U1-079 Opekiska Lock and Dam
Generation Interconnection

General

The Interconnection Customer (IC) has proposed a 10 MW (10 MW capacity) hydro power generating facility be located at the Opekiska Lock and Dam in Opekiska, Monongalia County, West Virginia. U1-079 will interconnect with the APS system at the future Opekiska Dam substation on either the 23kV (Option 1) or the 138kV (Option 2) system. The project was evaluated for compliance with reliability criteria for summer peak conditions in 2012. The planned in service date is June 1, 2015.

Option 1

Point of Interconnection

U1-079 Option 1 will interconnect with the Allegheny Power distribution system at the future Opekiska Dam 23kV substation on the existing Georgetown-Pharoah Run line. Option 1 was studied as a 10 MW injection at the AP Price Hill-Brady 23kV substation.

Direct Connection Requirements

Transmission Owner Scope of Direct Connection Work

The Transmission Owner's scope of work for the direct connection facility includes constructing the new Opekiska Dam 23kV substation. The Georgetown-Pharoah Run 23kV line will be tapped to serve the new Opekiska Dam substation between the Indian Creek Tap and Georgetown Tap. Major equipment in the new substation will include: one (1) 23kV circuit breaker, one (1) 23kV vertical break switch, 23kV metering and associated facilities. The substation will also include a control building, which will house all protective relaying, metering and SCADA RTU communications equipment required to accommodate the electrical facilities. Site preparation including grading and an access road is included in the estimate.

> The estimated cost to perform this work is **$812,000 in 2015 dollars**. 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.

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 U1-079 generating station and the 23kV direct connection line on the IC side of the POI. The IC will interconnect U1-079 with the AP system by constructing a customer-owned 23kV circuit (approximately 4,900' in length) from the generating station site to AP's new Opekiska Dam 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 ICs 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 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 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.

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)*

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.

Listed below are the positive and zero sequence source equivalent impedance at the proposed Opekiska Dam substation site with the GSU and generators OPEN.

Positive: (0.16674+j0.60191)
Zero: (0.36989+j2.28428)

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

Steady-State Voltage Requirements

Will be performed during the Queue U1-079 System Impact Study.

Stability and Reactive Power Requirements

Will be performed during the Queue U1-079 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

Other Supporting Facility Charge

The Other Supporting Facilities Charges may include non-transmission facilities directly assigned and/or a general (rolled-in) facilities charge. The guidelines apply to all wholesale customers and all generators selling into or through the PJM Market, regardless of capacity, not connected directly to the AP Transmission System.

The Other Supporting Facilities Charge for the U1-079 generator interconnection project has been estimated to be **$6,000/month in 2008 dollars**. The estimate is based on an average (or rolled-in) rate for Monongahela Power's sub-transmission system, which may or may not reflect the charge determined under a direct assignment methodology for radial facilities.

Option 2

Point of Interconnection

U1-079 Option 2 will interconnect with the Allegheny Power (AP) transmission system at the future Opekiska Dam 138kV substation on the existing Rivesville-Westover line. Option 2 was studied as a 10 MW injection at the Westover 138kV substation.

Direct Connection Requirements

Transmission Owner Scope of Direct Connection Work

The Transmission Owner's scope of work for the direct connection facility includes constructing the new Opekiska Dam 138kV substation in a three (3) breaker ring bus configuration. The Rivesville-Westover 138kV line will be looped into the new Opekiska Dam substation approximately 4 miles from the Rivesville substation. Major equipment in the new substation will include: three (3) line dead end structures, three (3) 138kV circuit breakers, seven (7) 138kV air switches, and 138V metering and associated facilities. The substation will also include a control building, which will house all protective relaying, metering and SCADA RTU communications equipment required to accommodate the electrical facilities. Site preparation including grading and an access road is included in the estimate.

> The estimated cost to perform this work is **$3,004,000 in 2015 dollars**. 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.

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 U1-079 generating station and the 138kV direct connection line on the IC side of the POI. The IC will interconnect U1-079 with the AP system by constructing a customer-owned 138kV circuit (approximately 4,900' in length) from the generating station site to AP's new Opekiska Dam 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 ICs 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 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 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.

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)*

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.

Listed below are the positive and zero sequence source equivalent impedance at the proposed Opekiska Dam substation site with the GSU and generators OPEN.

Positive: (0.00501+j0.02966)
Zero: (0.01266+j0.05974)

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

Steady-State Voltage Requirements

Will be performed during the Queue U1-079 System Impact Study.

Stability and Reactive Power Requirements

Will be performed during the Queue U1-079 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