PJM Generator Interconnection
U3-016 Midlothian 230-kV
550 MW Capacity
Feasibility Study

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DMS #522300v1A

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).

Preface

The intent of the 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 the Interconnection Customer. As a requirement for interconnection, the Interconnection Customer 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 system. All facilities required for interconnection of a generation interconnection project must be designed to meet the technical specifications for the appropriate 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 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 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.

Potential Network Impacts

The queue project U3-016 was studied as a 550MW (550 MW capacity) injection into the Dominion system at Midlothian 230 kV substation. U3-016 was evaluated for compliance with reliability criteria for summer peak conditions in 2012. Potential network impacts were 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 contingencies only for the full energy output. Stuck breaker and bus fault contingencies will be performed for the Impact Study)

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

There is no impact to breaker interrupting capabilities as a result of U3-016. These results are subject to change due to changing system conditions.

DOMINION STUDY RESULTS

Dominion assessed the impact on the Dominion Transmission System that the proposed 550 MW injection of new generation capacity (U3-016) would have at the Oillville 230 kV Substation. The system was assessed using the Summer 2012 RTEP case provided to Dominion by PJM for this analysis. This analysis did include the impacts that higher order queue generators may have on the study results, specifically those generators located on the Dominion Transmission System which have a signed a PJM SIS or IISA and their associated network upgrades were also modeled. The following higher order queue generators were modeled in the case (P08, P16, P38, R19, R31, R63, R80, S52, S79, S80, S81, S86-89, S93-96, S99, S102, S108, S109, S110 and S112). When performing a generation analysis Dominion's main analysis will be load flow study results under single contingency (both normal and stressed system conditions) and import/export system conditions. Dominion Criteria consider a transmission facility overloaded if it exceeds 94% of its emergency rating under normal and stressed system conditions. A full listing of Dominion'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/about/elec-transmission/pdf/Facility_Connection_Requirements.pdf.

As part of its generation impact analysis Dominion routinely evaluates the impact that a proposed new generation resource will have under maximum generation conditions and stressed system conditions. For the U3-016 evaluation two different assessments were conducted.

a. The first being when local generation including the proposed U3-016 Facility is operated at their maximum capability. The result of this study is indicating that for an outage of Line #205 (Chesterfield – Locks 230 kV) that the segment of Line #100 (115 kV) located between Chesterfield – Tyler Substations is overloaded.

b. The second 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. The results of these studies indicate that the proposed U3-016 generation facility is impacting system FCITC's. See tables below.

Table A
Import Study Results

Imports			
Area	**Summer 2012**	**Summer 2012 with U3-016**	**Limiting Element**
AEP	2000+	2000+	NA
APS	2000+	2000+	NA
CPL	2000+	2000+	NA
PJM	2000+	2000+	NA

Export Study Results

Exports			
Area	**Summer 2012**	**Summer 2012 with U3-016**	**Limiting Element**
AEP	2000+	2000+	NA
APS	2000+	2000+	NA
CPL	2000+	1719	Line #205 (Chest – Tyler)
PJM	2000+	2000+	NA

The results of these studies indicate that Line #205(Chesterfield to Locks) is overloaded under export conditions.

Interconnection Requirements

The following provides the estimated cost and schedule for the Non-Direct and Direct Connection Network Upgrades and the Attachment Facilities:

Non – Direct Connection Network Upgrades

New System Reinforcements

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

1) The proposed solution for the Line #100 deficiency is to re-tension the 2.2 mile section of this line for an estimated cost $220,000.

2) To resolve the Line #205 deficiency it will be necessary to re-conductor this 2.2 mile long section of line with 1033 ACSR. The estimated cost of this re-conductor project is $660,000 dollars and is estimated to take two years to engineer and construct. The Facility

Study will provide a detailed engineering evaluation and cost estimate to perform this work.

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 were identified in Feasibility Study. These results will be finalized in the System Impact Study.

Direct Connection Network Upgrades

Consistent with Dominion Facility Connection Requirements the proposed facility will need to interconnect with the Midlothian to Short Pump 230 kV Line #2009 as shown in Figure 1 with a three breaker ring bus.

The Direct Connection Network Upgrade costs are estimated to be $2,400,000 dollars (2008 dollars) for the proposed 230 kV Switching Station. This cost estimate is based on the assumption that the developer will acquire the land needed for the switching station and that it will be located next to the existing Line #2009 right-of-way. It is expected that construction of the switching station will take 30 months to construct.

Attachment Facilities

Attachment Facilities costs are estimated to be $1,000,000 dollars (2009 dollars). The costs include the metering, relays and 230 kV line work to directly connect the proposed facility with the proposed 230 kV Switching Station. If the 230 kV attachment line be greater than one mile in length, then an additional 230 kV attachment line will be necessary to interconnect the proposed generation with the Dominion Transmission System. Assuming less than a mile interconnection length, the completion of Dominion Attachment Facilities construction will be coordinated for completion with the proposed 230 kV Switching Station. The IC is responsible for its own Attachment Facilities.

Alternate 500 kV Interconnection

PJM performed a sensitivity analysis for interconnection onto the Midlothian and North Anna 500 kV line. PJM's load flow analysis revealed no overloads. Short circuit results identified the 40 kA breaker, H502, at North Anna becomes overdutied, increasing from 99.4% to 103.1% of its rating. A detailed evaluation of this 500 kV interconnection alternative, including Dominion Import and Export criteria impacts and stability analysis, will be provided by PJM in the System Impact Study, if IC elects this option as the Point of Interconnection in the System Impact Study Agreement.

FIGURE 1

U3 -016