Generation Interconnection Feasibility Study Report Web Version

For

PJM Generation Interconnection Request Queue Position W1-052

Keller and Valley Camp Roads II Project

PJM DOCS No. 605679 v1
July, 2010

Overview

Interconnection Customer (IC) has submitted an Attachment N to propose the interconnection of 20 MW of PV solar generation in Franklin County, Pennsylvania for the purpose of selling up to 20 MW energy and 7.6 MW of Capacity into the PJM market via the Allegheny Power network. The Commercial Operation date for this project was requested to be December 31, 2011. The analysis was performed using a 2014 base year. By virtue of the developer's seeking QF status, this is a FERC jurisdictional interconnection.

PJM Feasibility Analysis Report

Network Impacts

Queue project W1-052 was studied as a 20.0MW (7.6MW of which is Capacity) injection into APS's system at two points of interconnection. The primary point of interconnection is at the Upton 34.5kV substation, and the secondary point of interconnection is at the St. Thomas 34.5kV substation. Project W1-052 was evaluated for compliance with reliability criteria for summer peak conditions in 2014. Potential network impacts were as follows:

Primary POI: Upton 34.5kV

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.

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.

Secondary POI: St. Thomas 34.5kV

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.

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 Analysis Report

This portion of this Feasibility Study Report has been prepared for PJM queue project W1-052 by Allegheny Power.

Primary POI: Injection at the Upton 34.5kV bus

Attachment Facilities and Related Network Upgrades

- No new facilities are necessary, assuming all facilities for the W1-014 project have been installed.

While the information in this transmittal 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 utilizing facilities constructed for the interconnection of W1_014. 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.

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 2012 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

1. During several contingencies, the local area experiences a voltage collapse. Furthermore, the addition of generation causes a large voltage deviation in the local area.
    - **Reinforcement:** Install a 25 MVAr 34.5kV SVC at Upton SS.
    - **Estimated Cost:** $3,827,845 in 2011 dollars
    - **Estimate Project Duration:** 18 months after receipt of an executed Interconnection Service Agreement and Construction Service Agreement.

Please note: the cost of this reinforcement will be shared with the W1-014 project.

2. The MILNOR-ROUTE 16 34.5kV line loads to 107% (AC power flow) of its emergency rating (36.9 MVA) for the loss of the MERCERSB-UPTON 34.5kV line. This project contributes approximately 1.29 MW to cause this thermal violation.
    - **Reinforcement:** Reconductor 1.25 miles of the MILNOR-ROUTE 16 34.5kV line with 795 AAC conductor. Upgrade the air switches at Route 16 tap. Upgrade the terminal equipment at Milnor and Mercersburg substations.
    - **Estimated Cost:** $369,262 in 2011 dollars
    - **Estimated Project Duration:** 18 months after receipt of an executed Interconnection Service Agreement and Construction Service Agreement.

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_052 generator interconnection project has been estimated to be **$10,800/month** in 2010 dollars. The estimate is based on a direct assigned rate and an average (or rolled-in) rate for West Penn's sub-transmission system.

Secondary POI: Injection at the St. Thomas 34.5kV bus

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 Lime Kiln substation. 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 2012 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

1. During several contingencies, the local area experiences a voltage collapse.

Note: Reactive support was included in the load flow case to eliminate the voltage collapse in order to further study the impact of this generator on the system. This reactive support was not "optimized", as reinforcements are not studied for option 2 POIs. Therefore, additional (or fewer) overloads may occur during further study of this option.

2. The GUILFORD-W1-013 TAP 34.5kV line loads to 100.3% of its emergency rating (36.8 MVA) for the loss of the LEMASTER-MERCERSB 34.5kV line. This project contributes approximately 0.02 MW to this thermal violation.

3. The LEMASTER-MERCERSB 34.5kV line loads to 231% of its emergency rating (19.1 MVA) for the loss of the FT. LOUD-LEMASTER 34.5kV line. This project contributes approximately 4.17 MW to this thermal violation.

4. The voltage at the WILLIAMS 34.5kV bus drops 5.15 p.u. for the loss of the MARLOWE-WILLIAMS 34.5kV line.

5. The voltage at the OLDTOWN 34.5kV bus drops 5.34 p.u. for the loss of the OLDTOWN-SWAN PON 34.5kV line.

Please note, during the impact study AP will perform a study of the effect of harmonics from solar inverters on its system, as well as a "time-based study" to determine any loading effects on its system (i.e. a passing cloud causing a change in area generation resulting in a voltage deviation). These studies may require the use of an external consultant.