

***Generation Interconnection Feasibility Study
Report***

***PJM Generation Interconnection Request
Queue Position #U3-010
Towanda
120 MW
(15.6 MW capacity)***

January 2009

Preface

The intent of the Generation Interconnection Feasibility Study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by the Interconnection Customer. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

The proposed interconnection facilities must be designed in accordance with the FirstEnergy “Requirements for Transmission Connected Facilities” document. Procedures for gaining access to these standards can be found at the link below.

<http://www.pjm.com/planning/design-engineering/to-tech-standards.aspx>

In some instances an Interconnection Customer may not be responsible for 100% of the identified Network Upgrade cost because other transmission network uses, e.g. another generation interconnection or merchant transmission upgrade, may also contribute to the need for the same network reinforcement. The possibility of sharing the reinforcement costs with other projects may be identified in the Generation Interconnection Feasibility Study, but the actual allocation will be deferred until the System Impact Study is performed.

The Generation Interconnection Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities unless noted in the report. The project Interconnection Customer is responsible for acquiring any necessary right of way and real estate, as well as applying for and obtaining any and all permits unless prior agreement by interested parties allows for other arrangements. For properties currently owned by Transmission Owners, some permitting and real estate costs may be included in the study.

Cost and Timing Estimates

The estimates in this report do not include tax gross-up.

While the information in this transmittal is reasonable for the scope of work defined, it should, however, be noted that the cost figures and time estimates are conceptual in nature at this stage, as an engineering team has not been assigned to the project. Any change to the scope of work will require that the estimates be revisited. The costs are a best estimate, but the Interconnection Customer will be charged for actual costs. Any under-runs or over-runs will be reconciled at the conclusion of the project.

General

The Queue Position U3-010 project was studied as a 120MW (15.6MW of which was capacity) injection into the PENELEC system. Two separate options were studied during this analysis: Option 1 was a tap of the South Troy – East Towanda 115kV line, while Option 2 was a tap of the East Towanda – Grover 230kV line. The option 2 study is limited to a sensitivity analysis, and no cost estimates will be provided. U3-010 was evaluated for compliance with reliability criteria for summer peak conditions in 2012.

Metering

The Interconnection Customer will be required to install and maintain metering and telemetry equipment to provide revenue metering and real-time telemetry data to PJM and the Transmission Owner. The PJM requirements for this equipment are listed in Appendix 2, section 8 of Attachment O to the PJM Tariff, as well as PJM Manuals 01 and 14D. The PJM and Transmission Owner requirements for Metering Equipment will be discussed in more detail in subsequent studies.

PENELEC Revenue Metering Requirements for Generation Interconnection Customer

Interconnection Customer shall install, own, operate, test and maintain the necessary revenue quality Metering Equipment. This includes current transformers, voltage transformers, mounting structures, wiring, meters, communication circuits, and associated devices. The Metering Equipment must meet the specifications listed in the FirstEnergy connection documents. The FirstEnergy “Requirements for Transmission Connected Facilities” can be retrieved from:

<http://www.pjm.com/planning/design-engineering/to-tech-standards.aspx>

The Metering Equipment shall be located at the generation facility on the high voltage side of the generator step-up transformers or facility main step-up transformer and/or station service power transformers. Power flows to and from the facility shall be compensated to the Point of Interconnection.

Penelec will provide revenue quality Metering Equipment for a station service power supply at a generation facility if the supply is from the local Penelec distribution system.

The revenue quality Metering Equipment shall be capable of collecting and storing bidirectional billing data. The billing data shall be stored in intervals specified by Penelec, typically fifteen minutes or thirty minutes. The Interconnection Customer must provide Penelec with remote access to the billing data in the Metering Equipment via a dedicated voice-grade analog telephone circuit. The Interconnection Customer shall provide Penelec with contact information for the person or persons responsible for meter programming and Metering Equipment maintenance.

The Interconnection Customer shall consult with Penelec regarding the revenue quality metering system design and provide the following information:

- Facility one line and revenue metering installation drawings (schematics, wiring diagrams, etc.)
- Estimated power flows to and from the facility at all revenue metering points

- Current transformer and voltage transformer specifications, including manufacturer, type, nameplate drawings, and certified accuracy test reports
- Revenue meter specifications including manufacturer, type, model number, and accuracy
- Revenue meter program information including but not limited to billing data recorder channel assignments, recorder pulse weights (Ke), and read-only password for access to interval data by the FirstEnergy billing data collection system (MV-90)
- Revenue meter telephone number
- Revenue meter loss compensation data (if applicable)

The Interconnection Customer shall provide Penelec with prior notification of any modifications at the facility that will affect the revenue meter measurements, including substation reconfigurations and meter program changes.

