**#T120 – Kankakee 138kV**
**Generation Interconnection**

## Option 1:

The T120 project was studied as a 250MW Energy (50MW Capacity) injection at the 138kV Kankakee TSS157 substation.

## Cost Estimate

The Kensington Ave. substation will be energized before T120 is allowed to interconnect. ComEd will engineer, design, procure materials, and construct the proposed interconnection work for the ComEd side of the Point of Interconnection. The estimated cost to complete the above mentioned work is **$2,100,000**. This is an Order-of-Magnitude estimate and the Interconnection Customer is responsible for the actual costs.

ComEd will take approximately 18-24 months to complete this work after the Interconnection Customer executes an Interconnection Service Agreement (ISA) and provides that appropriate funds.

The Interconnection Customer is responsible for all engineering, design, procurement, testing, and construction of all equipment on the Interconnection Customer's side of the Point of Interconnection.

## Risks Associated with the Interconnection

The proposed Kensington Ave. substation will be connected to the TSS 86 Davis Creek 345/138kV substation through two 138kV (13 miles long) lines.

Projects S36 and S37 are ahead of the T120 project in the PJM Queue with a planned interconnection into the Kensington Ave. substation. The total energy output of these two wind farms is 350MW. The T120 project proposes to connect an additional 250MW to this same Point of Interconnection (POI).

After the S36, S37, and T120 wind farms are connected to the Kensington Ave. substation, PJM operating restrictions would limit the total output of the three wind farms less local loads fed out of the TSS 157 Kankakee substation at or below the lower of the long term emergency ratings of the two 138kV lines to TSS 86 Davis Creek (317MVA in the summer). That is to say, the system will be operated in such a way that under normal conditions (both lines in), the three wind farms would be dispatched to prevent either line from exceeding its long term emergency rating upon the loss of the other.

If any subsequent queue projects choose to connect at the Kensington Ave. substation, the output of all the interconnected projects would have their combined output limited as described above.

Merchant upgrades to the transmission system can be requested to increase the load carrying capability of the transmission system. However, no request has been received. Please note that any Merchant upgrade cannot be reserved for the sole use of the requester. Furthermore, the maximum 138kV rating achievable on the ComEd system using standard conductors is 449MVA. Therefore, upgrading the 138kV line by reconductoring will still not provide adequate transmission line capacity to enable all of the energy from these projects to be delivered.

**Revenue Metering and SCADA Requirements**

**For PJM**: The Interconnection Customer 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 Section 24.1 to 24.2.

**For ComEd**: The Interconnection Customer will install equipment necessary to provide bi-directional Revenue Metering (KWH, KVARH) and real time data (KW, KVAR, circuit breaker status, and 138 kV voltage) for IC's generating Resource. See ComEd Applicable Standards available on the PJM website ("TO Standards") – "Exelon Energy Delivery Interconnection Guidelines (Generators Greater than 20 MW)".

**Network Impacts**

The T120 project was studied as a 250MW (50MW Capacity) injection at the TSS 199 Kensington Ave. 138 kV substation in the ComEd area. Project T120 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)*

No problems 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)*

1. The Kankakee tap to Kankakee portion of the Davis Creek – Kankakee – Bradley Red 138kV line #8603 loads from 60.0% to 112.7% of its applicable load dump rating (475MVA) for the tower outage of the Braidwood to Davis Creek Blue 345 kV line #2002 and the Davis Creek – Nucor Steel – Kankakee – Bradley Blue 138 kV line #8605. This project contributes approximately 250.0MW to cause this thermal violation.

2. The Kankakee Tap to Kankakee portion of the Davis Creek – Nucor Steel – Kankakee – Bradley Blue 138 kV line #8605 loads from 60.0% to 112.7% of its applicable load dump rating (475MVA) for the tower outage of the Davis Creek – Kankakee – Bradley Red 138 kV line

#8603 and the Davis Creek – Nucor Steel – Bradley 138 kV line #8604. This project contributes approximately 250.0MW to cause this thermal violation.

**Short Circuit**
*(Summary of impacted circuit breakers)*

To be determined in the System Impact Study.

