#Y3-103 – Valley - Raccoon 138kV
Generation Interconnection

General

The Interconnection Customer is proposing a 205MW (97MW Capacity) combined cycle natural gas facility to be interconnected to the Duquesne transmission system and located in Beaver County, PA. The proposed in-service date for this project is May 1, 2018.

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 Y3-103 project will tap the Valley – Raccoon 138kV line (Z-81). To accommodate this interconnection, installation of a new three-breaker loop 138kV substation, relaying, metering, RTU, SCADA and other miscellaneous supporting equipment will be required. The direct connects are estimated to cost approximately **$2,435,000**, with an extra **$1,007,000** 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 following assumptions were used in the preparation of this high-level cost estimate:

- DLCO will construct two new poles along the existing 138kV transmission line to accommodate a new looped substation.
- The estimates provided do not include relocation of DLCO transmission facilities traversing the site of the proposed petrochemical facility or system reinforcements required to serve the petrochemical facility load.
- DLCO will be responsible for the engineering, purchase, and construction of the high voltage equipment from the 138kV line entrance to the metering point within the customer substation including the line disconnect switch, 138kV breakers, and metering.
- DLCO will be responsible for the engineering of the foundations, structural steel, UG conduit and grounding associated with the DLCO high voltage equipment.
- The customer will be responsible for the engineering, purchasing and construction of the customer substation and equipment. DLCO will require the customer to supply current transformers and trip coils in all main breakers for exclusive use by DLCO.
- The customer will be responsible for the construction associated with the installation of the DLCO engineered and procured equipment located at the customer substation.
- The customer must meet all National, State, Local, and DLCO requirements and must share control of the customer-purchased circuit breaker(s).

- DLCO will install and maintain relay protection and communications equipment, in a secure area, associated with line protection for the DLCO equipment at the customer substation.
- The line metering, protection, and supervisory control for the DLCO system will be located inside a customer provided secure and environmentally controlled structure within or adjacent to the customer substation.
- The customer is responsible for providing, installing, and maintaining the steel, foundations, conduit, grounding, fencing, and control house per DLCO specifications.
- The customer is responsible for providing station service for DLCO use per DLCO specifications. DLCO requests two independent sources of 200A, 3 phase, 4 wire 120/208 services.
- The customer is responsible for obtaining land for the interconnection substation per DLCO specification including but not limited to size, grading, and location.
- All customer substation equipment beyond the DLCO metering point 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.

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 Y3-103 project was studied as a 205MW (97MW Capacity) injection into the Duquesne area at the 15STJOE 138kV substation. Project Y3-103 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 Y3-103 queue project **Valley-Raccoon 138kV**. One option was considered during this study: the option was direct connection to 15STJOE (tap of the Valley-Raccoon 138 kV line). PJM analysis found **6 new breakers** to be over-duty in DUQUESNE transmission area. The new over-duty breakers are listed below:

Bus_NO	BUS	BREAKER	Duty % with Y3-103_ATSI	Duty % without Y3-103_ATSI	Duty % Difference	Notes
0	CRSCNTZ1 138.kV	Z-23 PHILLIP	103.80%	100.00%	3.80%	New Overduty
0	CRSCNTZ1 138.kV	Z-25 HOPEW	103.20%	99.50%	3.70%	New Overduty
0	BV Z2 138.kV	Z-37 RACOON	102.20%	99.80%	2.40%	New Overduty
0	BV Z1 138.kV	Z-29 CRESCEN	100.90%	98.40%	2.50%	New Overduty
0	BV J3+4 345.kV	Clinton314#3	100.20%	99.60%	0.60%	New Overduty
0	BV J3+4 345.kV	Clinton314#4	100.20%	99.60%	0.60%	New Overduty

In addition, the analysis also showed a significant fault contribution (i.e. above 3%) to 1 breaker, which was already identified as over-duty. The breakers are listed below:

Bus_NO	BUS	BREAKER	Duty % with Y3-103_ATSI	Duty % without Y3-103_ATSI	Duty % Difference	Notes
980	STJOERES 138.kV	Z-81 VALLEY-	166.20%	131.10%	35.10%	Over 100%, > 3% contribution

The following upgrades in **Table 4** below will mitigate the Duquesne over-duty breakers listed above:

Table 4. Breaker Replacement Cost Estimate	
Description	**Total Cost**
Replace overdutied 138kV circuit breaker Z-37 at Raccoon.	$435,000
Replace overdutied 138kV circuit breaker Z-29 at Crescent.	$435,000
Tax Gross-up (if applicable)	$370,000
Total	**$1,240,000**

The reclosing on Crescent Z-82 138kV breaker, formerly Z-23 Phillips breaker, will be increased to 15 sec to eliminate the derate to the interrupting rating of this breaker. The full 50kA interrupting rating exceeds the duty identified on this breaker with the Y3-103 project. There is no cost associated with this change.

