

November 20, 2012

Mr. Ted Lyberogiannis  
Sustainment Manager - Transmission Stations Planning  
Hydro One Networks Inc.  
483 Bay Street  
Toronto, Ontario  
M5G 2P5



Dear Mr. Lyberogiannis:

***Replacement of T12 & T13 at Kirkland Lake TS  
Notification of Conditional Approval of Connection Proposal  
CAA ID Number: 2012-EX628***

Thank you for the information regarding the proposed replacement of T12 and T13 at Kirkland Lake TS. The IESO has concluded that the 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 as detailed in the attached expedited System Impact Assessment report. Please note that any material changes to your proposal may require a re-assessment by the IESO and may nullify your conditional approval.

You may now initiate the IESO's **Facility Registration/Market Entry** process. To do so, please contact Registration & Compliance Support at [market.entry@ieso.ca](mailto:market.entry@ieso.ca) as soon as possible prior to your expected energization date. The SIA report, attached hereto, details the requirements that your company must fulfill during this process, including demonstrating that the equipment *as installed* will not be materially different from the equipment *as approved* by the IESO. The document entitled [Market Entry: A Step-by-Step Guide](#) describes the key steps in the Market Entry process.

When your company has successfully completed the IESO's **Facility Registration/Market Entry** process, the IESO will provide you with a **final approval**, thereby confirming that the facility is fully authorized to connect to the IESO-controlled grid.

For further information, please contact me via [connection.assessments@ieso.ca](mailto:connection.assessments@ieso.ca).

Michael Falvo  
Manager – Market Facilitation  
Telephone: (905) 855-6209  
Fax: (905) 855-6319  
E-mail: [mike.falvo@ieso.ca](mailto:mike.falvo@ieso.ca)  
cc: IESO Records

**Final Report - Expedited System Impact Assessment**  
**Hydro One Networks Inc.**

**1.0 GENERAL DESCRIPTION & PROPOSED MODIFICATIONS**

Hydro One is proposing to replace T12 & T13 at Kirkland Lake TS with new units due to end of life. The expected in-service date for the replacement T12 & T13 will be communicated to the IESO.

**2.0 TECHNICAL SPECIFICATIONS**

The technical specifications of the existing and replacement transformers are given in the following table.

<b>Kirkland Lake TS</b>		
<i>All values for replacement equipment are specified at the time of order. Actual values to be provided prior to in-service dates.</i>		
<b>Transformer</b>	<b>Existing T12 &amp; T13</b>	<b>Replacement T12 &amp; T13</b>
<b>Configuration</b>	Three phase	Three phase
<b>Transformation (kV)</b>	110.0/44/4	115.5/44/4
<b>Winding Configuration</b>	Wye/wye/delta	Wye/wye/delta
<b>Thermal Rating</b>	25.0 MVA ONAN 33.3 MVA ONAF 41.7 MVA ONAF	25.0 MVA ONAN 33.3 MVA ONAF1 41.7 MVA ONAF2
<b>Continuous Thermal Rating (winter 10°C)</b>	41.7 MVA	41.7 MVA
<b>10-DAY Thermal Rating (winter 10°C)</b>	61.9 MVA	61.9 MVA <i>(assumed to be equal to the existing units)</i>
<b>15-MIN Thermal Rating (winter 10°C)</b>	82.3 MVA	82.3 MVA <i>(assumed to be equal to the existing units)</i>
<b>Positive Sequence Impedance (H-L)</b>	R = 0.57 % X = 13.64 % on 41.7 MVA base	R = 0.57 % X = 13.64 % on 41.7 MVA base <i>(assumed to be equal to the existing units)</i>
<b>Impedance to Ground</b>	110 kV – solidly grounded 44 kV - solidly grounded	115.5 kV - solidly grounded 44 kV - solidly grounded
<b>Under-load tap-changer</b>	44 ± 4.4 kV 16 Steps	44 ± 8.8 kV 32 Steps
<b>Off-load tap-changer</b>	Tap 1: 115.5 kV Tap 2: 112.75 kV Tap 3: 110.0 kV Tap 4: 107.25 kV Tap 5: 104.5 kV	Not applicable
<b>In service off-load tap position</b>	Tap 1: 115.5 kV	Not applicable

**Table 1 – Comparison of Existing and Replacement Transformers at Kirkland Lake TS**

### 3.0 REQUIREMENTS

Hydro One 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.

