

***Generation Interconnection
Feasibility Study Report***

For

***PJM Generation Interconnection Request
Queue Position AC1-147***

***Grassfield 34.5kV
12.6 MW Capacity / 20 MW Energy***

April / 2017

Introduction

This Feasibility Study has been prepared in accordance with the PJM Open Access Transmission Tariff, 36.2, as well as the Feasibility Study Agreement between the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is Virginia Electric and Power Company (VEPCO).

Preface

The intent of the Feasibility Study is to determine a plan, with high level estimated cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the IC. The IC may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the IC may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, 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 Impact Study is performed.

The Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The IC is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by ITO, the costs may be included in the study.

General

The IC has proposed a solar generating facility located in Chesapeake, VA (City of Chesapeake). The installed facilities will have a total capability of 20 MW with 12.6 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is 10/31/2018.

This study does not imply an ITO commitment to this in-service date.

Point of Interconnection

AC1-147 will interconnect with the ITO distribution system via a tap on to the Grassfield 34.5kV circuit #424.

Attachment facilities and local upgrades (if required) along with terms and conditions to interconnect AC1-147 will be specified in a separate two party Interconnection Agreement (IA) between ITO and the IC as this project is considered FERC non-jurisdictional per the PJM Open Access Transmission Tariff (OATT). From the transmission system perspective, no network impacts were identified as detailed below.

Transmission Owner Scope of Work

A 34.5kV line is located near the IC's site and the requested POI. The proposed 34.5 kV circuit # 424 will be served from a 33.6 MVA, 115/34.5 kV transformer in Grassfield Substation.

Attachment Facilities

To provide the interconnection the ITO will need to install approximately 300 feet of overhead three phase primary voltage conductors will be installed to provide an interconnection to the existing primary voltage conductors. A pole mounted electronic recloser, pole mounted primary bi-directional metering equipment, a power quality monitoring relay and a set of disconnects to provide an isolation point will also be provided. The estimated cost of these attachment facilities is 300,000. These costs do not include CIAC Tax Gross-up. The single line is shown below in Attachment 1.

Non-Direct Connection Cost Estimate

Grassfield Substation Upgrades - \$300,000

- Replace load side regulator controls with controls capable of regulation under reverse flow conditions

Hickory Distribution Upgrades – \$65,800

- Replace various upline fuses/cutouts

The estimated cost of these required System Upgrades to accommodate the 20 MW request is **\$665,800**. Estimated time for engineering, material acquisition, and construction: **12 months**

Remote Terminal Work: During the Facilities Study, ITO's System Protection Engineering Department will review transmission line protection as well as anti-islanding required to accommodate the new generation and interconnection substation. System Protection Engineering will determine the minimal acceptable protection requirements to reliably interconnect the proposed generating facility with the transmission system. The review is based on maintaining system reliability by reviewing ITO's protection requirements with the known transmission system configuration which includes generating facilities in the area. This review may determine that transmission line protection and communication upgrades are required at remote substations.

Interconnection Customer Requirements

ITO's Facility Connection Requirements as posted on PJM's website

<http://www.pjm.com/~media/planning/plan-standards/private-dominion/facility-connection-requirements1.ashx>

The ITO's preferred transformer configuration is wye grounded (primary)/delta (secondary) with provisions for external resistance grounding of the primary with the level of resistance to be determined by the IC and approved by the ITO. If a wye (primary)/wye (secondary) transformer configuration is utilized the IC will apply a ground bank configured transformer [zig-zag or wye (interconnection side) – delta (floated)] at (near) the point where the generation is connected.

Additionally, the ITO will require the IC to provide specific inverter information including the model and parameter data required for a short-circuit analysis including Positive, Negative and Zero Sequence Resistance and Reactance for the initial 4 to 6 cycles.

Revenue Metering and SCADA Requirements

PJM Requirements

The IC will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Sections 24.1 and 24.2.

PJM Analysis

PJM has completed the alternate queue process for this request and determined that these projects have no impacts to the Transmission System.