



IMO_REP_0053

CONNECTION ASSESSMENT & APPROVAL PROCESS

PRELIMINARY ASSESSMENT REPORT

APPLICANT: *Hydro One Networks Inc.*
PROJECT: *Manby TS: Remove Synchronous Condensers*

CAA ID No. *2001-049*

**Consistent Information Set Department, and
Long Term Forecasts & Assessments Department**

Date: *April 8, 2002*

TABLE OF CONTENTS

<u>Disclaimer</u>	5
1.0 BACKGROUND	6
2.0 PROPOSAL	7
3.0 IMPACT ASSESSMENT	7
3.1 IMPACT ON LOAD MEETING CAPABILITY	7
3.1.1 Load Forecast	7
3.1.2 Voltage Analysis	8
3.1.2.1 Steady State Voltages	8
3.1.2.2 Abrupt Voltage Changes	9
3.1.3 Loading Analysis	9
3.1.4 Conclusion	9
4.0 REQUIREMENTS FOR CONNECTION	10
5.0 SYSTEM IMPACT ASSESSMENT	11
6.0 CUSTOMER IMPACT ASSESSMENT	11
7.0 NOTIFICATION OF APPROVAL OF THE CONNECTION PROPOSAL	11
8.0 RELATED ISSUES	12
8.1 ASSUMPTIONS AND CRITERIA	12
8.2 THERMAL CAPABILITY	13
8.2.1 230 kV Transmission Facilities	14
8.2.1.1 Pre-contingency Analysis	14
8.2.1.2 Single-Element Contingencies	14
8.2.1.3 Double-Element Contingencies	14
8.2.2 Manby East 115 kV System	15
8.2.2.1 Pre-contingency Analysis (Tables 4&5)	15
8.2.2.2 Single-Element Contingencies (Table 3)	15
8.2.2.3 Double-Element Contingencies (Table 5)	15

TABLE OF CONTENTS CONT'D

8.2.3	Manby West 115 kV System.....	16
8.2.3.1	Pre-contingency Analysis (Tables 6&7)	16
8.2.3.2	Single-Element Contingencies (Table 6).....	16
8.2.3.3	Double-Element Contingencies (Table 7).....	16
8.3	SYSTEM AVAILABILITY	17
8.3.1	Availability Analysis for 230 kV System	17
8.3.1.1	Loss of R2K or R15K	17
8.3.1.2	Loss of (R13K+R15K) or (R1K+R2K)	18
8.3.1.3	Loss of (L21K+R2K) or (L22K+R15K).....	18
8.3.1.4	Loss of (L23CK+L24CR).....	18
8.3.2	Availability Analysis for 115 kV System	19
8.3.2.1	Single contingency 115 kV Line outages	19
8.3.2.2	Loss of (K13J+K14J).....	19
8.3.2.3	Loss of (K6J+H2JK).....	20
8.3.2.4	Loss of (K1W+K3W).....	20
8.3.2.5	Loss of (K11W+K12W).....	21
8.3.2.6	Loss of Manby TS Autotransformers.....	21
8.4	CONCLUSION.....	22

TABLE OF CONTENTS CONT'D

FIGURES

FIGURE 1.....	23
FIGURE 2.....	24
FIGURE 3.....	25

TABLES

TABLE 1.....	26
TABLE 2.....	27
TABLE 3.....	28
TABLE 4.....	29
TABLE 5.....	30
TABLE 6.....	31
TABLE 7.....	32
TABLE 8.....	33

HYDRO ONE NETWORKS INC.

MANBY TS: REMOVE SYNCHRONOUS CONDENSERS

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. In particular, this report does not address any other Market-related, or any commercial, aspects of the connection proposal. This report has been prepared solely for use by the Connection Applicant 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.

HYDRO ONE NETWORKS INC. MANBY TS: REMOVE SYNCHRONOUS CONDENSERS

1.0 BACKGROUND

Manby TS is a major 230-115 kV autotransformer and switching station supplying approximately 800 MVA or 15% of the city of Toronto load. The station is supplied via the Richview TS x Lakeview GS 230 kV circuits as shown in Figure 1. The station consists of six 230-115 kV autotransformers supplying eight 115 kV circuits. These circuits supply five 115-13.8 kV transformer stations which supply the City of Toronto. As shown in Figure 1, Manby TS consists of two separate 230/115 kV switchyards, designated Manby East and Manby West

Also, as shown in Figure 1, there are two 230 kV, 336 MVAR capacitor banks, one at Manby East and one at Manby West. These were installed in the late 1990's to provide voltage support in the area.

