Generation Interconnection Combined Feasibility/System Impact Study Report

For

PJM Generation Interconnection Request Queue Position V4-053

Double Tollgate 138kV

April 2010

Preface

The intent of the Combined Feasibilty/System Impact Study is to determine a plan, with approximate cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by the Interconnection Customer. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: Network or Local Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM or Interconnected Transmission Owner system. All facilities required for interconnection of a generation interconnection project must be designed to meet the technical specifications (on PJM web site) for the appropriate Interconnected Transmission Owner.

In some instances an Interconnection Customer may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection or merchant transmission upgrade, may also contribute to the need for the same network reinforcement. The possibility of sharing the reinforcement costs with other projects may be identified in the Feasibility Study, but the actual allocation will be deferred until the System Impact Study is performed.

The Combined Feasibility/System Impact Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study. The project developer must secure and convey any property or rights-of-way necessary for the Transmission Owner to construct, operate, and maintain their facilities. This conveyance must be in the form of either a deed or a permanent easement.

General

CornerStone Power Clarke County, LLC, the Interconnection Customer (IC), has proposed a 20 MW (7.6 MW capacity) solar powered generating facility to be located at the northeast corner of Double Tollgate Road and Highway 522 in Clarke County, Virginia. The project will consist of ground mounted fixed axis solar photovoltaic arrays with twenty (20) inverters. V4-053 was studied as a 20 MW (7.6 MW of which was capacity) injection into the 138kV Allegheny Power System at the Double Tollgate substation. The project was studied on a combined feasibility-impact basis which utilizes an AC analysis, and incorporates all contingency types. Project V4-053 was evaluated for compliance with reliability criteria for summer peak conditions in 2014. The current in-service date for the project is November 1, 2011.

Point of Interconnection

V4-053 will interconnect with the Allegheny Power (AP) transmission system at the Double Tollgate 138kV substation (see Attachment 1).

Direct Connection Requirements

Transmission Owner Scope of Direct Connection Work

The Transmission Owner's (AP) scope of work includes:

Attachment Facilities

Double Tollgate 138kV Substation

- At Double Tollgate SS, grade yard and extend the fence approximately 20 feet to the North. Extend the 138kV "A" bus. Note: Station expansion will require the purchase of additional property to the north of the station. This property shall be provided by the IC at no cost to AP in the form of either direct ownership or a perpetual lease. Install 138kV structures, foundations, and ground grid. Relocate the existing 138kV capacitor, reactors and switch to an adjacent position on the 138kV "A" bus. Install 1-138kV deadend structure, 1-138kV breaker, 3-138kV disconnect switches, 138kV metering, 3-138kV CVT's, control cables and panels, and associated equipment.

- Connection to the IC via an overhead 138kV line. If the IC installs an underground 138kV line from their facility to Double Tollgate SS, the IC is to install a 138kV terminal structure outside the Double Tollgate station fence and enter the station with an overhead 138kV span. The IC is required to install a fiberoptic link between Double Tollgate SS and V4-053.

  The estimated cost to perform this work is **$1,953,535** in 2011 dollars. (PJM Network Upgrade Number n1899)

Network Upgrades

No required network upgrades were identified.

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 **$10,000 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.

Interconnection Customer Scope of Direct Connection Work

The IC will interconnect with the Allegheny Power (AP) system via overhead line from a customer owned substation located adjacent to AP's 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 Facility Connection Manual:

http://www.alleghenypower.com/Bus2Bus/Gen%20Trans%20AP%20Facility%20Connection%20Requirements.pdf

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.

Cost and Timing Summary

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 estimated project duration is **21 months** after the receipt of an executed Interconnection Service Agreement and Construction Service Agreement. Property purchase and permitting may delay this estimated project duration.

Network Impacts

Potential network impacts are as follows:

Generator Deliverability

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

None

Multiple Facility Contingency

*(Double Circuit Tower Line, Line with Failed Breaker and, Bus Fault contingencies for the **Full** energy output.*

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 problems identified.

New System Reinforcements

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

None

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project.

None

Stability Analysis

Not required.

