



May 21, 2004

Mr. Emanuel DaRosa  
T&D Asset and Investment Manager  
Asset Management and Engineering Dept.  
Transmission and Distribution Division  
Great Lakes Power Limited – Transmission Division  
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Sault Ste. Marie, Ontario  
P6B 6J6

Dear Mr. DaRosa

***Northern Ave. TS  
Notification of Approval of Connection Proposal  
CAA ID Number: 2004-EX186***

Thank you for the detailed information that you provided on the plan to reconfigure the Northern Ave. Transformer Station.

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](mailto: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](http://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,

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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  
Northern Ave. TS***

***1.0 Description of Proposal***

Great Lakes Power Limited (GLPL) - Transmission Division is proposing to reconfigure the existing Northern Ave. Transformer Station (TS) in Sault Ste. Marie. This station is radially supplied from Third Line TS via the Northern Ave. 115 kV circuit.

GLPL has submitted in a separate document a detailed description of the proposed project including protection and control details. This document is attached as Appendix A to this Expedited System Impact Assessment report.

As shown in Figure 1 of Appendix A, the existing Northern Ave. TS feeds GLPL – Distribution load via Bruce Mines 34.5 kV feeder (back-up) and via 306 12 kV feeder (local industries) and 308 12 kV feeder (supply to GLPL office). These feeders will continue to exist in the new configuration. The MacDonald Ave. (P.U.C.) and the Pine St. Sub (P.U.C.) feeders no longer exist and will not be part of the new reconfigured station. The existing transformer T8 115/34.5 kV will be retained as T1 along with the existing 115 kV transformer disconnect switch.

The new transformer station will be constructed in the existing Northern Ave. TS switchyard. As shown in Figure 2 of Appendix A, the new configuration for the transformer station will be simplified and all unnecessary 115 kV, 34.5 kV and 12 kV equipment will be removed.

The planned in-service date for this project is December 2004.

***2.0 Assessment***

***2.1 Data Verification***

GLPL - Transmission Division submitted with their application, the station equipment data associated with the proposed project. The equipment specifications of the equipment associated with the IMO-controlled grid are highlighted below:

*Transformer T1*

Configuration – 3 phase

Transformation – 115/34.5 kV

Winding Configuration – H delta, X wye, no tertiary winding

Rating – 26.67 MVA

Positive Sequence Impedance –  $(0.61+j7.27)$  ohms on 20 MVA base

Off-load taps – 117.875 kV, 115 kV, 112.125 kV, 109.25 kV and 106.375 kV

*T1 High Voltage (HV) Transformer Disconnect Switch 387*

Type – Disconnect

Maximum Operating Voltage - 121 kV

Continuous Current Rating – 600 A

*T1 HV Surge Arresters*

Type – zinc oxide varistor

Voltage Rating – 88 kV line to ground

Class – Intermediate

The T1 HV transformer disconnect switch does not meet the *Market Rules* (Chapter 4, Appendix 4.1) requirement of 127 kV.

During commissioning of the new transformer GLPL - Transmission Division is required to determine the optimal tap position of transformer T1, based on historical information of system voltages.

The T1 HV transformer disconnect switch must meet the Market Rules (Chapter 4, Appendix 4.1) requirement of 127 kV.

## **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. It is required that GLPL-Transmission Division provide all the equipment needed to monitor the information required by the IMO on a continuous basis. Specifically, for this proposed reconfiguration of Northern Ave. TS, the IMO requires that the status and operating quantities associated with transformer T1 on a continual basis.

## **2.3 Protection Requirements**

With respect to the protection and telecommunication requirements, the GLPL - Transmission Division will have to follow the Transmission System Code technical requirements for transmission lines and transformer stations supplying load. The proposed protection systems for the Northern Ave. 115 kV circuit and T1 transformer meet the requirements.

GLPL must provide the IMO all the Northern Ave. 115 kV circuit and T1 transformer protection relay settings IMO via the facility registration process.

