PJM Generator Interconnection Request Queue #W2-044 Columbia 138kV Feasibility Study Report

November 2010
#621955

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,

W2-044 Columbia 138kV Feasibility Study

General

The interconnection customer (IC) proposes to install PJM Project #W2-044, a 100.5 MW generating facility comprised of 67 - 1.5 MW wind turbine generators connecting to the American Electric Power (AEP) Columbia 138 kV station (primary connection) or the Coesse Tap-Raebers Tap station (secondary connection). The proposed location of the generating facilities and switching station is in Whitely County, Indiana (see Exhibit 1). The projected in-service date is scheduled for September 2011.

Direct Connection

A direct connection to the Columbia station will require a design change of the station to accommodate the W2-044 Project. The addition of the W2-044 project will require the existing station be converted into a breaker-and-a-half scheme with 6 circuit breakers total (see Exhibit 2). The redesign will require five (5) additional 138 kV circuit breakers, 138 kV metering, SCADA, and associated equipment.

Changes to the relay packages and carrier communication frequencies at Northeast, Coesee (REMC), Raeber Tap and Sorenson stations are also required.

The AEP construction scope for attachment facilities includes:

At Columbia 138k V Station	
▪ Reconfiguration of station with 6 breakers	$5,000,000
At Northeast 138kV Station	
▪ Change relay packages	$300,000
At Coesse (REMC) 138kV or associated Stations	
▪ Change relay packages	$300,000
At Raeber tap 138kV or associated stations	
▪ Change relay packages	$300,000
At Sorenson 138kV Station	
▪ Change relay packages	$300,000
Total cost of the attachment facilities	**$6,200,000**

Option 2:

A new in-line 138kV switching station will be located between AEP's Columbia, Coesse (REMC) and Raeber Tap in Indiana. This new station is to consist of four (4) 138 kV circuit breakers configured in a breaker and one half bus arrangement operated as a ring-bus (see Exhibit 3). The station also includes 138 kV metering, SCADA, and associated equipment. The IC is expected to obtain, at their cost, a 200' x 200' (minimum) station site for the AEP facilities. The IC shall obtain all necessary permits.

A 138 kV line extension is required to loop through the proposed station. For the cost estimate, the AEP switching station is assumed to be located immediately adjacent to the existing transmission lines. A supplemental line easement for the tap poles will be required. It is expected that the IC will obtain the supplemental easement when the station property is purchased.

Changes to relay settings and carrier communication frequencies at Columbia, Coesse, Raeber Tap and Sorenson stations are required.

The AEP construction scope for attachment facilities includes:

At New Site	
▪ Proposed 138kV switching station	$6,500,000
▪ 138 kV line facilities looped into station	750,000
Sub-Total	$7,250,000
At Columbia Station	
▪ Change relay packages	300,000
At Coesse (REMC) or associated Stations	
▪ Change relay packages	300,000
At Raeber tap or associated stations	
▪ Change relay packages	300,000
At Sorenson Station	
▪ Change relay packages	300,000
Total Cost of the attachment facilities:	**$ 8,450,000**

Final estimates will require an on-site review and coordination with the IC to determine final construction requirements. Estimates are based on 2010 dollars. The IC is responsible for all costs associated with this connection. The costs above are reimbursable to AEP.

The standard time required for construction is 18 to 24 months after signing an interconnection agreement.

AEP 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 contingency performance criteria in accordance with the AEP FERC Form 715. The project was studied as a 100.5 MW net energy (capacity 13 MW) injection consistent with the interconnection application. The results are summarized below.

Option #1 (Directly connected at Columbia 138kV station)

Normal System (2012 Summer Conditions) – Capacity Output

- No problems identified.

Single Contingency (2012 Summer Conditions) – Capacity Output

- No problems identified.

Multiple Contingency (2012 Summer Conditions) – Full Output

- No problems identified.

Short Circuit Analysis

- No problems identified.

Stability Analysis

- 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.

Network Upgrades

- None

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Additional Limitations of Concern

- None

Option #2 (Connection between Coesse and Raeber Tap 138kV)

Normal System (2012 Summer Conditions)

- No problems identified.

Single Contingency (2012 Summer Conditions)

- No problems identified.

Multiple Contingency (2012 Summer Conditions)

- No problems identified.

Short Circuit Analysis

- No problems identified.

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- 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.

Network Upgrades

- None

Additional Limitations of Concern

- None

Network Impacts

Queue project W2-044 was studied as a(n) 100.5MW (13.06MW of which was Capacity) injection into AEP's system at two optional points of interconnection. The primary option was a direct connection at the Columbia 138kV substation, while the secondary option was a tap of the Coeese Tap-Raebers Tap 138kV line. PJM's study case did not have Coeese modeled, so the secondary option was modeled directly at the Raebers Tap 138kV facility. Project W2-044 was evaluated for compliance with reliability criteria for summer peak conditions in 2014. Potential network impacts were as follows:

Option #1 (Directly connected at Columbia 138kV station)

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

(*Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have % allocation of cost responsibility which will be calculated and reported for the Impact Study.)*

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)

None

Energy Portion of Interconnection Request
(PJM also studied the delivery of the energy portion of the surrounding generation. Any potential 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 Transmission Interconnection request.
Note: Only the most severely overloaded conditions are listed. 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 analyzes all overload conditions associated with the overloaded element(s) identified. As a result of the aggregate energy resources in the area, the following violations were identified.)

None

Option #2 (Connection between Coesse and Raeber Tap 138kV)

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.

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None

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None

Exhibit 1: Approximate interconnection location of the proposed facilities

Exhibit 2: Simplified diagram of proposed 138 kV interconnection (Option 1)

Exhibit 3: Simplified diagram of proposed 138 kV interconnection (Option 2)