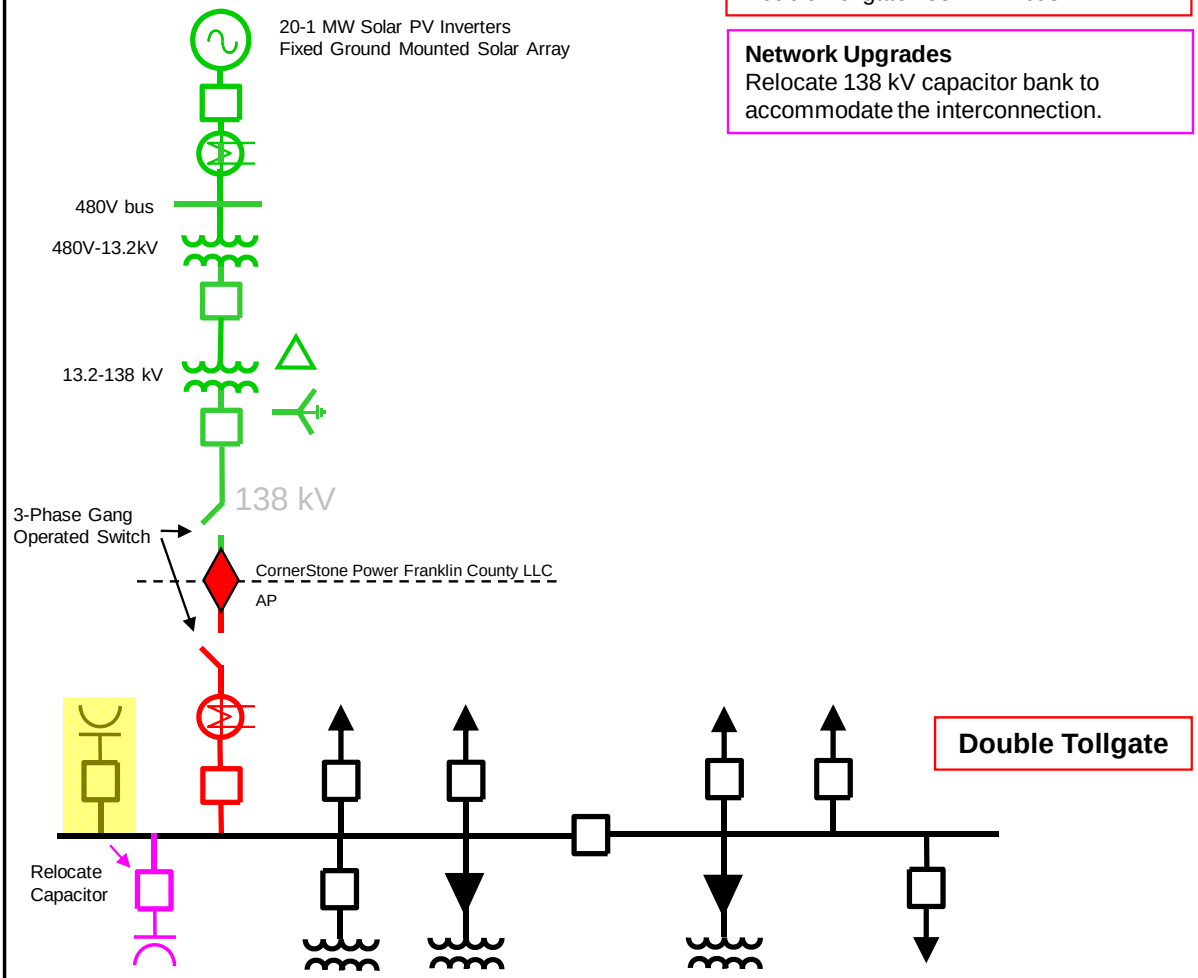
CornerStone Power Clarke County LLC

PJM Queue V4-053

20-1MW Solar PV inverters will be connected (as shown) for a total generating capability of **20 MW.**

Direct Attachment Facilities
Install a 3-phase gang operated switch, 138kV meter, and 138kV breaker on the Double Tollgate 138kV "A" bus.

Network Upgrades
Relocate 138 kV capacitor bank to accommodate the interconnection.



AP	
Relocate	
CornerStone Power Clarke County, LLC	
POINT OF INTERCONNECTION	

SOURCE R. Boyd	Allegheny Power PLAN	DRAWN 3/4/2010 G. Marchewka	PLAN NUMBER
CAD FILE V4_053 Clarke County Solar.ppt		CHKD	
REVIEWED	DOUBLE TOLLGATE SUBSTATION PROVIDE INTERCONNECTION FACILITIES FOR CORNERSTONE POWER CLARKE COUNTY LLC WINCHESTER SERVICE CENTER	SCALE NS	
APPROVED DATE		FUNDING PROJECT	REV SIS