



CONNECTION ASSESSMENT & APPROVAL PROCESS

PRELIMINARY ASSESSMENT REPORT

APPLICANT: *Hydro Ottawa Limited*

PROJECT: *Uplands MS Project*

ADDENDUM TO PA REPORT IMO_REP_026

*Review of Revised Connection Scheme for the
Proposed Facilities*

CAA ID Number : *2000-028*

Long Term Forecasts & Assessments Department

Date: *November 22, 2001*

Addendum to Preliminary Assessment Report IMO-Rep-026 Dated July 25, 2001.

Hydro Ottawa Limited: Uplands MS Project Review of Revised Connection Scheme for the Proposed Facilities

1.0 Proposed Changes and Rationale

Hydro Ottawa advised that they have revised the connection arrangement for adding the proposed third 115-27.6 kV, 20/33 MVA transformer to 115 kV circuit A3RM at their Uplands MS. Previously, the proposal was to add an additional dead end structure and extend the 115 kV overhead strain bus to an adjacent property where the new transformer and associated facilities were to be located.

Hydro Ottawa have encountered problems in acquiring the adjacent property needed for the original proposal and have decided instead to build the proposed facilities within the present Uplands MS station site. This requires a modification to the 115 kV connection in that the existing strain bus will not be extended to incorporate the proposed new facilities. Instead they are proposing to connect to the existing 115 kV dead end structure and drop down onto an open bus, to which the new facilities will be connected.

The Proposed revised connection is shown schematically in Figure 1A.

2.0 Assessment of Revised Connection

A review of this project with the changes described above, indicates that the proposed facilities will not have any adverse impacts on the IMO-controlled Grid.

3.0 Conclusion

Based on the above, it is concluded that this project may proceed in its revised form described above, subject to meeting the requirements identified in Section 4.0 of the Preliminary Assessment Report IMO-REP-026, dated July 25, 2001.

The Applicant should contact Hydro One regarding co-ordination of this work with any changes required on the Hydro One system.

As indicated in the above-mentioned PA report, a System Impact Assessment will not be required for this project.

