

***Generation Interconnection  
PJM Combined Feasibility/Impact Study  
and  
APS Feasibility Study Report***

***For***

***PJM Generation Interconnection Request  
Queue Position W1-080***

***Sutton Dam Project***

## **Overview**

Sutton Hydroelectric Company, LLC (IC) has submitted an Attachment N to propose the interconnection of 9.9 MW of hydroelectric generation for the purpose of selling up to 9.9 MW energy and 9.9 MW of Capacity into the PJM market. The Commercial Operation date for this project was requested to be December 31, 2012. The base year for the analysis of this project was 2014.

Since this project is FERC non-jurisdictional, this report will present a combined feasibility/impact study prepared by PJM, followed by a feasibility study prepared by the Transmission Owner, APS.

## **PJM Combined Feasibility/Impact Study Report**

### **Network Impacts**

Queue project W1-080 was studied as a 9.9MW capacity injection into APS's system at the Sutton Hill 138kV substation. Project W1-080 was evaluated for compliance with reliability criteria for summer peak conditions in 2014. Potential network impacts were as follows:

#### **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 Contingencies only with full energy output. Stuck Breaker and Bus Fault contingencies will be applied during the Impact Study)

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.)

No problems identified.

#### **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.

#### **Short Circuit**

Not required as part of PJM analysis.

**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.

No problems identified.

## APS Feasibility Study Report

This feasibility study has been prepared for PJM queue project W1-080 (Sutton Dam Project) by Allegheny Power

### Injection at the Sutton Hill 138/69kV Substation on the 69kV Bus Attachment Facilities and Related Network Upgrades

- At Sutton Hill SS, expand the existing yard and fence for an additional area of approximately 20' x 80'. Install a new 16' x 20' metal control building for new panels. Relocate the access road. Install 1-69kV initial bay, 1-2000A, 69kV transformer breaker, 1-2000A, 69kV line breaker, 12-69kV hookstick disconnects, 1-69kV vertical break switch, 69kV metering CT's and VT's, 69kV fuses, arresters, 69kV line trap and CVT, foundations, structures, grounding, control panels and cables, and associated material. Install 138kV and 69kV transfer trip facilities, including 1-138kV CVT, 1-69kV CVT, and 1-138kV line trap. Assume connection to the IC is by an overhead 69kV line. A fiber optic link is required between the Sutton Hill Substation and the IC. Note: All property associated with expansion of the station must be obtained by the IC and conveyed to AP, at no cost, in the form of either a perpetual lease or direct ownership. All rights-of-way must be obtained by the IC and transferred, at no cost, to AP.

**Estimated Cost: \$1,252,720 in 2013 dollars**

- Install 69kV power line carrier transfer trip facilities at Buckhannon substation.  
**Estimated Cost: \$110,048 in 2013 dollars**
- Install 69kV power line carrier transfer trip facilities at Crooked Fork substation.  
**Estimated Cost: \$110,048 in 2013 dollars**
- Install 138kV transfer trip facilities at French Creek substation.  
**Estimated Cost: \$48,533 in 2013 dollars**
- Install 138kV transfer trip facilities at Sutton substation.  
**Estimated Cost: \$48,533 in 2013 dollars**
- Install 138kV transfer trip facilities at Powell Mountain substation.  
**Estimated Cost: \$48,533 in 2013 dollars**

The estimated project duration is **18 months** after the receipt of an executed Interconnection Agreement and Construction Agreement. Permitting issues may delay this estimated project duration.

While the information in this report is reasonable for the scope of work defined, it should, however, be noted that the cost figures are conceptual in nature at this stage, as an engineering team has not 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 IC 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.

The IC will interconnect with the Allegheny Power (AP) system via overhead line from a customer owned substation located approximately one mile to the existing Sutton Hill Substation. The above cost estimates do not include construction of that line. Route selection, line design, rights-of-way acquisition and construction of such lines will be entirely the responsibility of the IC. It is assumed that the IC's main step up transformer will conform to the AP standard with delta on the low side and grounded wye on the high side as illustrated in the AP Engineering Manual:

[http://www.alleghenypower.com/PowerQuality/Attachments/e1936\\_00.pdf](http://www.alleghenypower.com/PowerQuality/Attachments/e1936_00.pdf).

### **Short Circuit**

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

AP reserves the right to review the electrical protection design and relay settings for IC facilities to ensure that the protective relaying equipment will be compatible with that installed at the new switching station. The relaying package will likely include both primary and backup protection. AP personnel must be present at the time of commissioning to inspect and witness proper function of the control scheme and related coordination. The estimated cost to perform this engineering review and field test effort is **\$5,000 in 2011 dollars**.

*Note: The purchase and installation of protective relaying and associated equipment at the generation site is the responsibility of the IC and is not included in this scope of work.*

It is assumed that a fiber optic interface will be used for the protection channel between the AP and IC 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 AP applicable standards.

