PJM Generator Interconnection

W1-073 Ladysmith 230 kV

498 MW Capacity / 612 MW Energy

Feasibility Study Report

July 2010
DMS #604401v1

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

Queue W1-073 is an IC 498 MW Capacity and 612 MW energy interconnection request consisting of two additional CT units at Ladysmith CT station. W1-073 generation will be located near Ladysmith, Virginia. Output from the generation will be studied as two options: the primary point of interconnection was the Ladysmith 230kV bus, while the secondary point of interconnection was the Ladysmith 500kV substation. Project W1-073 was evaluated for compliance with reliability criteria for summer peak conditions in 2014. Potential network impacts were as follows:

Option 1: Ladysmith 230 kV

Generator Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

1. The 6LDYSMT1-6MINE RD 230 kV line (from bus 314197 to bus 314138 ckt 1) loads from 86.73% to 101.71% (DC power flow) of its normal rating (860 MVA) for non-contingency condition. This project contributes approximately 128.84 MW to cause the thermal violation.

2. The 6HANOVER-6ELMONT 230 kV line (from bus 314222 to bus 314218 ckt 1) loads from 95.08% to 111.08% (DC power flow) of its emergency rating (797 MVA) for the single line contingency ('LN 2104'). This project contributes approximately 127.54 MW to cause the thermal violation.

3. The 6LDYSMT1-6MINE RD 230 kV line (from bus 314197 to bus 314138 ckt 1) loads from 97.73% to 115.22% (DC power flow) of its emergency rating (948 MVA) for the single line contingency ('LN 2032'). This project contributes approximately 165.79 MW to cause the thermal violation.

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)

No problems identified.

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)

4. The H.RDGE16-HOWARD32 230 kV line (from bus 220941 to bus 220954 ckt 1) loads from 110.75% to 111.22% (DC power flow) of its emergency rating (728 MVA) for the tower line contingency ('WCHPL_BRNDN'). This project contributes approximately 32.08 MW to cause the thermal violation.

5. The 6FRRIVER-6HANOVER 230 kV line (from bus 314212 to bus 314222 ckt 1) loads from 100.54% to 116.54% (DC power flow) of its emergency rating (797 MVA) for the

single line contingency ('LN 2104'). This project contributes approximately 127.54 MW to cause the thermal violation.

6. The 6FREDBRG-6CRANES 230 kV line (from bus 314137 to bus 314134 ckt 1) loads from 105.54% to 120% (DC power flow) of its emergency rating (637 MVA) for the single line contingency ('LN 568'). This project contributes approximately 92.3 MW to cause the thermal violation.

7. The 6MINE RD-6FREDBRG 230 kV line (from bus 314138 to bus 314137 ckt 1) loads from 107.44% to 128.24% (DC power flow) of its emergency rating (797 MVA) for the single line contingency ('LN 2032'). This project contributes approximately 165.79 MW to cause the thermal violation.

8. The 6COHMIL-6PL VIEW 230 kV line (from bus 314170 to bus 314072 ckt 2) loads from 130.44% to 130.8% (DC power flow) of its emergency rating (470 MVA) for the single line contingency ('LN 558_W1-061B'). This project contributes approximately 25.1 MW to cause the thermal violation.

9. The 6BRAMBL-6COHMIL 230 kV line (from bus 314171 to bus 314170 ckt 2) loads from 133.45% to 133.81% (DC power flow) of its emergency rating (470 MVA) for the single line contingency ('LN 558_W1-061B'). This project contributes approximately 25.1 MW to cause the thermal violation.

10. The 6LDYSMT1-6LDSMTH1 230 kV line (from bus 314197 to bus 314196 ckt 1) loads from 110.42% to 157.76% (DC power flow) of its emergency rating (1047 MVA) for the single line contingency ('LN 256'). This project contributes approximately 495.67 MW to cause the thermal violation.

11. The 8LDYSMTH 500/230 kV transformer (from bus 314196 to bus 314911 ckt 1) loads from 124.87% to 178.41% (DC power flow) of its emergency rating (925.799987792969 MVA) for the single line contingency ('LN 256'). This project contributes approximately 495.67 MW to cause the thermal violation.