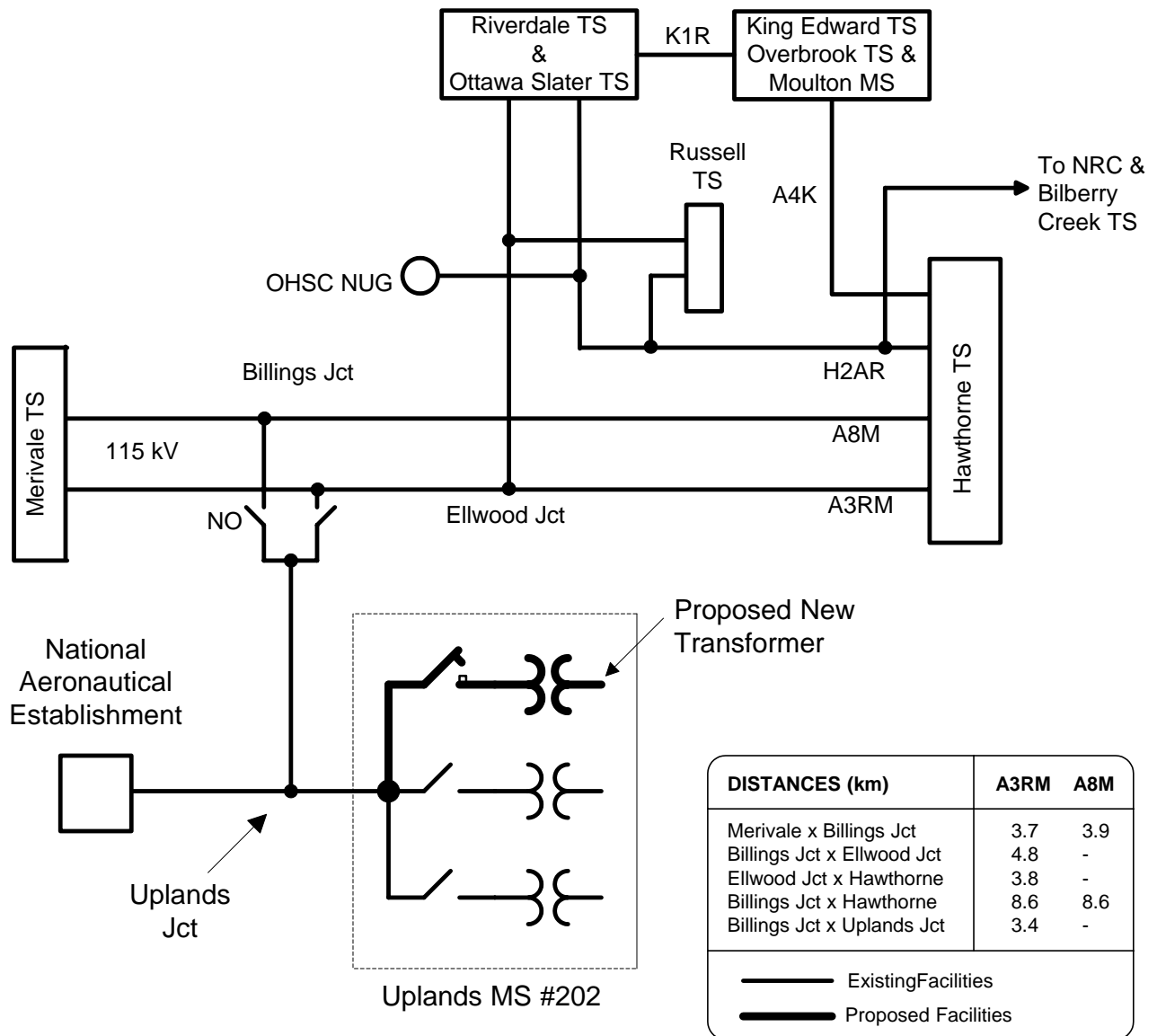


FIGURE 1A

HYDRO OTTAWA - UPLANDS MS PROJECT

REVISED 115 kV CONNECTION

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PRELIMINARY ASSESSMENT REPORT

HYDRO OTTAWA LIMITED: UPLANDS MS PROJECT

Disclaimer

This report has been prepared solely for the purpose of assessing 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 Connection 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

HYDRO OTTAWA LIMITED: UPLANDS MS PROJECT

1.0 PROPOSAL

This project is an extension to the existing Hydro Ottawa substation Uplands MS # 202. The existing station has two 115-8 kV transformers connected to the Hydro One 115 kV circuit A3RM (with backup from A8M) in the south central part of Ottawa. Hydro Ottawa is proposing to add a third transformer rated 115-27.6 kV, 20/33 MVA to supply the proposed new terminal building at the Ottawa International Airport and to provide backup for existing customers connected to Limebank MS and Leitrim MS. The new transformer will also be supplied at 115 kV by extending the existing supply to the location of the new transformer.

It is expected that the 8 kV load at Uplands MS #202 will be converted to 27.6 kV in the future. As development proceeds, it is expected that the 8 kV loads will be phased out and a second 115-27.6 kV transformer unit added in the 2005-2006 time frame.

Hydro Ottawa's current proposed in-service date is June 2002. The actual in-service date will have to be discussed and coordinated with Hydro One Networks.

2.0 LOAD

The following is the expected load to be supplied from the proposed new transformer(s):

Initial load in August 2001:	5 MW (transfer from Limebank MS and Leitrim MS)
Additional load in 2003:	6 MW (new airport terminal building)
Additional load in 2004:	2 MW (conversion of 8 kV load to 27.6 kV supply)
Projected additional load 2004-2010:	<u>15 MW</u> (from airport development)
Total Projected load	28 MW

3.0 REVIEW OF CONNECTION ARRANGEMENT

3.1 High Voltage Isolation

Based on information provided by Hydro Ottawa, the new transformer will be connected to the transmission system via a 115 kV circuit switcher. This is acceptable as long as 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

Market rules require that wholesale customers and distributors connected to the IMO-controlled grid be equipped with an automatic underfrequency load shedding (UFLS) system capable of rejecting up to 35% of the total customer/distributor peak load. It may be prudent, however, for the customer/distributor to install UFLS facilities at each new connection point so that the UFLS requirement can be met as the load grows.

Additional information regarding UFLS requirements and appropriate settings will be provided by the IMO upon request, in accordance with Chapter 5, Clause 10.4.7 of the Market Rules.

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 applicant will be required to take corrective action if the power factor is outside of this 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 Impact On Reliability

With the proposed 115 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.

