

PJM Generator Interconnection

Y1-048 Four Rivers 230 kV

20 MW Capacity / 0 MW Energy

&

Y1-066 Four Rivers 115 kV

13.3 MW Capacity / 6 MW Energy

Combined Feasibility & System Impact Study Report

*July 2012
DMS #708433v1*

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 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 Y1-048 was studied as a 20 MW Capacity injection in to the ITO area. The queue project Y1-066 was studied as a 13.3 MW Capacity injection in to the ITO area. Both projects were evaluated for compliance with reliability criteria for summer peak conditions in 2015. Potential network impacts were as follows:

Network Impacts (Primary Option):

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 Overdutied breakers here)

There is no impact to breaker interrupting capabilities.

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

Not required, unless the 6 MW of Maximum Facility Output increase from Y1-066 is desired.

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.

None.

ITO Analysis (Y1-048)

ITO assessed the impact of the proposed queue project Y1-048 interconnection of an additional 20 MW of capacity on the ITO system. The system was assessed using the summer 2015 RTEP case provided to ITO by PJM, This 20 MW capacity injection occurred at Four Rivers Substation at the location of the previous T167 queue project.

This analysis did include the impacts of the generation capacity 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>.

The results of these studies evaluate the system under a limited set of operating conditions and do not guarantee the full delivery of the capacity and associated energy of this proposed generation facility under all operating conditions. NERC Planning and Operating Reliability Criteria allow for the re-dispatch of generating units to resolve projected and actual deficiencies in real time and planning studies. Specifically NERC Category C Contingency Conditions (Bus Fault, Tower Line, N-1-1, and Stuck Breaker scenarios) allow for re-dispatch of generating units to resolve potential reliability deficiencies. For ITO Planning Criteria the re-dispatch of generating units for these contingency conditions is allowed as long as the projected loading does not exceed 100% of a facility Load Dump Rating.

These study results are also predicated on the PATH Project being in-service. This project has been deferred by PJM. Should this facility not be in-service then it is possible that operating constraints will restrict the output of this queue request.

As part of its generation impact analysis ITO routinely evaluates the impact that a proposed new generation resource will have under maximum generation conditions, stress system conditions and import/export system conditions. The results of these studies are discussed in more detail below.

1) The first being when local generation including the proposed Y1-048 Facility is operated at their maximum capability. The result of this study is shown below.

No problems identified.

2) The second being a stressed system condition where the largest generator in the area is unavailable. With the Y1-048 generator geographically located in Northern/Central Virginia, Possum Pt. Unit #5 is considered the most critical generating unit in the area. The impact of Y1-048 was studied with the outage of Possum Pt. Unit #5. The result of this study is shown below.

No problems identified.

3) The third being import and export conditions into and out of the ITO System. Any new facility that is interconnected with the ITO System should not significantly decrement FCITC between utilities. The results of these studies can be found in Tables A and B.

Table A: Import Study Results

Import Study Results			
Area	Summer 2015	Summer 2015 with Y1-048	Limiting Element
AEP	2000+	2000+	None
APS	2000+	2000+	None
CPL	2000+	2000+	None
PJM	2000+	2000+	None

Table B: Export Study Results

Export Study Results			
Area	Summer 2015	Summer 2015 with Y1-048	Limiting Element
AEP	2000+	2000+	None
APS	2000+	2000+	None
CPL	2000+	2000+	None
PJM	2000+	2000+	None

ITO's Planning Criteria indicates a need to have approximately 2000 MW of import and export capability. The results of these import and export studies are indicate that the proposed generation facility will not impact ITO's import or export capability.