In addition, there are four 13.8 kV 48 MVAR synchronous condensers at Manby TS. The status of the four synchronous condensers, designated C1-C4, is given below.

C1 and C2

These are located in the Manby West switchyard and are connected to the 13.8 kV tertiary windings of the 230-115 kV autotransformers T1 and T2 respectively. C1 is currently operable. C2 had a cable fault in 1998 and it was deemed uneconomic to restore it to an operable condition. Furthermore, since it has been idle for the last three years, it may now be unrepairable due to rotor hogging. The building that houses C1 and C2 also requires repair.

C3 and C4

These are located in the Manby West switchyard and are connected to the 13.8 kV tertiary windings of the 230-115 kV autotransformers T7 and T8 respectively. These condensers failed prior to 1995 and were declared surplus in 1995 because they were considered to be unrepairable. The building that houses C3 and C4 is also in very poor condition and is likely beyond repair.

2.0 PROPOSAL

Hydro One Networks Inc. has proposed to permanently disconnect and remove the four synchronous condensers (C1-C4) and associated equipment at Manby TS.

The proposed completion date for the work is May 2002.

3.0 IMPACT ASSESSMENT

3.1 IMPACT ON LOAD MEETING CAPABILITY

3.1.1 Load Forecast

The City of Toronto is supplied at 13.8 kV and 27.6 kV via 34 transformer stations; 17 of which are supplied at 115 kV and 17 at 230 kV. The 115 kV stations are supplied from two major sources; Leaside 230-115 kV TS from the east and Manby 230-115 kV TS from the west. The 230 kV stations are supplied from 230 kV circuits in the following major corridors: Cherrywood TS x Leaside TS, Cherrywood TS x Richview TS, Richview TS x Manby TS and Richview TS x Claireville TS.

The forecast summer peak loads of the transformer stations in the area of Manby TS and/or supplied from Manby TS are shown in Table 1. As shown, the 2002 summer peak load is forecast to be:

- 395 MVA of THES load supplied from Manby East
- 425 MVA of THES supplied from Manby West
- 405 MVA of THES supplied from Horner TS and the Manby TS DESNs
- 550 MVA of Mississauga and Oakville load supplied from L23CK and L24CR circuits

The above amounts to approximately 1775 MVA in 2002. These loads are forecast to grow at an equivalent annual rate of approximately 1.3 % between 2002 and 2010.

3.1.2 Voltage Analysis

3.1.2.1 Steady State Voltages

As noted in Section 1.0, only one of the two synchronous condensers at Manby TS is currently operable. For the purpose of this assessment, it was assumed that one of the two synchronous condensers at Manby East was returned to service. This condenser has been designated C3. Thus the normal condition would have C1 and C3 in operation.

Table 2 provides an analysis of voltages at major HT buses in the area for the years 2002, 2006 and 2010. Voltage levels are provided for the following four configurations:

- | | | |
|-----|---|-----------------------------------|
| (1) | C1, C3, SC21 & SC22 in-service | |
| (2) | SC21 & SC22 in-service | C1 & C3 out of service |
| (3) | SC22 in-service | C1+C3+SC21 out of service |
| (4) | SC21 in-service | C1+C3+SC22 out of service |

Table 2 shows the steady state voltages for all conditions studied.

Configuration (1) is the base case with all facilities in service. In this case, the voltages are in the range of 241-243 kV for the 230 kV system and 117-123 kV for the 115 kV system. This meets the Market Rule requirements of 220-250 kV for the 230 kV system and 113-127 kV for the 115 kV system.

Configuration (2) represents the system with the synchronous condensers removed as proposed by the Applicant. In this case, the nominal 230 kV voltages are in the range of 240-242 kV and the nominal 115 kV voltages are in the range of 115-123 kV. The lowest voltage of 115 kV occurs at John TS in 2010. This voltage is within the Market Rule requirement of 113-127 kV.

Configuration (3) is similar to Configuration (2) but with the further loss of the SC21 capacitor bank. With this contingency, the voltage at John TS drops to 113 kV and the voltage at the Manby West 115 kV bus drops to 116 kV in 2010. It is noted that the IMO's System Control Orders (SCOs) require the pre-contingency voltage at Manby TS to be maintained above 116 kV.

