

November 2, 2005

Mr. Shaun Gilligan
Senior Network Management Officer
Operating Effectiveness Department
Ontario Grid Control Centre (OGCC)
Network Operating Division - Hydro One Inc.

Dear Mr. Gilligan:

*Woodroffe T4 Replacement
Notification of Approval of Connection Proposal
CAA ID Number: 2005-EX254*

From the information provided, our review concludes that the proposed project will not result in a material adverse effect on the reliability of the IESO-controlled grid since the refurbished transformer T4 has similar impedance and capability as the original unit. The data supplied by Hydro One for the original and the refurbished transformer are attached to this notification.

The IESO is therefore pleased to grant **conditional approval** for the proposed installations subject to the implementation of the requirements 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 will be granted upon successful completion of the IESO Facility Registration process. During facility registration you will be expected to demonstrate that you have fulfilled the requirements and the modification is in line with the proposal assessed by the IESO. Please contact facility.registration@ieso.ca if you have not received a Facility Registration Summary package within the next 10 days.

For further information, please contact the undersigned.

Yours truly,

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cc: IESO Record

All information submitted in this process will be used by the IESO solely in support of its obligations under the *Electricity Act, 1998*, the *Ontario Energy Board Act, 1998*, the *Market Rules* and associated policies, standards and procedures and in accordance with its license. All information submitted will be assigned the appropriate confidentiality level upon receipt.

WOODROFFE TS – TRANSFORMER T4 REFURBISHMENT IESO EXPEDITED SYSTEM IMPACT ASSESSMENT – 2005-EX254

PROJECT DESCRIPTION

Transformer # 4 at Woodroffe TS experienced a ULTC failure and tripped on A and B differential protection. Now Hydro One is proposing to reinstall T4 after it is refurbished.

Woodroffe TS is equipped with four 115/13.8 kV transformers connecting onto the 115 kV transmission out of Merivale TS. Transformers T1 and T3 are connected to the 115 kV circuit C7BM going to Barrett Chute and transformers T2 and T4 are connected to the 115 kV radial circuit F10M going to Hinchey TS. The transformer banks have the capability to be operated connected on the LV side, T1 with T2 and T3 with T4, via bus tie breakers. However, the LV bus-tie breakers, QZ and BJ, are normally operated open because the system short circuit levels exceed the interrupting capability of the 13.8 kV breakers at Woodroffe TS. Load transfer between the transformers is possible by temporarily closing the bus tie breaker and then opening the LV breaker of the transformer that is being underloaded.

The configuration and connectivity of Woodroffe TS is shown in Figure 1.

EQUIPMENT DATA

The data for T4 before and after refurbishment was provided by Hydro One and is summarized in the following table for comparison.

Comparison Results of Woodroffe T4 (Before and After Refurbished)

	Before	After
Rating (MVA)	20/33.3	20/33.3
Voltage (kV)	110/12.0	110/14.2
Configuration	3-Phase, 60 cycle, Y/Δ	3-Phase, 60 cycle, Y/Δ
Impedance (pu on 33.3 MVA base)	0.0008+j0.021	0.0009+j0.018
U.L.T.C. (L.V.)	12.0 ± 10% kV in 16 steps	14.2 ± 10% kV in 16 steps
O.L.T.C. (H.V.)	104.5-115.5 kV in 4 steps	110-121 kV in 4 steps
Full Wave Impulse Level (kV)	N/A	500 (H.V.), 110 (L.V.)

Assessments

The information in the above table shows that the refurbished T4 has similar impedance and MVA capability as the original unit, but different OLTC turns ratios.

The refurbished transformer has a higher nominal turns ratio for the off-load tap changer than the original unit.

T1, T2, T3 and Original T4:	0.1148, 0.1119, 0.109, 0.1064, 0.1034
Refurbished Unit T4:	0.129, 0.1259, 0.1229, 0.120, 0.117

Hydro One's records indicate that T3 is presently operated on the 112.75 kV tap (0.1064). After the installation of the refurbished transformer T4, because the two units have very different off-load tap ratios, it is recommended to place T3 on the 104.5 kV tap and T4 on the 121 kV tap. This way the off-load tap ratios for the two transformers will be close enough and finer adjustment of voltage could be achieved with the on-load tap changer.

Conclusions

The IESO has concluded that the proposed replacement of transformer T4 with the refurbished unit will not have a negative effect on the reliability of the IESO-controlled grid. However, T3 and T4 must be operated such that it would be possible to parallel the two units when necessary.

Notification of Approval

It is therefore recommended that a Notification of Approval of the Connection Proposal be issued.

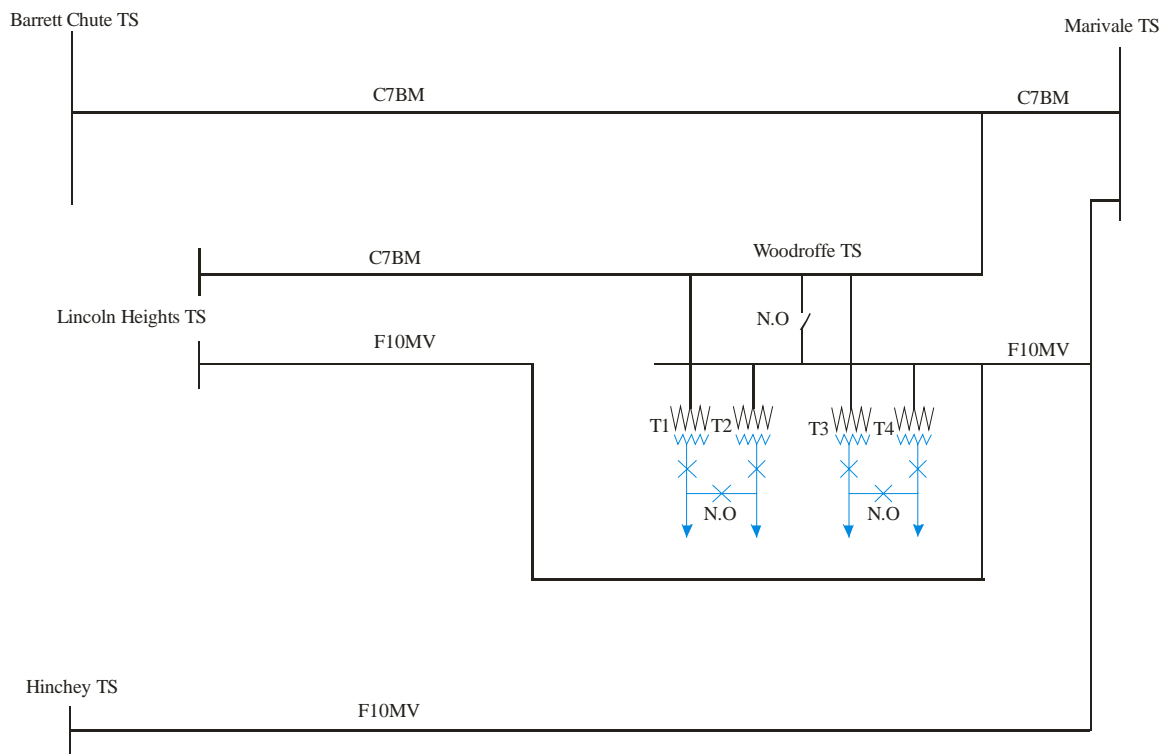


Figure 1. 115 kV Supply Arrangement to Woodroffe TS