

#Y3-042 – Elrama 138kV Generation Interconnection

General

The Interconnection Customer is proposing a 460MW (460MW Capacity) natural gas facility to be interconnected to the Duquesne (DLCO) transmission system and located in Washington County, PA. The proposed in-service date for this project is June 1, 2015.

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.

Facilities to Accommodate the Interconnection

Scope of Direct Connection Work

The Y3-042 project will interconnect to the DLCO transmission system through a new substation designated West Elizabeth. The West Elizabeth substation will have a six (6) breaker 138kV ring bus configuration with connections to the DLCO Dravosburg, USX Clairton, and Wilson substations as well as connections to the FirstEnergy (FE Bethel Park and Piney Fork substations). The proposed generator will connect to the remaining bus position. The direct connects are estimated to cost approximately **\$13,600,000**, with an extra **\$5,760,000** tax gross-up if applicable, to interconnect and take a minimum of **18 to 24 months** after the receipt of an executed Interconnection Service Agreement to complete this work. The cost estimate above is in 2013 dollars and does not include any of the upgrades listed in the Network Impacts section of the report. The construction lead time estimate is a conservative high-level estimate. Delays could occur based on weather, equipment lead time, procurement of right of way, site preparation, availability of construction labor, and availability of outages to perform the work.

The following assumptions were used in the preparation of this high-level cost estimate:

- DLCO will design, construct, own, and maintain the West Elizabeth substation.
- DLCO will construct the transmission facilities to feed the West Elizabeth substation.
- It was assumed that the West Elizabeth substation will be located on land presently owned by DLCO at the site of the former Elrama substation. If additional space is required, or if a different site is selected by the Interconnection Customer, the Interconnection Customer will be responsible for obtaining land per DLCO specification including, but not limited to, size and grading. The ownership of this alternate site, along with access roads, will be turned over to DLCO for the construction of West Elizabeth substation.
- The high-level cost estimate did not consider environmental or geological risks associated with the location of the West Elizabeth substation.
- The Interconnection Customer will be responsible for the engineering, purchasing and construction of the Interconnection Customer substation and equipment. DLCO will require the Interconnection Customer to supply current transformers and trip coils in all main breakers for exclusive use by DLCO.

- The Interconnection Customer must meet all National, State, Local, and DLCO requirements and must share control of the Interconnection Customer-purchased circuit breaker(s).
- All Interconnection Customer substation equipment beyond the DLCO metering point to the main Interconnection Customer interrupting device must be coordinated and meet DLCO specification. Protection installed on the main interrupting device(s) must be capable of interrupting full fault current and coordinate with DLCO protection.
- DLCO will install and maintain relay protection and communications equipment, in a secure area, at the Interconnection Customer substation associated with protection of the DLCO facilities.

The Interconnection Customer is responsible for constructing all of the Interconnection Customer-owned facilities on the Interconnection Customer's side of the Point of Interconnection.

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 Interconnection Customer's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Section 24.1 to 24.2.

Network Impacts

The Y3-042 project was studied as a 460MW (460MW Capacity) injection into the Duquesne area at the 15WELBTH 138kV substation. Project Y3-042 was evaluated for compliance with reliability criteria for summer peak conditions in 2017.

Potential network impacts were as follows:

Generator Deliverability

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

No violations were found.

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 violations were found.

Short Circuit

(Summary of impacted circuit breakers)

PJM has completed the short circuit analysis of the Y3-042 queue project **Elrama 138kV**. One option was considered during this study: the option was a tap of the West Elizabeth 138 kV

substation. PJM analysis found **7 new breakers** to be over-duty in the DUQUESNE transmission area. The new over-duty breakers are listed below:

Bus_NO	BUS	BREAKER	Duty % with Y3-042_ATSI	Duty % without Y3-042_ATSI	Duty % Difference	Notes
0	DRVSBGZ1 138.kV	Z-73 WEST MI	110.00%	99.40%	10.60%	New Over-duty
0	DRVSBGZ1 138.kV	Z-79 ILLINOI	108.80%	97.80%	11.00%	New Over-duty
0	DRVSBGZ2 138.kV	Z-70 ELWYNN	102.50%	91.80%	10.70%	New Over-duty
0	W.MFLN 2 138.kV	Z-14 USSCLAI	106.80%	97.70%	9.10%	New Over-duty
0	W.MFLN 1 138.kV	Z-93 IRVIN	108.00%	98.20%	9.80%	New Over-duty
0	W.MFLN 2 138.kV	Z-94 IRVIN	106.80%	97.70%	9.10%	New Over-duty
0	W.MFLN 1 138.kV	Z-73 DRAVOSB	100.50%	91.70%	8.80%	New Over-duty

PJM analysis showed a significant fault contribution (i.e. above 3%) to 1 breaker, which were already identified as over-duty in the DUQUESNE transmission area. The breaker is listed below:

Bus_NO	BUS	BREAKER	Duty % with Y3-042_ATSI	Duty % without Y3-042_ATSI	Duty % Difference	Notes
0	W.MFLN 2 138.kV	Z-74 DRAVOSB	129.70%	118.60%	11.10%	Over 100%, > 3% contribution

A short circuit analysis identified the Dravosburg Z-70 138 kV line breaker and the West Mifflin Z-14, Z-73, Z-93, and Z-94 138 kV line breakers as newly overdutied breakers. All five (5) of these 138 kV breakers will be replaced with breakers rated for an interrupting capability of 63 kA. It is a normal operating procedure for Duquesne to close the switch between USS IRVIN buses for outages on lines Z-14 and Z-74.

The short circuit analysis also identified the Dravosburg Z-73 and Z-79 138 kV breakers as overdutied. Baseline projects b0502.3 and b0502.1 are associated with replacing these breakers to increase their interrupting capability by June 1, 2016. Upon the Interconnection Customer signing an ISA, these breaker replacements will be advanced to a June 1, 2015 in-service date at no additional cost.

The short circuit analysis identified the Dravosburg Z-74 138kV breaker as already overdutied prior to project Y3-042. However, project Y3-042 contributes more than 3% to the overload and will be required to pay for part of the upgrade. Contribution and cost estimates for this breaker will be provided as a part of the System Impact Study.

The preliminary cost estimate for short circuit is **\$1,650,000** in 2013 dollars, with an extra **\$700,000** tax gross-up if applicable. The price will be adjusted for labor rate and material cost changes based on the actual project schedule. The short circuit cost estimate given does not include the Dravosburg Z-74 breaker.

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)

No violations were found.

New System Reinforcements

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

None.

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contributions to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study.)

None.

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.