Configuration (4) is similar to Configuration (3) but with capacitor bank SC22 out of service instead of SC21. With this contingency, the lowest voltages of 114 kV and 117 kV occur at John TS and Manby West respectively, in 2010.

It is also noted that the voltage at Richview and Manby TS drop to 238 kV in 2010 with either SC21 or SC22 out of service. This marginally meets the minimum 238 kV requirements stipulated in the SCOs.

The cases where the calculated voltages are within 1 kV of the minimum voltage specified in the Market Rules or applicable SCOs have been shaded in Table 2.

3.1.2.2 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.

As indicated in Table 2, this requirement is met over the entire 2002-2010 period.

3.1.3 Loading Analysis

An analysis of the loading on 230 kV and 115 kV transmission lines as well as the Manby TS 230-115 kV autotransformers was carried out and is documented in Section 8.0. These results assume that all synchronous condensers have been removed

Removal of the four 48 MVAR synchronous condensers would have only minimal impact on the loading of the 230 kV circuits supplying Manby TS and the autotransformers. There would also be a small increase in loading of the 115 kV circuits out of Manby TS, due to lower voltages. This is not expected to have any significant impact on the load meeting capability of these facilities, based on thermal limitations. However, Section 8.0 identifies various system deficiencies which are not directly related to the removal of the synchronous condensers. It is expected that these deficiencies will be addressed through separate CAA applications.

3.1.4 Conclusion

The above analysis indicates that with four synchronous condensers removed and with either SC21 or SC22 out of service:

- the voltages at Richview TS and Manby TS can be maintained within a range of 238 kV to 239 kV, which will only marginally meet the minimum voltage requirement of 238 kV specified in the current the SCOs
- similarly, the voltage at Manby West can be maintained within a range of 117 kV to 121 kV from 2002-2010. The lowest voltage of 117 kV in 2010, only marginally meets the minimum voltage requirement of 116 kV specified in the SCOs

-
- The voltage at John TS can be maintained within a range of 113 kV to 117 kV from 2002-2010. The lowest voltage of 113 kV in 2010, only marginally meets the minimum voltage requirement of 113 kV specified in the Market Rules

Based on the above, and in the absence of any new facilities to reinforce the transmission system in the Manby sector, further voltage support is expected to be required by about 2007 to ensure that the minimum voltages specified in the SCOs can be maintained under outage conditions involving the shunt capacitors SC21 or SC22.

Should higher than expected load growth occur, then the need for additional voltage support could be advanced.

It should be noted that the analysis has been performed with only those loads that have been forecast for the Manby sector. Should a need arise to temporarily transfer load from the Leaside sector then the ability to accept the additional load could be compromised in the event that capacitors SC21 or SC22 is out-of-service.

Also, as noted in Table 2, the values shown assume that the generation facilities at Lakeview GS are out-of-service and that the proposed Sithe-Southdown Project has not been incorporated. Operation of the generation facilities at Lakeview or at the Sithe-Southdown Project could improve voltages in the area by 1-2%.

Since the voltages in the Manby sector have been shown to be only marginally acceptable (compared to the minimum values specified in the SCOs and Market Rules) it is, therefore, recommended that Hydro One continue to monitor the situation in the Manby sector and that appropriate CAA application(s) be submitted as required, to ensure that the minimum voltages specified in the SCOs and Market Rules can be maintained.

4.0 REQUIREMENTS FOR CONNECTION

Based on the above analysis, it is concluded that the proposed removal of the four 48 MVAR synchronous condensers at Manby TS will have no immediate adverse impact on the IMO-controlled grid. However, because of concerns about the ability to maintain the minimum voltages as specified in the applicable SCOs and Market Rules whenever one of the shunt capacitors SC21 or SC22 is out-of-service during peak load periods, it is recommended that Hydro One continue to monitor the situation in the Manby sector. Should it be determined that further voltage support is required to meet the minimum voltages requirements, then appropriate proposal(s) for new facilities should be developed and approval for their connection sought from the IMO under the CAA process.

In addition, it is expected that the system deficiencies that have been identified in Section 8.0 of this Report will be addressed through separate CAA applications.

5.0 SYSTEM IMPACT ASSESSMENT

Based on the results of this Preliminary Assessment, it is concluded that no further analysis is required for the proposed removal of the four 48 MVAR synchronous condensers at Manby TS. It is, therefore, recommended that the System Impact Assessment for this work be foregone.