#### Reactive Power Requirements

The Market Rules require that Hydro One have the capability to maintain a power factor within the range of 0.9 lagging and 0.9 leading as measured at the defined metering point at Kirkland Lake TS. This power factor range translates into a load angle range of  $\pm 0.45$  radians. All the points above 0.45 radians indicate a lagging power factor below 0.9. All points below -0.45 radians indicate a leading power factor below 0.9.

#### Monitoring Requirements

The Market rules (Chapter 4 section 7.4) require that the transmitter shall provide the IESO on a continual basis with on-line monitored quantities as specified in Appendix 4.16. For this proposed project, the IESO will continue to require the operating quantities associated with the new transformer.

Among other things, end to end telemetry testing must be completed by the applicant along with the IESO to ensure that standards are met and sign conventions are understood.

Provided that the TSC requirements are satisfied, the IESO does not have additional requirements.

### 4.0 ASSESSMENT & CONCLUSIONS

#### 4.1 Replacement Transformer

The information provided by Hydro One shows that the replacement transformers T12 and T13 will be identical to the existing T12 and T13.

#### 4.2 10-Day Winter Transfer Capabilities

The 10-DAY winter transfer capability for Kirkland Lake TS is determined by removing the transformer with the highest 10-DAY thermal rating from service. The 10-DAY winter LTRs of the two transformers at Kirkland Lake TS are listed in the table below. The 10-DAY winter LTRs for the new T12 and T13 are assumed to be identical to the existing T12 and T13.

<b>10-DAY Winter Thermal Ratings (10°C) for Transformers at Kirkland Lake TS</b>		
<b>Transformer</b>	<b>Existing T12 &amp; T13</b>	<b>New T12 &amp; T13</b>
<b>T12</b>	<b>O/S (61.9 MVA)</b>	<b>O/S (61.9 MVA)</b> <i>(assumed to be equal to the existing units)</i>
<b>T13</b>	61.9 MVA	61.9 MVA <i>(assumed to be equal to the existing units)</i>
<b>Winter 10-DAY Transfer Capability</b> (with highest rated transformer out of service)	<b>61.9 MVA</b>	<b>61.9 MVA</b>

