#U4-037– Kincaid - Brokaw 345kV
Generation Interconnection

Revenue Metering and SCADA Requirements

For PJM: IC will be required to 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.

For ComEd: IC will be required to 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)".

Option 1:

The queue U4-037 project was studied as a 201MW (26.1MW Capacity) injection into ComEd's system a tap of the Brokaw Tap – Lanesville 345kV line 8001.

Facilities to Accommodate the Interconnection

Direct Connection Cost Estimate

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

Description	Total Cost
Three 345kV breaker Interconnection Substation Logan TSS92 (assuming ComEd engineers, procures & builds the substation)	**$15,000,000**
345kV transmission line tie-in (By ComEd)	**$ 2,000,000**
Total	**$17,000,000**

Non-Direct Connection Cost Estimate

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

Description	Total Cost
Remote-end relay upgrade (By ComEd)	**$ 1,000,000**

Network Impacts

The queue U4-037 project was studied as a 201MW (26.1MW Capacity) injection into ComEd's system. The project was modeled at the Brokaw Tap – Lanesville 345kV line 8001. Project U4-037 was evaluated for compliance with reliability criteria for summer peak conditions in 2013.

IN THE DELIVERY OF ENERGY PORTION OF INTERCONNECTION REQUEST SECTION THERE ARE SEVERAL SITUATIONS THAT WILL LIKELY CAUSE CURTAILMENT OF THIS PROJECT. SOME MAY LIMIT THE AGGREGATE TOTAL OF THE ENERGY OUTPUT OF THIS PROJECT AND ADJACENT GENERATING FACILITIES WELL BELOW THEIR FULL ENERGY OUTPUT ON A FREQUENT, IF NOT CONTINUOUS, BASIS. FACTORS THAT CAN AFFECT THE AMOUNT OF CURTAILMENT ARE SEASONAL VARIATIONS IN LINE RATINGS, ACTUAL LOAD FLOWS, AND ACTUAL DISPATCH OF OTHER LOCAL GENERATION. UNDER LIGHT LOAD CONDITIONS FOR WIND FARMS, CURTAILMENT MAY BE EVEN MORE SEVERE. PLEASE NOTE THAT ANY REQUIRED UPGRADES LISTED BELOW WILL NOT ELIMINATE THIS CONGESTION. SEE THIS SECTION AT THE END OF THE REPORT FOR FURTHER DETAILS.

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.)

No problems were identified.

Short Circuit
(Summary of impacted circuit breakers)

To be determined in the System Impact Study.

Contribution to Previously Identified Overloads
(U4-037 contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

No problems were identified.

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 Requirement 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)

No new system requirements were identified.

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)

None.

Potential Issues

In the previous queue, multiple projects were studied with more than one option. The U queue was studied with the primary Point of Interconnection (POI) from the prior queue. U queue primary POI selections were studied with only other U queue primary POI selections and the prior queue constraints listed above. U queue secondary POI selections were studied with only other U queue secondary POI selections and the prior queue constraints listed above. Depending on which POI selection the prior queue projects choose, results may significantly change between the Feasibility and Impact Studies.

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 identified:

Table 1 - Delivery of Energy Portion of Interconnection Request

Item	Project	Contribution MW	Overloaded Element	Overload %		Rating		Contingency
				From	To	Type	MVA	
1a	U4-037	70.5	Loretto (O51) Tap to Wilton Center 345kV line 11212	247.4%	252.9%	Emergency	1280	R78 to Dresden Red 345kV line 1214 ('345-L1214__-S_WITH_O24_R78B')
1b	U4-037	70.5	Pontiac MidPoint to Loretto (O51) Tap 345kV line 8012	226.9%	232.7%	Emergency	1201	R78 to Dresden Red 345kV line 1214 ('345-L1214__-S_WITH_O24_R78B')
1c	U4-037	70.2	R78 to Dresden Red 345kV line 1214	179.1%	183.2%	Emergency	1739	Loretto (O51) to Wilton Center 345kV line 11212 ('O51_SINGLE_B')
1d	U4-037	70.2	Pontiac MidPoint to R78 Tap 345kV line 8014	169.2%	173.2%	Emergency	1739	Loretto (O51) to Wilton Center 345kV line 11212 ('345-L11212___-S_WITH_O51B')
1e	U4-037	38.7	Dresden to Elwood Red 345kV line 1222	160.6%	163.2%	Emergency	1479	Dresden to Electric Junction Red 345kV line 1223 ('345-L1223T_R-S')
1f	U4-037	61.9	Blue Mound to Pontiac MidPoint 345kV line 8012	150.0%	154,06%	Emergency	1528	Lanesville to Pontiac MidPoint 345kV line 8001 ('345-L8001_S_U4-011B')
1g	U4-037	62.4	Latham to Blue Mound 345kV line 2102	125.3%	130.0%	Emergency	1334	Lanesville to Pontiac MidPoint 345kV line 8001 ('345-L8001_S_U4-011B')
1h	U4-037	83.6	U4-011 to Pontiac MidPoint 345kV line 8001	121.2%	127.0%	Emergency	1441	SPS at Kincaid with outage on Kincaid to Latham 345kV line 2102 also trips Kincaid to Pawnee West(Ameren/CIPS) 345kV line 2106 ('SPS-2102&2106_U2-058')
1i	U4-037	83.6	Brokaw tap to U4-011 345kV line 9201	104.9%	110.7%	Emergency	1441	SPS at Kincaid with outage on Kincaid to Latham 345kV line 2102 also trips Kincaid to Pawnee West(Ameren/CIPS) 345kV line 2106 ('SPS-2102&2106_U2-058')
1j	U4-037	130.6	U4-037 to Brokaw tap 345kV line 8001	97.9%	108.8%	Emergency	1201	SPS at Kincaid with outage on Kincaid to Latham 345kV line 2102 also trips Kincaid to Pawnee West(Ameren/CIPS) 345kV line 2106 ('SPS-2102&2106_U2-058')

