



**IMO\_REP\_0028**

## **CONNECTION ASSESSMENT & APPROVAL PROCESS**

### **PRELIMINARY ASSESSMENT REPORT**

**APPLICANT:** Waterloo North Hydro Inc.

**PROJECT:** New 230-28 kV Transformer Station (MTS #3)

**CAA ID No. 2001-032**

Long Term Forecasts & Assessments Department

Date: *June 21, 2001*

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# **PRELIMINARY ASSESSMENT REPORT**

## **WATERLOO NORTH HYDRO NEW 230-28 KV TRANSFORMER STATION (MTS #3)**

### **Disclaimer**

This report has been prepared solely for the purpose of assessing, on a preliminary basis, whether the connection applicant's proposed connection with the IMO-controlled grid would have an adverse impact on the reliability of the integrated power system and whether a System Impact Assessment of the proposed connection should be conducted under Chapter 4, section 6 of the Market Rules. This report has not been prepared for any other purpose and should not be used or relied upon by any person for another purpose. This report has been prepared solely for use by the connection applicant, Hydro One and the IMO in accordance with Chapter 4, section 6 of the Market Rules. The IMO assumes no responsibility to any third party for any use which it makes of this report. Any liability which the IMO may have to the Connection Applicant in respect of this report is governed by Chapter 1, section 13 of the Market Rules. The IMO may revise this report at any time, in its sole discretion, without notice to the Applicant. Although the IMO will use its best efforts to advise you of any such changes, it is the responsibility of the Connection Applicant to ensure that it is using the most recent version of this report.

# **PRELIMINARY ASSESSMENT REPORT**

## **WATERLOO NORTH HYDRO NEW 230-28 KV TRANSFORMER STATION (MTS #3)**

### **1.0 PROPOSAL**

Waterloo North Hydro is in the final stages of constructing a new 230-28 kV transformer station (designated MTS #3) in the west side of the City of Waterloo. MTS #3 is a standard DESN (2 x 40/53.2/66.4 MVA transformers) configuration connected to the existing Hydro One owned 230 kV circuits D6V and D7V, approximately 6 km from Detweiler TS.

The station is needed to meet Waterloo North Hydro's forecast load demand for the summer of 2001 and beyond.

The proposed in-service date is August 2001. This date will have to be discussed and coordinated with Hydro One.

### **2.0 LOAD**

The initial load on MTS #3 is expected to be 6 MW. This is expected increase to 90 MW by 2009.

### **3.0 REVIEW OF CONNECTION ARRANGEMENT**

#### **3.1 High Voltage Isolation**

Based on information provided by Waterloo North Hydro, each power transformer will be connected to the transmission system via a 230 kV circuit switcher. This is acceptable as long the requirements listed in the Transmission System Code for this type of connection are satisfied.

#### **3.2 Voltage Reduction**

The proposed new supply point is to be equipped with facilities that would allow a 3% and a 5% voltage reduction to be initiated remotely.

#### **3.3 Under-Frequency Load Shedding**

The proposed new supply point is to be equipped with an automatic underfrequency load shedding system capable of rejecting up to 35% of the load supplied from the MTS. Appropriate settings for the underfrequency relaying will be provided by the IMO, prior to commissioning.

### **3.4 Power Factor**

Market rules require that wholesale customers and distributors connected to the IMO-controlled grid shall operate at a power factor within the range of 90% lagging to 90% leading as measured at the *defined meter point*. The *defined meter point* is determined by the IMO and is normally at the point of connection to the Transmitter's network. The applicant indicated a power factor of 90% in their supporting documentation. It is noted that a power factor of 90% on the load side of the transformers results in a power factor of about 88% on the supply side (230 kV) of the transformers, based on a TS loading of 85 MVA. The applicant will be required to take corrective action if the power factor is outside the specified range.

### **3.5 Telemetry**

In order to permit the IMO to direct the operations of the IMO-controlled grid, wholesale customers and distributors connected to the IMO-controlled grid shall provide the IMO with data in accordance with Chapter 4, Section 7.5 of the Market Rules.

## **4.0 IMPACT ASSESSMENT**

### **4.1 Assumptions**

### **4.2 Impact On Reliability**

With the proposed 230 kV circuit switchers on the HV side of the transformers and protections in accordance with the requirements listed in the Transmission System Code, the connection of the proposed facilities should not have any significant detrimental impact on existing levels of supply reliability.

### **4.3 Impact on Load Meeting Capability**

#### **4.3.1 Waterloo Area Transmission System**

The proposed new MTS #3 will be supplied at 230 kV via the existing Hydro One Detweiler TS x Orangeville TS 230 kV circuits D6V and D7V, as shown in Figure 1. These circuits also supply Scheifele TS, Guelph Campbell TS and Fergus TS.

