Power to Ontario.
On Demand.
Station A, Box 4474
Toronto, ON
M5W 4E5

April 22, 2010 – **revised March 28, 2011**

Ms. Eva Tarasiewicz
Sr. Engineer
Hydro One Networks Inc.
483 Bay St., 15th Floor, North Tower
Toronto, ON
M5G 2P5

Dear Ms. Tarasiewicz

Mitigate Reliability Issues at HV Shunt Capacitor Installations
Notification of Conditional Approval of Connection Proposal
CAA ID Number: 2009-EX458

Thank you for the information regarding the proposed plan to mitigate reliability issues at high voltage shunt capacitor installations.

We have concluded that these proposed changes will not result in a material adverse impact on the reliability of the integrated power system.

The IESO is therefore pleased to grant **conditional approval** for the modification detailed in the attached assessment report. Any material changes to your proposal may require re-assessment by the IESO in accordance with Market Manual 2.10, and may nullify your conditional approval.

Final approval to connect the facility to the IESO-controlled grid will be granted upon successful completion of the IESO Market Entry process including, without limitation, satisfactory completion of the requirements set out in the System Impact Assessment report. During this process you will be expected to demonstrate that you have fulfilled the requirements and that the facility you have installed is materially unchanged from the proposal assessed by the IESO. Please refer to the '**External Guidelines for Connection to the IESO**' attachment in your approval email for key steps in the Market Entry process. In order to initiate this process, please contact Market Entry at market.entry@ieso.ca as soon as possible prior to your energization date.

For further information, please contact the undersigned.

Yours truly,

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cc: IESO Records

Final Report - Expedited System Impact Assessment - revised

Hydro One Networks Inc.

1.0 GENERAL DESCRIPTION & PROPOSED MODIFICATIONS

Hydro One is proposing modifications at a number of high voltage shunt capacitor installations in order to mitigate reliability problems caused by the rate of rise of recovery voltage for HV circuit breakers. Surge capacitors will be installed at a number of reactor equipped capacitor bank installations in order to reduce the transient recovery voltage to a level that is within the capacitor breakers' withstand capabilities.

In-service dates will be communicated via the IESO Outage process.

The following work will be performed in addition to surge capacitors:

- the installation of new 115 kV and 230 kV buswork to ensure all installations are capable of carrying the maximum foreseeable fault current;
- replacing various motorized disconnect switches with load interrupters (2 per capacitor bank);
- replace existing breakers with new breakers

2.0 TECHNICAL SPECIFICATIONS

The specifications of the surge capacitors are not part of this assessment.

The following motorized disconnect switches at Richview TS will be replaced with load interrupters that meet the following specifications:

Replace Disconnect Switches with Load Interrupters @ Richview TS		
	Existing disconnect switches (SC21H-H2 & SC22A-A1)	**Replacement load interrupters (SC21SC & SC22SC)**
Configuration	three phase	three phase
Nominal Voltage (kV)	230	230
Maximum Voltage (kV)	not known	250
Interrupting Time	N/A	50 msec
Continuous Current Rating (A)	2000	3000
Load Switching Current Rating (A)	N/A	2000
Short Circuit Symmetrical Duty (kA)	N/A	70

The following breakers will be replaced with breakers that meet the following specifications:

Primary Breaker Burlington TS **(SC11SC)** **Secondary Breaker** Burlington TS **(SC11K)**	
	Replacement
Configuration	three phase
Interrupting Medium	SF6
Nominal Voltage (kV)	115
Maximum Voltage (kV)	245 kV interrupters minimum to be installed
Interrupting Time	3 cycles (max)
Continuous Current Rating (A)	2000
Short Circuit Symmetrical Duty (kA)	63
Independent Pole Operated (IPO) closing time spread limit (applicable to SC11SC only)	2.0 msec (max)

The following breakers will be replaced with breakers that meet the following specifications:

Primary Breakers Richview TS **(SC21SC & SC22SC)**, Burlington TS **(SC21SC, SC22SC)**, Trafalgar TS **(SC21SC)** **Secondary Breakers** Richview TS **(SC21H and SC22A)**, Burlington TS **(SC21A1, SC22H2)**, Trafalgar TS **(SC21L)**	
	Replacement
Configuration	three phase
Interrupting Medium	SF6
Nominal Voltage (kV)	230
Maximum Voltage (kV)	362 kV interrupters minimum to be installed
Interrupting Time	3 cycles (max)
Continuous Current Rating (A)	2000
Short Circuit Symmetrical Duty (kA)	80
Independent Pole Operated (IPO) closing time spread limit (applicable to primary breaker only)	2.0 msec (max)

The following breakers will be replaced with breakers that meet the following specifications:

Primary Breakers Manby TS **(SC21SC & SC22SC)** **Secondary Breakers** Manby TS **(SC21A and SC22H)**	
	Replacement
Configuration	three phase
Interrupting Medium	SF6
Nominal Voltage (kV)	230
Maximum Voltage (kV)	550 kV interrupters minimum to be installed
Interrupting Time	3 cycles (max)
Continuous Current Rating (A)	2000
Short Circuit Symmetrical Duty (kA)	80
Independent Pole Operated (IPO) closing time spread limit (applicable to primary breaker only)	2.0 msec (max)

3.0 REQUIREMENTS

The proponent must notify the IESO as soon as it becomes aware of any changes to the assumptions made in the connection assessment. The IESO will determine whether these changes require a re-assessment.

Maximum Voltage

Appendix 4.1, reference 2 of the Market Rules states that under normal conditions the 115, 230 and 500 kV systems in Ontario are maintained within the voltage ranges shown in the below. Thus, the IESO requires that high voltage equipment in Ontario must have maximum continuous voltage ratings as listed in the table below.

Fault interrupting devices must be able to interrupt fault current at the maximum continuous voltages.

Permissible Voltage Ranges in Ontario **(Appendix 4.1, reference 2 of the Market Rules)**		
	Voltage range	**Maximum continuous voltage**
115 kV system – southern Ontario	113 - 127 kV	127 kV
230 kV system	220 - 250 kV	250 kV

Fault Levels

The Transmission System Code (TSC), Appendix 2 establishes maximum fault levels for the transmission system. The maximum 3 phase symmetrical fault levels and the single line to ground (SLG) symmetrical fault levels are listed in the table below.

The TSC requires that new equipment be designed to sustain the fault levels in the area where the equipment is installed. If any future system enhancement results in an increased fault level higher than the equipment's capability, the connection applicant is required to replace the equipment at their own expense with higher rated equipment capable of sustaining the increased fault level, up to the TSC's maximum fault levels as listed in the table below.

Maximum Permissible Fault levels in Ontario **(Appendix 2 of the Transmission System Code)**		
	maximum 3 phase symmetrical fault level	**single line to ground (SLG) symmetrical fault level**
115 kV system	50 kA	50 kA
230 kV system	63 KA	80 kA (usually limited to 63 kA)

Monitoring Requirements for Transmitters

In accordance with the telemetry requirements for transmitters (see Appendices 4.16, 4.20 and 4.21 of the Market Rules) the connection applicant must install equipment at this project with specific performance standards to provide telemetry data to the IESO. The data is to consist of certain equipment status and operating quantities which will be identified during the IESO Market Entry Process.

4.0 ASSESSMENT & CONCLUSIONS

The information provided by Hydro One shows that the technical characteristics of the replacement breakers and interrupters listed above meet the requirements in the Transmission System Code and will have no material adverse effect on the IESO-controlled grid.