The reclosing on the Crescent Z-25 138kV breaker has been increased to 15 sec, which eliminated the derate to the interrupting rating of this breaker. The full 50kA interrupting rating exceeds the duty identified on this breaker with the Y3-103 project. As such, no mitigation is necessary for this breaker.

DLCO has supplemental projects s0504.5 and s0504.9 to replace the Beaver Valley – Clinton 314 #3 and 314 #4 section 345kV breakers. The replacement breakers will have an interrupting rating of 80kA and will exceed the duty with the Y3-103 project. Should these supplemental projects be cancelled, this project will be responsible for these breaker replacements.

The proposed interconnection will be physically located at the St. Joe Resources site. The St. Joe Resources substation, including the Z-81 138kV breaker, will be eliminated should the Y3-103 generator be constructed. Therefore, replacement of this breaker is unnecessary.

PJM analysis found **14 new breakers** to be over-duty in the ATSI transmission area. **This is originally a DUQUESNE project but an ATSI bus is 3 or more buses away.** The new over-duty breakers are listed below:

Bus_NO	BUS	BREAKER	Duty % with Y3-103_ATSI	Duty % without Y3-103_ATSI	Duty % Difference	Notes
9728	B.MNSFLD 345 345.kV	BVLY1-HOYT :	100.70%	99.80%	0.90%	New Overduty
9728	B.MNSFLD 345 345.kV	BVLY1-S. BUS	100.70%	99.80%	0.90%	New Overduty
9728	B.MNSFLD 345 345.kV	BVLY2-GEN1 :	100.70%	99.80%	0.90%	New Overduty
9728	B.MNSFLD 345 345.kV	BVLY2-S. BUS	100.70%	99.80%	0.90%	New Overduty
9728	B.MNSFLD 345 345.kV	CHAMB-S. BUS	100.70%	99.80%	0.90%	New Overduty
9728	B.MNSFLD 345 345.kV	CRESENT-S. B	100.70%	99.80%	0.90%	New Overduty
9728	B.MNSFLD 345 345.kV	GEN NO 1-N.	100.70%	99.80%	0.90%	New Overduty
9728	B.MNSFLD 345 345.kV	GEN NO 2-N.	100.70%	99.80%	0.90%	New Overduty
9728	B.MNSFLD 345 345.kV	GEN NO 3-N.	100.70%	99.80%	0.90%	New Overduty
9728	B.MNSFLD 345 345.kV	GEN2-CHAMB :	100.70%	99.80%	0.90%	New Overduty
9728	B.MNSFLD 345 345.kV	GEN3-S. BUS	100.70%	99.80%	0.90%	New Overduty
9728	B.MNSFLD 345 345.kV	HIGH-CRESCEN	100.70%	99.80%	0.90%	New Overduty
9728	B.MNSFLD 345 345.kV	HIGH-N. BUS	100.70%	99.80%	0.90%	New Overduty
9728	B.MNSFLD 345 345.kV	HOYT-N. BUS	100.70%	99.80%	0.90%	New Overduty

The following upgrades in **Table 5** below will mitigate the ATSI over-duty breakers listed above:

Table 5. Breaker Replacement Cost Estimate

Description	Total Cost	Tax	Total with Tax
Replace three overdutied 345kV circuit breakers at Bruce Mansfield.	$2,560,000	$618,300	$3,178,300
Replace three overdutied 345kV circuit breakers at Bruce Mansfield.	$2,560,000	$618,300	$3,178,300
Replace three overdutied 345kV circuit breakers at Bruce Mansfield.	$2,560,000	$618,300	$3,178,300
Replace three overdutied 345kV circuit breakers at Bruce Mansfield.	$2,560,000	$618,300	$3,178,300
Replace two overdutied 345kV circuit breakers at Bruce Mansfield.	$1,711,000	$413,300	$2,124,300
Total	**$11,951,000**	**$2,886,500**	**$14,837,500**

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.