PJM Generator Interconnection Request
Queue #U1-058
Olive-Dumont (St. Joseph Power Station) 345kV
Feasibility Study

492504

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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,

General

Interconnection Customer (IC) proposes to install PJM Project #U1-058, a nominal 650 MW 2x1 combined cycle generating facility with a summer (92 degrees F) capability of 586 MW that will be connected to the American Electric Power (AEP) Olive-Dumont 345 kV circuit. The interconnection will be via a 5-breaker 345kV substation. The proposed location of the generating facilities and switching station is at 54555 Walnut Road, New Carlisle, St. Joseph County, Indiana (See Exhibit 1). The projected in-service date is scheduled for June 1, 2013.

Attachment Facilities

The Attachment Facilities will consist of a new in-line switching station located within 1 mile of AEP's Dumont – Olive 345kV line in Indiana. The new station will include five (5) 345 kV circuit breakers configured in a ring-bus arrangement with 345 kV metering (See Exhibit 2). AEP will retain ownership of the proposed in-line station facilities. It is understood that IC will be responsible for all costs associated with this construction, as well as facilities associated with connecting the 586 MW of generation to the in-line facilities.

It is expected that any right-of-way for line extensions, as well as a 400' x 400' (minimum) station site, will be provided to AEP by IC. Note that the IC station facilities and any facilities outside the new station are not included in the cost estimate. These are assumed to be IC's responsibility.

The AEP construction scope for the attachment facilities:

- Construction of a new switching station connecting to the Dumont – Olive 345 kV line, including 5-345 kV circuit breakers, relays, 345 kV metering, SCADA, and associated equipment.
  Estimated Cost (2008 Dollars)*: **$8,000,000**

- Construction of up to 1 mile of 345 kV line facilities to loop in and out of the new switching station from the Dumont – Olive 345 kV line.
  Estimated Cost (2008 Dollars)*: **$1,700,000 per mile**

- Due to the close proximity of the proposed switching station to the AEP 345 kV Olive Station, new line relays will be required at AEP's 345 kV Olive Station. As per AEP practices, a current differential protection scheme will be installed instead of the present carrier protection scheme. This will also require installation of fiber between the proposed switching station and AEP 345 kV Olive Station. **The cost of fiber cannot be determined as part of the feasibility study and would require site visit as well as detailed engineering and exact location of the new facilities. This cost will be provided as part of the impact study.**
  Estimated Cost of upgrading relays at Olive Station (2008 Dollars)*: **$350,000**

- Construction of the new switching station will also require upgrading line tuner set at AEP's 345 kV Dumont Station.
  Estimated Cost (2008 Dollars)*: **$15,000**

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

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 criterion was used to assess the impact of the proposed facility on the AEP System. The project was studied as a 586 MW net energy injection (586 MW capacity) consistent with the interconnection application. The results are summarized below.

Normal System (2011 Summer Conditions)

- AEP Olive 345/138 kV transformer #2 gets loaded to 99% (702 MVA) of its normal rating under system normal conditions. Without the addition of U1-058 Project, the same facilities are loaded to 90% (641 MVA) of normal rating.

- AEP New Carlisle – Olive 138 kV line gets loaded to 101% (251 MVA) of its normal rating under system normal conditions. Without the addition of U1-058, the same facilities are loaded to 92% (228 MVA) of normal rating.

Single Contingency (2011 Summer Conditions)

- Elements overloaded in the base case under normal conditions, as described in the above section, also remained overloaded for various single contingencies. No new limitations were identified.

Multiple Contingency (2011 Summer Conditions)

- Elements overloaded in the base case under normal conditions, as described in the above section, also remained overloaded for various single contingencies. No new limitations were identified.

Short Circuit Analysis

- The proposed generation project #U1-058 over-duties 345 kV circuit breaker CB-E at AEP Olive 345 kV Station. 345 kV CB-E duty increases from 89% to 102%.
  Estimated Cost to upgrade over-duty breaker (2008 Dollars)*: $650,000[1]

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

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.

Local/Network Upgrades

- AEP New Carlisle - Olive138 kV line is overloaded under system normal conditions with the addition of PJM Project #U1-058. Also, Olive 345/138 kV transformer is near 99% of its capability as a result of PJM Project #U1-058.

