

# **U3-025 Elk Garden – Parr Run 138kV Generation Interconnection**

## **General**

The Interconnection Customer (IC) has proposed an 80 MW energy (10.4 MW capacity) wind power generating facility to be located near Sulphur City, Mineral County, West Virginia. The project was evaluated for compliance with reliability criteria for summer peak conditions in 2012. The Attachment “N” planned in service date of the project is December 31, 2011.

U3-025 will interconnect to the Allegheny Power (AP) transmission system either via a tap of the Elk Garden-Parr Run 138kV circuit (Option 1) or as a direct connection into the substation being constructed for queue project N47 (Option 2).

## **Option 1**

### **Point of Interconnection**

U3-025 Option 1 will interconnect with the AP transmission system at the new Sulphur City 138kV substation which is a tap of the Elk Garden-Parr Run 138kV circuit approximately 2.8 miles east of the Elk Garden 138kV substation. Option 1 was studied as an 80 MW injection into the AP transmission system at the Elk Garden-Parr Run 138kV circuit.

## **Direct Connection Requirements**

### **Transmission Owner Scope of Direct Connection Work**

The Transmission Owner’s (Allegheny Power) scope of work for the direct connection facility includes:

- Sulphur City Substation: Obtain property at no cost to AP for an approximate 200’ x 210’ fenced area. Grade site and install fence, ground grid, yard stone and cable trough. Install 16’ x 28’ metal control building, SCADA and communications. Install three (3) 138kV breakers in a ring bus configuration, seven (7) 138kV disconnect switches, 138kV steel structures, three (3) 138kV deadend structures, 138kV metering, controls panels and equipment, and associated facilities. Cut the Albright-Parr Run 138kV circuit, approximately 2.6 miles from Parr Run and loop the line through the new Sulphur City 138kV substation using 954 kcmil ACSR.

**Estimated Cost: \$3,474,400 in 2011 dollars**

- Install facilities for transfer trip at Albright SS. Install 138kV line trap, CVT, transfer trip panel and associated equipment.

**Estimated Cost: \$156,000 in 2011 dollars**

- Install facilities for transfer trip at Parr Run SS. Install 138kV line trap, CVT, transfer trip panel and associated equipment.

**Estimated Cost: \$156,000 in 2011 dollars**

**Interconnection Customer Scope of Direct Connection Work**

The Interconnection Customer (IC) has assumed full responsibility for the design and construction of all facilities associated with the U3-025 generating facility and the 138kV direct connection line on the IC side of the Point of Interconnection (POI). The IC will interconnect U3-025 with the AP transmission system by constructing a customer-owned 138kV line from the generating facility site to AP's Sulphur City 138kV substation. Route selection, line design, right-of-way acquisition and construction of such lines will be entirely the responsibility of the IC. Cost estimates do not include construction of that line. It is assumed that the IC's step up transformer will conform to the AP standard of delta on the low side and grounded wye on the high side. It is further assumed that a fiber optic interface will be used for the protection channel between the AP and developer's stations.

The IC 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**

While the information in this transmittal is reasonable for the scope of work defined, it should be noted 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 cost estimates in this report do not include tax gross-up, land acquisition, or any network upgrades which may have been identified and required by this project.

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.

**Network Impacts**

Potential network impacts are as follows:

**Generator Deliverability**

*(Single or N-1 contingencies for the **Capacity** output of the interconnection)*

None

### **Multiple Facility Contingency**

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

None

### **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

### **Short Circuit**

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

While Allegheny Power can't mandate that their personnel install protective relaying and communications equipment at the generator site, AP has the 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 substation. 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**.

### **Stability and Reactive Power Requirements**

Will be performed during the Queue U3-025 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)*

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 System Impact Study)*

None

### **Delivery of Energy Portion of Interconnection Request**

*PJM also studied the delivery of the energy portion of this interconnection request with all earlier queues at their energy output and the system at peak load with all transmission facilities in service. Any problems identified below may result in operational restrictions to the project under study or other PJM generation. There may also be other conditions causing congestion which were not studied. The developer can proceed with network upgrades to eliminate the potential congestion at their discretion by submitting a Merchant Transmission Interconnection request now or in the future.*

***These are not required reliability upgrades.***

*As a result of the aggregate energy resources in the area, the following potential congestion was identified:*

None

## **Option 2**

### **Point of Interconnection**

U3-025 Option 2 will interconnect with the AP transmission system at the future N47 138kV substation adjacent to the existing Albright-Black Oak 138kV circuit. Option 2 was studied as an 80 MW injection into the AP transmission system at the N47 138kV substation.