4.2 Impact on Load Meeting Capability

The proposed new 115-27.6 kV transformer will be supplied from an existing Hydro One 115 kV radial tap (approx 3.5 km) normally connected to the Merivale TS x HawthorneTS 115 kV circuit A3RM, but switchable to A8M, as shown in Figure 1. In addition to the proposed new transformer, the 115 kV radial tap also supplies the existing Uplands MS #202 and the National Aeronautical Establishment.

This Preliminary Assessment considered the effect of the proposed new load on the following facilities:

- 115 kV circuit A3RM, Hawthorne TS x Merivale TS plus tap to Uplands MS
- 115 kV circuit A8M, Hawthorne TS x Merivale TS

For the purpose of this assessment, the following system conditions were assumed:

- 28 MW load at the new Uplands transformer
- 3 MW load at Uplands MS #202
- Estimated 2010 summer peak loads at remaining stations

Table 1 shows the loading of transmission system elements based on above loads and under various contingency conditions. The Table shows that there are no line loading limitations, with or without the proposed new Uplands DS load, for the loads and system conditions assumed.

Hydro One has advised that preliminary studies on the adequacy of the overall Ottawa transmission system indicates possible overloading of the Hawthorne TS autotransformers and 115 kV transmission circuit(s) over the next 2-3 years. They have initiated a study to look at providing relief for the autotransformers and other constraints in the Ottawa area.. It is noted however, that the proposed new Uplands DS load will not have a significant impact on the Hydro One study results and that the two can proceed independently. Any new facilities/changes proposed by Hydro One will be handled through a separate CAA application(s).

4.3 Impact on Transmission System Voltages

4.3.1 Abrupt Voltage Changes

Market rules require that voltage changes for capacitor switching and line switching operations shall not normally exceed:

- 4% of steady state rms voltage for capacitor switching operations
- 10% of steady state rms voltage for line switching operations.

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

4.3.2 Steady State Voltages

Under normal conditions, the steady state voltage for the nominal 115 kV portion of the IMO controlled grid in the Ottawa area is in the range of 113 – 127 kV.

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

Figure 2 shows the actual measured voltage at Hawthorne TS 115 kV bus during the year 2000. The voltage at the location of the proposed new Uplands transformer is expected to be approximately 1 kV below the level at Hawthorne TS.

4.4 Technical Considerations

Since the Merivale x Hawthorne transmission corridor uses 500/230/115kV multiple-voltage transmission towers to support the 500kV circuits X522A and X532A, the 230kV circuits M30A, and M31A, and the 115kV circuit A3RM and A8M, the circuits are exposed to high-induction

phenomenon which can create such induction related effects such as transformer ferroresonance, breaker recovery voltage stress, load residual undervoltage, and terminal ground switch current interrupting duty.

In the present configuration, the A3RM circuit will experience a temporary overvoltage (TOV) condition under single-phase fault conditions whenever the fault is backfed through a DESN transformer pair at either Ottawa Slater TS, Russell TS, or Riverdale TS. The proposed HV surge arrester on the new Uplands MS transformer will also be exposed to this TOV stress and as such, the arresters TOV capability must be carefully co-ordinated with this anticipated TOV stress in order to avoid arrester failure. This requires factoring in the effects of both the A3RM cable section to Ottawa Slater TS, and the NAE and Uplands MS loads.

The Applicant should contact Hydro One regarding the required studies and possible solutions.