6.0 CUSTOMER IMPACT ASSESSMENT

Hydro One Networks has reviewed the effect of the proposed removal of the four synchronous condensers at Manby TS on the customers in the area and determined that there will be no adverse impact. Therefore, a formal Customer Impact Assessment is not required for this Project.

7.0 NOTIFICATION OF APPROVAL OF THE CONNECTION PROPOSAL

Since a Customer Impact Assessment is not required, then, 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.

8.0 RELATED ISSUES

LOAD MEETING CAPABILITY OF THE RICHVIEW X MANBY X LAKEVIEW TRANSMISSION FACILITIES FOR SUPPLY TO TORONTO, MISSISSAUGA AND OAKVILLE

8.1 ASSUMPTIONS AND CRITERIA

- The transformer station loads shown in Table 1 were used in the assessments.
- The adequacy of the 230 kV and 115 kV transmission system has been assessed for single-element as well as double-element contingencies. For double-element (line) contingencies only outages of circuits on common towers or the loss of two transmission elements resulting from a stuck breaker situation were considered.
- For the purpose of this assessment, the following criteria for transmission line loading limits based on thermal ratings were used:
 - the pre-contingency flows will be required to respect the continuous rating, based on a maximum conductor operating temperature of 93°C
 - the post-contingency flows will be required to respect the following (as appropriate):
 - the 15-minute limited-time-rating, based on the 'sag' temperature of the line
 - the 'continuous emergency' rating based on a conductor temperature of 127°C OR the 'sag' temperature of the line, whichever is less
- The adequacy of the Manby TS autotransformers has been assessed for single-element as well as double-element contingencies based on the following:
 - Pre-contingency flows must be less than continuous ratings
 - Post-contingency flows must be less than the 10-day LTR ratings for single-element contingencies
 - Post-contingency flows must be less than 2-hour LTR ratings for double-element contingencies. In this case the expectation is that one of the outaged autotransformers will be returned to service within 2 hours.
- In accordance with the requirements of the current version of the System Control Orders for Southern Ontario, the following operating conditions were assumed for the 230 kV busbars at Lakeview TGS and Richview TS:

Generation	Lakeview 230 kV Bus	Richview 230 kV Bus
Lakeview: 0 Sithe-Southdown: 0	Solid	Solid
Lakeview: 2 or more units Sithe-Southdown: 0	Split	Solid
Lakeview: 0 Sithe-Southdown: 800 MW	Split	Split

Note: The above assumes that the impact on fault levels of the Sithe-Southdown Project would be similar to three units at Lakeview. Therefore, as indicated, with the Sithe-Southdown Project in-service both busbars would need to be operated split.

- For the purpose of this Assessment, the supply availability levels for transmission facilities have been assessed in accordance with the following criteria:
 - For affected loads totalling more than 150 MW but less than 250 MW, supply is to be restorable automatically (within 2 sec) for a single-circuit contingency and restorable within 8 hours for a double-circuit contingency.
 - For affected loads totalling more than 250 MW but less than 500 MW, restoration is to be possible by switching within 30 minutes for double-circuit contingencies.
 - For affected loads totalling more than 500 MW, no interruption in supply is to occur for double circuit contingencies
 - For a breaker failure contingency, supply is to be restorable within 2 hours for loads greater than 40 MW.

8.2 THERMAL CAPABILITY

The existing 230 kV circuits from Richview TS to Manby TS to Lakeview GS currently supply a summer peak load of approximately 1700 MVA in Toronto, Mississauga and Oakville. The transformer stations supplying this load and forecast summer peak loads from 2001-2010 are shown in Table 1.

The 115 kV system out of Manby TS is supplied from the 230 kV system via six 230-115 kV autotransformers at Manby TS.

The supply facilities considered in this Assessment are listed below:

- Richview TS x Manby TS 230 kV circuits R1K, R2K, R13K, R15K
- Manby TS x Lakeview GS 230 kV circuits L21K, L22K, L23CK
- Richview TS x Lakeview GS 230 kV circuit L24CR
- Manby TS x John TS 115 kV circuits H2JK, K6J, K13J, K14J
- Manby TS x Wiltshire TS 115 kV circuits K1W, K3W, K11W, K12W
- The 230-115 kV autotransformers at Manby TS:
 - T1, T2 and T12 at Manby West
 - T7, T8 and T9 at Manby East

8.2.1 230 kV Transmission Facilities

Table 3 shows the loading on the 230 kV transmission system elements, under various 230 kV single and double-element contingency conditions. The results are summarized in the following Sections 8.2.1.1 to 8.2.1.3.