Short Circuit

BUS_NO	BUS	BREAKER	Rating Type	Duty Percent With w1-073 opt1	Duty Percent Without w1-073 opt1	Duty Percent Difference	Note
2971	LADYSMITH S1 230.kV	SX1272	S	105.10%	89.50%	15.60%	New Over-duty
2971	LADYSMITH S1 230.kV	GT172	S	100.60%	85.00%	15.60%	New Over-duty
2971	LADYSMITH S1 230.kV	GT272	S	100.60%	85.00%	15.60%	New Over-duty

System Stability Analysis

Dynamic studies are part of the System Impact Study.

Option 2: Ladysmith 500 kV

Generator Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

No problems identified.

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)

No problems identified.

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)

To be determined at the System Impact Study.

Short Circuit

No problems identified.

System Stability Analysis

Dynamic studies are part of the System Impact Study.

ITO Assessment Results

ITO assessed the impact of the proposed 498MW generation capacity on the ITO Transmission System. The system was assessed using the summer 2014 RTEP case provided to ITO by PJM. The primary point of interconnection was the Ladysmith 230kV bus at the Ladysmith CT site, while the secondary point of interconnection was the Ladysmith 500kV substation. 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 base case and 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 planning criteria and interconnection requirements can be found in the ITO Facility Connection Requirements which are publicly available at: http://www.dom.com.

Option 1: Ladysmith 230 kV

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 W1-073 evaluation three different assessments were conducted.

1) The first being when local generation including the proposed W1-073 Facility is operated at their maximum capability. The result of this study is shown below in Table A.

Table A: PMax System Conditions (1)

Overloaded Element	Cont Loading (MVA)	Rating	Cont Loading (%)	Contingency Label
314212 6FRRIVER 230 314222 6HANOVER 230 1	**1015.1**	948.0	**107.1**	Base Case
314218 6ELMONT 230 314222 6HANOVER 230 1	**975.3**	948.0	**102.9**	Base Case
314212 6FRRIVER 230 314222 6HANOVER 230 1	**1275.7**	948.0	**134.6**	314196 6LDSMTH1 230 314197 6LDYSMT1 230 1
314218 6ELMONT 230 314222 6HANOVER 230 1	**1236.1**	948.0	**130.4**	314196 6LDSMTH1 230 314197 6LDYSMT1 230 1

Overloaded Element	Cont Loading (MVA)	Rating	Cont Loading (%)	Contingency Label
314137 6FREDBRG 230 314138 6MINE RD 230 1	766.0	797.0	96.1	314150 6STJOHN 230 314197 6LDYSMT1 230 1
314137 6FREDBRG 230 314138 6MINE RD 230 1	**906.4**	797.0	**113.7**	314196 6LDSMTH1 230 314197 6LDYSMT1 230 1
314137 6FREDBRG 230 314138 6MINE RD 230 1	**906.4**	797.0	**113.7**	314196 6LDSMTH1 230 314911 8LDYSMTH 500 1
314138 6MINE RD 230 314197 6LDYSMT1 230 1	**1001.0**	948.0	**105.6**	314196 6LDSMTH1 230 314197 6LDYSMT1 230 1
314138 6MINE RD 230 314197 6LDYSMT1 230 1	**1001.0**	948.0	**105.6**	314196 6LDSMTH1 230 314911 8LDYSMTH 500 1
314138 6MINE RD 230 314197 6LDYSMT1 230 1	**1053.7**	948.0	**111.2**	314218 6ELMONT 230 314222 6HANOVER 230 1
314196 6LDSMTH1 230 314197 6LDYSMT1 230 1	**1049.3**	1047.0	**100.2**	314138 6MINE RD 230 314197 6LDYSMT1 230 1
314196 6LDSMTH1 230 314197 6LDYSMT1 230 1	**1266.3**	1047.0	**120.9**	314212 6FRRIVER 230 314222 6HANOVER 230 1
314196 6LDSMTH1 230 314197 6LDYSMT1 230 1	**1236.9**	1047.0	**118.1**	314218 6ELMONT 230 314222 6HANOVER 230 1
314196 6LDSMTH1 230 314911 8LDYSMTH 500 1	**1003.7**	925.8	**108.4**	314137 6FREDBRG 230 314138 6MINE RD 230 1
314196 6LDSMTH1 230 314911 8LDYSMTH 500 1	**1292.6**	925.8	**139.6**	314212 6FRRIVER 230 314222 6HANOVER 230 1
314684 3MT LREL 115 314696 3HALIFAX 115 1	139.2	147.0	94.7	314696 3HALIFAX 115 314716 3REEDY C 115 1

As shown above in Table A, the impact of the W1-073 generator under base case and single contingency conditions results in thermal overloads of several 115kV and 230kV line sections.

