

***PJM Generator Interconnection Request
Queue #W2-063
Millbrook Park (Green-up Hydro)138kV
Feasibility Study***

618066

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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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General

The interconnection customer (IC) has requested that the Green-up Hydro project located along the Ohio River approximately 5 miles south of Green-up, Kentucky become an internal resource in PJM. The project was built in the 1980's and originally connected to AEP. In the 1995-1996 time period the line connecting the plant to AEP's Millbrook Park station was modified to connect to East Kentucky Power Cooperative's (EKPC) Argentum 138/69kV substation. The City of Hamilton is selling Green-up output under a banking arrangement to Duke who is selling the plant output to EKPC. With Duke Energy's proposed move to PJM, the City of Hamilton wants to move the Green-up Hydro generator to an internal resource to PJM. This best achieved by establishing metering so that the power goes to AEP.

The interconnection request is for 66MW capacity and 4 MW energy.

Attachment Facilities

The power plant is connected via a 138kV transmission line, owned by the City of Hamilton, to AEP's Millbrook Park station. A tap in the line connects to a 138/69kV transformer at EKPC's Argentum station. The 69kV system connected to Argentum is a network that ties to AEP 69kV facilities. To be considered an internal resource to PJM the generating plant needs to be connected directly and exclusively to PJM facilities.

The IC will meet this requirement by adding switches at the point where the Green-up's hydroelectric plant's tie-line enters the EKPC Argentum substation. The switches will tie the plant's tie-line to the Hamilton owned line that interconnects EKPC and AEP. The switches will be open to the EKPC Argentum substation and closed to the AEP interconnection. This will create a line from the plant to AEP facilities with no direct path to EKPC facilities.

The 138kV line from the plant to Argentum station is approximately four miles long and the distance from Argentum to AEP facilities is approximately 11 miles. AEP facilities start 6.5 miles from Millbrook Park.

Since W2-063 is an existing generation facility, at the present time there is no requirement for an in-line switching station, new circuit breaker arrangement or relaying at remote station adjustments

No new station site will be required for this project. Note that customer station facilities and any facilities outside the current generation station were not included in the cost estimate. If there are adjustments or changes needed to these facilities, it is assumed the IC will work with owner to implement these changes (see Exhibit 3).

The revenue metering installed at Millbrook Park will be used for this project.

The AEP construction scope includes:

- Not Applicable

Estimated Cost (2009 Dollars): \$0.00

Total Attachment Facilities Cost¹: \$0.00

Local Network 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 Greenup 70 MW hydro-electric generator project was studied as a 70 MW net energy injection consistent with the interconnection application. The results are summarized below.

Normal System (2013 Winter Conditions)

- No problems identified.

Single Contingency (2013 Winter Conditions)

- No problems identified.

Multiple Contingency (2013 Winter Conditions)

- No problems identified.

Short Circuit Analysis

- No problems identified.

Stability Analysis

¹ 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.

² Two overduty 138 kV breakers H and O at Millbrook Park were previously identified in PJM RTEP 2011 Breaker Short Circuit Assessment. Both of these over duties breakers will be replaced as part of the RTEP planning process.

- Stability analysis was not performed as part of this Feasibility Study. 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.

Local Upgrades

- None required.

Network Impacts

The queue W2-063 project was studied as a 70MW injection (70 MW of which was capacity) into the AEP system at Millbrook Park 138kV substation. Project W2-063 was evaluated for compliance with reliability criteria for summer peak conditions in 2014. Potential network impacts were as follows:

Generator Deliverability

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

No problems identified.

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)

None

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

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 developer 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 the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed that shall study all overload conditions associated with the overloaded element(s) identified.

No problems identified

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 Iberdrola will adhere to this standard.

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

Exhibit 2: Existing Configuration Simplified diagram of W2-063

Exhibit 3: Proposed Configuration Simplified diagram of W2-063