T158 Elk Garden-Junction 138kV
Generation Interconnection

General

The Interconnection Customer (IC), has proposed a 70 MW (14 MW capacity) wind generating facility to be located in Mineral County, West Virginia. T158 was studied as a 70 MW injection into the Allegheny Power (AP) transmission system at the PARR RUN-JUNCTION 138kV line. The project was evaluated for compliance with reliability criteria for summer peak conditions in 2012. The planned commercial in service date is November 30, 2010.

Point of Interconnection

T158 will interconnect with the Allegheny Power (AP) transmission system at the future New Creek Mountain 138kV switching station on the PARR RUN – JUNCTION line.

Direct Connection Requirements

Transmission Owner Scope of Direct Connection Work

The scope of work and estimated costs for the direct connection facilities is as follows:

New Creek Mountain switching station

1) Install a fourth 138 kV circuit breaker in the (future) New Creek Mountain switching station ring bus along with associated equipment.

2) Install 138 kV revenue metering on the feed to the generator.

The estimated cost to perform this work is **$778,000** in 2010 dollars.

Interconnection Customer Scope of Direct Connection Work

The Interconnection Customer will interconnect with the AP system by constructing a customer-owned 138 kV circuit from the T158 site to AP's New Creek Mountain switching station. It is assumed that the developer's station will be adjacent to AP's New Creek Mountain switching station and the interconnection is to be a rigid bus over the fence design. The above cost estimates do not include construction of that line. Route selection, line design, right-of-way acquisition and construction of such lines will be entirely the responsibility of the Interconnection Customer. It is assumed that the Interconnection Customer will provide a graded site including an access road if required. It is further assumed that the Interconnection Customer's step up transformer will conform to the AP standard of delta on the low side and grounded wye on the high side.

While we can't mandate that our personnel install protective relaying and communications equipment at the generator site, Allegheny Power has responsibility for designing the protection scheme and

providing specifications for all relays 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. Allegheny Power is also responsible for testing and calibrating all relays and performing all tests to assure that relaying at the generator site is properly installed and functional.

The estimated total cost of this engineering and field test effort is **$5,000 in 2010 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.

The estimated cost for Allegheny Power Controls Engineering to complete a coordination review of the area, develop new relay settings, and implement the required changes is approximately **$5,000 in 2010 dollars**.

It is assumed that a fiber optic interface will be used for the protection channel between the AP and developer's stations. The Interconnection Customer will be required to install metering and telemetry equipment to provide revenue metering and real-time telemetry data to PJM. The requirements for this equipment are listed in Appendix 2, Section 8 of Attachment O to the PJM Tariff, as well as PJM Manuals 01 and 14D. Protective relaying and metering design and installation must comply with the Allegheny Power Applicable Standards.

Cost and Timing Summary

If T158 is constructed in conjunction with R22 the estimated time to provide for the interconnection of this project is **24 months** after the receipt of a signed Interconnection Service Agreement and Construction Service Agreement. If constructed after R22 the estimated time is **18 months**.

While the information in this transmittal is reasonable for the scope of work defined, it should be noted however, that the cost figures are conceptual in nature at this stage, and that an engineering team has not yet been assigned to the project. Obviously, any change to the scope of work will require that the estimates be revisited. The costs are a best estimate, but the developer will be charged for actual costs. Any under-runs or over-runs will be reconciled at the conclusion of the project.

The estimates in this report do not include tax gross-up.

Network Impacts

Generator Deliverability

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

None

Multiple Facility Contingency

*(Double Circuit Tower Line contingencies only for the **full energy** output. Stuck breaker and bus fault contingencies will be performed for the System Impact Study)*

1. The 01CHEATL-01LKLYNN 138kV (APS) line loads from 95.94% to 100.85% (DC power flow) of its emergency rating (176 MVA) for the tower line outage (31). This project contributes approximately 8.6 MW to cause this thermal violation.

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)

2. The 01ALBRIG-01RUTHBL 138kV (APS) line loads from 104.22% to 109.13% (DC power flow) of its emergency rating (176 MVA) for the tower line outage (31). This project contributes approximately 8.6 MW to the thermal violation.

3. The 01RUTHBL-01CHEATL 138kV (APS) line loads from 101.84% to 106.74% (DC power flow) of its emergency rating (176 MVA) for the tower line outage (31). This project contributes approximately 8.6 MW to the thermal violation.

Short Circuit

No breakers were identified as being over their maximum interrupting rating.

Listed below are the positive and zero sequence source equivalent impedance at the proposed New Creek Mountain site with the GSU and generators OPEN.

Positive: (0.01325+j0.07317)
Zero: (0.00520+j0.05053)

Steady-State Voltage Requirements

Will be performed during the Queue T158 System Impact Study.

Stability and Reactive Power Requirements

Will be performed during the Queue T158 System Impact Study.

New System Reinforcements

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

1. To mitigate the 01CHEATL-01LKLYNN 138kV (APS) line overload would require the reconductor of approximately 2.00 miles with 954 ACSR. Due to the age of the line it is assumed

that a complete rebuild of the circuit will be required. The estimate to perform this work is **$740,000 in 2009 dollars** with **30 months** lead time.

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 System Impact Study)

2. To mitigate the 01ALBRIG-01RUTHBL 138kV (APS) line overload would require the reconductor of 1.46 miles of the Albright-Ruthbelle 138kV line with 954 ACSR and upgrade all necessary terminal equipment. The estimated cost to perform this work is **$487,000** in 2010 dollars.

3. To mitigate the 01RUTHBL-01CHEATL 138kV (APS) line overload would require the reconductor of 18.44 miles of the Ruthbelle-Cheat Lake 138kV line with 954 ACSR and upgrade all necessary terminal equipment. The estimated cost to perform this work is **$6,813,000** in 2010 dollars.

Delivery of Energy Portion of Interconnection Request

*(PJM also studied the delivery of the **full 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 Transmission Interconnection Request).*

As a result of the aggregate energy resources in the area, the following violations were identified. ***These are not required reinforcements.***

1. The NEWCRKMT-01JUNCTN 138kV (APS) line loads from 77.9% to 107.3% (DC power flow) of its emergency rating (201 MVA) for the single line contingency outage (APS-SB-78). This project contributes approximately 59.2 MW to the thermal congestion. To mitigate the overload would require the reconductor of 12.13 miles of the New Creek Mountain-Junction 138kV line with 954 ACSR and upgrade all necessary terminal equipment. The estimated cost to perform this work is **$4,100,000 in 2010 dollars**