2) The second being a stressed system condition where the largest generator in the area is unavailable. With the W1-073 generator geographically located in North-Central Virginia, Possum Pt. Unit #5 is considered the most critical generating unit in the area. The impact of W1-073 was studied with the outage of Possum Point Unit #5. The result of this study is shown below in Table B.

Table B: Stressed System Conditions (1)

Overloaded Element	Cont Loading (MVA)	Rating	Cont Loading (%)	Contingency Label
314134 6CRANES 230 314137 6FREDBRG 230 1	**667.1**	637.0	**104.7**	314196 6LDSMTH1 230 314197 6LDYSMT1 230 1
314134 6CRANES 230 314137 6FREDBRG 230 1	**667.1**	637.0	**104.7**	314196 6LDSMTH1 230 314911 8LDYSMTH 500 1
314134 6CRANES 230 314137 6FREDBRG 230 1	**647.5**	637.0	**101.6**	314212 6FRRIVER 230 314222 6HANOVER 230 1
314134 6CRANES 230 314137 6FREDBRG 230 1	**640.8**	637.0	**100.6**	314218 6ELMONT 230 314222 6HANOVER 230 1
314134 6CRANES 230	**662.6**	637.0	**104.0**	314911 8LDYSMTH 500

Overloaded Element	Cont Loading (MVA)	Rating	Cont Loading (%)	Contingency Label
314137 6FREDBRG 230 1				314922 8POSSUM 500 1
314134 6CRANES 230 314137 6FREDBRG 230 1	598.8	637.0	94.0	314916 8MORRSVL 500 314918 8NO ANNA 500 1
314137 6FREDBRG 230 314138 6MINE RD 230 1	751.3	797.0	94.3	314132 6BIRCHWD 230 315033 1BRCHWDA 18.0 1
314137 6FREDBRG 230 314138 6MINE RD 230 1	**874.3**	797.0	**109.7**	314196 6LDSMTH1 230 314197 6LDYSMT1 230 1
314137 6FREDBRG 230 314138 6MINE RD 230 1	**874.2**	797.0	**109.7**	314196 6LDSMTH1 230 314911 8LDYSMTH 500 1
314137 6FREDBRG 230 314138 6MINE RD 230 1	**880.1**	797.0	**110.4**	314218 6ELMONT 230 314222 6HANOVER 230 1
314137 6FREDBRG 230 314138 6MINE RD 230 1	793.2	797.0	99.5	314911 8LDYSMTH 500 314922 8POSSUM 500 1
314138 6MINE RD 230 314197 6LDYSMT1 230 1	**970.1**	948.0	**102.3**	314196 6LDSMTH1 230 314197 6LDYSMT1 230 1
314138 6MINE RD 230 314197 6LDYSMT1 230 1	**969.9**	948.0	**102.3**	314196 6LDSMTH1 230 314911 8LDYSMTH 500 1
314138 6MINE RD 230 314197 6LDYSMT1 230 1	**987.8**	948.0	**104.2**	314212 6FRRIVER 230 314222 6HANOVER 230 1
314138 6MINE RD 230 314197 6LDYSMT1 230 1	**975.0**	948.0	**102.8**	314218 6ELMONT 230 314222 6HANOVER 230 1
314196 6LDSMTH1 230 314911 8LDYSMTH 500 1	878.6	925.8	94.9	314137 6FREDBRG 230 314138 6MINE RD 230 1
314196 6LDSMTH1 230 314911 8LDYSMTH 500 1	**949.0**	925.8	**102.5**	314138 6MINE RD 230 314197 6LDYSMT1 230 1
314196 6LDSMTH1 230 314911 8LDYSMTH 500 1	881.5	925.8	95.2	314212 6FRRIVER 230 314222 6HANOVER 230 1
314212 6FRRIVER 230 314222 6HANOVER 230 1	897.7	948.0	94.7	314137 6FREDBRG 230 314138 6MINE RD 230 1
314212 6FRRIVER 230 314222 6HANOVER 230 1	929.7	948.0	98.1	314138 6MINE RD 230 314197 6LDYSMT1 230 1

As shown in Table B, the impact of the W1-073 generator under base case and single contingency conditions results in thermal overloads of several 230kV line sections and transformers.

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 C and D.