The revenue metering system at each location shall be tested for accuracy by the Interconnection Customer once every two years. The Interconnection Customer shall give reasonable notice to Penelec of the time when the testing is scheduled so that Penelec may have representatives present. Penelec shall have the right to audit the revenue Metering Equipment and/or related documents. The Interconnection Customer shall be given a reasonable period of time to comply with any requests associated with an audit.

Design Requirements

The generation owner is responsible for specifying appropriate equipment and facilities such that the parallel generation is compatible with the Penelec Transmission System. The generation owner is also responsible for meeting any applicable federal, state, and local codes. It is also the Interconnection Customer's responsibility to obtain any needed right-of-way between the plant site and Penelec's facilities.

Penelec will complete detailed relay coordination studies to identify off-site relay setting changes required due to this generation interconnection during the Facilities Study on construction phase of this project. This may result in additional individual relay replacements being required. These relay replacements will be done at the cost of the Interconnection Customer.

Reactive Power

Requirements to be provided during the System Impact Study or Facilities Study phase of the project studies.

Cost and Timing Estimates

While the information in this transmittal is reasonable for the scope of work defined, it should, however, be noted that the cost figures and time estimates are conceptual in nature at this stage, as an engineering team has not been assigned to the project. Any change to the scope of work will require that the estimates be revisited. The costs are a best estimate, but the Interconnection Customer will be charged for actual costs. Any under-runs or over-runs will be reconciled at the conclusion of the project.

Cost Estimates provided in this report were derived from estimates received in association with other similar projects.

Direct Connection Facilities

The Interconnection Customer is responsible for constructing all of the facilities on its side of the Point of Interconnection.

The proposed Interconnection Facilities must be designed in accordance with the FirstEnergy “Requirements for Transmission Connected Facilities” document. Procedures for gaining access to these standards can be found at the link below.

<http://www.pjm.com/planning/design-engineering/to-tech-standards.aspx>

Below are conceptual estimates for the engineering/construction associated with direct connection requirements based upon similar projects that have been designed and/or constructed. The cost below is based on U3-010 being the only project to connect at this substation.

Option 1: South Troy – East Towanda 115kV line (see Figure 1)

Item	Description	Conceptual Cost Estimate
1	New 115 kV 3-breaker ring bus termination point at a new interconnection substation.	\$3,263,000
2	New 115 kV loop into interconnection substation.	\$250,000
3	115 kV transmission line extending from the new interconnection substation structure to the generation plant substation.	N/A Interconnection Customer cost. Line built, owned and maintained by the Interconnection Customer.
4	Relay and control work at the South Troy 115kV substation	\$250,000
5	Relay and control work at the East Towanda 115kV substation	\$250,000
	Additional communications and control evaluations to occur during the System Impact Study may require the installation of fiber optic cable	

Conceptual Estimate: \$4,013,000
 Estimated Lead Time: 2.0 years from signed CSA

Notes:

Detailed Engineering & Construction Estimates to be determined during subsequent phase(s) of this projects development.

The above estimates do not include 1) tax gross-up, 2) property costs and site development up to rough grade which is to be provided by the Interconnection Customer, 3) interconnection metering and generation SCADA to be provided by the Interconnection Customer, 4) engineering and field activities for design review and commissioning of the Interconnection Customer’s facilities, and 5) Real estate costs that may be required for right-of-way easements to extend the 115 kV line.

Option 2: East Towanda – Grover 230kV line (see figure 2)

Item	Description	Conceptual Cost Estimate
1	New 230 kV 3-breaker ring bus termination point at a new interconnection substation.	\$3,580,000
2	New 230 kV loop into interconnection substation	\$400,000
3	230 kV transmission line extending from the new interconnection substation structure to the generation plant substation.	Developer cost. Line built, owned and maintained by the developer.
4	Relay and control work on Moshannon-East Towanda 230 kV line (Moshannon, Chapman, Lobo, Laurel Hill, Grover, and East Towanda substations)	\$2,730,000

Notes:

Detailed Engineering & Construction Estimates to be determined during subsequent phase(s) of this projects development.

The above estimates do not include 1) tax gross-up, 2) property costs and site development up to rough grade which is to be provided by the Interconnection Customer, 3) interconnection metering and generation SCADA to be provided by the Interconnection Customer, 4) engineering and field activities for design review and commissioning of the Interconnection Customer’s facilities, and 5) Real estate costs that may be required for right-of-way easements to extend the 230 kV line.

