PJM Generator Interconnection
U2-013 Northeast 34.5 kV
8 MW Capacity
Combined Feasibility & System Impact Study

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DMS #531489v2

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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 a combined Feasibility and System Impact 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 IC. As a requirement for interconnection, the IC may be responsible for the cost of constructing Local and Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM and underlying 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 IC 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 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.

General

IC has requested study of a 8 MW interconnection for its proposed Richmond, VA, landfill gas to energy facility onto Dominion Virginia Power's, the Interconnected Transmission Owner (ITO), 34.5 kV Distribution System. The requested site is located approximately 175 feet from the ITO's existing 34.5 kV circuit 375 from Northeast Substation. The requested in-service date for the interconnection is December, 2009.

Potential PJM Network Impacts

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 U2-013. These results are subject to change due to changing system conditions.

Dominion Study Results

Interconnection Requirements

The following provides the ITO estimated cost and schedule for the Non-Direct and Direct Connection Local Upgrades and the Attachment Facilities (refer to Figure 1).

Non–Direct Connection Local Upgrades

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

None.

Direct Connection Local Upgrades

None.

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.

Attachment Facilities

ITO

ITO will construct the following facilities to attach the generators to the Dominion system:

1. Transfer trip capability to existing 3-phase electronic recloser 375R24.
2. Transfer trip capability on circuit 375 circuit breaker in Northeast Substaion.
3. Three wood poles.
4. 175 feet of 477 MCM overhead wire.
5. Overhead line tension disconnects.
6. Pole mounted bi-directional metering.

The total cost for all new attachments and upgrades is $158,235. The estimated time for construction and interconnection is approximately 3 months.

IC

IC will be required to install the following:

In addition to the ITO facilities indicated above, the IC will be responsible for providing and maintaining telephone and communication lines to the ITO's metering equipment, and from the IC's main generator breaker to the ITO's up line reclosers and the ITO's Circuit 375 circuit breaker in Northeast Substation to provide a transfer trip circuit protection scheme. The IC provided 34.5 kV 3-phase circuit will interconnect overhead at the Point of Interconnection which will be the load side terminals of the ITO provided bi-directional meter. It will be the IC's responsibility to obtain any required right-of-way between the ITO's existing facilities and the Point of Interconnection. A one-line sketch of the project is shown in Figure 1.

Operating Restrictions

Northeast Substation Circuit 375 can be interconnected with other distribution circuits during abnormal and/or emergency conditions. Under these abnormal and/or emergency conditions the required transfer trip protection scheme will not be available. As a result, under these conditions ITO will require the IC to take their generation off line.

Protective Relay Requirements

At a minimum, the IC will provide the following protective relays with the corresponding settings:

Function		Set Point	Duration to Trip (seconds)	
			Preferred	Maximum
27	Undervoltage	90% of nominal operating voltage	Less than 2.0	2.0
59	Overvoltage	106 to 110% of nominal operating voltage	Less than 2.0	2.0
81U	Underfrequency	59.0 to 59.5 Hz	Less than 2.0	2.0
81O	Overfrequency	60.5 to 61.0 Hz	Less than 2.0	2.0
51	Phase Time-delay Overcurrent	Set for minimum, with adequate load allowance	Maintain proper coordination (should coordinate below connecting transformer high-side fuses)	
51N	Ground Time-delay Overcurrent	Set for minimum, with adequate imbalance allowance	Maintain proper coordination (should coordinate below connecting transformer high-side fuses)	

The direct pilot wire tripping function is installed from ITO's substation transformer #6 lockouts, bus #2 lockout and 37562 circuit breaker (normal configuration) and from transformer #5 lockouts, bus #4 lockout and T404 transfer breaker (alternate configuration) and from line recloser 375R24LS to IC's lockout (main breaker). This direct tripping function should sectionalize all customer generation for any opening of transformer #6 or bus #2 or circuit breaker 37562 in the normal operational mode, or transformer #5 or bus #4 or transfer breaker T404 in a potential alternative operational mode or for openings of the line recloser (375R24LS). The direct trip feature is meant to ensure that a "prolonged" (or "permanent") islanding condition (with IC generation supplying ITO load in the absence of the ITO source) will not be set-up. It also serves as an aid in protecting IC generators from an out-of-step reclosure of the utility source.