Table C: Import Study Results (1)

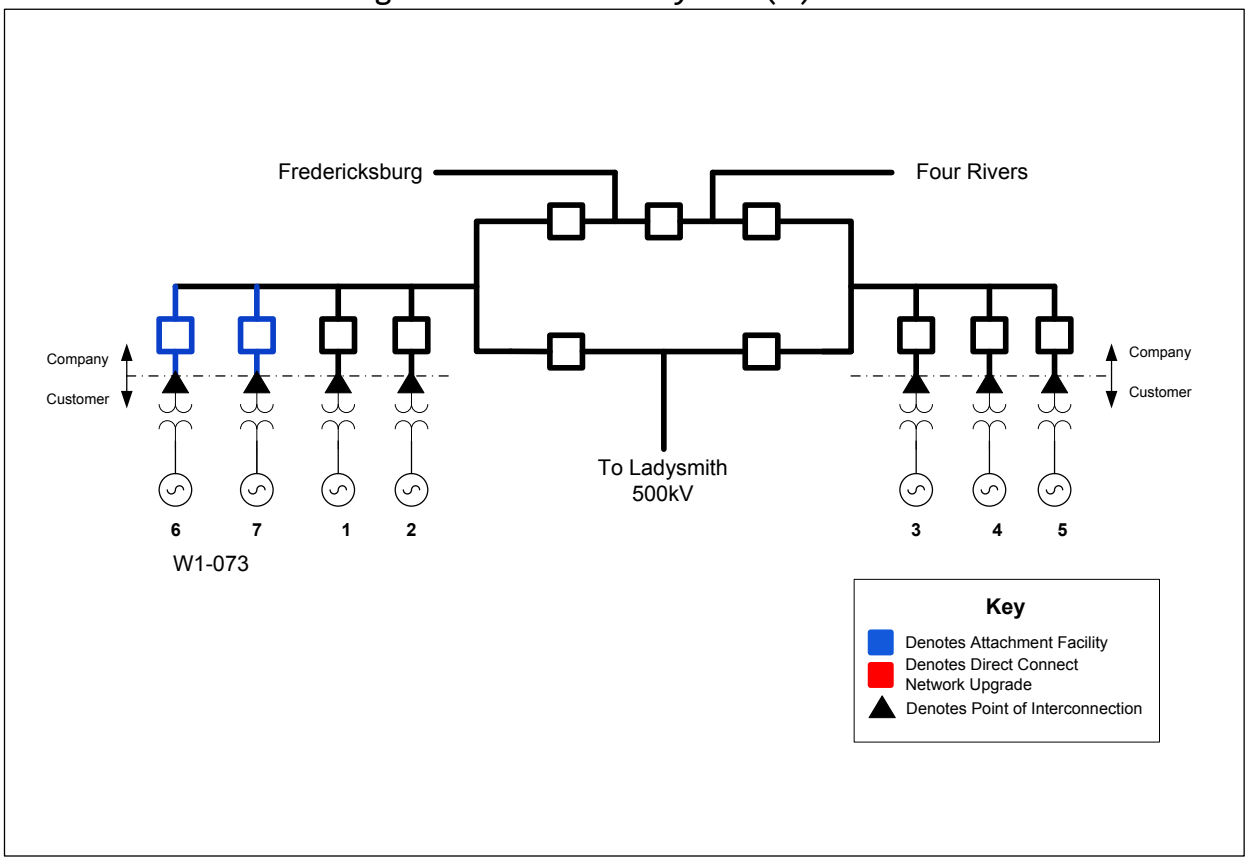
Import Study Results			
Area	**Summer 2014**	**Summer 2014 with W1-073**	**Limiting Element**
AEP	2000+	2000+	None
APS	2000+	2000+	None
CPL	2000+	2000+	None
PJM	2000+	2000+	None

Table D: Export Study Results (1)

Export Study Results			
Area	**Summer 2014**	**Summer 2014 with W1-073**	**Limiting Element**
AEP	2000+	2000+	None
APS	2000+	2000+	None
CPL	2000+	2000+	None
PJM	2000+	2000+	None

ITO 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 import or export capability.

Figure A: W1-073 Layout (1)



Attachment Facilities

The proposed layout and attachment facilities are illustrated below in Figure A. The estimated cost of these

facilities which includes metering, protection equipment along with two 230kV breakers is $2 million and is estimated to take 24 to 30 months to complete.

Non-Direct Connection Network Upgrades

The results of these studies, as indicated above in Tables A and B, show overloads on four 230kV lines, one 115kV line and one 500-230kV transformer. In order to resolve these thermal violations, the following work would need to be completed prior to adding the generation capacity of W1-073 in the option 1 location.

