

#Y1-078 – Crawford 138kV Generation Interconnection

Option 1:

The Y1-078 project was studied as a 20MW Energy (0.0MW Capacity) injection at the Crawford Red 138kV substation.

Attachment Facilities

The proposed interconnection of Y1-078 will connect into the Station 13 Crawford 138kV substation Red bus. This interconnection would consist of the addition of a 138kV breaker, line bay, revenue metering, and SCADA/relaying upgrades at Station 13 Crawford 138kV substation.

The Interconnection Customer is responsible for constructing all of the facilities on the Interconnection Customer's side of the Point of Interconnection. It will be the Interconnection Customer's responsibility to obtain any right-of-way between the Collector Substation and the Interconnection Substation.

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 **\$1,800,000**. This is an Order-of-Magnitude estimate and the Interconnection Customer is responsible for the actual costs.

The total timeframe to complete engineering, procurement and construction for the ComEd portion of this project is approximately 18-24 months after the Interconnection Customer executes an Interconnection Service Agreement (ISA), Construction Service Agreement (CSA) 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

ComEd will install a Static VAR Compensator (SVC) at the Crawford 138kV substation by 2016. Harmonics injected into the ComEd transmission system by the Y1-078 battery inverters may interfere with the operation of the ComEd SVC. Therefore, a detailed harmonic analysis will need to be performed during the Facilities Study. The results of this analysis may require additional harmonic filtering to be installed. The harmonics study and the installation of any harmonic filtering will be performed at the developer's expense.

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 138 kV voltage) for IC's generating Resource. See ComEd Applicable Standards available on the PJM website ("TO Standards") – "Exelon Energy Delivery Interconnection Guidelines greater than 2MVA but less than or equal to 20 MVA".

Network Impacts

The queue Y1-078 project was studied as a 20MW (0.0MW Capacity) injection into ComEd's system at the Crawford Red 138kV substation. Project Y1-078 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 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

(U1-049 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

(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)

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)

None.

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 identified:

Item 1a. The G ACR; T-05OLIVE 345 kV line (from bus 270771 to bus 243229 ckt 1) loads from 101.67% to 101.71% (AC power flow) of its emergency rating (971 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('WILTO; _05DUMONT _003'). This project contributes approximately 2.05 MW to the thermal violation.

CONTINGENCY 'WILTO; _05DUMONT _003'

DISCONNECT BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 /*
765/765KV, AREA 222/205.
END

Item 1b. The 17GRNACR-G ACR; T 345 kV line (from bus 255104 to bus 270771 ckt 1) loads from 102% to 102.03% (AC power flow) of its emergency rating (971 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('WILTO; _05DUMONT _003'). This project contributes approximately 2.05 MW to the thermal violation.

CONTINGENCY 'WILTO; _05DUMONT _003'
DISCONNECT BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 /*
765/765KV, AREA 222/205.
END

Item 1c. The BURNH;0R-17MUNSTR 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 107.2% to 107.25% (AC power flow) of its emergency rating (1069 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('WILTO; _05DUMONT _003'). This project contributes approximately 3.23 MW to the thermal violation.

CONTINGENCY 'WILTO; _05DUMONT _003'
DISCONNECT BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 /*
765/765KV, AREA 222/205.
END

Item 1d. The UPNOR;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 113.14% to 113.18% (AC power flow) of its emergency rating (971 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('WILTO; _05DUMONT _003'). This project contributes approximately 2.37 MW to the thermal violation.

CONTINGENCY 'WILTO; _05DUMONT _003'
DISCONNECT BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 /*
765/765KV, AREA 222/205.
END

Item 1e. The WILTO;-05DUMONT 765 kV line (from bus 270644 to bus 243206 ckt 1) loads from 125.83% to 125.85% (AC power flow) of its normal rating (4047 MVA) for non-contingency condition. This project contributes approximately 5.8 MW to the thermal violation.

Option 2:

The Y1-078 project was studied as a 20MW Energy (0.0MW Capacity) injection at the Crawford Green 138kV substation.

Attachment Facilities

The proposed interconnection of Y1-078 will connect into the Station 13 Crawford 138kV substation Green bus. This interconnection would consist of the addition of a 138kV breaker, line bay, revenue metering, and SCADA/relaying upgrades at Station 13 Crawford 138kV substation.

The Interconnection Customer is responsible for constructing all of the facilities on the Interconnection Customer's side of the Point of Interconnection. It will be the Interconnection Customer's responsibility to obtain any right-of-way between the Collector Substation and the Interconnection Substation.

Cost Estimate

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: 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 138 kV voltage) for IC's generating Resource. See ComEd Applicable Standards available on the PJM website ("TO Standards") – "Exelon Energy Delivery Interconnection Guidelines greater than 2MVA but less than or equal to 20 MVA".

Network Impacts

The queue Y1-078 project was studied as a 20MW (0.0MW Capacity) injection into ComEd's system at the Crawford Green 138kV substation. Project Y1-078 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 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

(U1-049 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

(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)

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)

None.

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 identified:

Item 2a. The BURNH; B-17SHEFLD 345 kV line (from bus 270674 to bus 255111 ckt 1) loads from 99.98% to 100.02% (**DC power flow**) of its emergency rating (1069 MVA) for the single line contingency ('WILTO; _05DUMONT _003'). This project contributes approximately 2.5 MW to the thermal violation.

CONTINGENCY 'WILTO; _05DUMONT _003'

DISCONNECT BRANCH FROM BUS 270644 TO BUS 243206 CKT 1
765/765KV, AREA 222/205.

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END