8.2.1.1 Pre-contingency Analysis

- The pre-contingency flows on all 230 kV circuits are less than the continuous rating of the circuits for all cases studied.

8.2.1.2 Single-Element Contingencies

- The post-contingency flows on 230 kV circuits R2K and R15K exceed the emergency rating of the circuits in about 2009 if no generation at Lakeview GS or the Sithe-Southdown Project is assumed.

8.2.1.3 Double-Element Contingencies

- The post-contingency flows on the 230kV circuits R2K and R15K are expected to exceed the emergency line ratings marginally in 2003 for outages of (R13K+R15K) or (R1K+R2K) if no generation at Lakeview GS or the Sithe-Southdown Project is assumed. For outages of (R15K+L22K) or (R2K+L21K), they are expected to exceed the emergency ratings by about 2008.

Possible Remedial Measures

- The above overload conditions are based on a conductor operating temperature of 127⁰C for the R2K and R15K circuits. By operating the conductors at their sag temperature of 134⁰C (and accepting the resultant conductor loss of life), the circuits can carry a load of 1630 A. This would extend the adequacy until about 2010 for the single-element contingencies and about 2005 for the (R13K+R15K) and (R1K+R2K) double-element contingencies.

-
- The (R15K+L22K) and (R2K+L21K) contingencies occur as a result of stuck breaker conditions. In these situations the overload conditions can be corrected by isolating the stuck breaker and restoring at least one of the outaged circuits. This would need to be done within 15 minutes to take advantage of the 15 minute LTR of the circuit, should its loading exceed the emergency rating.
 - As an alternative to, or in addition to the above, increase the emergency ratings of the 230 kV circuits R2K and R15K. An increase of about 200 A from 1570 A to 1770 would provide adequate capacity until about 2010.

Impact of Lakeview and Sithe Generation

It is noted that the overloads identified in Sections 8.2.1.2 and 8.2.1.3 above are for conditions with no generation at Lakeview and without the proposed Sithe-Southdown Project. As shown in Table 3, the overloads would be avoided with generation at the proposed Sithe-Southdown Project (and/or generation at Lakeview).

8.2.2 Manby East 115 kV System

Tables 4 and 5 show the loading on the 115 kV transmission system elements and the 230-115 kV autotransformers, under various single-element (Table 4) and double-element (Table 5) contingency conditions. The results are summarized in the following Sections 8.2.2.1 to 8.2.2.3.

8.2.2.1 Pre-contingency Analysis (Tables 4&5)

- The pre-contingency flows on all 115 kV circuits are less than the continuous rating of the circuits for all cases studied.
- The pre-contingency flows on the 230-115 kV autotransformers are less than the continuous rating of the autotransformers for all cases studied.

8.2.2.2 Single-Element Contingencies (Table 3)

- The post-contingency flows on all 115kV circuits are less than the emergency rating of the circuits for all cases studied.
- The post-contingency flows on the 230-115 kV autotransformers are less than the continuous rating of the autotransformers for all cases studied.

8.2.2.3 Double-Element Contingencies (Table 5)

- The post-contingency flows on all 115kV circuits are less than the emergency rating of the circuits for all cases studied.
- The post-contingency flows on autotransformers T7 and T9 exceed the 2-hour limited time rating (LTR) in 2002 and the 15-min LTR in 2005.

Possible Remedial Measures

- Since the overload condition above occurs as a result of losing two autotransformers due to a stuck breaker condition, it is expected that at least one of the autotransformers could be returned to service within 15 minutes, through appropriate switching. This response is expected to be suitable for the period through to 2005 when the post-contingency transfers are expected to remain within the 15-minute limited-time-rating of the remaining autotransformer.
- Beyond 2005, when the post-contingency flows are expected to exceed the 15-minute limited-time-rating, additional transformation capacity will be required.

8.2.3 Manby West 115 kV System

Tables 6 and 7 show the loading on the 115 kV transmission system elements and the 230-115 kV autotransformers, under various single-element (Table 6) and double-element (Table 7) contingency conditions respectively. The results are summarized in the following Sections 8.2.3.1 to 8.2.3.3.