## **2.4 Fault Level Assessment**

GLPL - Transmission Division performed short circuit assessment and concluded that the project will not change the fault levels on the 115 kV system.

## **2.5 Conclusions**

The IMO has concluded that the proposed reconfiguration of Northern Ave. TS will not have a negative effect on the reliability of the IMO-controlled grid.

## **3.0 Customer Impact Assessment**

GLPL - Transmission Division performed a Customer Impact Assessment and concluded that:

- The symmetrical fault currents on the 12 kV bus at Northern Ave. TS will decrease,
- The asymmetrical fault currents on the 12 kV bus at Northern Ave. TS will increase,
- The 12 kV distribution system voltage at Northern Ave. TS will be maintained with acceptable limits by the VR2 voltage regulators,
- The T1 and T2 transformers at Northern Ave. TS have sufficient capacity to meet existing and future peak loads, and
- The reliability of supply for Northern Ave. TS should improve due to the reduced operating complexity of the station.

## **4.0 IMO Requirements**

The assessment concluded that GLP - Transmission is required:

- To determine the optimal tap position for the new 115/34.5 kV transformer based on historical information of system voltages.
- To ensure that the voltage rating of the T1 HV transformer disconnect switch meets the Market Rules (Chapter 4, Appendix 4.1) requirement of 127 kV.
- To meet IMO's on-line monitoring requirements.
- To meet Transmission System Code requirements with respect to protection systems.

- To meet Distribution System Code requirements with respect to voltage variation.

### ***5.0 Notification of Approval***

It is recommended that Notification of Approval be granted to GLP - Transmission Division for the reconfiguration of Northern Ave. TS.

This Notification of Approval is subject to GLP - Transmission Division meeting the requirements listed in Section 4.0 and those of the IMO facility registration process.



## Appendix A

### **Description of Northern Ave. TS Project and Single Line Diagrams for the IMO Expedited System Impact Assessment Application (ESIAA)**

#### **1.0 Introduction**

The focus of this Expedited SIAA is to review the system impact of reconfiguring the existing Northern Ave. TS in Sault Ste. Marie. The existing Northern Ave. TS is shown in Figure 1 and the proposed Northern Ave. TS configuration is shown in Figure 2.

#### **2.0 Station Reconfigurations**

##### **Northern Ave. TS Existing (Figure 1)**

The existing station feeds GLPL – Distribution load via Bruce Mines 34.5kV feeder (back-up) and via 306 12kV feeder (local industries) and 308 12kV feeder (supply to GLPL office). These feeders will continue to exist in the new configuration. The MacDonald Ave. (PUC) feeder and the Pine St. Sub (P.U.C.) feeders no longer exist and will not be part of the new reconfigured station. The existing transformer T8 115/34.5kV will be retained as T1 along with an existing HV transformer disconnect switch.

##### **Northern Ave. TS New (Figure 2)**

The new transformer station will be constructed in the existing Northern Ave. TS switchyard. The new configuration for the transformer station will be simplified and all unnecessary 115kV, 34.5kV and 12kV equipment will be removed. The proposed configuration will include:

- one existing 115kV manual transformer disconnect switch 387,
- T1 (formerly T8) 115/34.5kV transformer,
- 34.5kv motorized (SCADA controlled) T1 transformer disconnect switch 388,
- HV and LV lightning arrestors on T1,
- two 38kV breakers 382 & 385 (SCADA controlled) with manual disconnect switches on both sides,
- new T2 34.5/12 kV transformer,
- HV and LV lightning arrestors on T2,
- new VR2 – 3 x single phase 7.62 kV voltage regulators,
- Disconnect 371 and fuse disconnect 372 for GLP office building feeder,
- Disconnect 373 and SSA,
- Disconnects 361 & 363, recloser 364 and fuse disconnect 362 for 12kV feeder,
- IMO revenue metering on the 34.5kV bus, and
- SCADA control.

## **3.0 Protection System Description**

### **3.1 Northern Ave. 115kV Line**

The existing Northern Ave. 115kV pilot wire and backup line protections will be replaced with new A impedance and B phase/ground protections at Third Line TS.

