Generation Interconnection Feasibility Study Report

PJM Generation Interconnection Request Queue Position #U1-051 Dubois – Rockton Mountain 115 kV 130 MW (17 MW capacity)

January 2009

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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.

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General

The Queue Project #U1-051 was studied as a(n) 130MW(Capacity=17MW) injection at the Dubois – Rockton Mountain 115 kV line in the Penelec area. Project U1-051 was evaluated for compliance with reliability criteria in accordance with the procedures set forth in PJM Manual 14A and the FirstEnergy planning 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.

Design Requirements

The generation owner is responsible for specifying appropriate equipment and facilities such that the parallel generation is compatible with the FirstEnergy 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 FirstEnergy's facilities.

FirstEnergy 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.

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Direct Connection Facilities

It is proposed that the project be connected at a new 115 kV 3 breaker ring bus. The Interconnection Customer is responsible for constructing all of the facilities on its side of the Point of Interconnection, which will be between the 115 kV line and the customer substation.

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 U1-051 being the only project to connect at this substation.

Dubois – Rockton Mountain 115 kV line

Item	Description	Conceptual Cost Estimate
1	New 115 kV 3-breaker ring bus termination point at a new interconnection substation.	$2,763,000
2	New 115 kV loop into interconnection substation.	$250,000
3	Relaying and fiber optic cable	$700,000
4	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.

Conceptual Estimate: $3,713,000
Estimated Lead Time: 2.0 years from signed CSA

Notes:
Detailed Engineering & Construction Estimates TBD via Facility Study.
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.

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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)

1. The SHELOCTA-KEYSTONE 230kV line loads from 117.70% to 120.42% (DC power flow) of its emergency rating (841MVA) for the tower line outage (83) (Loyalhanna-Luxor, Loyalhanna-Social Hall). This project contributes approximately 22.9MW to the thermal violation. To mitigate an overload would require the replacement of a disconnect switch at Shelocta Substation (estimated to cost $100,000) and a disconnect switch (estimated to cost $100,000) and two CT circuits (estimated to cost $280,000) at Keystone Substation. Further upgrades would require the upgrade/reconductor of 2.26 miles of transmission line (estimated to cost $1,356,000).

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.

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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 TR-TOWANDA 115kV line loads from 343.5% to 348.7% (DC power flow) of its emergency rating (119MVA) for the single line contingency outage (GROVER_TWANDA_B). This project contributes approximately 6.2MW to the thermal congestion.

2. The N36 C-SABINSVI 115kV line loads from 181.8% to 185.6% (DC power flow) of its emergency rating (159MVA) for the single line contingency outage (PN28). This project contributes approximately 6.0MW to the thermal congestion.

3. The GOLD-N36 C 115kV line loads from 105.5% to 109.3% (DC power flow) of its emergency rating (159MVA) for the single line contingency outage (PN28). This project contributes approximately 6.0MW to the thermal congestion.

4. The NILES VA-MANSFIEL 115kV line loads from 195.5% to 200.3% (DC power flow) of its emergency rating (119MVA) for the single line contingency outage (PN28). This project contributes approximately 5.8MW to the thermal congestion.

5. The SABINSVI-NILES VA 115kV line loads from 169.2% to 172.8% (DC power flow) of its emergency rating (159MVA) for the single line contingency outage (PN28). This project contributes approximately 5.8MW to the thermal congestion.

6. SHADE GP-ROXBURY 115kV line loads from 118.4% to 124.1% (DC power flow) of its emergency rating (150MVA) for the single line contingency outage (PN29_WITH_S44OPT1B). This project contributes approximately 8.5MW to the thermal congestion.

7. The #00C-E.TWANDA 230kV line loads from 98.0% to 102.5% (DC power flow) of its emergency rating (554MVA) for the single line contingency outage (PN27). This project contributes approximately 24.6MW to the thermal congestion.

8. The ROCKTON-SHAWVL 1 115kV line loads from 74.9% to 137.2% (DC power flow) of its emergency rating (146MVA) for the single line contingency outage (PN9). This project contributes approximately 91.0MW to the thermal congestion.

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9. The FARM VLY-LEWIS RN 115kV line loads from 198.2% to 203.4% (DC power flow) of its emergency rating (146MVA) for the single line contingency outage (SOUTHTR_Q72). This project contributes approximately 7.6MW to the thermal congestion.

10. The FOREST-01ELKO 230kV line loads from 102.0% to 108.6% (DC power flow) of its emergency rating (505MVA) for the single line contingency outage (PN28). This project contributes approximately 33.5MW to the thermal congestion.

11. The R92C-ROCKTON 115kV line loads from 59.6% to 109.1% (DC power flow) of its emergency rating (184MVA) for the single line contingency outage (PN9). This project contributes approximately 91.0MW to the thermal congestion.

12. The LEWIS RN-GLADE TP 230kV line loads from 115.7% to 119.3% (DC power flow) of its emergency rating (213MVA) for the single line contingency outage (SOUTHTR_Q72). This project contributes approximately 7.6MW to the thermal congestion.

