

**PJM Generator Interconnection  
Y1-073 Riders Creek 115 kV  
7.6 MW Capacity / 20 MW Energy  
Feasibility Study Report**

*July 2012  
DMS #709151v1*

## **Introduction**

This Feasibility Study has been prepared in accordance with the PJM Open Access Transmission Tariff, §36.2 and §110, as well as the Feasibility Study Agreement between Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is Virginia Electric and Power Company.

## **Preface**

The intent of this Feasibility Study is to determine a plan, with preliminary cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by IC. As a requirement for interconnection, IC may be responsible for the cost of constructing Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM and the underlying system. All facilities required for interconnection of a generation interconnection project must be designed to meet ITO technical specifications.

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. IC is responsible for its right of way, real estate, and construction permit issues.

## **General**

The queue project Y1-073 was studied as a 20 MW (7.6 MW Capacity) solar injection at Riders Creek 115 kV substation in to the ITO area. Project Y1-073 was evaluated for compliance with reliability criteria for summer peak conditions in 2015. The project's interconnection is not jurisdictional to FERC, thus IC and ITO will determine the distribution upgrades through the state's interconnection process. This study focuses only on the potential transmission system network impacts, which were identified as follows:

### **Network Impacts:**

#### **Impactful Contingencies**

*(The following contingencies resulted in overloads identified below)*

None.

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

None.

### **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.)

None.

### **Short Circuit**

(Report Overduty breakers here)

No over-duty breakers were identified.

### **Stability and Reactive Power Requirement**

(Results of the dynamic studies should be inserted here)

Not required.

### **Delivery of Energy Portion of Interconnection Request**

PJM also studied the delivery of the energy portion of this interconnection request. Any 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 Merchant Transmission Interconnection request. 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 will study all overload conditions associated with the overloaded element(s) identified.

1. The Y1-043 TAP-3MACKEYS 115 kV line (from bus 913340 to bus 314586 ckt 1) loads from 90.37% to 102.37% (AC power flow) of its emergency rating (142 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('LN 101\_B'). This project contributes approximately 20 MW to the thermal violation.

```
CONTINGENCY 'LN 101_B'                               /*, MACKEYS - RIDERS CREEK- RADIAL
OPEN BRANCH FROM BUS 913340 TO BUS 314566 CKT 1    /*MACKEYS - CRESWELL
OPEN BRANCH FROM BUS 314566 TO BUS 314597 CKT 1    /*CRESWELL - RIDERS CREEK
END
```

See mitigation under ITO section.

2. The 8LOUDOUN-8BRAMBLETON 500 kV line (from bus 314913 to bus 314933 ckt 1) loads from 106.8% to 106.81% (AC power flow) of its emergency rating (2323 MVA) for the single line contingency outage of CONTINGENCY DESCRIPTION ('WELTONSP\_KEMPTOWN'). This project contributes approximately 2.43 MW to the thermal violation.

```
CONTINGENCY 'WELTONSP_KEMPTOWN'
DISCONNECT BRANCH FROM BUS 235634 TO BUS 235636 CKT 1
END
```

The overload of 500 kV transmission Line #558 section from Brambleton to Loudoun identified above will be resolved when the proposed PJM baseline project b1694 is constructed. The in-service target date is May 2016, and the line will have a rating of 4000 MVA.

3. The Y1-043 TAP-3MACKEYS 115 kV line (from bus 913340 to bus 314586 ckt 1) loads from 100.28% to 111.45% (AC power flow) of its normal rating (129 MVA) for non-contingency condition. This project contributes approximately 20 MW to the thermal violation.

See mitigation under ITO section.

### ITO Analysis

ITO assessed the impact of the proposed 7.6 MW of generation Capacity and 20 MW of generation energy on the ITO transmission system. The system was assessed using the summer 2015 RTEP Case provided to ITO by PJM, where the proposed generation capacity was injected at the Riders Creek 115 kV Substation. This analysis did include the impacts of the generation capability for all higher order queue generators within the ITO transmission system. When performing a generation analysis, ITO main analysis was load flow study results under single contingency (both normal and stressed system conditions) and import/export system conditions. ITO criteria consider a transmission facility overloaded if it exceeds 94% of its emergency rating under normal and stressed system conditions. For import/export studies, ITO considers a transmission facility overloaded if it exceeded 100% of its emergency rating. A full listing of ITO planning criteria and interconnection requirements can be found in the ITO facility connection requirements, which are publicly available at: <http://www.dom.com>.

As part of its generation impact analysis ITO routinely evaluates the impact that a proposed new generation resource will have under maximum generation conditions and stressed system conditions. For the Y1-073 evaluation three different assessments were conducted.

- 1) The first being when local generation including the proposed Y1-073 Facility is operated at their maximum capability. The result of this study is shown below.

a. Capacity Portion of Interconnection Request:

The 7.6 MW of capacity from Y1-073 has a direct contribution to the overload of the 115 kV transmission line section Y1-043 tap point to Mackeys Substation, which was previously identified for the Y1-043 queue project. The mitigation is to reconductor approximately 7.0 miles of the existing 115 kV transmission line between the Y1-043 tap point and Mackeys Substations (It is assumed that the Y1-043 tap point is located half way between Mackeys Substation and the Creswell Substation). The cost of this upgrade is estimated to be \$7.5 million (2012 dollars) and is expected to take 24 to 36 months to complete. Cost allocations are not determined until the SIS.

b. Energy Portion of Interconnection Request:

The 20 MW of energy from Y1-073 has a direct contribution to the overload of the 115 kV transmission line section Y1-043 tap point to Mackeys Substation, which was previously identified for the Y1-043 Queue Project. See 1a for costs and duration estimates.

- 2) The second being a stressed system condition where the largest generator in the area is unavailable. With the Y1-073 generator geographically located in Eastern Virginia, Surry Unit #2 is considered the most critical generating unit in the area. The impact of Y1-073 was studied with the outage of Surry Unit #2. The result of this study is shown below.

c. Capacity Portion of Interconnection Request:

The 7.6 MW of capacity from Y1-073 has a direct contribution to the overload of the 115 kV transmission line section Y1-043 tap point to Mackeys Substation, which was previously identified for the Y1-043 Queue Project. See 1a for costs and duration estimates.

- 3) The third being import and export conditions into and out of the Dominion System. Any new facility that is interconnected with the Dominion System should not significantly decrement FCITC between utilities.

Since the Capacity value of the proposed queue request is less than 20 MW no analysis needs to be done.

Attachment Facilities and Direct Connection Local Upgrades will be determined separately through the state's interconnection process.