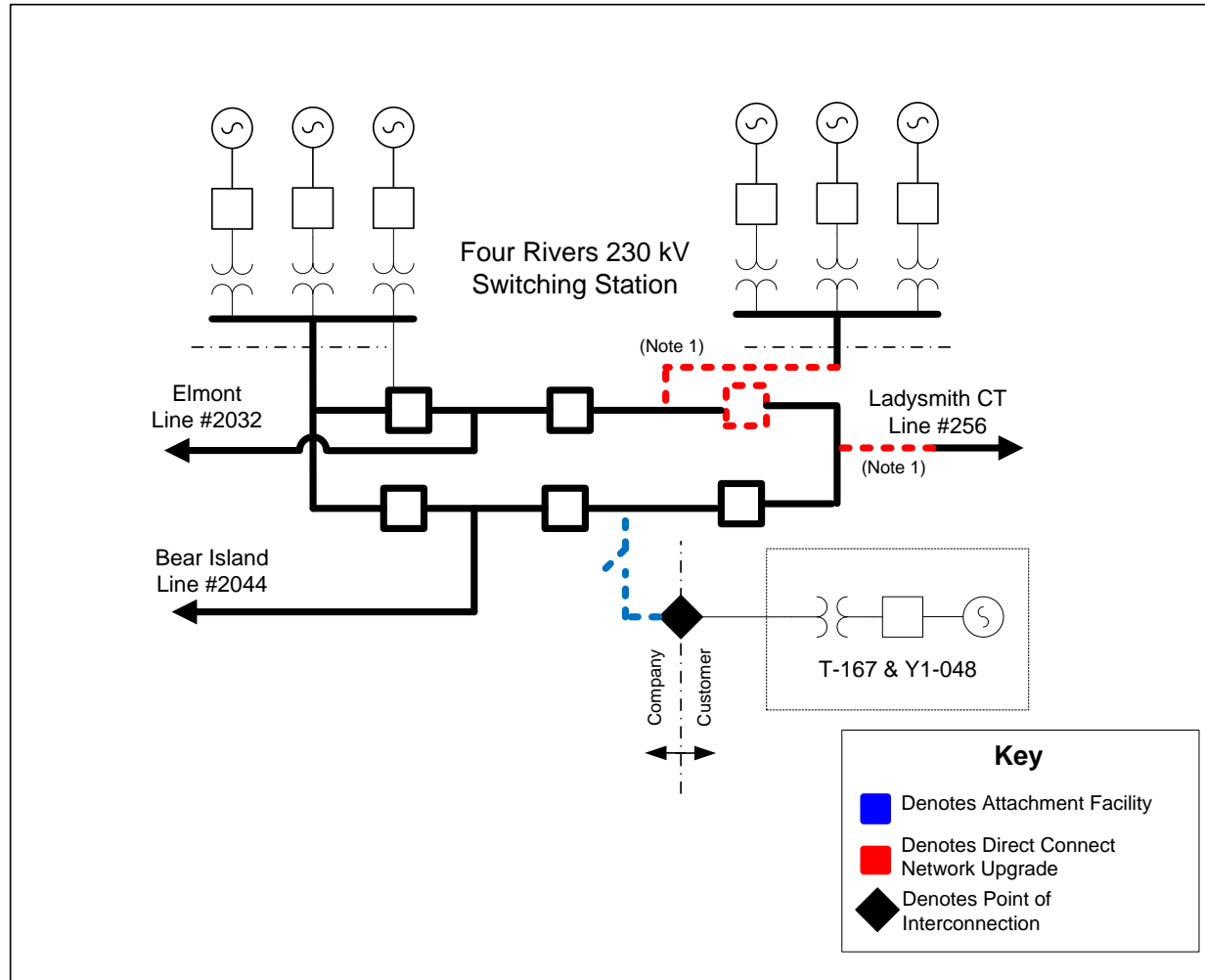
Attachment Facilities

The proposed layout and attachment facilities are illustrated below in Attachment A (One-Line). The proposed Y1-048 generation will be added to the ITO Transmission System through previous Generation Interconnect Queue T167. The necessary attachment facilities will be included with the previous Queue.