The normal rating of AEP New Carlisle – Olive 138 kV line is determined conductor rating of a 0.065 mile of section comprising of 795 ACSR. AEP proposes the replacement of the line section with 1033 ACSR which will improve the normal rating from 251 MVA to 289 MVA. The emergency rating will also improve from 335 MVA to 383 MVA.

The loading on the AEP Olive 345 kV transformer is 99% of its normal rating. Since the result is under 100% of the normal rating the transformer is not required to be replaced, however, there is a potential for the loading to increase when the Impact Study is done.

Replacement of the line section with a lower impedance conductor will decrease the overall impedance of AEP New Carlisle – Olive 138 kV line. Since the section is only 0.065 mile in length the change in impedance is negligible and therefore it does not impact the loading of the AEP Olive 345 kV Transformer.

- A transmission line structure analysis is required to analyze the strength and capability of existing structures. If the existing structures are able to support 1033 ACSR then the 0.065 mile section will be reconductored, or else the section will be rebuild. For estimating purposes the cost of rebuilding the line is shown since it is higher than the reconductoring cost.

[1] The existing breaker has free standing CT's. A new breaker will have bushing CT's as per AEP's standards which will eliminate the need for free standing CT's and will require installation of new disconnect switches.

Estimated Cost (2008 Dollars)*: **$115,000**

Network Impacts

The Queue Project #U1-58 was studied as a(n) 586MW (Capacity=586MW) injection at the Olive – Dumont 345 kV line in the AEP area. Project #U1-58 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)

1. **(AEP)** The Olive-New Carlisle 138kV line loads from 97.2% to 101.7% (DC power flow) of its emergency rating (335MVA) for the single line contingency outage (345-L6608-R-S). This project contributes approximately 15.0MW to cause this thermal violation.

Multiple Facility Contingency

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

1. **(AEP)** The Olive-New Carlisle 138kV line loads from 97.74% to 102.26% (DC power flow) of its emergency rating (335MVA) for the tower line outage (L6607_+_L6608). This project contributes approximately 15.1MW to cause this thermal violation.

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)

1. **(APS/BGE)** The Kemptown-North Northwest 500kV line loads from 197.58% to 199.59% (DC power flow) of its emergency rating (2901MVA) for the tower line outage (19). This project contributes approximately 58.4MW to the thermal violation.

New System Reinforcements

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

- The overload on the Olive-New Carlisle 138kV transmission line can be alleviated by reconductoring or rebuilding the circuit.

  A transmission line structure analysis is required to analyze the strength and capability of existing structures. If the existing structures are able to support 1033 ACSR then the 0.065 mile section will be reconductored, or else the section will be rebuild. For estimating purposes the cost of rebuilding the line is shown since it is higher than the reconductoring cost.
  Estimated Cost (2008 Dollars)*: **$115,000**

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)

1. The overload on the Kemptown-N. Northwest 500kV circuit can be alleviated by installing the following.

BGE Project Scope

Kemptown to North Northwest 500 kV line – Install 2 single circuit 500kV lines at an estimated cost of **$ 279 million** and estimated time of 10 yrs.

Assumptions:
New 350 ft. wide R/W parallels existing Northwest to Mt Airy Tap R/W
Total R/W length = 28.3 miles
3 - bundle 1,590 kcm conductor
Kemptown located 1/4 mile west of Mt Airy Tap
North Northwest located 4 miles north of Northwest

Substation Terminations (all in 2012 dollars):
NNW - Install a 3 breaker bay **$7.7M**
Kemptown - Install a 3 breaker bay **$7.7M**

APSProject Scope:

Purchase additional property, extend and grade the new yard for an approximately 250’ x 350’ fenced area. Install new fence, ground grid, yard stone, and access roads. Extend the existing 2-500kV cross buss, install 2-500kV line terminals with 4-500kV breakers. Install 4-500kV line

traps and 6-500kV CVT's. Install required controls cable, panels and equipment in the existing control building.

The project duration is 24 months. A plan is required 6 months prior to the project start.

Permitting and property purchase issues may delay the project.

The estimated cost for this work is $10,063,900

This design is subject to complete revamp as the study process progresses towards a realistic model of the generation interconnection in this study queue.

MISO Impacts

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