

1 Q. C-29; Volume II, Tab 14: Upgrade Power Transformers, page 17, Hydro states:

2 *“Based on the findings of the report, several recommendations have been made,*  
3 *when implemented, would reduce the likelihood of another failure.”*

4 What are the recommendations and how do they relate to the work to be  
5 undertaken in this project?

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8 A. The report referred to in the statement quoted above is a report written by ABB

9 (ABB is the present day original equipment manufacturer of the Sunnyside T1

10 transformer that failed on January 4, 2014). The report entitled “Design Study And

11 Failure Investigation For Auto Transformer Nalcor Serial # 289147 Canadian General

12 Electric” makes recommendations about Sunnyside T1 as well as its three sister

13 units Sunnyside T4, Stony Brook T1, and Stony Brook T2. Below is a table which

14 consists of the recommendations from that report as well as the current status of

15 each recommendation. Also noted in the table is which recommendations are to be

16 completed under the Upgrade Power Transformers project.

Recommendation	Decision	Status
Comprehensive DGA, oil quality tests and transformer testing is to be planned.	Adopt	COMPLETED completed by Equipment Engineer
Any bushings with high C2 capacitance need to be compared to initial benchmark test results. Higher results need to be investigated.	Adopt	COMPLETED Results analyzed by Doble Engineering, no issues identified.
As the bushings of these transformers are about 40 years old, it is recommended to replace the bushings.	Adopt	PLANNED The replacement of SSD T4, STB T1, & STB T2 bushings are planned to be completed in 2016 under the Upgrade Power Transformers capital project.
Add a conservator diaphragm.	Review	IN PROGRESS Equipment Engineer will evaluate taking into consideration the cost of the upgrade and the remaining transformer service life and make a recommendation by June 30th, 2015
Consider adding oxidation inhibitor to oil.	Adopt	IN PROGRESS A long term plan for re-inhibiting (which includes SSD T4, STB T1, & STB T2) will be developed in 2015 with re-inhibiting to be completed in under the Upgrade Power Transformers capital project beginning in 2016.
Monitor Acetylene (C <sub>2</sub> H <sub>2</sub> ) closely especially for (STB T2).	Adopt	COMPLETED Equipment Engineer monitoring acetylene levels. STB T1 currently monitored annually, SSD T4 & STB T2 currently monitored semi-annually.
Confirm that the cause of the acetylene is due to seeping from the LTC diverter oil compartment. This can be done by applying pressure on the diverter compartment and checking if oil leaks into the main compartment (the pressure drops).	Adopt	IN PROGRESS STB T2 is planned for 2014 while the scheduling of SSD T4 is subject to the outcome of STB T2.
Consider adding online gas monitor.	Adopt	COMPLETED Online gas monitors will be installed as per the long term plan which currently states 2018, 2021, and 2021 for STB T2, STB T1, and SSD T4 respectively. The capital program under which this work is to be completed is anticipated to begin in 2015 under the "Install Transformer On Line Gas Monitoring" proposal included in the 2015 Capital Budget submission.
Consider adding bushing monitors.	Adopt	IN PROGRESS Equipment Engineer will make a recommendation by June 30th, 2015.
Measure the oil break down voltage per ASTM D1816 (1mm or 2mm) method.	Adopt	COMPLETED
Repeat the TV windings resistance test (on unit STB T1) and compare to the sister unit results.	Adopt	IN PROGRESS Scheduled for November 2014
Repeat the HV resistance test (on unit SSD T1) and compare to the sister unit results.	Reject	NO ACTION REQUIRED No longer possible (due to post-failure condition of SSD T1)
Inspect and overhaul the LTC diverters. Most LTC manufacturers recommend LTC diverter inspections every seven years. It is also recommended to re-condition or replace the oil in the LTC diverter tanks with new oil if it is not already done.	Adopt	IN PROGRESS LTC diverters are inspected and overhauled if they meet Hydro's criteria. The current criteria is condition-based but is being revised in early 2015 to include age and usage. The Equipment Engineer will make a recommendation on STB T2, STB T1, and SSD T4 by May 31st, 2015. LTC diverter overhauls are completed under the Upgrade Power Transformers capital project.