1) Upgrade substation wire limitations at Howard. The cost for this Howard work is $100,000 and it will take 6 months to complete. This assumes that the High Ridge baseline work is completed in 2012. The resultant new rating normal & emergency become 670 & 844 MVA respectively.

2) Convert and reconductor the existing 115kV, 73 line between Elmont and Four Rivers to relieve the overloads on the existing 230kV, 2032 line between Elmont and and Four Rivers during base case and contingency conditions. This improvement would require the replacement of one distribution transformer (Hanover), the installation of a 168 MVA, 230-115kV transformer at Four Rivers, and the conversion and reconductor (to 2-795 ACSR) of 9 miles of transmission line from 115kV to 230kV. This conversion would also require the installation of two 230kV breakers and one 115kV breaker. The cost of this conversion estimated to be $17.5 Million dollars and is expected to take 36 to 48 months to complete. This includes obtaining all necessary SCC permits.

3) Upgrade the existing 230kV, 2090 line between Fredericksburg and Ladysmith by replacing two 230kV line switches at Mine Rd Substation. The cost of this upgrade is estimated to be $50 thousand dollars and is expected to take 12 months to complete.

4) Install a 2nd 230kv line between the Ladysmith CT station and the Ladysmith 500/230kV Substation to relieve the overloads on the existing 230kV, 2089 line

and 500-230kV Ladysmith transformer. This installation would require a 4 mile 230kV line and 2nd 280 MVA, 500-230kV transformer at Ladysmith Substation. The cost of this new line is estimated to be $18 Million dollars and expected to take 36 to 48 months to complete. This includes obtaining all necessary SCC permits.

5) Upgrade the existing 115kV, 33 line between Halifax and Mount Laurel Substations by re-sagging 10.8 miles of line to achieve a 125 degree C rating. The cost of this upgrade is estimated to be $3 Million dollars and is expected to take 24 – 36 months to complete.

6) Upgrade the existing 230kV, 2104 line between Fredericksburg and Cranes Corner Substation by replacing a wave trap at Fredericksburg Substation. The cost of this upgrade is estimated to be $20 thousand dollars and is expected to take 12 months to complete.

7) The estimated cost to replace the three overdutied breakers at Ladysmith 230 kV switchyard is $591,000 and will take about 9.5 months to complete (2 weeks for each replacing breaker and 8 months for equipment order time).

Total cost estimated to be $39.2 million dollars and maximum duration is 4 years.

Direct Connection Network Upgrades

None required for this addition.

Contributions to Previously Identified Overloads

(Tables E and F show 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.)

Table E: PMax System Conditions (1)

Overloaded Element	Prior Cont Loading (MVA)	Post Cont Loading (MVA)	Rating	Prior Cont Loading (%)	Post Cont Loading (%)	Contingency Label
314137 6FREDBRG 230 314138 6MINE RD 230 1	**799.2**	**974.0**	797.0	**100.3**	**122.2**	314212 6FRRIVER 230 314222 6HANOVER 230 1
314137 6FREDBRG 230 314138 6MINE RD 230 1	786.7	**959.7**	797.0	98.7	**120.4**	314218 6ELMONT 230 314222 6HANOVER 230 1
314138 6MINE RD 230 314197 6LDYSMT1 230 1	892.7	**1068.1**	948.0	94.2	**112.7**	314212 6FRRIVER 230 314222 6HANOVER 230 1
314196 6LDSMTH1 230 314911 8LDYSMTH 500 1	925.1	**1292.6**	925.8	99.9	**139.6**	314212 6FRRIVER 230 314222 6HANOVER 230 1
314196 6LDSMTH1 230 314911 8LDYSMTH 500 1	898.7	**1262.7**	925.8	97.1	**136.4**	314218 6ELMONT 230 314222 6HANOVER 230 1

Table F: Stressed System Conditions (1)

Overloaded Element	Prior Cont Loading (MVA)	Post Cont Loading (MVA)	Rating	Prior Cont Loading (%)	Post Cont Loading (%)	Contingency Label
314137 6FREDBRG 230 314138 6MINE RD 230 1	749.8	**892.7**	797.0	94.1	**112.0**	314212 6FRRIVER 230 314222 6HANOVER 230 1

Option 2: Ladysmith 500 kV

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 W1-073 evaluation three different assessments were conducted.

