#Z1-030 – Bay Shore 138kV
Generation Interconnection

General

The Interconnection Customer is proposing a 464MW Capacity natural gas facility to be interconnected to the ATSI transmission system and located in Lucas County, OH. ATSI is a FirstEnergy (FE) company. The proposed in-service date for this project is June 1, 2017.

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.

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.

For ATSI: The Interconnection Customer will be required to comply with all FE Revenue Metering Requirements for Generation Interconnection Customers. The Revenue Metering Requirements may be found within the "FirstEnergy Requirements for Transmission Connected Facilities" document located at the following links:
www.firstenergycorp.com/feconnect
www.pjm.com/planning/design-engineering/to-tech-standards.aspx

Network Impacts

The Z1-030 project was studied as a 464.0 MW (464.0 MW Capacity) injection into the ATSI area at Bayshore 138kV substation. Project Z1-030 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 Z1-030 queue project **Bay Shore 138 kV**. One option was considered during this study: the option was a direct connection to Bayshore 138 kV substation. **Z1-030 is taking rights from Bayshore 2, 3 and 4 units.** Our analysis found **8 new breakers**, to be over-duty in the ATSI transmission area. The new over-duty breakers are listed below:

Bus_NO	BUS	BREAKER	Duty % with Z1-030_ATSI	Duty % without Z1-030_ATSI	Duty % Difference	Notes
9602	BAYSHORE_138 138.kV	78-B-13105	100.00%	95.90%	4.10%	Newly over-duty
9602	BAYSHORE_138 138.kV	78-B-13106	100.00%	95.90%	4.10%	Newly over-duty
9602	BAYSHORE_138 138.kV	78-B-13255	100.00%	95.90%	4.10%	Newly over-duty
9602	BAYSHORE_138 138.kV	78-B-13256	100.00%	95.90%	4.10%	Newly over-duty
9602	BAYSHORE_138 138.kV	78-B-13257	100.00%	95.90%	4.10%	Newly over-duty
9602	BAYSHORE_138 138.kV	78-B-4-L	100.00%	95.90%	4.10%	Newly over-duty
9602	BAYSHORE_138 138.kV	78-B-4-M	100.00%	95.90%	4.10%	Newly over-duty
9602	BAYSHORE_138 138.kV	78-B-K-M	100.00%	95.90%	4.10%	Newly over-duty

In addition, the analysis also showed a significant fault contribution (i.e. above 3%) to **15 breakers**, which was already identified as over-duty. The breakers are listed below:

Bus_ NO	BUS	BREAKER	Duty % with Z1-030_ATSI	Duty % without Z1-030_ATSI	Duty % Difference	Notes
9602	BAYSHORE_138 138.kV	78-B-13261	131.60%	104.40%	27.20%	Over 100%, > 3% contribution
9602	BAYSHORE_138 138.kV	78-B-13260	120.00%	100.10%	19.90%	Over 100%, > 3% contribution
9602	BAYSHORE_138 138.kV	78-B-1-J	111.50%	106.90%	4.60%	Over 100%, > 3% contribution
9602	BAYSHORE_138 138.kV	78-B-1-K	111.50%	106.90%	4.60%	Over 100%, > 3% contribution
9602	BAYSHORE_138 138.kV	78-B-13103	111.50%	106.90%	4.60%	Over 100%, > 3% contribution
9602	BAYSHORE_138 138.kV	78-B-13104	111.50%	106.90%	4.60%	Over 100%, > 3% contribution
9602	BAYSHORE_138 138.kV	78-B-13252	111.50%	106.90%	4.60%	Over 100%, > 3% contribution
9602	BAYSHORE_138 138.kV	78-B-13253	111.50%	106.90%	4.60%	Over 100%, > 3% contribution
9602	BAYSHORE_138 138.kV	78-B-13254	111.50%	106.90%	4.60%	Over 100%, > 3% contribution
9602	BAYSHORE_138 138.kV	78-B-2-J	111.50%	106.90%	4.60%	Over 100%, > 3% contribution
9602	BAYSHORE_138 138.kV	78-B-2-K	111.50%	106.90%	4.60%	Over 100%, > 3% contribution
9602	BAYSHORE_138 138.kV	78-B-3-J	111.50%	106.90%	4.60%	Over 100%, > 3% contribution
9602	BAYSHORE_138 138.kV	78-B-3-K	111.50%	106.90%	4.60%	Over 100%, > 3% contribution
9602	BAYSHORE_138 138.kV	78-B-J_L	111.50%	106.90%	4.60%	Over 100%, > 3% contribution
9602	BAYSHORE_138 138.kV	78-B-13251	108.80%	104.20%	4.60%	Over 100%, > 3% contribution

Installation of two 10 Ohm reactors is required to alleviate all overloads, except breaker 78-B-13261. Replacement of breaker 78-B-13261 is also required. Since project Z1-030 contributes to the existing overload on this breaker, cost allocations will be given at the System Impact Study phase. It is expected to take a minimum of **12 months** after the receipt of an executed Construction Service Agreement to complete this work. Please see **Table 1** below for cost breakdown per reinforcement.

Table 1. Direct Connect Cost Estimate			
Description	**Total Cost**	**Tax**	**Total with Tax**
Install two 10 Ohm 138kV reactors in series with the low side of the two 345/138 kV transformers at Bayshore 138 kV substation.	$1,500,000	$337,400	$1,837,400
Replace overdutied breaker 78-B-13261 with a 63kA breaker at Bayshore 138 kV substation. **Note: Cost allocation to this breaker will be provided in the System Impact Study Report.**	$225,800	$50,800	$276,600
Total	**$1,725,800**	**$388,200**	**$2,114,000**

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.