8.2.3.1 Pre-contingency Analysis (Tables 6&7)

- The pre-contingency flows on all 115 kV circuits are less than the continuous rating of the circuits for all cases studied.
- The pre-contingency flows on the 230-115 kV autotransformers are less than the continuous rating of the autotransformers for all cases studied.

8.2.3.2 Single-Element Contingencies (Table 6)

- The post-contingency flows on all 115kV circuits are less than the emergency rating of the circuits for all cases studied.
- The post-contingency flows on the 230-115 kV autotransformers are less than the continuous rating of the autotransformers for all cases studied.

8.2.3.3 Double-Element Contingencies (Table 7)

- The post-contingency flows on circuits K6J and H2JK exceed the emergency rating of the circuits by about 3% in 2003 increasing to about 25% in 2010.
- The post-contingency flows on circuits K13J and K14J marginally exceed the emergency rating of the circuits in 2010.
- (Loss of two autotransformers was not considered in this case since there is no single stuck breaker condition that would result in this situation.)

Possible Remedial Measures

- The overload condition K6J and H2JK is based on a conductor operating temperature of 127⁰C. By operating the conductors at their sag temperature of 150⁰C (and accepting the resultant conductor loss of life), the loading on the circuits can be increased to 1230 A. This rating would not be exceeded until about 2007.
- Increasing the emergency rating of circuits K6J and H2JK to 1360 Amp. would provide adequate capacity until about 2010. This would require reconductoring of the circuits and possibly tower structural changes and other upgrades at Manby and John TS. The feasibility of this would need to be determined.

8.3 SYSTEM AVAILABILITY

System availability was assessed using the criteria defined in Section 8.1. The results are described below and in Table 8.

8.3.1 Availability Analysis for 230 kV System

8.3.1.1 Loss of R2K or R15K

These contingencies affect the load supplied by Horner TS starting about 2009. Since this load is forecast to be about 165 MW in 2009, automatic restoration within 2 seconds is required for a single-circuit contingency.

Possible Remedial Measure

- The above contingencies would result in overloading of the R2K or the R15K circuit starting in about 2009. By operating the conductors at their sag temperature of 134⁰C (and accepting the resultant conductor loss of life), overloading of the circuits could be deferred by about a year
- As an alternative to, or in addition to the above, increase the capacity of 230 kV circuits R2K and R15K. Increasing the emergency ratings by about 200 Amp. from 1570 Amp. to 1770 Amp. would extend the adequacy until beyond 2010.

8.3.1.2 Loss of (R13K+R15K) or (R1K+R2K)

These double-circuit outages can potentially affect the entire load of approximately 1500-1800 MW (from 2003-2010) that is supplied from the Richview x Manby x Lakeview 230 kV circuits. For a load of this size, there should be no interruption of supply under double-circuit contingency conditions, if the availability criteria described in Section 8.1 are to be met.

Possible Remedial Measures

- The above contingencies would result in overloading of the R2K or the R15K circuit starting in about 2003. By operating the conductors at their sag temperature of 134⁰C (and accepting the resultant conductor loss of life), overloading of the circuits could be deferred until about 2006.
- As an alternative to, or in addition to the above, increase the capacity of 230 kV circuits R2K and R15K. Increasing the emergency ratings by about 200 Amp. from 1570Amp. to 1770 Amp. would provide adequate capacity until about 2010.

8.3.1.3 Loss of (L21K+R2K) or (L22K+R15K)

These stuck breaker outages would result in overloading of the R2K or the R15K circuit starting in about 2008 and can potentially affect the entire load that is supplied from the Richview x Manby x Lakeview 230 kV circuits.

Since these outages occur as a result of stuck breaker conditions, then, should the post-contingency flow exceed the emergency rating of the circuit, it is expected that at least one of the circuits could be returned to service through switching within a period of 15-minutes, to take advantage of the circuit's 15-minute limited-time-rating.

This meets the availability criterion for a breaker failure contingency, described in Section 8.1, which calls for restoration of the supply within 2 hours for loads over 40 MW.

8.3.1.4 Loss of (L23CK+L24CR)

The load affected by this contingency is the Mississauga and Oakville load supplied by Cooksville TS, Lorne Park TS, Oakville TS and the Ford CTS. Since this load is greater than 500 MW, a continuous supply is required to meet the supply availability criteria for the loss of two circuits. The criteria also call for restoration of supply within ½ hour for loads between 250 MW and 500 MW. Since there is no back-up supply for the stations involved, this criterion is also not met. Corrective measures would, therefore, be required to meet the availability criteria specified in Section 8.1.