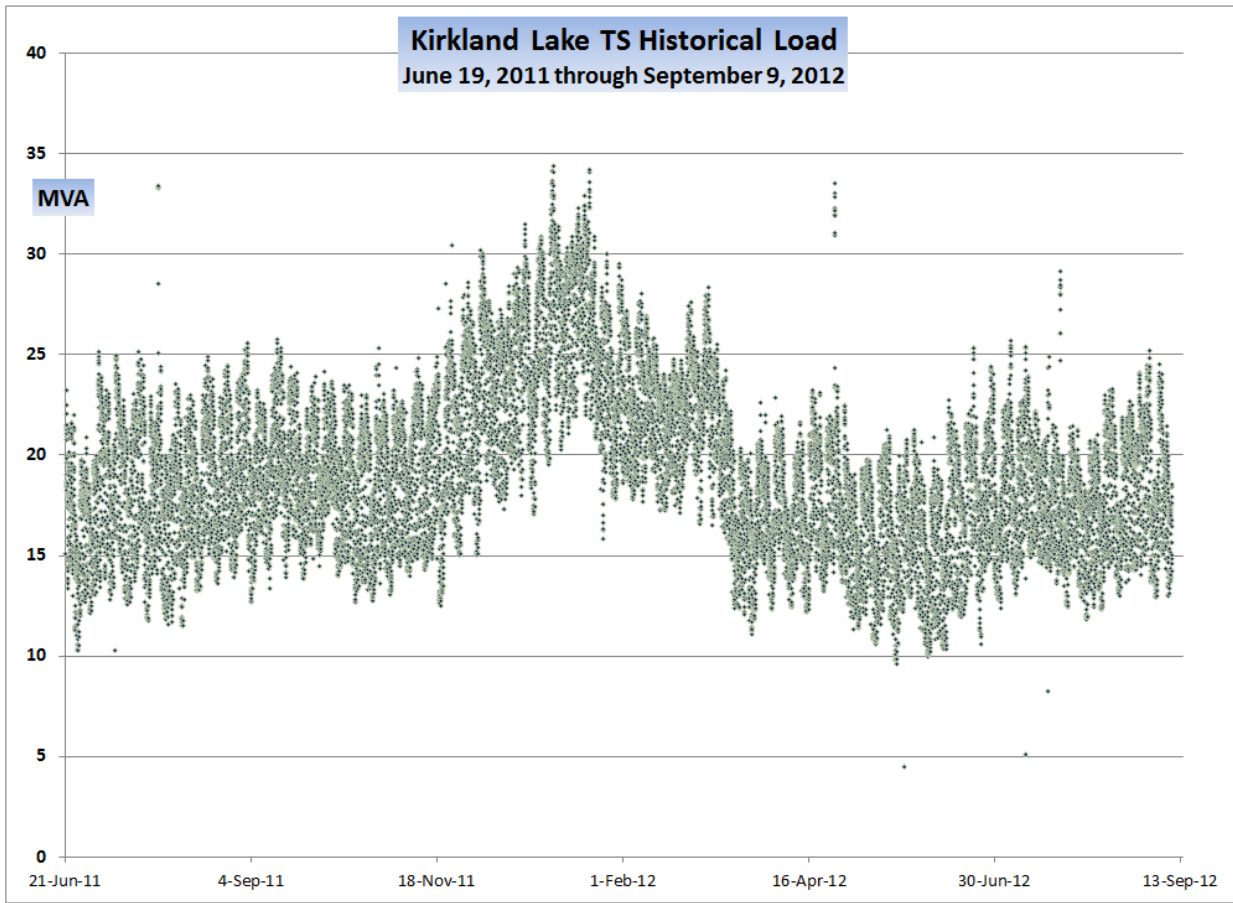
**Table 2 – 10-DAY Winter Thermal Ratings for Transformers at Kirkland Lake TS**

For Kirkland Lake TS, the existing 10-DAY winter transfer capability is 61.9 MVA. The 10-DAY winter transfer capability is assumed to remain the same when the new T12 and T13 are put into service.

**4.3 Load Peaks and Projections**

Revenue meter information from June 19, 2011 through September 9, 2012 was used to evaluate the load on T12 & T13 at Kirkland Lake TS.

The peak load of 34.4 MVA at Kirkland Lake TS occurred on January 3, 2012 at 17:30. The figure below shows the loading at the LV side of T12 and T13. This peak load is below the existing 10-DAY winter capability of 61.9 MVA and also below the assumed new 10-DAY winter capability of 61.9 MVA at Kirkland Lake TS.



