#Y1-074 – Martin 12kV
Generation Interconnection

General

The Interconnection Customer is proposing a 7.8MW (2.96MW Capacity) solar facility to be interconnected to the ATSI transmission system and located in Summit County, OH. ATSI is a FirstEnergy (FE) company. The proposed in-service date for this project is November 1, 2013.

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.

Option 1:

The Y1-074 project will tap the Martin 12.5kV line for this option.

Facilities to Accommodate the Interconnection

Scope of Direct Connection Work

The Y1-074 project will tap the No. 2 transformer bus of the Ohio Edison owned Martin 12.5kV substation. To accommodate this interconnection, a 1.7 mile express distribution feeder will be installed from the Y1-074 site to the Martin substation to be used solely for this solar interconnection project. Ohio Edison will build, own and maintain the 1.7 mile express feeder. The Point of Interconnection and 12.5kV metering will be on the Y1-074 site. The Interconnection Customer will furnish and install the primary metering pole with CT's and VT's supplied by Ohio Edison Company. The Interconnection Customer will also be responsible for all necessary phone lines and communication systems required for the revenue metering and monitoring purposes. To provide adequate protection for the 69kV subtransmission system, numerous changes and additions will be necessary including: a new 69kV breaker on the high side of the Martin No. 2 transformer, a grounding transformer (zig-zag connected) with a 69kV breaker, fiber optic communication channels from Martin substation to both Dale and Star substations and relay panels with required relays for line and transformer protection. The direct connects are estimated to cost approximately **$4,444,500** to interconnect and take a minimum of **17 months** after the receipt of an executed Construction Service Agreement to complete this work. See **Table 1** below for cost breakdown. If applicable, add 23.25% tax gross-up to the cost estimate above. The cost estimate above does not include any of the upgrades listed in the Network Impacts section of the report.

The Interconnection Customer is responsible for meeting all criteria as specified in the applicable sections of the "FirstEnergy Requirements for Transmission Connected Facilities" document. The proposed interconnection facilities must be designed in accordance with this document as well.

Direct Connection Cost Estimate

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

Table 1. Direct Connect Cost Estimate			
Description	**Total Cost**	**Tax**	**Total with Tax**
Install approximately 1.7 miles of new three phase distribution circuit with primary metering and overcurrent protection at generator site	$460,000	$106,900	$566,900
Install approximately 3 miles of new fiber for communication between Martin and Star substations	$337,500	$78,500	$416,000
Install approximately 8 miles of new fiber for communication between Martin and Clinton substations	$899,900	$209,200	$1,109,100
Install approximately 5 miles of new fiber for communication between Clinton and Nimisila substations	$562,500	$130,800	$693,300
Install approximately 6 miles of new fiber for communication between Nimisila and Dale substations	$674,900	$156,900	$831,800
Install two 69kV breakers with relaying, one new high side grounding transformer with relaying and one new 12.47kV distribution exit with breaker, relaying and necessary bus work for new equipment	$1,159,700	$269,600	$1,429,300
Install an RFL 9745 DTT for breaker position indication to Martin fiber (69kV Star line exit) at Dale	$78,700	$18,300	$97,600
Install an RFL 9745 DTT for breaker position indication to Martin fiber (69kV Dale line exit) at Star	$78,700	$18,300	$97,600
Install an SEL 2505 for switch position indication to Martin via fiber at Nimisila	$53,900	$12,600	$66,500
Install an SEL 2505 for switch position indication to Martin via fiber at Clinton	$54,200	$12,600	$66,800
Engineering Oversight and Commissioning	$84,500	$19,700	$104,200
Total	**$4,444,500**	**$1,033,400**	**$5,477,900**

Table 1. Direct Connection Cost Estimate

The following assumptions were made by ATSI when putting together the direct connection cost estimate listed in Table 1 above. If any of these assumptions prove not to be correct, this could cause time delays and changes in cost estimates:

- *Detailed engineering and construction estimates to be provided during detailed engineering associated with work to be performed during construction of the project under the Construction Service Agreement.*
- *The above estimates do not include:*
  - *Property costs and site development up to rough grade which is to be provided by the developer*
  - *Interconnection metering and generation SCADA to be provided by the developer.*
- *No environmental issue with any properties associated with this project.*
- *No delays acquiring necessary permits for implementing the defined direct connect and network upgrades.*
- *PJM will allow transmission system outages when requested.*
- *Note: All cost estimates contained in this report were produced without a detailed engineering review and are, therefore, subject to error.*

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 Y1-074 project was studied as a 7.8MW (2.96MW Capacity) injection into the ATSI area at the MARTINOE 69kV substation. Project Y1-074 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 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)

Not required.

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.

Option 2:

The Y1-074 project will tap the Johnson Corner's 12.5kV substation for this option.

Facilities to Accommodate the Interconnection

Scope of Direct Connection Work

The Y1-074 project will tap the Johnson Corner's 12.5kV substation. To accommodate this interconnection, it would require a complete rebuild of the Johnson Corner's substation and will be significantly more expensive than the primary POI's costs as listed in the above Option 1 section.

The Interconnection Customer is responsible for meeting all criteria as specified in the applicable sections of the "FirstEnergy Requirements for Transmission Connected Facilities" document.

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 Y1-074 project was studied as a 7.8MW (2.96MW Capacity) injection into the ATSI area as a tap of the 02BARB-2 23kV substation. Project Y1-074 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 violations 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 violations identified.

Short Circuit
(Summary of impacted circuit breakers)

Not required.

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.