Possible Remedial Measures

- Install additional transmission facilities to provide the capability of maintaining a continuous supply to the affected load, e.g. additional 230 kV circuits from Burlington TS or other suitable supply source.

It is expected that the deficiencies identified above will be addressed through separate CAA applications.

8.3.2 Availability Analysis for 115 kV System

8.3.2.1 Single contingency 115 kV Line outages

As shown in Tables 4, 6 and 8, these contingencies do not result in any line overloads or load loss. Hence, the availability criteria are met.

8.3.2.2 Loss of (K13J+K14J)

This contingency affects Strachan TS and John TS with a total load of about 380-450 MW in 2003-2010. The availability criterion for this load level requires restoration of supply within 30 minutes.

Possible Remedial Measures

- Transfer half of the John TS load, post-contingency, to the Leaside sector via circuit H2JK.

The above transfer would only be possible if all elements are in-service in the Leaside sector, and if the rating of circuit H2JK is restored to its original value of 218 MVA. (Due to issues regarding the quality of the backfill that has been used for the cabled section between Hearn TGS and John TS, this circuit has been derated to just 104 MVA)

Since the load at Esplanade TS that is supplied from H2JK totals approximately 56-65 MVA from 2003-2010, there would be an opportunity to transfer approximately 162-153 MVA (from 2003-2010) from the Manby sector to the Leaside sector via H2JK, if the circuit were to be restored to its original rating. This would only be sufficient to allow the thermal ratings of the circuits in the Manby sector to be respected until about 2005. Beyond that date, reinforcement of the transmission system in the Manby sector would be necessary.

8.3.2.3 Loss of (K6J+H2JK)

This contingency affects Strachan TS which has a forecast load of about 95-135 MW from 2002-2010. The availability criterion for this load level requires restoration of supply within 8 hours.

Possible Remedial Measures

- Restore the supply the Strachan TS by sectionalizing the circuits to provide a supply from John TS. This may require the conductors of circuits K13J & K14J to be operated to their sag limit and accepting the resultant conductor loss of life.
(It is assumed that only the overhead circuit sections between Manby TS and Riverside Jct are out of service.)

8.3.2.4 Loss of (K1W+K3W)

Loss of (K1W+K3W) affects Fairbank TS and Wiltshire TS with a total load of about 250-270 MW in 2002-2010. The availability criterion for this load level requires restoration of supply within 30 minutes.

Possible Remedial Measures

- Supply to the Wiltshire TS DESN can be restored within 1/2 hour by opening the K1W and K3W line disconnect switches and reclosing the circuit breakers at Wiltshire TS.
- Although restoration of the supply to Fairbank TS, (160- 170 MW from 2002-2010) is unlikely to be possible within 1/2 hour since there is no alternative supply available, restoration of at least one circuit should be possible within 8 hours, by sectionalising the circuits to isolate the faulted section .

The availability level for this contingency is considered marginal since the initial load loss is in the range of 250-270 MW and only part of it can be restored within 1/2 hour.

8.3.2.5 Loss of (K11W+K12W)

This contingency affects Runnymede TS. This station has a load level of less than 250 MW and hence requires restoration within 8 hours.

- In this case, supply can likely be restored within 8 hours by restoring at least one circuit to service and/or by sectionalizing the circuits. This may require operating the conductors to their sag temperature and accepting the resultant conductor loss of life.

8.3.2.6 Loss of Manby TS Autotransformers

Loss of One Autotransformer

Loss of one autotransformer at either Manby East or Manby West does not affect any load and hence the availability criteria described in Section 8.1 are met.

Loss of Two Autotransformers

Two autotransformers (T7+T8) or (T8+T9) can be forced out simultaneously by a stuck breaker condition, as indicated in Table 5. The load affected by this contingency is the entire load normally supplied by the Manby East autotransformers. This load is approximately 355 to 375 MW from 2002-2010.

The availability criteria described in Section 8.1 require that for a breaker failure contingency, supply should be restorable within 2 hours for load levels over 40 MW.

It is expected that at least one autotransformer could be returned to service by switching.

8.4 CONCLUSION

The preceding Sections 8.2 and 8.3 identified various load meeting capability and availability deficiencies in the period 2002-2010, based on the assumptions and criteria outlined in Section 8.1.

