



September 24, 2004

Mr. Tom Kydd
Acting Manager – Stations T&D: Sustainment Programs
Hydro One Networks Inc.
483 Bay Street
15th Floor - North Tower
Toronto, ON M5G 2P5

Dear Mr. Tom Kydd:

***Manby TS – T4 and TR4 Replacement
Notification of Approval of Connection Proposal
CAA ID Number: 2004-EX147***

Thank you for the detailed information that you provided on the plan to replace the existing Manby step-up transformer T4 and regulating transformer TR4 with one unit equipped with under-load tap changer.

The assessment concluded that the proposed project would not have a negative impact on the reliability of the IMO-controlled grid.

The IMO is therefore pleased to grant **conditional approval** for the installation of the new equipment, as detailed in the attached *System Impact Assessment Report*. Any material changes to your proposal may require a re-assessment by the IMO in accordance with Market Manual 2.10, and may nullify your conditional approval.

Final approval will be granted upon successful completion of the IMO Facility Registration process. During facility registration you will be expected to demonstrate that the project you have installed is materially unchanged from the proposal assessed by the IMO. Contact facility.registration@theIMO.com if you have not received a Facility Registration Summary package within the next 10 days. A copy of the Report will be posted on the IMO web site: www.theimo.com.

To commence the construction process, please follow the necessary procedures and obtain the required approvals, licences and permits as may be required by the OEB and other regulatory authorities.

For further information, please contact the undersigned.

Yours truly,

Bob Gibbons
Manager – Long Term Forecasts & Assessments
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All information submitted in this process will be used by the IMO 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 licence. All information submitted will be assigned the appropriate confidentiality level upon receipt.

Expedited System Impact Assessment Report for the Replacement of Manby T4 and TR4

1.0 Description of Proposal

Manby West 230 kV Transformer Station (TS) is equipped with three 230/115 kV transformers and four 230/28 kV transformers configured as two DESN type arrangements. One DESN arrangement consists of transformers T3 and T4. The two transformers are connected to the 230 kV buses A1 and H1, respectively. Transformer T3 was replaced with a universal unit in 2003. The replacement was approved by the IMO under CAA ID 2001-EX003.

Recently, Hydro One Networks Inc. (HONI) has proposed to replace the existing unit T4 and the associated 26.4/26.4 kV regulating transformer TR4 with a single transformer equipped with under-load tap changer. The new transformer will be connected to the same location as the old unit. Hydro One submitted a Connection Assessment application which included a detailed project scope of work that is attached in Appendix 1.

The proposed work will be started in mid- October and it is scheduled for completion before the end of 2004.

2.0 Assessment

2.1 Data Verification

A comparison between the technical specifications of the exiting and the new transformer is given below.

New Transformers T4

Configuration – 3 phase
Transformation – 215.5/28 kV
Winding Configuration – HV wye, LV zigzag
Rating Continuous – 25/33.3/41.7 MVA
LTR 10 Day – 44.8 MVA
Positive Sequence Impedance – min turns; 5.7% o, max turns; 12%; tap#12; 8.5% on 25 MVA
On-load tap-changer – +/- 30 kV in +/- 24 equal steps;
 Minimum tap: 185.5 kV,
 Maximum tap: 245.5 kV

Existing Transformers T4

Configuration – 3 phase
Transformation – 228.8/28.4 kV
Winding Configuration – HV wye, LV zigzag
Rating Continuous – 40 MVA
Summer LTR 10 Day – 44.8 MVA
Positive Sequence Impedance – 14.61% on 40 MVA
On-load tap-changer – Not Available

Existing Regulating Transformer TR4

Configuration – 3 phase

Transformation – 26.4/26.4 kV

Winding Configuration – Not Available

Rating Continuous – 40 MVA

Summer LTR 10 Day – 43.2 MVA

Positive Sequence Impedance – 1.69% on 40 MVA

On-load tap-changer – Not Available

It can be concluded that the new transformer will not have an adverse impact on the reliability of the IMO-controlled grid because:

- The new and the old units have the same winding configuration and thermal rating.
- The impedance of the new unit (8.5 % on 25 MVA) is slightly lower than the equivalent impedance of the existing two transformers calculated on the same MVA base (10.2 on 25 MVA).
- The new transformer is to be equipped with under-load tap changer and would exhibit equivalent operational characteristics as the existing fixed tap and regulating transformer pair.