#### **4.3.2 Transmission Elements Affected**

This Preliminary Assessment considered the effect of the proposed new load on the Detweiler TS x Orangeville TS 230 kV circuits D6V and D7V.

### **4.3.3 Results of Analysis**

The forecast 2001-2009 summer peak loads at the Waterloo North stations are listed in Table 1.

Table 2 shows the loading of transmission system elements based on loads in Table 1 and under various contingency conditions.

Based on the results shown in Table 2, there are no line loading limitations, with or without the proposed new Waterloo North Hydro MTS #3, over the entire 2001-2010 period.

## **4.4 Impact on Transmission System Voltages**

### **4.4.1 Abrupt Voltage Changes**

Market rules require that voltage changes shall not normally exceed 4% of steady state rms voltage for capacitor switching operations. Our studies show that this requirement is met over the entire 2001-2009 period.

Market rules also require that voltage changes shall not normally exceed 10% of steady state rms voltage for line switching operations. Our studies show that this requirement is met over the entire 2001-2009 period.

### **4.4.2 Steady State Voltages**

Under normal conditions, the steady state voltage for the nominal 230 kV portion of the IMO controlled grid in Southern Ontario is in the range of 220-250 kV

Our studies show that this requirement is met over the entire 2001-2010 period.

Figure 2 shows the actual measured voltage at Detweiler TS 230 kV bus during the year 2000. The voltage at the location of the proposed new WN MTS #3 is expected to be approximately 1 kV below the level at Detweiler TS.

## **5.0 REQUIREMENTS FOR CONNECTION**

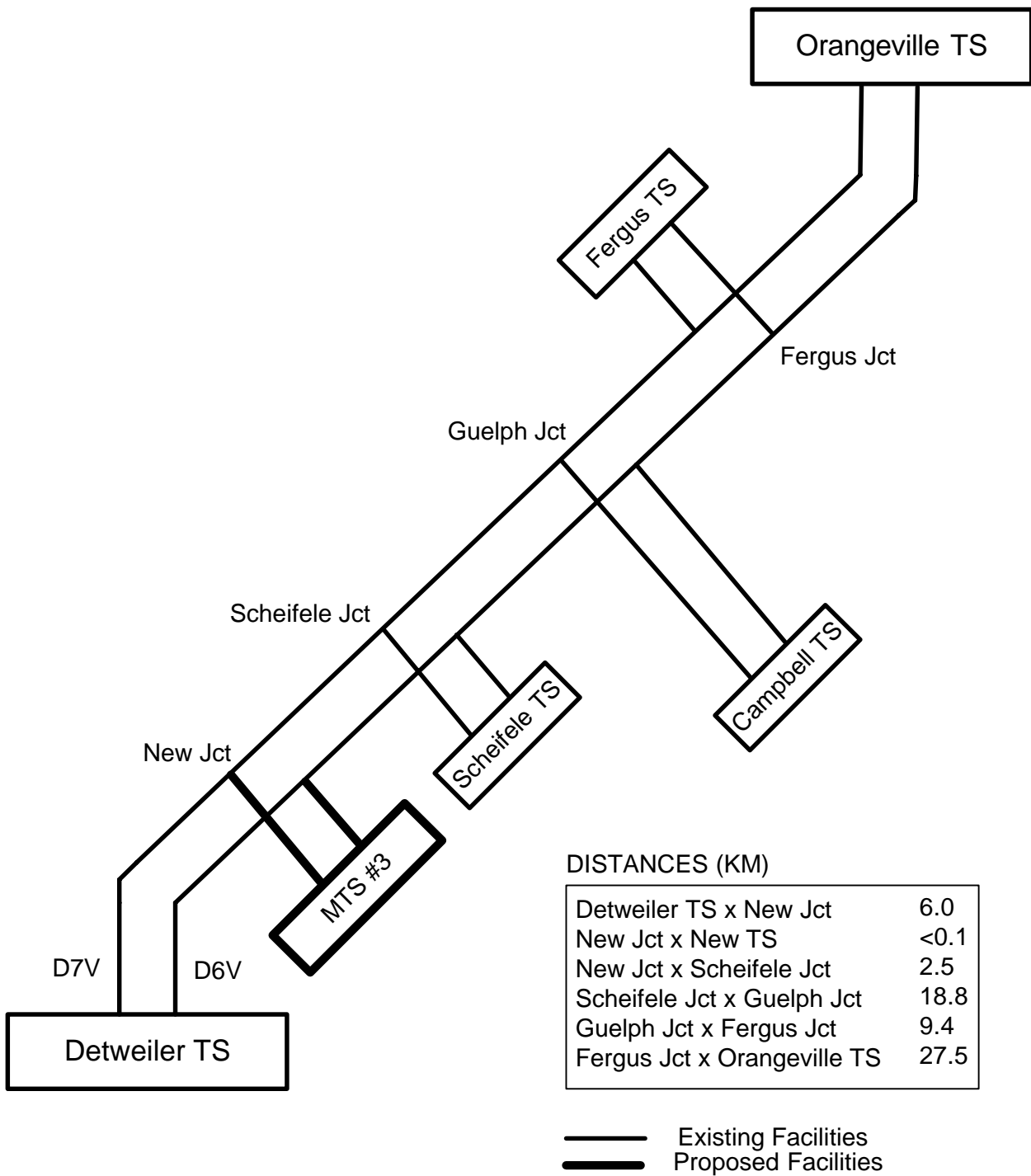
Based on the above analysis, it is concluded that the proposed new Waterloo North Hydro MTS #3 connection will not have any significant system impacts. The project may, therefore, proceed subject to meeting the requirements identified in Section 3.0 as well as all other applicable market rules and regulatory requirements. Information on Market Entry can be found at the following IMO website. <http://www.theimo.com/imoweb/marketEntry/me.asp>

