

PJM Generation Interconnection Request

Queue R52

Mechanicsburg - Darby 69kV

Feasibility Study

430533v1
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Preface

The intent of the 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. All facilities required for interconnection of a generation interconnection project must be designed to meet the technical specifications (on PJM web site) for the appropriate transmission owner.

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 feasibility study, but the actual allocation will be deferred until the impact study is performed.

The Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

General

Everpower Ohio, LLC (Everpower) has proposed a 300 MW (60 MW capacity) wind generating facility to be studied as interconnected at two locations in the Dayton system. 100 MW (20 MW capacity) has been studied as injecting into the Kings Creek 69 kV substation. 200 MW (40 MW capacity) has been studied as injection into the Mechanicsburg to Givens section of the Urbana – Mechanicsburg - Darby 138 kV circuit. Project #R52 was evaluated for compliance with reliability criteria for summer peak conditions in 2011. The proposed in-service date for this project is October 1, 2008.

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. This study was limited to short-circuit analyses as well as load flow analyses of probable contingencies. PJM has provided preliminary estimates of the type, scope, cost, and lead time for construction of facilities. If the interconnection customer elects to pursue a System Impact Study, a more comprehensive analysis will be performed.

Attachment Facilities

The proposed wind generation project will interconnect at the two locations stated above. The interconnection to Kings Creek will require a new terminal addition (Figure 1). A new Switching-Station would be required the 138 kV line interconnection as illustrated in Figure 2. The new station will be configured as a three breaker bus. Dayton Power and Light (Dayton) will construct the switching stations on property provided by Everpower. Everpower will construct facilities to interconnect the wind turbine generators through collection systems and step up transformation to 69 kV and 138 kV at the Point of Interconnection.

Everpower's generation must also not cause the system harmonics level to exceed Standard IEEE 519 limits.

The scope of Dayton's work and estimated cost by project segment are listed below:

69 kV interconnection:

Construct a new line terminal at the Dayton of the Kings Creek 69 kV substation including:

- One 69 kV circuit breaker
- Disconnect switches
- 69 kV metering units
- Relaying.
- Site preparation and grading.
- Perform a protection coordination review of the Dayton System area surrounding the switching-station to determine if relaying modifications or relay-setting changes are required.

This estimate assumes the developer will build the transmission line to the DP&L take-off structure at Kings Creek substation. The lead time to complete this work is 9 months. These estimates do not include any tax gross up cost.

Estimated Cost: \$790,000 in 2009 dollars.

Direct Connection Network Upgrades

138 kV interconnection:

Construct a new switching station interconnected to the Dayton Mechanicsburg to Givens section of the Urbana – Mechanicsburg - Darby 138 kV circuit including:

- Three dead-end structures
- Three 138 kV circuit breakers
- Ten 138 kV air break switches
- 138 kV metering units
- Site preparation and grading
- A control building to house protective relaying, metering and communications equipment, including SCADA RTU facilities.
- Relaying.

Estimated Cost: \$2,400,000 in 2009 dollars.

This estimate does not include any cost for land. It is assumed that the developer will provide the necessary land near or adjacent to the line. This estimate provides cost to terminate the existing lines one span into the substation. If transmission lines of longer distance are required, the estimated cost is **\$400,000/Mile in 2009 dollars**. The construction of a 138kV substation requires Ohio Power Siting approval. The siting approval requires a 6 months – 1 year lead time. **The lead time to complete this work as estimated above is 24 months.** These estimates do not include any tax gross up cost.

Additionally Dayton will provide specifications for the relaying protection package to be employed on the interconnection breaker terminal at the generation site to assure that the protective relaying equipment will be compatible with that installed on the interconnection breaker terminal at the new switching station. The relaying package will likely include both primary and backup protection. DP&L is also responsible for testing and calibrating all relays protecting the interconnect line and performing all tests to assure that this relaying is properly installed and functional.

The estimated total cost of this engineering and field test effort is **\$3,000 in 2009 dollars**.

Note: Purchase and installation of protective relaying and associated equipment at the generation site is not included in this scope of work. This phase of work is the responsibility of the customer.

- Prepare right of way as needed and install new line facilities required to loop the Dayton Mechanicsburg to Givens section of the Urbana – Mechanicsburg - Darby 138 kV circuit transmission line into the proposed new switching-station for the interconnection.

