Generation Interconnection Feasibility Study Report

PJM Generation Interconnection Request Queue Position #R92 Dubois 115kV

70 MW

(14 MW capacity)

September 2008

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/trans-standard.html

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 developer 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 developer will be charged for actual costs. Any under-runs or over-runs will be reconciled at the conclusion of the project.

General

The #R92 project was studied as a 70 MW (14 MW of capacity) injection into the Dubois – Rockton Mountain 115 kV line in the Penelec region. Project #R92 was evaluated for compliance with reliability criteria for summer peak conditions in 2011. Potential network impacts were as follows:

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 developer'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 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 developer.

Reactive Power

To be specified during the System Impact Study phase of the project.

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 developer will be charged for actual costs. Any under-runs or over-runs will be reconciled at the conclusion of the project.

Direct Connection Facilities

Connection to the Dubois – Rockton Mountain 115 kV line would be through a 115 kV substation with a 3 breaker ring bus (see Figure 1).

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

The proposed change to the 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/trans-standard.html

Below are conceptual estimates for the engineering/construction associated with Direct Connection requirements based upon similar projects that have been designed and/or constructed.

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.	Interconnection Customers responsibility

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 developer, 3) interconnection metering and generation SCADA to be provided by the developer, 4) engineering and field activities for design review and commissioning of the developer's facilities, and 5) Real estate costs that may be required for right-of-way easements to extend the 115 kV line.

Potential network impacts were as follows:

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

1. The Homer CT – Shelocta 230 kV line is overloaded from 100.0% to 100.3% (857 MVA) (DC power flow) of its emergency rating (854MVA) for the single line contingency outage of Homer CY – Waterc 345 kV line (PN18). This project contributes approximately 2.1 MW to cause this thermal violation. Mitigation requires the replacement of a disconnect switch at Shelocta with an estimated cost of $100,000.

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 system, and found no breakers to be over-duty as a result of the project. Additional short circuit study will be performed during the System Impact Study phase of the project.

Potential Congestion Issues
There are several wind generation plants proposed in the general area of the Queue Position #R92 project, each with only 20% of their peak output level considered as a Capacity Resource, and the remaining 80% as Energy only resource. If all of the wind generation plants are at their maximum out put level simultaneously, a significant number of the 115 kV and 230 kV facilities, and many underlying system facilities are likely to be overloaded, restricting operation to a lower output level.

PJM and FirstEnergy studied the delivery of the energy portion of this Interconnection Request. The following analysis has been performed to inform the Interconnection Customer (Queue Position #R92) of potential congestion issues (operational restrictions) that may occur and affect the Queue Position #R92 project's ability to operate at full output for certain system conditions. **The upgrades listed below are not required reliability upgrades for the Queue Position #R92 interconnection.** Please note that the number of facilities identified below as requiring upgrades may be quite extensive – with a number of these facilities requiring reconductoring/rebuilding of transmission lines. Some of the reconductoring/rebuilding projects can be done in a "short" time frame while others are quite extensive and will require a "long" time to complete. In general, the

time necessary to design and rebuild an extensive facility upgrade will take approximately 2-3 years to complete. The developer can proceed with Network Upgrades to eliminate the operational restriction at their discretion by submitting a 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.