Potential network impacts were as follows:

Option 1: South Troy – East Towanda 115kV line

Network Impacts

Potential network impacts were as follows:

Generator Deliverability

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

No problems were identified

Multiple Facility Contingency

(Double Circuit Tower Line for the full energy output. Stuck breaker and bus fault contingencies will be performed for the System Impact Study)

No problems were identified

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 problems were identified

Short Circuit

PJM studied the 230kV and above voltage systems and found no new breakers to be overdutied, and no addition to the fault current associated with any previously identified overdutied breakers. Additional short circuit study will be conducted during the System Impact Study phase of this project.

Steady-State Voltage Requirements

(Results of the steady-state voltage studies should be inserted here)

To be determined during the System Impact Study phase of the study of this project.

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

To be determined during the System Impact Study or Facilities Study phase of the study of this project.

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 Interconnection Customer 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 overloaded conditions associated with the overloaded element(s) identified.

As a result of the aggregate energy resources in the area, the following violations were identified:

1. The Homer Ct – Shelocta 230kV line #477-505 loads from 147.49% to 149.18% of its emergency rating (854MVA) for single contingency PN33A. This project contributes approximately 14.44MW to the thermal congestion.
2. The Two Mile – Farm Valley 115kV line #370-375 loads from 123.69% to 132.02% of its normal rating (162MVA) under normal system conditions. This project contributes approximately 13.50MW to the thermal congestion.
3. The Towanda – E. Sayre 115kV line #381-383 loads from 92.82% to 101.98% of its emergency rating (159MVA) for single contingency PN18. This project contributes approximately 14.57MW to cause this thermal violation.
4. The Potter – Two Mile 115kV line #20234-370 loads from 128.78% to 136.40% of its normal rating (177MVA) under normal system conditions. This project contributes approximately 13.50MW to the thermal congestion.
5. The Potter – Two Mile 115kV line #20234-370 loads from 193% to 228% of its emergency rating (225MVA) for single contingency Towanda – U3-010 115 kV. This project contributes approximately 78MW to the thermal congestion.
6. The O52 – Potter 115kV line #93940-20234 loads from 92.84% to 100.46% of its normal rating (177MVA) under normal system conditions. This project contributes approximately 13.50MW to cause this thermal violation.
7. The Shingl – Lewistown 230kV line #20248-214 loads from 100.14% to 102.68% of its emergency rating (505MVA) for single contingency PN28. This project contributes approximately 12.78MW to the thermal congestion.
8. The South Troy 115/34.5 kV transformer #2 loads from 214% to 290% of its emergency rating (21 MVA) for the single contingency outage Towanda – U3-010 115 kV. This project contributes approximately 16 MW to the thermal congestion.
9. The South Troy 115/34.5 kV transformer #1 loads from 214% to 290% of its emergency rating (21 MVA) for the single contingency outage Towanda – U3-010 115 kV. This project contributes approximately 16 MW to the thermal congestion.

10. The Two Mile – Farmers Valley 115 kV circuit loads from 227% to 271% of its emergency rating (179 MVA) for the single contingency outage Towanda – U3-010 115 kV. This project contributes approximately 78 MW to the thermal congestion.
11. The N36 – Gold 115 kV circuit loads from 195% to 244% of its emergency rating (159 MVA) for the single contingency outage Towanda – U3-010 115 kV. This project contributes approximately 78 MW to the thermal congestion.
12. The Grover 230/34.5 kV transformer loads from 187% to 243% of its emergency rating (76 MVA) for the single contingency outage Towanda – U3-010 115 kV. This project contributes approximately 42 MW to the thermal congestion.
13. The Q72 Tap – Mansfield 115 kV circuit loads from 128% to 202% of its emergency rating (119 MVA) for the single contingency outage Towanda – U3-010 115 kV. This project contributes approximately 88 MW to the thermal congestion.
14. The Mansfield – Niles Valley 115 kV circuit loads from 133% to 199% of its emergency rating (119 MVA) for the single contingency outage Towanda – U3-010 115 kV. This project contributes approximately 78 MW to the thermal congestion.
15. The Farmers Valley – Lewis Run 115 kV circuit loads from 162% to 194% of its emergency rating (146 MVA) for the single contingency outage Towanda – U3-010 115 kV. This project contributes approximately 46 MW to the thermal congestion.
16. The O52 – Potter 115 kV circuit loads from 153% to 188% of its emergency rating (225 MVA) for the single contingency outage Towanda – U3-010 115 kV. This project contributes approximately 78 MW to the thermal congestion.
17. The Gold - O52 115 kV circuit loads from 135% to 170% of its emergency rating (225 MVA) for the single contingency outage Towanda – U3-010 115 kV. This project contributes approximately 78 MW to the thermal congestion.
18. The Farmers Valley - Ridgeway 115 kV circuit loads from 117% to 139% of its emergency rating (146 MVA) for the single contingency outage Towanda – U3-010 115 kV. This project contributes approximately 32 MW to the thermal congestion.
19. The Niles Valley – Sabinsville 115 kV circuit loads from 78% to 127% of its emergency rating (159 MVA) for the single contingency outage Towanda – U3-010 115 kV. This project contributes approximately 78 MW to cause this overload.
20. The Sabinsville – N36 115 kV circuit loads from 70% to 119% of its emergency rating (159 MVA) for the single contingency outage Towanda – U3-010 115 kV. This project contributes approximately 78 MW to cause this overload.

