PJM Generator Interconnection Request
Queue #U2-050
Lonesome Pine 138kV
Feasibility Study

519076

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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 to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, 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,

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U2-040 Lonesome Pine 138kV Feasibility Study Report

General

The Interconnection Customer (IC) proposes to install PJM Project #U2-050, a 100 MW wind powered generating facility comprised of 40 – 2.5 MW Clipper C96 turbine generators connecting to the American Electric Power (AEP) Lonesome Pine Station. The proposed location of the generating facilities is in Tazewell County, Virginia 0n East River Mountain, approximately four miles from the Lonesome Pine station (See Exhibit 1). IC will construct a radial transmission line from the project site to the station. The projected in-service date is scheduled for December 2010.

Attachment Facilities

The facilities required to connect to the AEP transmission system at the Lonesome Pine station will include four (4) 138 kV circuit breakers configured in a ring-bus arrangement and associated equipment (See Exhibit 2). AEP will retain ownership of the proposed in-line station facilities. In addition, relaying at remote stations, Bluefield Avenue and Tazewell, will need to be upgraded. It is understood that IC will be responsible for all costs associated with this construction.

It is expected that the AEP Lonesome Pine station will be expanded by 220' x 220' and the cost associated with this expansion of land will be provided by IC. Note that the IC station facilities and any facilities outside the Lonesome Pine station were not included in the cost estimate; these are assumed to be IC's responsibility.

The AEP construction scope:

- Expand Lonesome Pine Station, including four (4) 138 kV circuit breakers, relaying, 138 kV box bay structure and customer revenue metering
  Estimated Cost (2008 dollars): $**4,100,000**

- Modify relaying with AEP standard package at Bluefield Avenue Station
  Estimated Cost (2008 dollars): **$323,100**

- Modify relaying with AEP standard package at Tazewell Station
  Estimated Cost (2008 dollars): **$316,000**

Total Attachment Facilities Cost: **$4,739,100**

These estimates are preliminary in nature, as they were determined without the benefit of detailed engineering studies. Final estimates will require an on-site review and coordination to determine final construction requirements. It will take approximately one year after obtaining the authorization to construct the facilities as outlined above.

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Local AEP Impacts

The impact of the proposed generating facility on the AEP System was assessed for adherence with applicable reliability criteria. AEP planning criteria require that the transmission system meet single contingency performance criteria in accordance with the AEP FERC Form 715. Therefore, this set of criteria was used to assess the impact of the proposed facility on the AEP System. The IC project was studied as a 100 MW net energy injection consistent with the interconnection application. This project was studied with PJM projects #U2-017 and U2-024 already in service at 100% output in the vicinity of U2-050. The interconnection project was studied at full capacity. The results are summarized below.

Before this report was issued the U2-024 project was withdrawn from the Generator Interconnection queue.

Limitations for Category A Conditions (2012 Summer Conditions)

- No problems identified.

Limitations for Category B Conditions (2012 Summer Conditions)

- AEP Bearwallow – Faraday[1] 69 kV line is overloaded to 101% (35MVA) of its emergency rating for an outage of the AEP Saltville – Tazewell 138 kV line when generating at capacity. Without the addition of U2-050 Project, the same facilities are loaded to 99% (35 MVA) of emergency rating. If the generation were to operate at full output, the line would be overloaded to 114% (40 MVA).

Short Circuit Analysis

- No problems identified.

Stability Analysis

- Stability studies were not performed as part of this Feasibility Study and are not normally performed as part of a Facility Study effort. The stability assessments are part of the System Impact Study. Based upon the results of this future System Impact Study, the extent of system upgrades could change and the associated costs could be significantly different.

[1] The affected facility may appear in additional contingencies that are not mentioned.

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Local/Network Upgrades

The network upgrade estimates provided in this section are intended to be preliminary in nature, as they were determined without the benefit of detailed engineering studies. Final estimates will require on-site review and coordination to determine final construction requirements.