5.0 REQUIREMENTS FOR CONNECTION

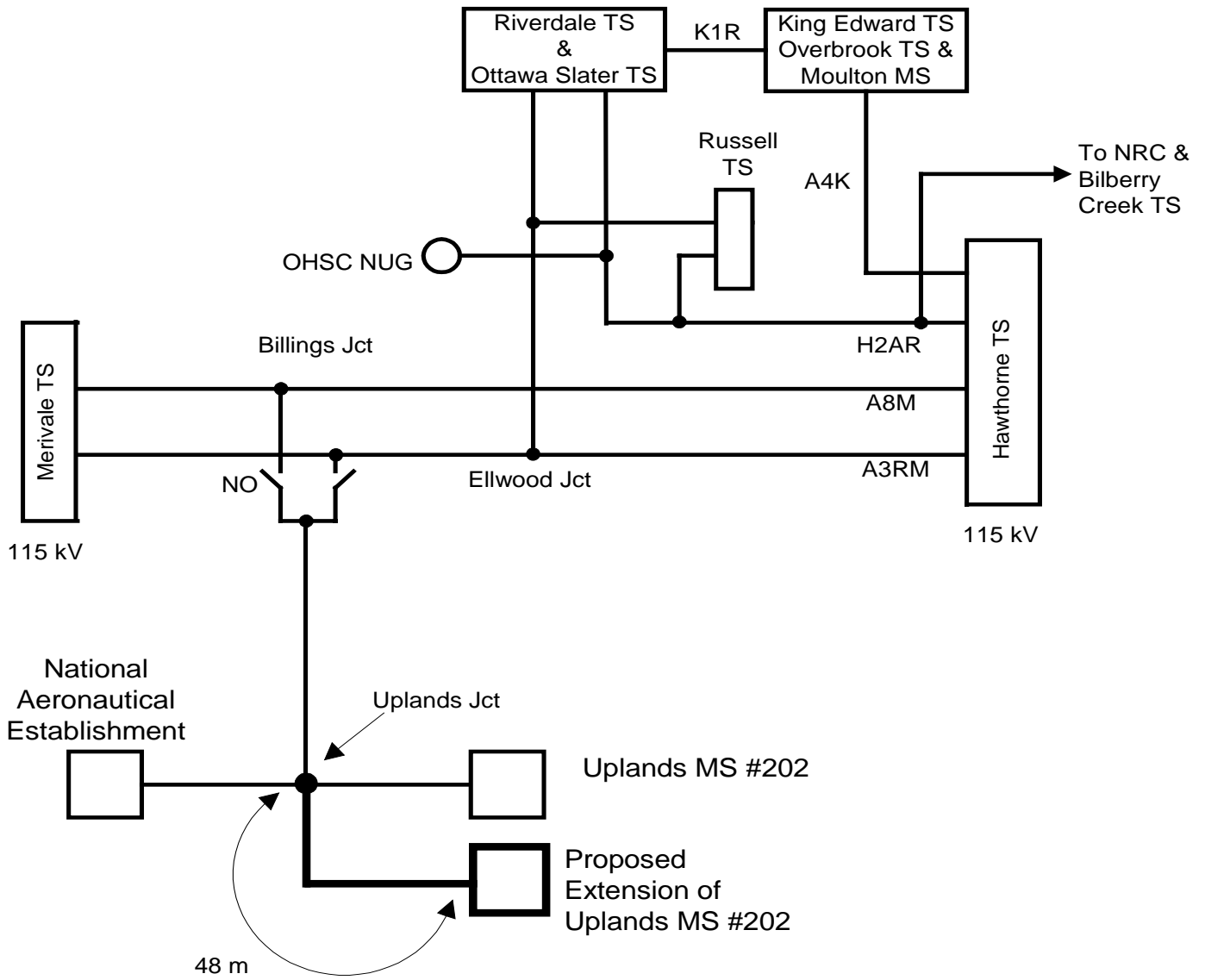
Based on the above analysis, it is concluded that the proposed Hydro Ottawa Uplands MS connection will not have any significant system impacts. The project may, therefore, proceed subject to meeting the requirements identified in Section 3.0 and 4.4 as well as all other applicable market rules and regulatory 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.



DISTANCES (km)	A3RM	A8M
Merivale x Billings Jct	3.7	3.9
Billings Jct x Ellwood Jct	4.8	-
Ellwood Jct x Hawthorne	3.8	-
Billings Jct x Hawthorne	8.6	8.6
Billings Jct x Uplands Jct	3.4	-