1. The Keystone 500/230 kV ckt#3 transformer is overloaded at 166% (1064 MVA)of its emergency rating (642 MVA) for the outage of Keystone 500/230 kV transformer ckt4 (Cont Id. PJM31). The R92 project contributes approximately 12 MW to this overload.
2. The Keystone 500/230 kV ckt#4 transformer is overloaded at 167% (1060 MVA)of its emergency rating (634 MVA) the outage of Keystone 500/230 kV transformer ckt#3 (Cont Id. PJM30). The R92 project contributes approximately 12 MW to this overload.
3. The Keystone 500/230 kV ckt#3 transformer is overloaded at 118% (585 MVA) of its normal rating (496 MVA). The R92 project contributes approximately 8 MW to this overload.
4. The Keystone 500/230 kV ckt#4 transformer is overloaded at 118% (580 MVA) of its normal rating (493 MVA). The R92 project contributes approximately 8 MW to this overload.
5. The Shawville - Shingletown 230 kV line is overloaded at 100% (556 MVA)of its emergency rating (554 MVA) for the outage of L19 to Milesburge 230 kV line (Cont Id. AP170B). The R92 project contributes approximately 15 MW to this overload.
6. The Oxbow - Lackawanna 230 kV line is overloaded at 126% (776 MVA)of its emergency rating (617 MVA) for the **generator** outage of Susquehanna machine#1 at bus 3163 (Cont Id. PL57). The R92 project contributes approximately 9 MW to this overload.
7. The Oxbow - Lackawanna 230 kV line is overloaded at 130% of its normal rating (499 MVA). The R92 project contributes approximately 9 MW to this overload.
8. The L19 – Milesburge 230 kV line is overloaded from 99% to 101% of its emergency rating (593 MVA) for the outage of Shawville – Shingletown 230 kV line (Cont Id. PN26). The R92 project contributes approximately 14 MW to cause the thermal violation.
9. The Shingletown - Lewistown 230 kV line is overloaded at 124% (636 MVA)of its emergency rating (512 MVA) for the outage of Raystown to Altoona 230 kV line and Raystown to Lewistown 230 kV line (Cont Id. PN38). The R92 project contributes approximately 18 MW to this overload.
10. The Homer City - Shelocta 230 kV line is overloaded at 186% of its emergency rating (854 MVA) for the outage of Handsome Lake to Wayne 345 kV line (Cont Id. PN33A). The R92 project contributes approximately 11 MW to this overload.
11. The Homer City - Shelocta 230 kV line is overloaded at 178% of its normal rating (694 MVA). The R92 project contributes approximately 11 MW to this overload.
12. The North Meshoppen - Oxbow 230 kV line is overloaded at 127% of its emergency rating (617 MVA) for the **generator** outage of Susquehanna machine#1 at bus 3163 (Cont Id. PL57). The R92 project contributes approximately 9 MW to this overload.
13. The North Meshoppen - Oxbow 230 kV line is overloaded at 130% of its normal rating (499 MVA). The R92 project contributes approximately 9 MW to this overload.

14. The Shelocta – Keystone 230 kV line is 197% (1657 MVA) of its emergency rating (841 MVA) for the outage of Erie West to Wayne 345 kV line and Wayne 345/115 kV transformer (Cont Id. PN32). The R92 project contributes approximately 15 MW to this overload.
15. The Shelocta – Keystone 230 kV line is 182% (1304 MVA) of its normal rating (718 MVA). The R92 project contributes approximately 15 MW to this overload.
16. The Lewistown - Juniata 230 kV line is overloaded at 152% of its emergency rating (617 MVA) for the outage of Shelocta to Homer Ct 230 kV line and Shelocta to Keystone 230 kV line (Cont Id. PN41). The R92 project contributes approximately 18 MW to this overload.
17. The Lewistown - Juniata 230 kV line is overloaded at 143% of its normal rating (499 MVA). The R92 project contributes approximately 15 MW to this overload.
18. The Juniata – JuniataH1 230 kV line is overloaded at 104% of its emergency rating (573 MVA) for the outage of Dauphin to Juniata 230 kV and Dauphin 230/69 kV transformer (Cont Id. PL10). The R92 project contributes approximately 10 MW to this overload.
19. The East Towanda – North Meshoppen 115 kV line is overloaded at 348% (554 MVA) of its emergency rating (159 MVA) for the **generator** outage of Susquehanna machine#1 at bus 3163 (Cont Id. PL57). The R92 project contributes approximately 7 MW to cause the thermal violation.
20. The Shawville 230/115 kV transformer #1 is overloaded from 111% to 119% of its emergency rating (171 MVA) for outage of Altoona - Raystown – Lewistown 230 kV (Cont Id. PN38). The R92 project contributes approximately 14 MW to this overload.
21. The Shawville 230/115 kV transformer #2 is overloaded from 113% to 121% of its emergency rating (171 MVA) for outage of Altoona - Raystown – Lewistown 230 kV (Cont Id. PN38). The R92 project contributes approximately 14 MW to this overload.

Figure #1