Additionally, the new transformer's characteristics are very similar to Manby T3 transformer which was replaced by Hydro One in 2003. This would ensure a balanced loading of the two transformer units T3 and T4.

2.2 On-line Monitoring Requirements

The *Market Rules* (Chapter 4 section 7.4) require that each transmitter shall provide the IMO on a continual basis with on-line monitored quantities as specified in Appendix 4.16. For this proposed project, the IMO requires the status and operating quantities associated with transformers T1 and T3 on a continual basis.

3.0 Protection Requirements

With respect to the protection and telecommunication requirements, the HONI will have to follow the Transmission System Code technical requirements for transmission lines and transformer stations supplying load.

4.0 Fault Level Assessment

The proposed transformer replacement will not change the fault levels on the system.

5.0 Conclusions

The IMO has concluded that the proposed transformer replacement project at Manby TS will not have a negative effect on the reliability of the IMO-controlled grid.

6.0 IMO Requirements

The assessment concluded that HONI is required:

- To meet IMO's on-line monitoring requirements.
- To meet Transmission System Code requirements with respect to protection systems.

7.0 Notification of Approval

It is recommended that Notification of Approval be granted to HONI for the replacement of step-up transformer T4 and regulating transformers TR4 at Manby TS with the new equivalent unit equipped with under-load tap changer.

This Notification of Approval is subject to HONI meeting the requirements listed in Section 3.0 and those of the IMO facility registration process.

APPENDIX 1- Hydro One

Investment # 11495 Manby T4; Replace Transformer Scope of Work General

The scope of work includes: modification of HV and LV bus to suit, addition of surge arresters on LV side, removal/modifications of steel structure adjacent to the transformer T4, installation of a new steel structure for 27.6kV cable terminations support, installation of a new steel structure for 27.6kV neutral reactor, installation of new protective relaying and associated control cabling, installation of the metering cabinet in the switchyard to contain IMO compliant metering and the installation of IMO approved wholesale revenue metering for the new T4 power transformer at Manby TS is a shared project with Toronto Hydro. (Toronto Hydro will provide metering components inside the new metering cabinet and the PT's. Toronto Hydro MSP group will be responsible for IMO registration to be provided by Toronto Hydro).

Engineering

- Remove existing Power Transformer.
- Remove existing Grounding Transformer
- Remove Regulating Transformer
- Remove 16m of underground cable connection between the neutral bus and the grounding transformer
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- Remove 27.6kV connections: 60m of bus and forty(40)insulators
- Install One (1) Power Transformer: 25/33.3/41.7 MVA; 215.5-28kV
- One (1) Neutral Reactor (manufacturer Trench Limited),
- Three (3) 27.6kV Surge Arresters,
- 27.6 kV underground cable
- Install three (3) 230kV post insulators
- Install ten (10) 44kV insulators on new steel structure
- Remove underground cable between 30kVA step down transformer and existing mechanical box
- Install 40m of 4" Aluminum bus,
- Install 30m of 1c-1000kCMIL Copper; 600V PVC conductor directly buried between the neutral reactor and neutral bus
- Extend existing 4" fiber conduits from underneath the old pylon to the new cable support structure
- Allow extra funds for under crossing cable duct

- Install 6 lengths of 70m of 1c1000kCMIL, Copper, 27.6kV XLPE insulated cable in 4" fibre conduit
- Install 12 cold shrink terminations 27.6 kV
- Install grounding connections for the for power transformer per SIU-DBS-59120-1701
- Procure and install grounding stirrups on the top of the power transformer.
- Procure and install grounding stirrups on the HV buses
- Install grounding connections for the LV surge arresters. Consider #4/0AWG Copper conductor
- Install three (3) 27.6kV potential transformers and associated electrical connections
- Install new junction box on the new steel structure
- Install metering cabinet on the new steel structure
- Install cable for AC power supply
- Remove foundations and steel structure associated with the grounding and regulating transformers Pull and terminate approximately 60 cables.
- Build "A" and "B" transformer protections in one 19" relay rack.
- Remove Regulating Transformer steel structure (partial)
- Remove Regulating transformer foundations
- Remove cable pylon at the transformer end
- Install foundations and new steel structures.
- Wire PT secondary wires and cables from the IT's to the junction box.
- Wire CT and PT secondary wires and cables from the junction box/T4 mechanical box to the metering cabinet.
- Wire one dedicated telephone circuit from the Bell/Hydro interface cabinet to the metering cabinet.