1) The first being when local generation including the proposed W1-073 Facility is operated at their maximum capability. The result of this study is shown below in Table G.

Overloaded Element	Cont Loading (MVA)	Rating	Cont Loading (%)	Contingency Label
314212 6FRRIVER 230 314222 6HANOVER 230 1	911.9	948.0	96.2	Base Case
314212 6FRRIVER 230 314222 6HANOVER 230 1	**1067.7**	948.0	**112.6**	314137 6FREDBRG 230 314138 6MINE RD 230 1
314138 6MINE RD 230 314197 6LDYSMT1 230 1	897.2	948.0	94.6	314218 6ELMONT 230 314222 6HANOVER 230 1
314218 6ELMONT 230 314222 6HANOVER 230 1	898.8	948.0	94.8	314134 6CRANES 230 314142 6STAFORD 230 1
314218 6ELMONT 230 314222 6HANOVER 230 1	914.0	948.0	96.4	314139 6OAKGROV 230 314190 6WESTMOR 230 1
314218 6ELMONT 230 314222 6HANOVER 230 1	906.3	948.0	95.6	314182 6NORNECK 230 314183 6SANDERS 230 1
314218 6ELMONT 230 314222 6HANOVER 230 1	910.5	948.0	96.0	314183 6SANDERS 230 314190 6WESTMOR 230 1
314218 6ELMONT 230 314222 6HANOVER 230 1	**1002.9**	948.0	**105.8**	314196 6LDSMTH1 230 314197 6LDYSMT1 230 1
314218 6ELMONT 230 314222 6HANOVER 230 1	910.6	948.0	96.1	314218 6ELMONT 230 314908 8ELMONT 500 1
314218 6ELMONT 230 314222 6HANOVER 230 1	914.7	948.0	96.5	314218 6ELMONT 230 314908 8ELMONT 500 2
14218 6ELMONT 230 314222 6HANOVER 230 1	894.2	948.0	94.3	314220 3FRRIVER 115 314221 3HANOVER 115 1
314218 6ELMONT 230 314222 6HANOVER 230 1	895.5	948.0	94.5	314287 6CHSTF B 230 315065 1CHESTF6 24.0 1
314218 6ELMONT 230 314222 6HANOVER 230 1	893.5	948.0	94.2	314423 6YORKTWN 230 315092 1YORKTN3 25.0 1
314218 6ELMONT 230 314222 6HANOVER 230 1	894.9	948.0	94.4	314538 6SURRY 230 315116 1SURRY 1 22.0 1
314218 6ELMONT 230 314222 6HANOVER 230 1	906.0	948.0	95.6	314902 8CARSON 500 314914 8MDLTHAN 500 1
314218 6ELMONT 230 314222 6HANOVER 230 1	891.8	948.0	94.1	314903 8CHCKAHM 500 314908 8ELMONT 500 1
314218 6ELMONT 230 314222 6HANOVER 230 1	894.8	948.0	94.4	314907 8DOOMS 500 314910 8CUNNING 500 1
314218 6ELMONT 230 314222 6HANOVER 230 1	**1005.4**	948.0	**106.1**	314908 8ELMONT 500 314911 8LDYSMTH 500 1
314218 6ELMONT 230 314222 6HANOVER 230 1	**978.1**	948.0	**103.2**	314914 8MDLTHAN 500 314918 8NO ANNA 500 1
314684 3MT LREL 115 314696 3HALIFAX 115 1	139.1	147.0	94.7	314696 3HALIFAX 115 314716 3REEDY C 115 1

As shown above in Table G, the impact of the W1-073 generator under base case and single contingency conditions results in thermal overloads of 115kV and 230kV line sections.

2) The second being a stressed system condition where the largest generator in the area is unavailable. With the W1-073 generator geographically located in North-Central Virginia, Possum Pt. Unit #5 is considered the most critical generating unit in the area. The impact of W1-073 was studied with the outage of Possum Point Unit #5. The result of this study is shown below.

   No Problems Indentified.

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 H and I.