Estimated Cost: (assumed by PJM to be part of the \$2.4M above)

- Install transfer trip receiver at Darby substation and install a transfer trip transmitter at Urbana substation.

The estimated cost for this work is **\$93,000 in 2009 dollars**.

Non Direct Connection Network Upgrades

Generator Deliverability

No problems were identified.

Multiple Facility Contingency

1. The Kings Creek - Logan 69 kV line is loaded from 85% to 123% of its emergency rating (72 MVA) for the **tower** outage of Sidney - Shelby 138 kV line and Shelby- E. Sidney-Quincy-Logan 138 kV line and Logan 138/69 kV transformer. This project contributes approximately 27 MW to cause the thermal violation.

Contribution to Previously Identified Overloads

The R52 project contributes 42 MW to the Kammer transformer overload. This project may have a cost allocation for the reinforcement. This will be determined during the System Impact Study.

New System Reinforcements

The Kingscreek-Logan 69 kV Circuit was identified as requiring an upgrade to mitigate reliability criteria violations with the proposed wind farm in place.

The estimated cost to upgrade the limiting breaker/CT on this circuit is approximately **\$75,000** and the lead time would be approximately one month, given DP&L has an inventory of spare breakers.

Contribution to Previously Identified System Reinforcements

To be determined at the System Impact Study.

Short Circuit

The following 4 breakers were over-duty as a result of Queue R52 generation:

1. Urbana 69kV breakers DB-BH1, DB-BL7, DB-BH3E, and DB-BH3W

New System Reinforcements

All of the over-duty breakers are solenoid operating oil circuit breakers with single trip coil design and opening times of 5 to 8 cycles. Upgrading these breakers, which range in age from 56 to 61 years, would not be practical. All over-duty breakers should be replaced with 3 cycle, 40kA redundant trip coil gas circuit breakers. The installed cost of each breaker would be approximately **\$85,000**, and the estimated installation time is about 5 work days per breaker.

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.

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

1. Contribution of 37 MW further congests the 765/500 kV Kammer transformer from 130% to 133% of its emergency rating (2094 MVA) for the outage of the Harrison-Belmont 500 kV line. The monitored facility was first congested by project P37.
2. Contribution of 5 MW further congests the Belmont - Harrison 500 kV line within from 123% to 125% of its emergency rating (2285 MVA) for the outage of the 502 Junction-Kammer 500 kV line. The monitored facility was first congested by project Q75.
3. Contribution of 34 MW further congests the Cabot - Keystone 500 kV line from 122% to 125% of its emergency rating (2598 MVA) for the outage of the Keystone-South Bend kV line. The monitored facility was first congested by project Q75.
4. Contribution of 28 MW further congests the South Bend - Keystone 500 kV line from 116% to 118% of its emergency rating (3013 MVA) for the outage of the Keystone-Cabot 500 kV line. The monitored facility was first congested by project Q75.
5. Contribution of 31 MW further congests the Harrison - Prunty Town 500 kV line from 112% to 114% of its emergency rating (3502 MVA) for the outage of the 500 kV three-terminal line 502 J.-Kammer-Harrison-G30_W51. The monitored facility was first congested by project Q75.
6. Contribution of 10 MW causes congestion on the Woodstock-Marysville 69 kV for the loss of the 138/69 kV Darby transformer. Pre-and-post-R52 loadings on the monitored element are 99% and 119%, respectively.
7. Contribution of 47 MW causes congestion on the Kings Creek-Logan 69 kV for the loss of the 345/138 kV Shelby transformer. Pre-and-post-R52 loadings on the monitored element are 90% and 138%, respectively.

COST AND TIMING SUMMARY

Total Estimated Cost for interconnection is **\$3,701,000 in 2009 dollars** .
This assumes the Reliant will construct the transmission line.

This project will require **24 months** to complete from the date of receipt of a signed Construction Service Agreement (CSA). This project will require an Impact and Facilities Study and with the time expected to complete these studies the Interconnection Customer's required backfeed date cannot be met without pursuing an Interim ISA. The Interconnection Customer, Dayton and PJM should discuss the schedule and options.

