection**

This analysis was completed to assess the reliability impact for the new generation interconnecting to the PJM system as a capacity resource.

Local Impacts

Option #1

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 201 MW net energy injection (26 MW capacity) consistent with the interconnection application. The results are summarized below.

Normal System (2011 Summer Conditions)

- No problems identified.

Single Contingency (2011 Summer Conditions)

- No problems identified

Multiple Contingency (2011 Summer Conditions)

- No problems identified

Short Circuit Analysis

- The East Lima 138 kV circuit breaker A1 is overdutied to 100.4% for the addition of the new generating facility, and would need to be replaced.
- It should be noted that this new generating facility contributes 2-3% to several 138 kV circuit breakers at East Lima and South Kenton stations.

Stability Analysis

- Stability studies were not performed as part of this Feasibility Study and are not normally performed as part of a Facility Study effort. The stability assessments are part of the System Impact Study. Based upon the results of this future System Impact Study, the extent of system upgrades could change and the associated costs could be significantly different.

Reactive Requirements

PJM requires a power factor correction to 95% lead/lag at the point of interconnection for wind generating facilities. It is expected that the Interconnection Customer (IC) will adhere to this standard.

Local Upgrades*

- Replace 138 kV circuit breaker A1 and associated equipment at East Lima station.
Estimated Cost (2008 Dollars): **\$500,000**

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).

As a result of the aggregate energy resources in the area, the following violations were identified:

- The East Lima – South Kenton 138 kV line is overloaded to more than 100% of its normal rating of 185 MVA for an outage on either side of U1-060 between East Lima and South Kenton when the U1-060 project is at full output.
- The 600 A switches at West Newton are overloaded to 105% and 107% of their summer emergency ratings of 192 MVA for the outage on the Lynn – U1-060 138 kV line, and to 104% and 106% for the outage on the Lynn – South Kenton 138 kV line.
- A 600 A switch at South Kenton is overloaded to 104% of its summer emergency rating of 192 MVA for the outage on the U1-060 – West Newton 138 kV line.

Upgrades Required for Full Output of the Energy Capability of the Project

- A sag check will need to be completed to determine if the East Lima-South Kenton 138kV line can be operated above its normal rating. If the line can be operated above its normal rating, an upgrade may still be required if the U1-060 project is to operate at full output following the single-contingency line outage. Alternately, the U1-060 generation could be curtailed under this condition. A cost estimate for the sag study and possible line upgrade was not completed as part of the feasibility study.
- Replace the 600 A Switches at West Newton Station.
Estimated Cost (2008 Dollars): **\$100,000**
- Replace the 600 A Switch at South Kenton Station on the East Lima line.
Estimated Cost (2008 Dollars): **\$50,000**

If the three upgrades listed here, while not mandatory, are not done, the output of the project could be limited to the lowest equipment rating at all times.

Option #2

Normal System (2011 Summer Conditions)

- No problems identified.

Single Contingency (2011 Summer Conditions)

- No problems identified.

Short Circuit Analysis

- No problems identified.

Stability Analysis

- Stability studies were not performed as part of this Feasibility Study and are not normally performed as part of a Facility Study effort. The stability assessments are part of the System Impact Study. Based upon the results of this future System Impact Study, the extent of system upgrades could change and the associated costs could be significantly different.

Local Upgrades

- None required.

Reactive Requirements

PJM requires a power factor correction to 95% lead/lag at the point of interconnection for wind generating facilities. It is expected that IC will adhere to this standard.

Network Impacts

Option #1

The Queue Project #U1-60 was studied as a(n) 201MW (Capacity=26MW) injection at the East Lima-South Kenton 138 kV transmission line in the AEP area. Project #U1-60 was evaluated for compliance with reliability criteria for summer peak conditions in 2012. Potential network impacts were as follows:

Generator Deliverability

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

None

Multiple Facility Contingency

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

None

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)

None

New System Reinforcements

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

None

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)

None

MISO Impacts

Any impacts on the MISO transmission system will be identified in the Impact Study.

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.

As a result of the aggregate energy resources in the area, the following violations were identified:

1. **(AEP)** The R60C-Robison Park 345kV line loads from 133.5% to 135.1% (DC power flow) of its normal rating (897MVA) for non-contingency condition. This project contributes approximately 14.5MW to the thermal congestion. It must be noted that the same thermal violation (DC power flow: 133.1%) already exists in the 2012 base case.

Option #2

The Queue Project #U1-60 was studied as a(n) 201MW (Capacity=26MW) injection into the Marysville-Southwest Lima 345 kV substation in the AEP area. Project #U1-60 was evaluated for compliance with reliability criteria for summer peak conditions in 2012. Potential network impacts were as follows:

Generator Deliverability

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

None

Multiple Facility Contingency

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

None

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)

None

New System Reinforcements

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

None

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)

None

MISO Impacts

Any impacts on the MISO transmission system will be identified in the Impact Study.

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.

As a result of the aggregate energy resources in the area, the following violations were identified:

1. **(AEP)** The R60C-Robison Park 345kV line loads from 133.5% to 134.6% (DC power flow) of its normal rating (897MVA) for non-contingency condition. This project contributes approximately 9.4MW to the thermal congestion. It must be noted that the same thermal violation (DC power flow: 133.1%) already exists in the 2012 base case.