- Replace 4.5 miles of conductor on the Bearwallow – Faraday 69 kV line.
  Estimated Cost (2008 Dollars): **$4,500,000**

Local/Network Upgrade Cost: **$4,500,000**

Contributions to Previously Identified Local/Network Overloadss

1. AEP U2-024 – M&B Coal Company[2] 138 kV line is overloaded to 152% (460 MVA) of its normal rating under system normal conditions. Without the addition of U2-050 Project, the same facilities are loaded to 146% (442 MVA) of normal rating. *

2. AEP M&B Coal Company – Baileysville[1] No. 2 138 kV line is overloaded to 152% (460 MVA) of its normal rating under system normal conditions. Without the addition of U2-050 Project, the same facilities are loaded to 148% (442 MVA) of normal rating. *

3. AEP Baileysville No. 1 – Baileysville[1] No. 2 138 kV line is overloaded to 152% (306 MVA) of its normal rating under system normal conditions. Without the addition of U2-050 Project, the same facilities are loaded to 148% (297 MVA) of normal rating. *

4. 2 miles of 138kV from U2-024 to the M&B Coal Tap is overloaded to 187% of its emergency rating (under single contingency). Without the addition of U2-050 Project, the same facilities are loaded to 184% (under single contingency). *

5. 8 miles of 138kV from the M&B Coal Tap to Baileysville Station is overloaded to 187% of its emergency rating (under single contingency). Without the addition of U2-050 Project, the same facilities are loaded to 184% (under single contingency).*

6. 138kV bus tie breaker at Baileysville station (between Bus #1 & Bus #2) is overloaded to 182% of its emergency rating (under single contingency). Without the addition of U2-050 Project, the same facilities are loaded to 180% (under single contingency).*

7. AEP U2024 – Wyoming[2] 138 kV line is overloaded to 113% (446 MVA) of its emergency rating for an outage of the AEP U2024 – M&B Coal Company 138 kV line. Without the addition of U2-050 Project, the same facilities are loaded to 109% (427 MVA) of emergency rating.*

[2] Please note that because these facilities are overloaded under normal conditions, the same overload issues may appear for several contingencies in the following sections but are not discussed hereafter.

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* This equipment is overloaded prior to the addition of U2-050. PJM will allocate the costs associated with the overloads based on the results of previous studies.

Contribution to Previously identified Local Network Upgrades

- Rebuild 9 miles of 138kV six-wired single circuit from U2-024 to Baileysville Station to accommodate a double circuit configuration with larger 1590 ACSS conductor. New towers will be needed to accommodate the 1590 ACSS conductor. Add additional breakers at Baileysville and U2-024 to accommodate second circuit. Estimated cost is **$9,900,000*.** (This alleviates overloads 1,2,4,5, & 7)

- Difference of building one of the two single circuit lines from U2-024 to the Baileysville-Tazewell 138 kV circuit. Estimated cost is **$600,000.** (This alleviates overloads 1,2,4,5, & 7)

- Bus tie breaker at Baileysville Station will need to be replaced to eliminate overloads during normal and contingency conditions. Estimated cost is **$550,000***. (Includes: circuit breaker, conductor, switches, and some bus modifications) (This alleviates overloads 3 & 6)

*Estimates are intended to be preliminary in nature, as they were determined without the benefit of detailed engineering studies. Final estimates will require an on-site review and coordination to determine final construction requirements.

Reactive Requirements

PJM requires a power factor correction to 95% lead/lag at the point of interconnection for wind generating facilities. It is expected that IC will adhere to this standard.

Network Impacts

The Queue Project U2-050 was studied as a(n) 100MW (Capacity = 13MW) injection at Lonesome Pine 138 kV substation in the AEP area. Project U2-050 was evaluated for compliance with reliability criteria for summer peak conditions in 2012. Potential network impacts were as follows:

Generator Deliverability

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

No problems identified.

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Multiple Facility Contingency
(Double Circuit Tower Line, Line with Failed Breaker and Bus Fault contingencies for the full energy output)

No problems identified

Short Circuit
(Summary form of Cost allocation for breakers will be inserted here if any)

No problems 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 identified except for the local network problems identified above.

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)

None

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)
(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

None

MISO Impacts

Any impacts on the MISO transmission system will be identified in the Impact Study.

Exhibit 1: Approximate interconnection location of the proposed facilities

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