 Existing Facilities
 Proposed Facilities

FIGURE 1
HYDRO OTTAWA: UPLANDS MS PROJECT

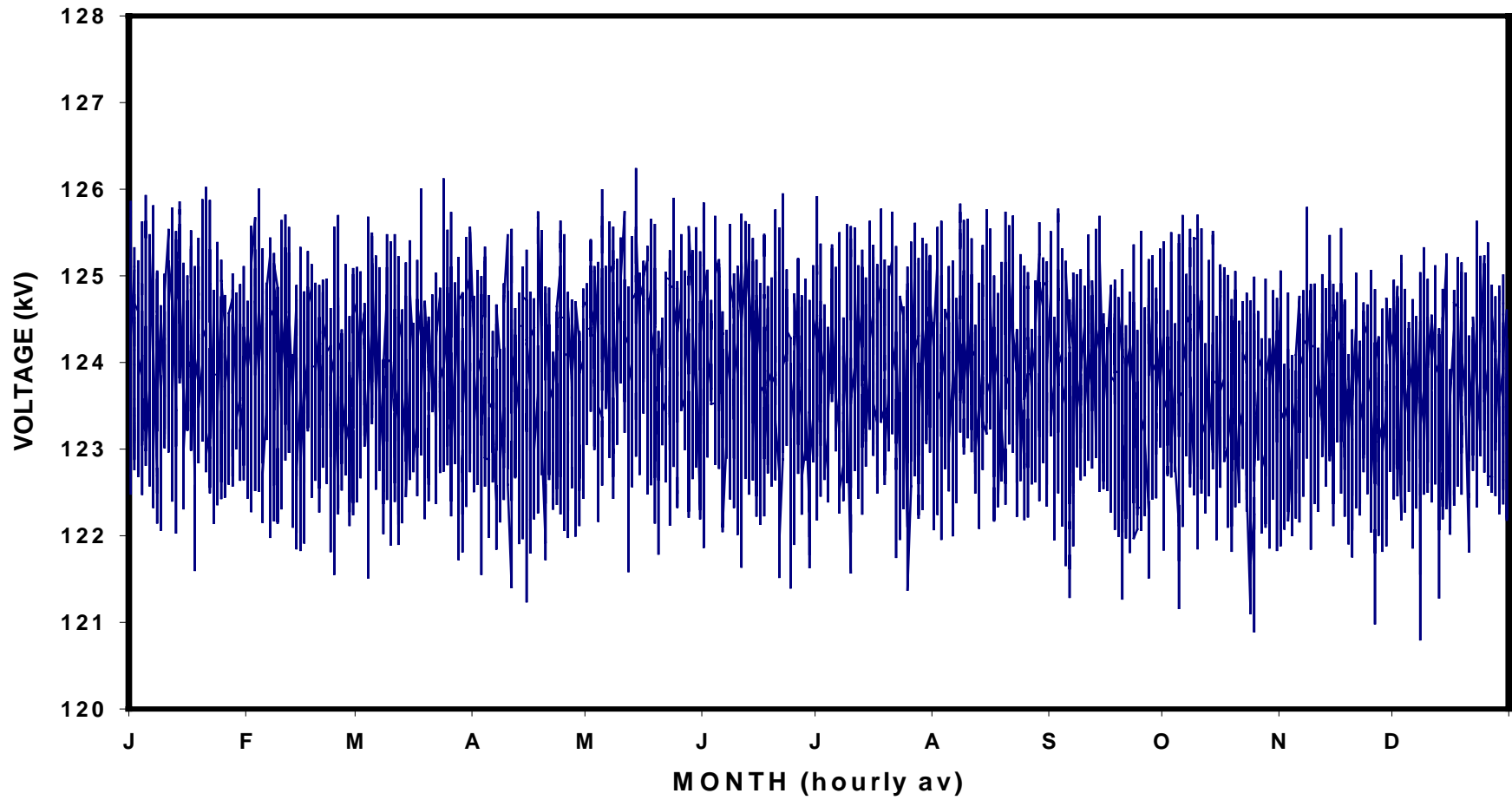


FIGURE 2

HAWTHORNE TS : YEAR 2000 MEASURED VOLTAGE

TABLE 1
LOAD MEETING CAPABILITY ANALYSIS

SYSTEM FACILITIES / CONTINGENCIES	SUMMER RATING (continuous) (Amps)	2010 SUMMER PEAK LOADING ¹ (Post-contingency)(Amps)	
		Without New Load	With New Load
THERMAL CAPABILITY ANALYSES			
115kV Circuit H2AR O/S			
A3RM, Hawthorne TS x Elmwood Jct	1,060	880	920
A3RM, Merivale TS x Billings Jct	1,310	180	250
A3RM, Billings Jct x Uplands Jct	570	160	260
A8M, Hawthorne TS x Merivale TS	1,310	210	225
230 kV Circuit M30A O/S			
A3RM, Hawthorne TS x Elmwood Jct	1,060	600	660
A3RM, Merivale TS x Billings Jct	1,310	100	130
A3RM, Billings Jct x Uplands Jct	570	160	260
A8M, Hawthorne TS x Merivale TS	1,310	225	250
VOLTAGE ANALYSES			
Steady State Voltage Levels	Within range specified in Chapter 4, Appendix 4.1 of Market Rules		
Abrupt Voltage Changes			
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)		

(1) See Section 4.2 for loading assumptions