There is no need for line protections or transfer trip receive at the Northern Ave. TS since the load will always be feed radial.

### **3.2 T1 Transformer and 34.5kV Bus 1**

T1 will be protected with a differential protection (A87-T1) which will be supplied from CT's on the HV of the transformer, feeder side of breaker 385 and T2 side of breaker 382. Gas trip (A63G) and over temperature trip (A49T) will be part of the A protection A87/A63G/A49T-T1. This will protect the T1 transformer and the 34.5kV Bus 1.

T1 will also have phase and ground overcurrent back-up protections B50/51-T1 which will be supplied from CT's on the HV of the transformer and B50N/51N-T1 which will be supplied from a CT on the neutral of the transformer.

There will be transfer trip to Third Line TS via existing fiber optic for T1 transformer faults.

### **3.3 Bruce Mines 34.5kV Feeder**

Bruce Mines 34.5kV feeder will have a standard overcurrent feeder protection (50/51/50N/51N-F1) installed with single shot reclosing.

### **3.4 T2 Transformer**

T2 will be protected with a differential protection (A87-T2) which will be supplied from CT's on the 34.5kV BUS 1 side of breaker 382 and the LV of the transformer. Gas trip (A63G) and over temperature trip (A49T) will be part of the A protection A87/A63G/A49T-T2.

T2 will also have overcurrent back-up protections B50/51-T2 which will be supplied from CT's on the 34.5kV BUS 1 side of breaker 382 and B50N/51N-T2 which will be supplied from a CT on the neutral of the transformer. These protections will protect the VR2 voltage regulators and the 12kV bus.

### **3.5 12 kV Feeders**

Supply to the GLP office building will be via disconnect 371 and fuse disconnect 372

SSA will be supplied via fuse disconnect 373

The distribution feeder will be supplied from recloser (phase and ground settings) 364 or by pass fuse disconnect 362 during maintenance of the recloser.

### **3.6 Coordination of Protections**

The B50/51-T1, B50N/51N-T1, B50/51-T2, B50N/51N-T2, B50/51/50N/51N-F1, fuse 372 and recloser (phase and ground) 364 will all be coordinated to provide selective tripping with the B50/51-T1, B50N/51N-T1 providing back-up for the 34.5kV F1 feeder protection and the B50/51-T2 and B50N/51N-T2 protections providing back-up to the 12kV fuses and recloser.

## **4.0 AC & DC System**

- There will be a single AC station service supply from transformer SSA with annunciation via SCADA.

- There will be a single 125Vdc battery and charger system with annunciation via SCADA.

## **5.0 Control System Description**

The reconfigured station will use the existing RTU which will allow monitoring and control of the station from the GLP System Control SCADA. This will allow GLP to meet the IMO Monitoring Requirements as outlined in the Market Rules Chapter 4 Appendix 4.16

### **Status:**

Transformer Disconnect Switch 388 (34.5kV)  
Breakers 382 & 385 (34.5kV)

### **Metering:**

MW and MVAR quantities for transformer T1 & T2  
Phase to phase voltages on the 34.5kV and 12kV

## **6.0 Customer Impact Assessment (CIA)**

GLP is conducting a CIA and will forward any findings to the IMO on completion of the final report. A copy of the Initial Draft Report dated February 27, 2004 is being provided to the IMO as part of this application.

## **7.0 Station Schematic Diagrams**

The following Station Schematic Diagrams are being provided to show the existing and proposed stations.

**Figure 1 – Existing System Operating Diagram Northern Ave. T.S.**

**Figure 2 – Proposed Single Line Diagram for the Northern Ave. T.S.**

Figure 1 – Existing System Operating Diagram Northern Ave. T.S.