Table H: Import Study Results (2)

Import Study Results			
Area	**Summer 2013**	**Summer 2014 with W1-073**	**Limiting Element**
AEP	2000+	2000+	None
APS	2000+	2000+	None
CPL	2000+	2000+	None
PJM	2000+	2000+	None

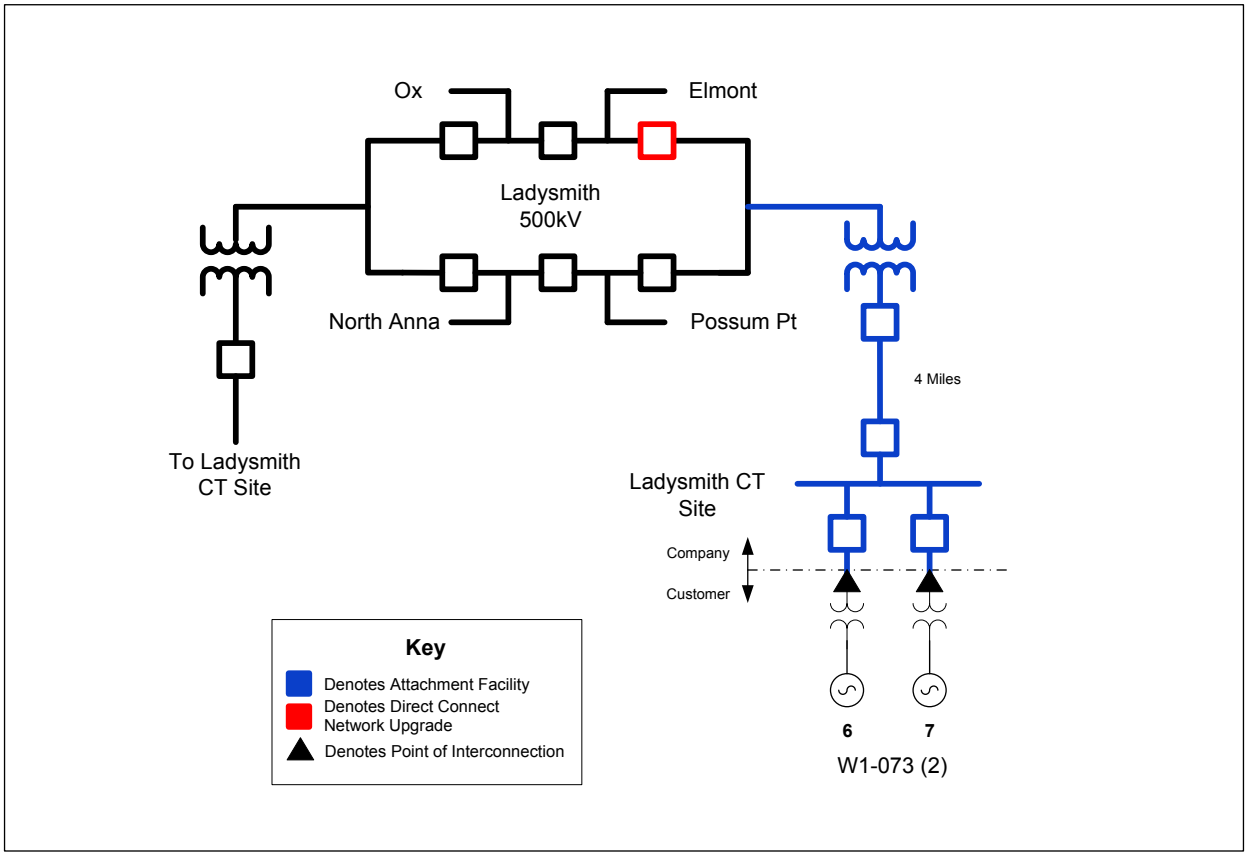
Table I: Export Study Results (2)

Export Study Results			
Area	**Summer 2013**	**Summer 2014 with W1-073**	**Limiting Element**
AEP	2000+	2000+	None
APS	2000+	2000+	None
CPL	2000+	2000+	None
PJM	2000+	2000+	None

ITO 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 import or export capability.

Figure B: W1-074 Layout (2)



Attachment Facilities

The proposed layout and attachment facilities are illustrated below in Figure B. The attachment facilities would include construction at the Ladysmith CT site along with a 4 mile 230kV transmission line to the Ladysmith 230/500kV Substation where a 500-230kV transformer and associated equipment would be installed to connect to the 500kV. The estimated cost of these facilities which includes metering, protection equipment along with a four mile 230kV lines is $18 Million and is estimated to take 36 to 48 months to complete. This includes obtaining all necessary SCC permits.

Direct Connection Network Upgrades

To reliably interconnect the proposed generation with the ITO transmission system it will be necessary to install a 500kV breaker at Ladysmith Substation as shown below in Figure B. The estimated cost of this work is $1.0 Million and is estimated to take 12 months to complete.