## **6.0 SYSTEM IMPACT ASSESSMENT**

Based on the results of this Preliminary Assessment, it is concluded that no further analysis is required for this project, and, it is therefore recommended that the System Impact Assessment be foregone.

## **7.0 NOTIFICATION OF APPROVAL OF THE CONNECTION PROPOSAL**

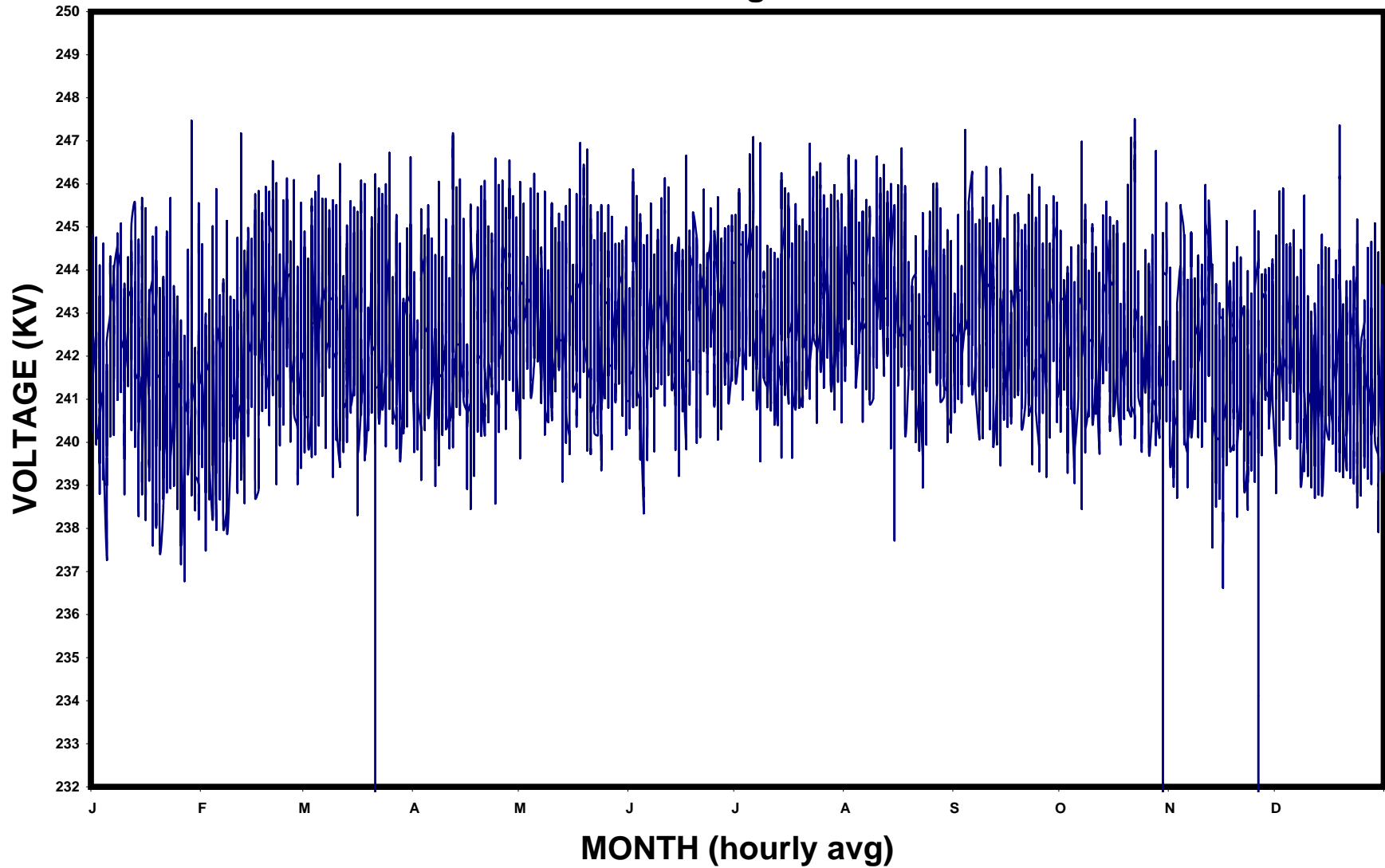
Based on the results of this Assessment, it is recommended that the Applicant should receive a “Notification of Approval of the Connection Proposal” for this project. The Applicant is required to obtain the necessary approvals as may be required by the OEB and other regulatory authorities.