**Contribution to Previously Identified Overloads**
*(T120 contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)*

The Kankakee Red tap to Bradley portion of the Davis Creek – Kankakee – Bradley Red 138kV line #8603 overloads from 124.6% to 168.2% of its applicable load dump rating (266MVA) for the Davis Creek – Nucor Steel - Kankakee – Bradley Blue 138 kV and the Davis Creek to Wilmington 138 kV tower line outage (#8605 & #8607). A second contingent element contributes to this overload for the Braidwood to Davis Creek Red 345 kV and the Davis Creek – Nucor Steel – Kankakee – Bradley Blue 138 kV tower line outage (#2004 & #8605). This project contributes approximately 115.9MW to the thermal violation.

**Steady-State Voltage Requirements**
*(Summary of the VAR requirements based upon the results of the steady-state voltage studies)*

To be determined in the System Impact Study

**Stability and Reactive Power Requirements for Low Voltage Ride Through**
*(Summary of the VAR requirements based upon the results of the dynamic studies)*

To be determined in the System Impact Study

**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 of the Kankakee tap to Kankakee portion of the Davis Creek – Kankakee – Bradley Red 138kV line #8603 can be addressed by replacing the line trap on this line at Kankakee. This upgrade has been roughly estimated to cost $**100,000**. This will be reviewed during the System Impact Study.

2. The overload of the Kankakee Tap to Kankakee portion of the Davis Creek – Nucor Steel – Kankakee – Bradley Blue 138 kV line #8605 can be addressed by replacing the line trap on this line at Kankakee. This upgrade has been roughly estimated to cost $**100,000**. This will be reviewed during the System Impact Study.

It should be noted that these additions do not address the congestion issues in this area (See Delivery of Energy Portion of the Interconnection Request section below). Projects S36, S37

and T120 total 600 MW and connect to a single double circuit 138 kV tower line at Kankakee. This generation is much greater than the local load at Kankakee. Thus even under the peak load conditions studied in the case, most of the output of these projects can only flow from Kankakee on these lines and energy deliverability is limited.

**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)*

The overload of the Kankakee Red Tap to Bradley portion of the Davis Creek – Kankakee – Bradley Red 138kV line #8603 can be addressed by replacing the 0.14 miles of conductor between the tap and Bradley with conductor having an applicable load dump rating of 455 MVA. This has been roughly estimated to cost $**150,000**.

**Potential Issues**

**Impacts on the MISO member transmission systems are not included in this analysis, but they will be included in the Impact Study, which may reveal upgrades needed in the MISO system not identified in this Feasibility 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.*

*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 determined:

1. The Kankakee Red tap to Kankakee portion of the Davis Creek – Kankakee – Bradley Red 138kV line #8603 loads from 79.4% to 149.1% of its emergency rating (359MVA) for the outage of the Davis Creek – Nucor Steel – Kankakee – Bradley Blue 138 kV line #8605. This project contributes approximately 250.0MW to the thermal congestion.

2. The Kankakee Blue tap to Kankakee portion of the Davis Creek – Nucor Steel - Kankakee – Bradley Blue 138kV line #8605 loads from 79.4% to 149.1% of its emergency rating (359MVA) for the outage of the Davis Creek – Kankakee – Bradley Red 138 kV line #8603. This project contributes approximately 250.0MW to the thermal congestion.

**Option 2:**

The T120 project is 250MW Energy (50MW Capacity) wind farm that will be connecting to the 345kV TSS 86 Davis Creek substation. However, PJM has not yet evaluated this interconnection.

**Cost Estimate**

ComEd will engineer, design, procure materials, and construct the proposed interconnection work for the ComEd side of the Point of Interconnection. The estimated cost to complete the above mentioned work is **$5,000,000**. This is an Order-of-Magnitude estimate and the Interconnection Customer is responsible for the actual costs.

ComEd will take approximately 18-24 months to complete this work after the Interconnection Customer executes an Interconnection Service Agreement (ISA) and provides that appropriate funds.

The Interconnection Customer is responsible for all engineering, design, procurement, testing, and construction of all equipment on the Interconnection Customer's side of the Point of Interconnection.

If chosen, this option would be studied in detail during the System Impact Study phase.

**Revenue Metering and SCADA Requirements**

**For PJM**: The Interconnection Customer 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 Section 24.1 to 24.2.

**For ComEd**: The Interconnection Customer will install equipment necessary to provide bi-directional Revenue Metering (KWH, KVARH) and real time data (KW, KVAR, circuit breaker status, and 345 kV voltage) for IC's generating Resource. See ComEd Applicable Standards available on the PJM website ("TO Standards") – "Exelon Energy Delivery Interconnection Guidelines (Generators Greater than 20 MW)".