21. The Lewis Run – Glade Tap 230 kV circuit loads from 86% to 108% of its emergency rating (213 MVA) for the single contingency outage Towanda – U3-010 115 kV. This project contributes approximately 46 MW to cause this overload.
22. The Lewis Run 230/115 kV transformer loads from 87% to 107% of its emergency rating (225 MVA) for the single contingency outage Towanda – U3-010 115 kV. This project contributes approximately 46 MW to cause this overload.
23. The U2-016 – E. Towanda 230 kV circuit loads from 98% to 105% of its emergency rating (554 MVA) for the single contingency outage Towanda – U3-010 115 kV. This project contributes approximately 37 MW to cause this overload.
24. The Shelocta - Keystone 230 kV line loads from 131% to 133% of its emergency rating (854MVA) for single contingency PN33A. This project contributes approximately 14 MW to the thermal congestion.
25. The Forest – Elko 230 kV line loads from 107% to 109% of its emergency rating (505 MVA) for single contingency PN28. This project contributes approximately 8 MW to the thermal congestion.

Option 2: East Towanda – Grover 230kV line

Network Impacts

Potential network impacts were as follows:

Generator Deliverability

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

No problems were identified

Multiple Facility Contingency

(Double Circuit Tower Line for the full energy output. Stuck breaker and bus fault contingencies will be performed for the System Impact Study)

No problems were identified

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 problems were identified

Short Circuit

PJM studied the 230kV and above voltage systems and found no new breakers to be overdutied, and no addition to the fault current associated with any previously identified overdutied breakers. Additional short circuit study will be conducted during the System Impact Study phase of this project.

Steady-State Voltage Requirements

(Results of the steady-state voltage studies should be inserted here)

To be determined during the System Impact Study phase of the study of this project.

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

To be determined during the System Impact Study or Facilities Study phase of the study of this project.

Delivery of Energy Portion of Interconnection Request

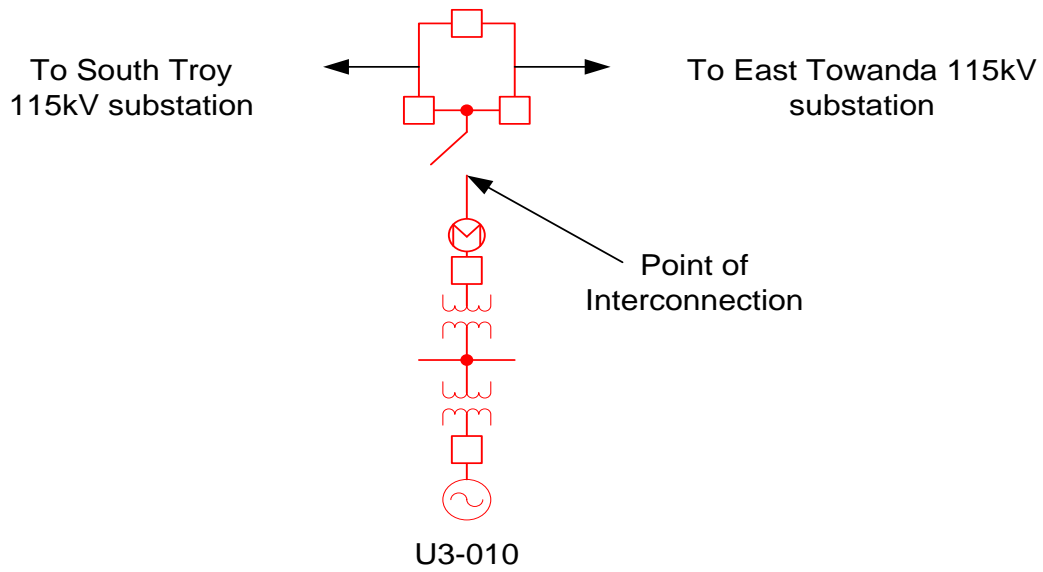
PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The Interconnection Customer can proceed with network upgrades to eliminate the operational restriction at their 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 overloaded conditions associated with the overloaded element(s) identified.