Option 2:

A sensitivity study was completed for the queue U4-037 project as a 201MW (26.1MW Capacity) injection into ComEd's system a tap of the Blue Mound Blue to Latham Tap 345kV line 2102.

Facilities to Accommodate the Interconnection

Direct Connection Cost Estimate

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

Description	Total Cost
Three 345kV breaker Interconnection Substation Logan TSS92 (assuming ComEd engineers, procures & builds the substation)	**$15,000,000**
345kV transmission line tie-in (By ComEd)	**$ 2,000,000**
Total	**$17,000,000**

Non-Direct Connection Cost Estimate

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

Description	Total Cost
Remote-end relay upgrade (By ComEd)	**$ 1,000,000**

Network Impacts

A sensitivity study was completed for the queue U4-037 project as a 201MW (26.1MW Capacity) injection into ComEd's system. The project was modeled at the tap of the Blue Mound Blue – Latham Tap 345kV line 2102. Project U4-037 was evaluated for compliance with reliability criteria for summer peak conditions in 2013. 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.)

No problems were identified.

Short Circuit

(Summary of impacted circuit breakers)

To be determined in the System Impact Study.

Contribution to Previously Identified Overloads

(U4-037 contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

Table 2 - Contribution to Previously Identified Overloads

Item	Project	Contribution MW	Overloaded Element	Overload %		Rating		Contingency
				From	To	Type	MVA	
2a	U4-037	14.8	U4-037 to Blue Mound 345kV line 2102	110.6%	111.7%	Emergency	1334	U4-011 to Pontiac MidPoint 345kV line 8001 ('345-L8001_S_U4-011B')
2b	U4-037	61.8	Loretto (O51) Tap to Wilton Center 345kV line 8012	137.0%	140.8%	Applicable Load Dump Rating	1632	Tower outage of Dresden to Elwood 345kV line 1220 and Dresden to Elwood 345kV line 1222 ('345-L1220__B-S_+_345-L1222__R-S')
2c	U4-037	58.3	R78 to Dresden Red 345kV line 1214	131.4%	134.7%	Emergency	1739	Tower outage of Blue Island to Wilton Center 345kV line 11613 and Blue Island to Wilton Center 345kV line 11614 ('345-L11613AB-S_+_345-L11614AR-S')
2d	U4-037	61.8	Pontiac MidPoint to Loretto (O51) Tap 345kV line 8012	112.9%	116.7%	Applicable Load Dump Rating	1632	Tower outage of Dresden to Elwood 345kV line 1220 and Dresden to Elwood 345kV line 1222 ('345-L1220__B-S_+_345-L1222__R-S')
2e	U4-037	58.2	Pontiac MidPoint to R78 Tap 345kV line 8014	123.6%	127.0%	Emergency	1739	Tower outage of Blue Island to Wilton Center 345kV line 11613 and Blue Island to Wilton Center 345kV line 11614 ('345-L11613AB-S_+_345-L11614AR-S')

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 Requirement 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)

No new system requirements were identified.

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)

If this option is chosen, reinforcements and cost estimates will be provided during the System Impact Study.

Potential Issues

In the previous queue, multiple projects were studied with more than one option. The U queue was studied with the primary Point of Interconnection (POI) from the prior queue. U queue primary POI selections were studied with only other U queue primary POI selections and the prior queue constraints listed above. U queue secondary POI selections were studied with only other U queue secondary POI selections and the prior queue constraints listed above. Depending on which POI selection the prior queue projects choose, results may significantly change between the Feasibility and Impact Studies.

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, no violations were identified.