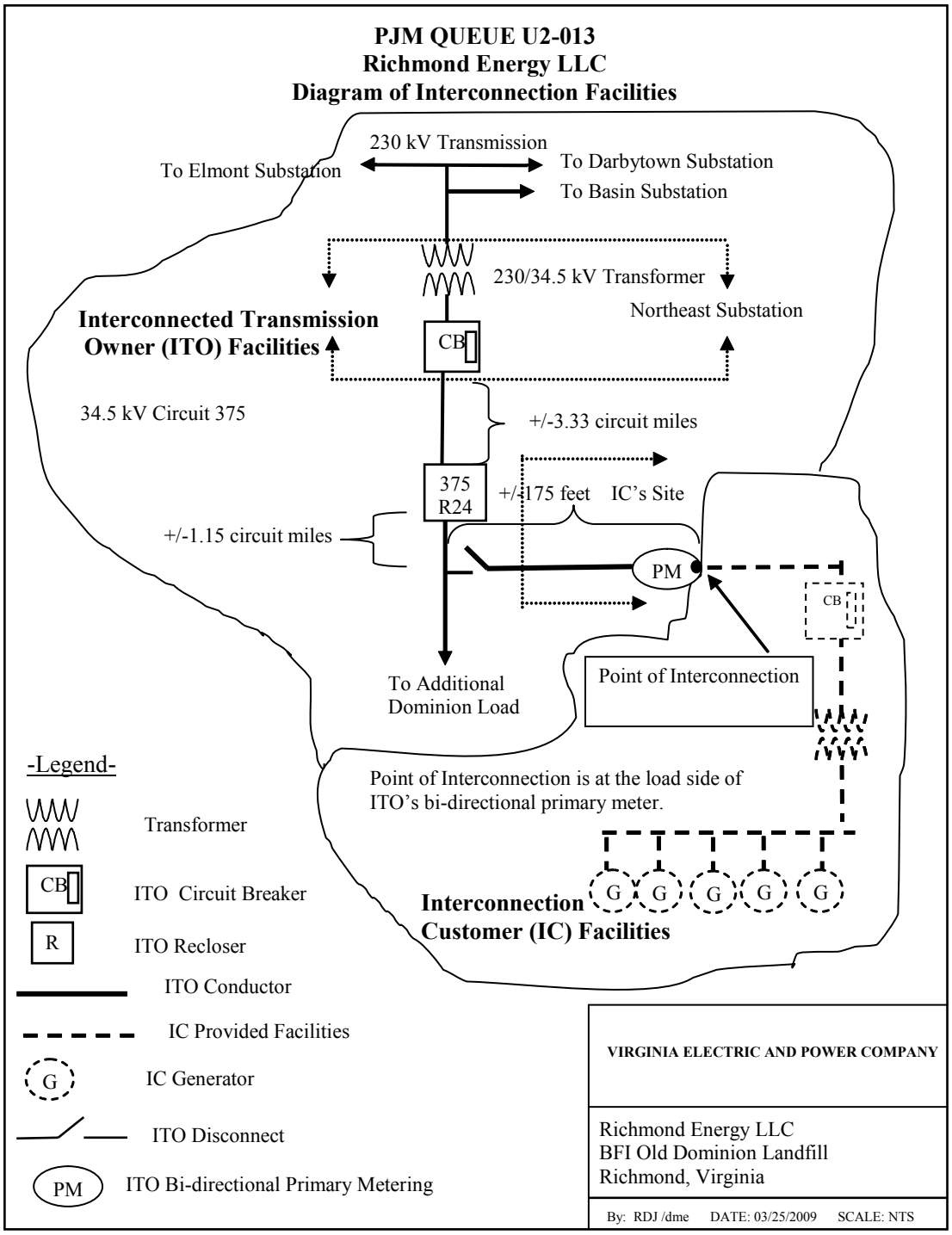

Figure 1