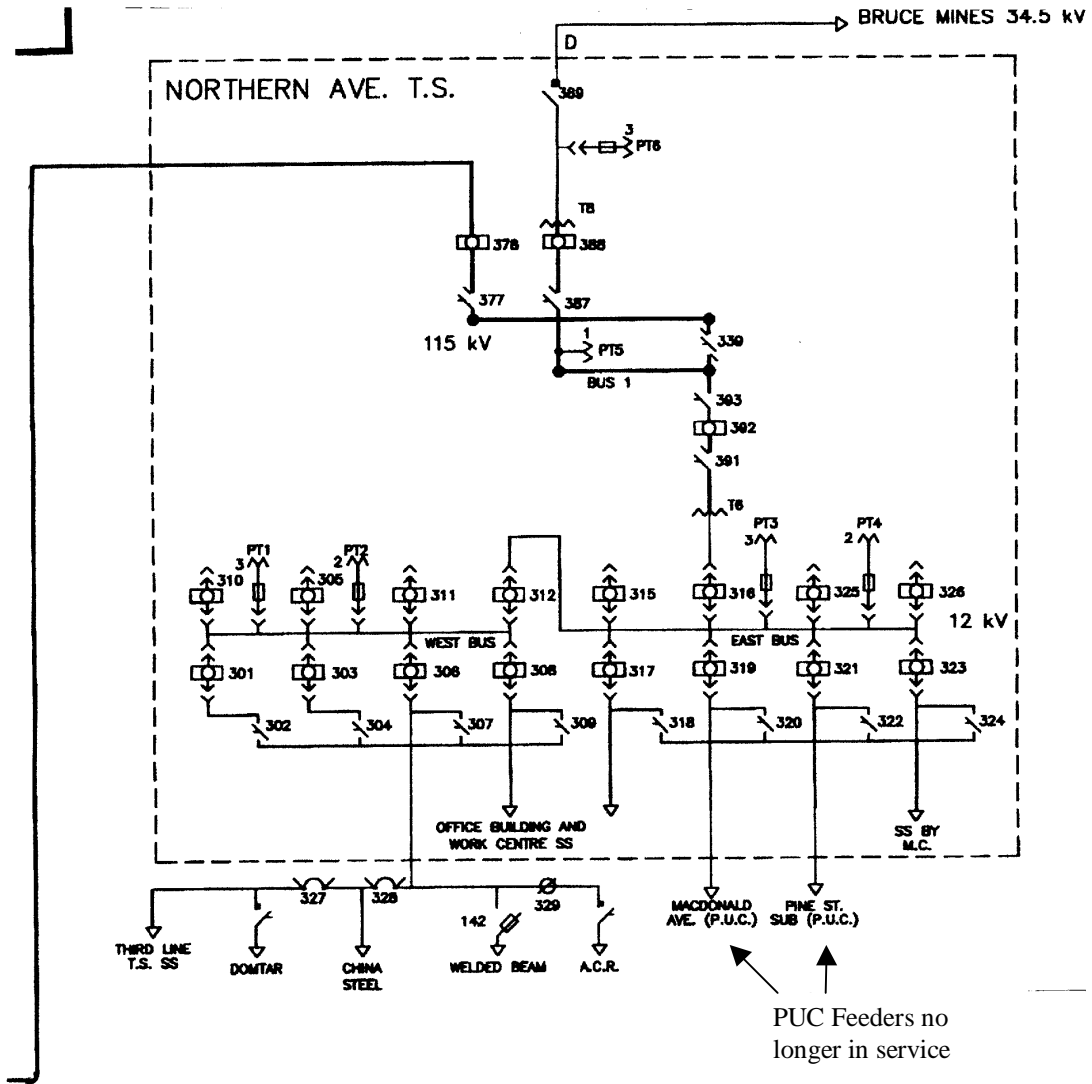
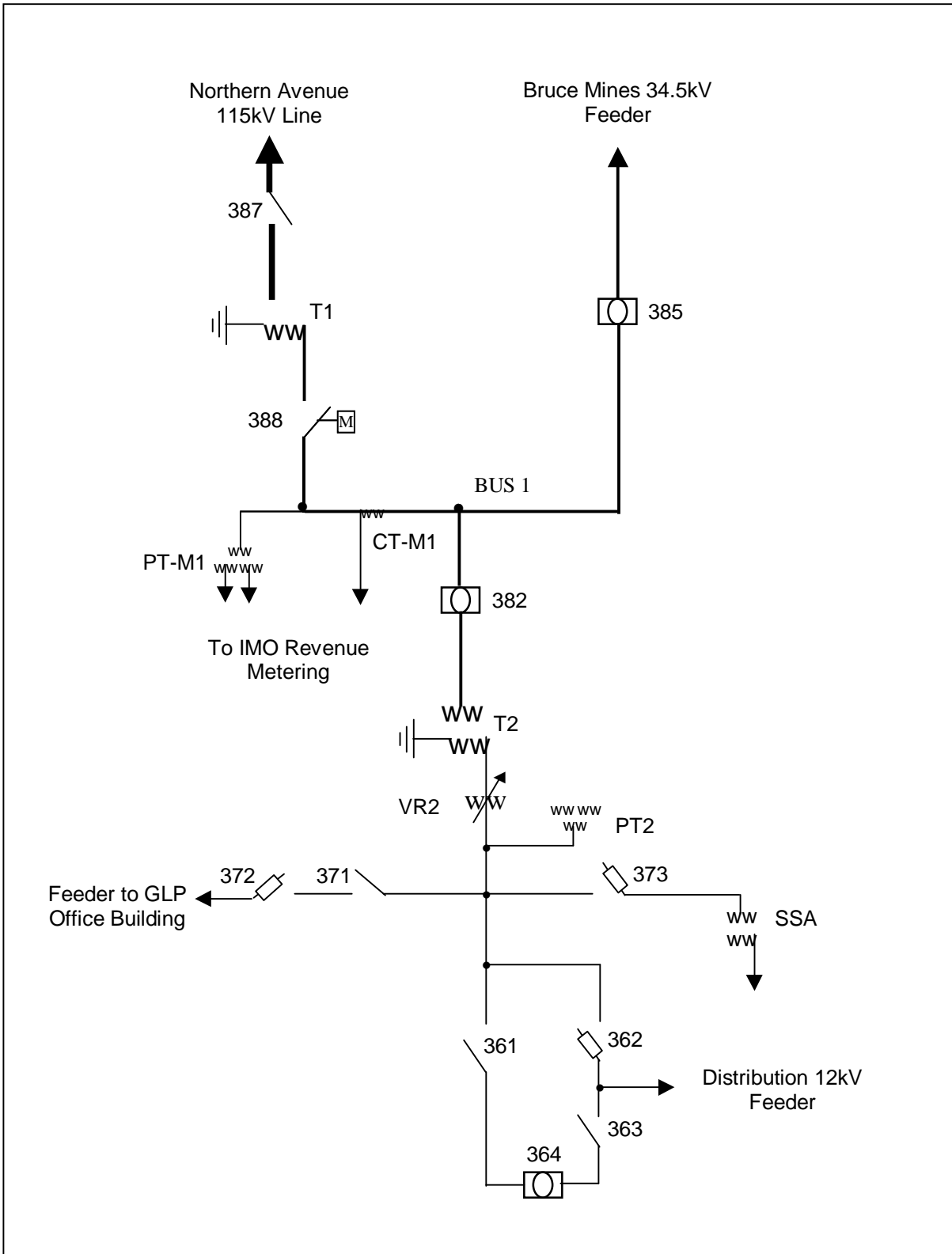


Figure 2 – Proposed Single Line Diagram for the Northern Ave. T.S.



## **8.0 Tentative Schedule**

The entire project will take approximately nine months to complete with the station construction and in service completed by December 2004. Since detailed engineering has not been completed, staging of construction may change depending on engineering and operational considerations.

## **9.0 Preliminary Construction Outage Details**

A preliminary construction schedule will be developed as part of the in service of the new station. The new equipment will be located to minimize the outages to the existing 12kV feeders during construction. Once the new facilities are completed and ready for in service, there may be a need for short duration outages to the existing feeders to make the final connections to the reconfigured station.