13. The 01SHINGL-LEWISTWN 230kV line loads from 100.5% to 108.3% (DC power flow) of its emergency rating (505MVA) for the single line contingency outage (GROVER_TWANDA_B). This project contributes approximately 39.5MW to the thermal congestion.

14. The SHAWVL 2-01SHINGL 230kV line loads from 96.8% to 102.5% (DC power flow) of its emergency rating (505MVA) for the single line contingency outage (APS-SB-272). This project contributes approximately 28.9MW to the thermal congestion.

15. The GLADE-WARREN 230kV line loads from 94.3% to 100.3% (DC power flow) of its emergency rating (540MVA) for the single line contingency outage (PN9). This project contributes approximately 32.6MW to the thermal congestion.

16. The HOMER CT-SHELOCTA 230kV line loads from 153.0% to 154.9% (DC power flow) of its emergency rating (854MVA) for the single line contingency outage (PN33A). This project contributes approximately 16.7MW to the thermal congestion.

17. The ALTOONA-RAYSTOWN 230kV line loads from 100.3% to 101.4% (DC power flow) of its emergency rating (554MVA) for the single line contingency outage (PN27). This project contributes approximately 6.5MW to the thermal congestion.

18. The S44COP1-JUNIATA 230kV line loads from 116.6% to 122.0% (DC power flow) of its normal rating (499MVA) for non-contingency condition. This project contributes approximately 26.9MW to the thermal congestion.

19. The 01EDGEWT-01LOYALH 138kV line loads from 123.6% to 128.2% (DC power flow) of its emergency rating (129MVA) for the single line contingency outage (PN41). This project contributes approximately 5.9MW to the thermal congestion.

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20. The Q72 – South Troy 115 kV line loads from 346% to 352% (DC power flow) of its emergency rating (119 MVA) for the single line contingency outage Warren Glade 230 kV and the Warren 230/115 kV transformer (PN28). This project contributes approximately 7 MW to the thermal congestion.

21. The Mansfield – Q72 115 kV line loads from 214% to 220% (DC power flow) of its emergency rating (119 MVA) for the single line contingency outage Warren Glade 230 kV and the Warren 230/115 kV transformer (PN28). This project contributes approximately 7 MW to the thermal congestion.

22. The Keystone 500/230 kV transformer #3 loads from 101.5% to 104% (DC power flow) of its emergency rating (642 MVA) for the single contingency outage of Keystone 500/230 kV #4. This project contributes approximately 14 MW to the thermal congestion.

23. The Keystone 500/230 kV transformer #4 loads from 102% to 104.5% (DC power flow) of its emergency rating (634 MVA) for the single contingency outage of Keystone 500/230 kV #3. This project contributes approximately 14 MW to the thermal congestion.

24. The Shawville 230/115 kV transformer #1 loads from 87% to 113% (DC power flow) of its emergency rating (171 MVA) for the single contingency outage of Dubois – R92 115 kV. This project contributes approximately 44 MW to the thermal congestion.

25. The Shawville 230/115 kV transformer #2 loads from 85% to 111% (DC power flow) of its emergency rating (171 MVA) for the single contingency outage of Dubois – R92 115 kV. This project contributes approximately 44 MW to the thermal congestion.

26. The R92 – Dubois 115 kV line loads from 38% to 109% (DC power flow) of its emergency rating (184 MVA) for the single contingency outage of Rockton – R92 115 kV. This project contributes approximately 130 MW to the thermal congestion.

27. The Lewistown – S44 Option 1 230 kV line loads from 109% to 116% (DC power flow) of its emergency rating (617 MVA) for the single line contingency outage of Grover – T100 230 kV (Grover_Twanda_B). This project contributes approximately 31 MW to the thermal congestion.

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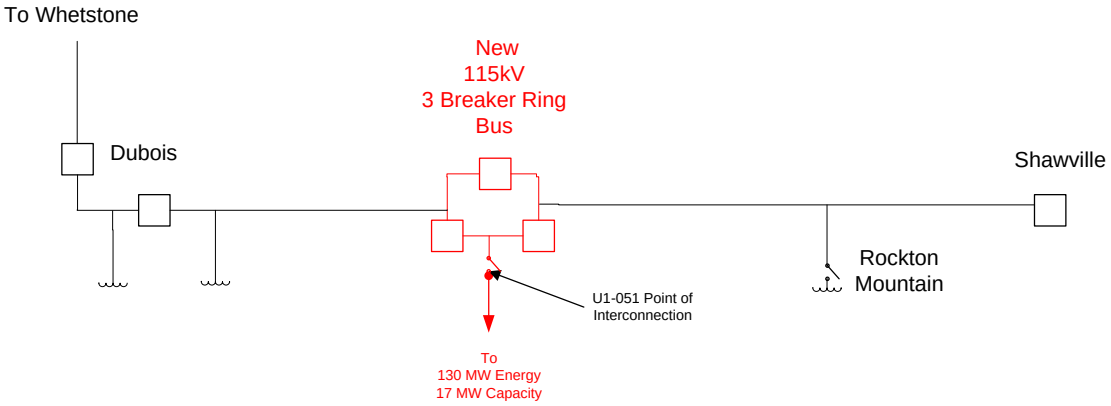
Figure 1

Existing 115 kV

Figure 2

New 115 kV



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