Direct Connection Network Upgrades

The direct connection network upgrade was previously identified with Queue T-167 as shown in Attachment A: One-Line Diagram. The following is associated with Note 1 on One-Line. The layout studied in the T-167 Facility Study would cause loss of 256 and 2032 lines on breaker failure. The new layout identified during this study would prevent breaker failure at Four Rivers Substation from taking out both the 256 and 2032 Lines which removes the network path for all 230kV generation at Four Rivers. There is an an \$80,000 incremental cost anticipated with this rearrangement beyond the cost presented with the T167 ISA. This change would be required without the Y1-048 request.

Attachment A: One-Line Diagram



ITO Analysis (Y1-066)

ITO assessed the impact of the proposed queue project Y1-066 interconnection of an additional 13.3 MW of capacity on the ITO Transmission System. The system was assessed using the summer 2015 RTEP case provided to ITO by PJM, This 13.3 MW Capacity injection occurred at 115kV Four Rivers Substation at the location of the existing Four Rivers Unit #1.

This analysis did include the impacts of the generation capacity for all higher order queue generators within the ITO Transmission System. When performing a generation analysis, ITO's main analysis will be load flow study results under single contingency (both normal and stressed system conditions) and import/export system conditions. ITO Criteria considers 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's Planning Criteria and interconnection requirements can be found in the Company's Facility Connection Requirements which are publicly available at: <http://www.dom.com>.

The results of these studies evaluate the system under a limited set of operating conditions and do not guarantee the full delivery of the capacity and associated energy of this proposed generation facility under all operating conditions. NERC Planning and Operating Reliability Criteria allow for the re-dispatch of generating units to resolve projected and actual deficiencies in real time and planning studies. Specifically NERC Category C Contingency Conditions (Bus Fault, Tower Line, N-1-1, and Stuck Breaker scenarios) allow for re-dispatch of generating units to resolve potential reliability deficiencies. For ITO Planning Criteria the re-dispatch of generating units for these contingency conditions is allowed as long as the projected loading does not exceed 100% of a facility Load Dump Rating.

These study results are also predicated on the PATH Project being in-service. This project has been deferred by PJM. Should this facility not be in-service then it is possible that operating constraints will restrict the output of this queue request.

As part of its generation impact analysis ITO routinely evaluates the impact that a proposed new generation resource will have under maximum generation conditions, stress system conditions and import/export system conditions. The results of these studies are discussed in more detail below.

1) The first being when local generation including the proposed Y1-066 Facility is operated at their maximum capability. The result of this study is shown below.

No problems identified.

2) The second being a stressed system condition where the largest generator in the area is unavailable. With the Y1-066 generator geographically located in Northern/Central Virginia, Possum Pt. Unit #5 is considered the most critical generating unit in the area. The impact of Y1-066 was studied with the outage of Possum Pt. Unit #5. The result of this study is shown below.

No problems identified.

3) The third being import and export conditions into and out of the ITO System. Any new facility that is interconnected with the ITO System should not significantly decrement FCITC between utilities. The results of these studies can be found in Tables A and B.

Table A: Import Study Results

Import Study Results			
Area	Summer 2015	Summer 2015 with Y1-066	Limiting Element
AEP	2000+	2000+	None
APS	2000+	2000+	None
CPL	2000+	2000+	None
PJM	2000+	2000+	None

Table B: Export Study Results

Export Study Results			
Area	Summer 2015	Summer 2015 with Y1-066	Limiting Element
AEP	2000+	2000+	None
APS	2000+	2000+	None
CPL	2000+	2000+	None
PJM	2000+	2000+	None

ITO's Planning Criteria indicates a need to have approximately 2000 MW of import and export capability. The results of these import and export studies are indicate that the proposed generation facility will not impact ITO's import or export capability.

Attachment Facilities

The proposed Y1-066 generation Capacity will be added to the ITO Transmission System through the existing Four Rivers Unit #1 as shown in Attachment A. No new attachment facilities will be required.

Direct Connection Network Upgrades

The proposed Y1-066 generation Capacity will be added to the ITO Transmission System through the existing Four Rivers Unit #1 as shown in Attachment A. No upgrades will be required.

Attachment A: One-Line Diagram