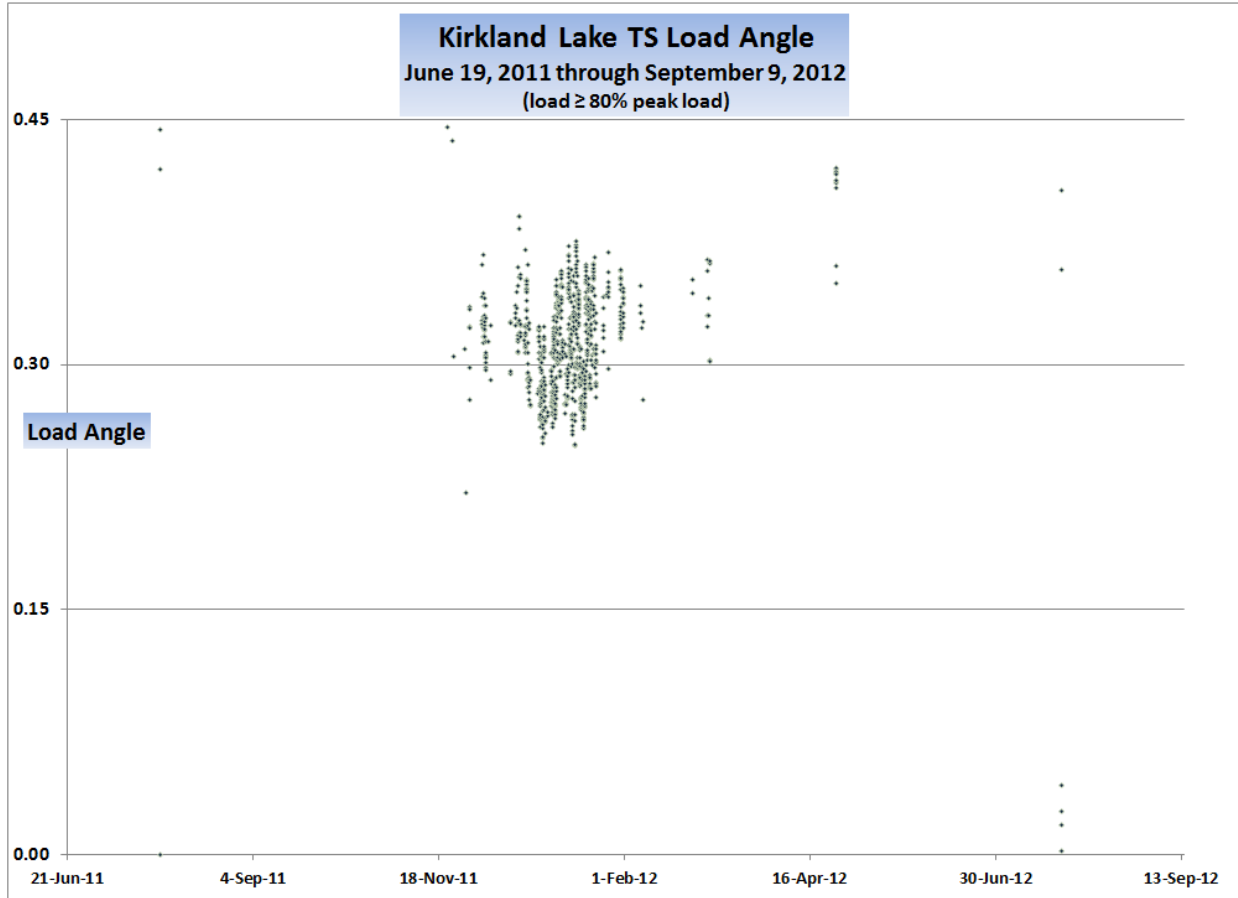
**Figure 1 – T12 and T13 Load at Kirkland Lake TS**

The 10-Day winter transfer capability at Kirkland Lake TS will not be exceeded in the foreseeable future.

**4.4 Load Angle & Power Factor**

Revenue meter information from June 19, 2011 through September 9, 2012 was used to evaluate the load angle on T12 & T13 at Kirkland Lake TS. The figure below illustrates the load angle on the LV side of T12 and T13 for instances when the load is above 80% of the peak load.

There is one low voltage shunt capacitor, SC1 at Kirkland Lake TS providing reactive support.



**Figure 2 – Load Angle at Kirkland Lake TS**

Between June 19, 2011 and September 9, 2012, the load angle at Kirkland Lake TS was within the IESO required limits for instances when the load is above 80% of the peak load.

**4.5 Conclusions**

It can be concluded that the replacement of T12 and T13 at Kirkland Lake TS will not result in a material adverse impact on the reliability of the IESO-controlled grid provided that all requirements in this report are met.