**FIGURE 1**

**WATERLOO NORTH HYDRO : NEW MTS #3 PROJECT**

**FIGURE 2**  
**Detweiler TS 230kV Voltage Measured in Year 2000**



**TABLE 1**  
**STATION LOADS IN THE VICINITY OF THE PROPOSED NEW WN MTS #3**

	SUMMER PEAK LOAD								
	2001	2002	2003	2004	2005	2006	2007	2008	2009
<b>Fergus TS<sup>1</sup></b>									
MW	105	106	108	110	112	114	116	118	120
MVAR	45	45	46	47	48	48	49	50	51
MVA	114	116	118	120	122	124	126	128	130
<b>Campbell TS<sup>1</sup></b>									
MW	170	173	176	179	182	185	188	191	195
MVAR	53	54	55	56	58	58	59	60	61
MVA	178	181	184	187	190	194	197	200	204
<b>Scheifele TS<sup>1</sup></b>									
MW	135	138	140	142	145	148	150	152	153
MVAR	70	71	73	74	75	76	78	79	79
MVA	152	155	158	160	163	166	169	171	172
<b>New MTS #3<sup>2</sup></b>									
MW	6	8	12	17	23	33	46	64	90
MVAR	3	4	6	8	11	16	22	31	44
MVA	7	9	13	18	26	36	51	71	100

**NOTES**

- (1) Loads based on July 2000 base case escalated at 1.7% per year.
- (2) Based on initial and maximum loads provided by Waterloo North Hydro. In between values are prorated.

**TABLE 2  
LOAD MEETING CAPABILITY ANALYSIS  
BASED ON 2009 SUMMER PEAK LOADS<sup>3</sup>**

SYSTEM FACILITIES / CONTINGENCIES	SUMMER RATING (continuous) (Amps)	POST - CONTINGENCY FLOW (Amps)	
		Without New MTS#3	With New MTS#3
<b>THERMAL CAPABILITY ANALYSES</b>			
<b>D6V or D7V Contingency</b>			
D6V, Detweiler TS x New Jct <sup>1</sup>	1,090	855	1080
D6V, Orangeville TS x Fergus Jct <sup>2</sup>	1,650	1,095	1150
D6V, Fergus Jct x Guelph Jct <sup>2</sup>	1,090	740	810
D7V, Detweiler TS x New Jct <sup>1</sup>	1,090	1,055	1080
D7V, Orangeville TS x Fergus Jct <sup>2</sup>	1,650	1,095	1150
D7V, Fergus Jct x Guelph Jct <sup>2</sup>	1,090	740	810
<b>Stuck Breaker Condition Resulting in Outage of D7V and M21D</b>			
D6V, Detweiler TS x New Jct <sup>2</sup>	1,090	800	920
D6V, Orangeville TS x Fergus Jct <sup>2</sup>	1,650	1,270	1335
D6V, Fergus Jct x Guelph Jct <sup>2</sup>	1,090	900	980
<b>VOLTAGE ANALYSES</b>			
<b>Steady State Voltage Levels</b>	Within range specified in Chapter 4, Appendix 4.1 of Market Rules		
<b>Abrupt Voltage Changes</b>			
Capacitor Switching	Less than 4% (meets Market Rule requirements specified in Chapter 4, Appendix 4.4)		
Line Contingency	Less than 10% (meets Market Rule requirements specified in Chapter 4, Appendix 4.4)		

**NOTES**

(1) Based on the following bulk system conditions: high FETT (4400MW), maximum import from Michigan, maximum negative BLIP flow.

(2) Based on the following bulk system conditions: minimum FETT interface flow, maximum export to Michigan, positive BLIP flow of 3380 MW.

(3) Based on 2009 loads shown in Table 1