This estimate does not include tax gross up. The figures above do not include construction of the line required to interconnect the customer's proposed new generating facilities with the Dayton system. Route selection, line design, right of way acquisition and construction of these lines will be entirely the responsibility of the interconnection customer. The cost figures 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.

Figure 1.

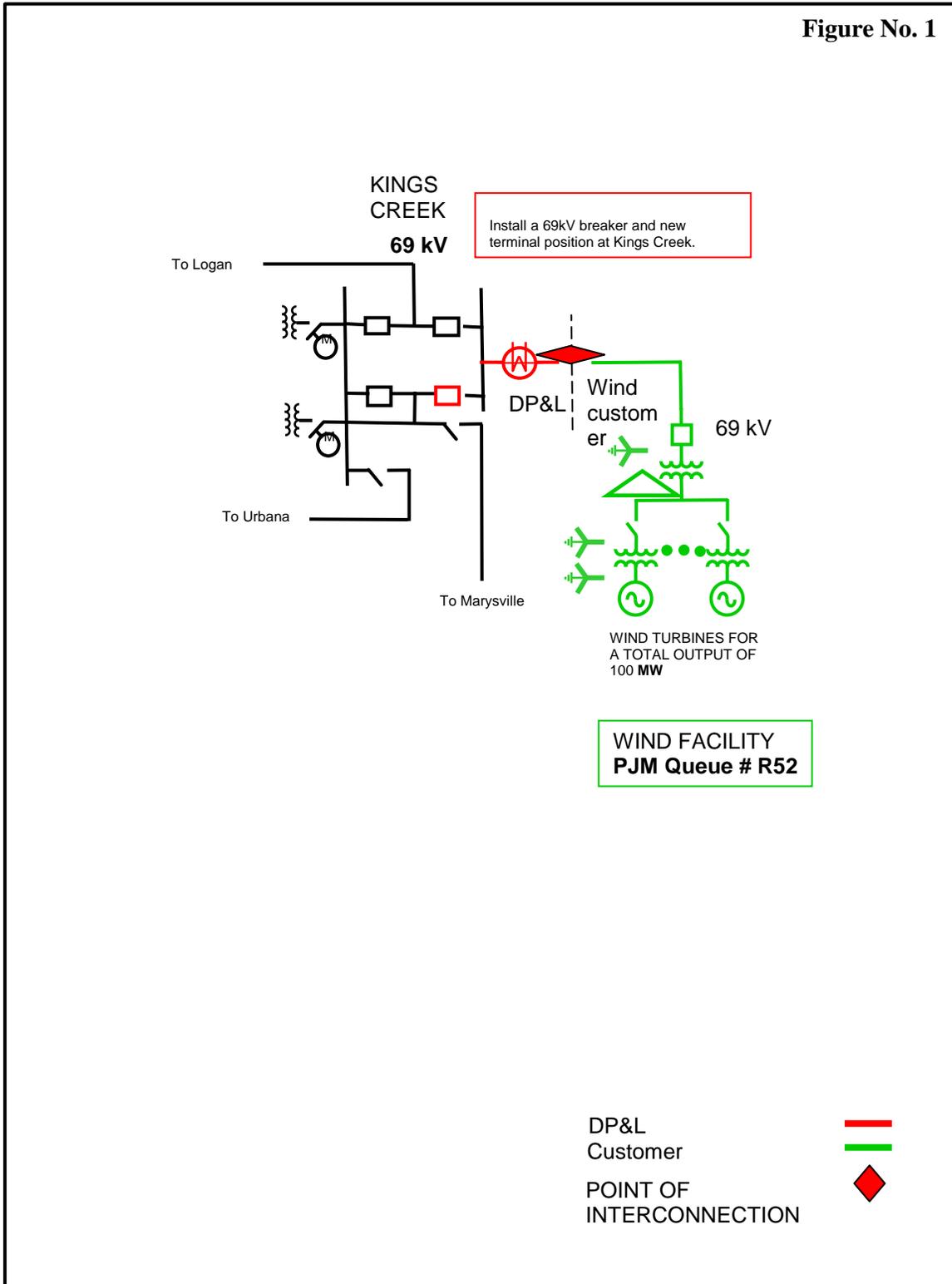


Figure 2