Non-Direct Connection Network Upgrades

The results of these studies, as indicated above in Table E show overloads on two 230 kV lines and one 115kV line. In order to resolve these thermal violations, the following work would need to be completed prior to adding the generation capacity of W1-073 in the option 2 location.

1) Upgrade the existing 230kV, 2032 line between Elmont and Four Rivers by replacing two 230kV line switches at Hanover Substation. The cost of this upgrade is estimated to be $50 thousand dollars and is expected to take 12 months to complete.

2) Upgrade the existing 230kV, 2090 line between Fredericksburg and Ladysmith by replacing two 230kV line switches at Mine Rd Substation. The cost of this upgrade is estimated to be $50 thousand dollars and is expected to take 12 months to complete.

3) Upgrade the existing 115kV, 33 line between Halifax and Mount Laurel Substations by re-sagging 10.8 miles of line to achieve a 125 degree C rating. The cost of this upgrade is estimated to be $3 Million dollars and is expected to take 24 – 36 months to complete.

Total cost estimated to be $3.1 Million dollars and the maximum duration is 3 years.

Contributions to Previously Identified Overloads

(Tables J and K show 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 in the System Impact Study.)

Table J: PMax System Conditions (2)

Overloaded Element	Prior Cont Loading (MVA)	Post Cont Loading (MVA)	Rating	Prior Cont Loading (%)	Post Cont Loading (%)	Contingency Label
314137 6FREDBRG 230 314138 6MINE RD 230 1	**799.2**	**816.0**	797.0	**100.3**	**102.4**	314212 6FRRIVER 230 314222 6HANOVER 230 1
314137 6FREDBRG 230 314138 6MINE RD 230 1	786.7	**803.4**	797.0	98.7	**100.8**	314218 6ELMONT 230 314222 6HANOVER 230 1
314138 6MINE RD 230 314197 6LDYSMT1 230 1	892.7	910.0	948.0	94.2	96.0	314212 6FRRIVER 230 314222 6HANOVER 230 1
314218 6ELMONT 230 314222 6HANOVER 230 1	897.7	922.6	948.0	94.7	97.3	314131 6ARNOLDS 230 314139 6OAKGROV 230 1
314218 6ELMONT 230 314222 6HANOVER 230 1	909.2	934.1	948.0	95.9	98.5	314131 6ARNOLDS 230 314175 6COMORN 230 1
314218 6ELMONT 230 314222 6HANOVER 230 1	910.9	935.8	948.0	96.1	98.7	314132 6BIRCHWD 230 314175 6COMORN 230 1
314218 6ELMONT 230 314222 6HANOVER 230 1	896.0	917.8	948.0	94.5	96.8	314134 6CRANES 230 314137 6FREDBRG 230 1
314218 6ELMONT 230 314222 6HANOVER 230 1	**1002.4**	**1027.8**	948.0	**105.7**	**108.4**	314137 6FREDBRG 230 314138 6MINE RD 230 1
314218 6ELMONT 230 314222 6HANOVER 230 1	**1034.2**	**1059.6**	948.0	**109.1**	**111.8**	314138 6MINE RD 230 314197 6LDYSMT1 230 1
314218 6ELMONT 230 314222 6HANOVER 230 1	894.1	916.4	948.0	94.3	96.7	314149 3STJOHND 115 314154 3STJOHNS 115 1
314218 6ELMONT 230 314222 6HANOVER 230 1	894.1	916.4	948.0	94.3	96.7	314150 6STJOHN 230 314154 3STJOHNS 115 1
314218 6ELMONT 230 314222 6HANOVER 230 1	**996.2**	**1002.9**	948.0	**105.1**	**105.8**	314196 6LDSMTH1 230 314911 8LDYSMTH 500 1
314218 6ELMONT 230 314222 6HANOVER 230 1	899.5	919.9	948.0	94.9	97.0	314908 8ELMONT 500 314910 8CUNNING 500 1

Table K: Stressed System Conditions (2)

Overloaded Element	Prior Cont Loading (MVA)	Post Cont Loading (MVA)	Rating	Prior Cont Loading (%)	Post Cont Loading (%)	Contingency Label
314137 6FREDBRG 230 314138 6MINE RD 230 1	749.8	761.4	797.0	94.1	95.5	314212 6FRRIVER 230 314222 6HANOVER 230 1