### **Direct Connection Requirements**

#### **Transmission Owner Scope of Direct Connection Work**

The Transmission Owner's (Allegheny Power) scope of work for the direct connection facility includes:

Assuming that the N47 interconnection facilities are built as planned, and that the U3-025 project connects to those facilities via a three breaker ring bus, the proposed Cross School substation detailed in project N47 will require no enhancement.

**Estimated Cost: \$0**

### **Interconnection Customer Scope of Direct Connection Work**

The Interconnection Customer (IC) has assumed full responsibility for the design and construction of all facilities associated with the U3-025 generating facility and the 138kV direct connection line on the IC side of the POI. The IC will interconnect U3-025 with the AP system by constructing a customer-owned 138kV line from the generating facility site to AP's new N47 138kV substation. Route selection, line design, right-of-way acquisition and construction of such lines will be entirely the responsibility of the IC. Cost estimates do not include construction of that line. It is assumed that the IC's step up transformer will conform to the AP standard of delta on the low side and grounded wye on the high side. It is further assumed that a fiber optic interface will be used for the protection channel between the AP and developer's stations.

The IC 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**

While the information in this transmittal is reasonable for the scope of work defined it should be noted 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 cost estimates in this report do not include tax gross-up or any network upgrades which may have been identified and required by this project.

The estimated time to provide for the interconnection of this project is **contingent** upon the schedule for queue project N47.

### **Network Impacts**

Potential network impacts are as follows:

#### **Generator Deliverability**

*(Single or N-1 contingencies for the **full energy** output of the interconnection request)*

None

#### **Multiple Facility Contingency**

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

None

### **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. The 01BLACKO 138/500 kV transformer (APS) (bus# 20446-20103 ckt 3) loads from 107.91% to 117.74% of its emergency rating (437 MVA) for tower line outage contingency (37). This project contributes approximately 42.94 MW to cause this thermal violation.

### **Short Circuit**

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

While Allegheny Power can't mandate that their personnel install protective relaying and communications equipment at the generator site, AP has the 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 substation. 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**.

### **Stability and Reactive Power Requirements**

Will be performed during the Queue U3-025 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)*

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 System Impact Study)*

1. To mitigate the 01BLACKO 138/500 kV transformer (APS) overload would require the installation of a second 500/138kV, 210/280/350 MVA, LTC transformer, a new 500kV breaker, 138kV metering, and two (2) new 138kV breakers. It will also require the upgrade of all bus work, connectors, and disconnect switches as necessary. The estimated cost to perform this work is **\$9,600,000** and will take **27 months** to complete after the receipt of a fully executed Interconnection Service Agreement and Construction Service Agreement.

### **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 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 Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.*

***These are not required reliability upgrades.***

*As a result of the aggregate energy resources in the area, the following potential congestion was identified:*

1. The 01ALBRIG-01KINGWD 138kV (APS) (bus# 20120-20356) line loads from 112.35% to 121.07% (DC power flow) of its emergency rating (176 MVA) for the single line contingency outage (AP128\_OP). This project contributes approximately 15.33 MW to the thermal congestion. To mitigate this overload would require the reconductor of 4.0 miles of 556 ACSR from Albright substation to Kingwood substation with 954 ACSR. The estimated cost to perform this work is **\$1,540,000** and will take **24 months** to complete after the receipt of a fully executed Interconnection Service Agreement and Construction Service Agreement.
2. The 01KINGWD- 01PRNTY 138kV (APS) (bus# 20356-20391) line loads from 102.84% to 111.55% (DC power flow) of its emergency rating (176 MVA) for the single line contingency outage (AP128\_OP). This project contributes approximately 15.33 MW to the thermal congestion. To mitigate this overload would require the replacement of structures to eliminate clearance de-rate for portions of the 21.28 miles of 556 ACSR conductor from Kingwood substation to Pruntytown substation. The estimated cost and time to perform this work has not yet been determined.