### **Overloads and Required Reinforcements**

No Generator Deliverability overloads were identified.

### **Other Supporting Facilities Charge**

The Other Supporting Facilities Charge (OSFC) 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 W1-080 generator interconnection project has been estimated to be **\$5,940/month** in 2010 dollars. The estimate is based on an average (or rolled-in) rate for Monongahela Power's sub-transmission system.

**Please note, since U1-075 and W1-080 are the same projects with different points of interconnection, it is understood that ultimately only one (or neither) project will go forward. Therefore, this report includes system protection (transfer trip) equipment that would have been assumed to be a part of the U1-075 interconnection project.**

## Single Line Diagram

### PJM Queue W1-080

### Sutton Hydroelectric Company, LLC

9.9 MW will be connected to the 69 kV bus (as shown)

#### Direct Attachment Facilities – Sutton Hill

Expand the existing yard and fence for an additional area of approximately 20' x 80' and relocate the access road. Install 1-69kV line breaker, 69kV metering, and associated facilities. Install 1-69kV transformer breaker and 69kV bus differential relaying. Install a new 16' x 20' metal control building for new panels.

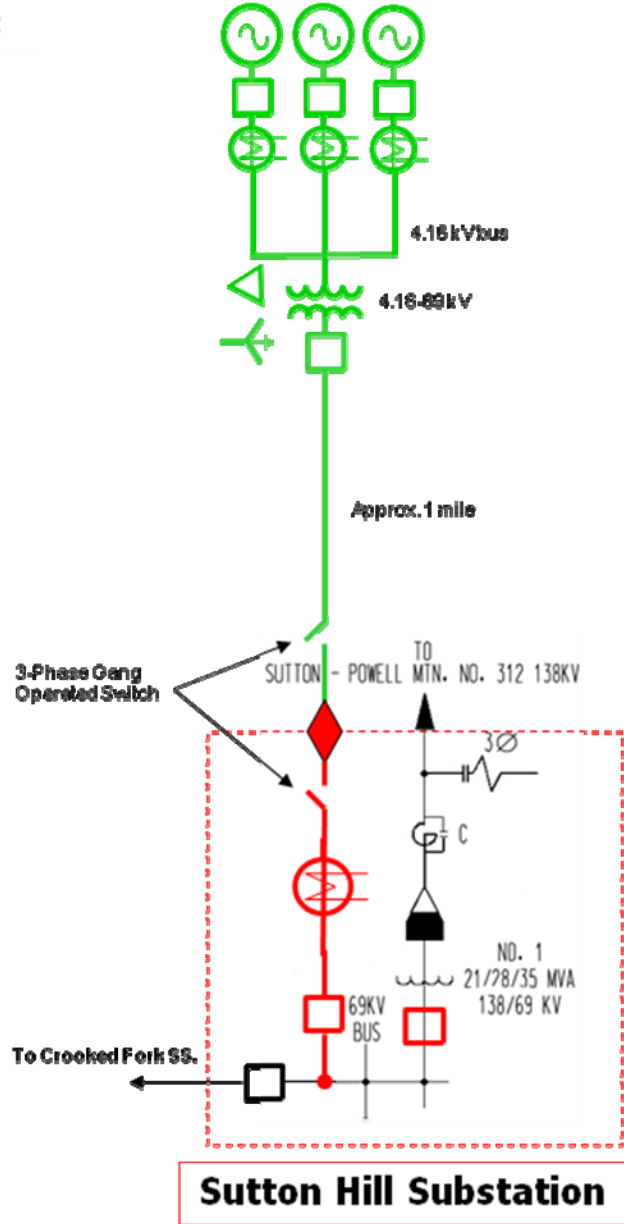
#### Network Upgrades

Install a 69kV and 138kV anti-islanding (transfer trip) scheme with logic such that the W1-080 GIP shall be taken offline for the loss of both the 138kV system and the 69kV system.

**69kV Anti-Islanding:** Install transfer trip equipment and line traps in Buckhannon, Crooked Fork, and Sutton Hill substations.

**138kV Anti-Islanding:** Install transfer trip equipment in French Creek, Sutton, Sutton Hill, and Powell Mountain substations.

9.9 MW Total Injection



AP	
Sutton Hydroelectric Company, LLC	
Existing Equipment	
POINT OF INTERCONNECTION	

DOWPCB C&E FILE W1-080.ppt PREPARED APPROVED DATE	 <b>Allegheny Power</b> PLAN  <b>SUTTON HILL SUBSTATION</b> <b>PROVIDE INTERCONNECTION FACILITIES FOR</b> <b>SUTTON HYDROELECTRIC COMPANY, LLC</b> <b>GASSAWAY SERVICE CENTER</b>	DATE 07/02/2010 G. Marchevka CREDIT SCALE NS FUNDING PROJECT	PLAN NUMBER FEAS
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