As a result of the aggregate energy resources in the area, the following violations were identified:

1. The South Troy – Towanda 115kV line #380-381 loads from 294.91% to 305.24% of its emergency rating (130MVA) for single contingency PN35A_U2016_B. This project contributes approximately 13.42MW to the thermal congestion.
2. The Homer Ct – Shelocta 230kV line #477-505 loads from 147.49% to 149.15% of its emergency rating (854MVA) for single contingency PN33A. This project contributes approximately 14.17MW to the thermal congestion.
3. (APS/PN) The Shingl – Lewistown 230kV line #20248-214 loads from 98.68% to 107.55% of its emergency rating (505MVA) for single contingency PN35A_U2016_B. This project contributes approximately 44.83MW to the thermal congestion.
4. The Shelocta – Keystone 230 kV line loads from 138% to 140% of its emergency rating (854 MVA) for single contingency PN33A. This project contributes approximately 14 MW to the thermal congestion.

5. The Two Mile – Farmers Valley 115 kV line loads from 109% to 112% of its emergency rating (179 MVA) for single contingency PL63. This project contributes approximately 5 MW to the thermal congestion.
6. The U2-016 – East Towanda 230 kV line loads from 99% to 115% of its emergency rating (554 MVA) for single contingency outage South Troy – Towanda 115 kV. This project contributes approximately 89 MW to cause this overload.
7. The Grover 230/34.5 kV transformer loads from 90% to 108% of its emergency rating (76 MVA) for single contingency outage PN35A_U2016_B. This project contributes approximately 14 MW to cause this overload.
8. The Potter - Two Mile 115 kV line loads from 100% to 102% of its emergency rating (225 MVA) for single contingency PL63. This project contributes approximately 5 MW to the thermal congestion.

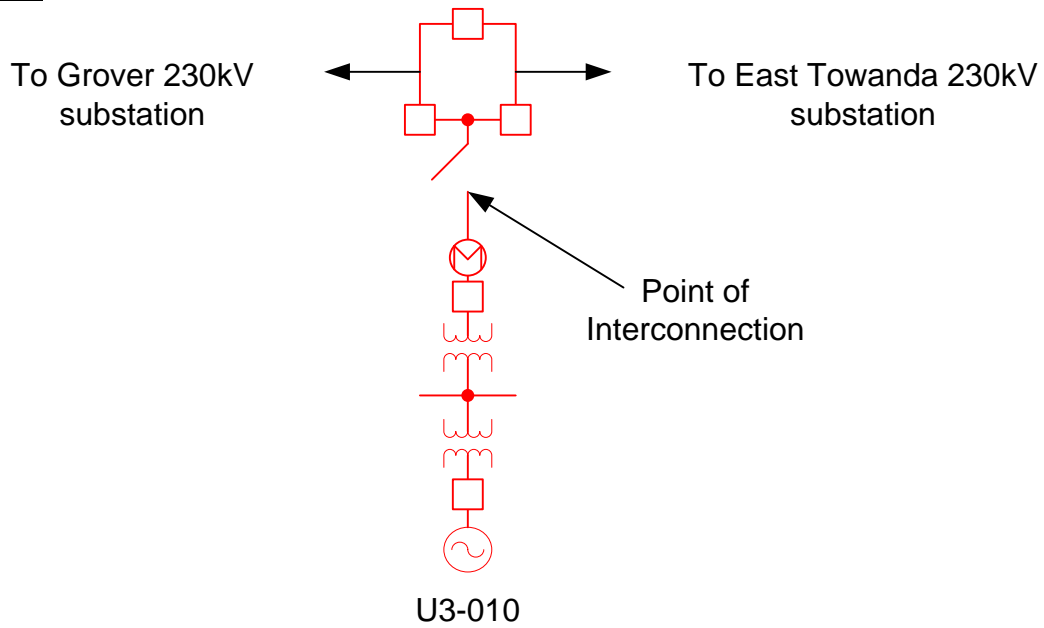
Figure 1








Legend	
	Generator
	Breaker
	Transformer
	Disconnect Switch
	Revenue Meter

All facilities depicted in black are existing facilities. All facilities depicted in red are facilities to be added as a result of this Interconnection Request.

Figure 2



Legend

-  Generator
-  Breaker
-  Transformer
-  Disconnect Switch
-  Revenue Meter

All facilities depicted in black are existing facilities. All facilities depicted in red are facilities to be added as a result of this Interconnection Request.