The results are summarized below:

230 kV system

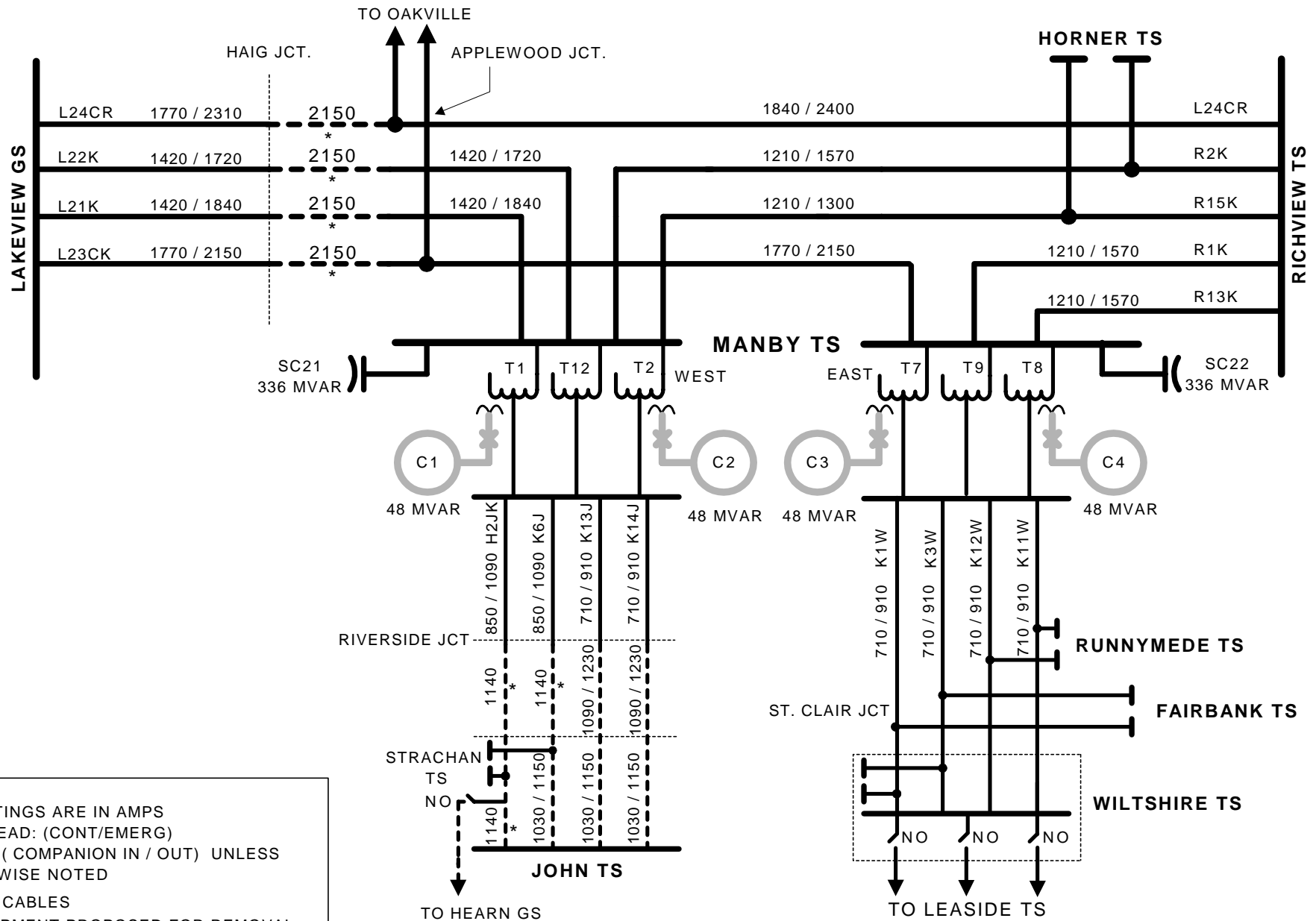
- With no generation at Lakeview TGS or the proposed Sithe-Southdown Project:
 - The loading on 230 kV circuits R2K and R15K exceeds the emergency rating of the circuits in 2003 under double-contingency line outage conditions and in 2009 under single-contingency line outage conditions.
 - The availability criteria for contingencies affecting flows on 230 kV circuits R2K and R15K are not met in 2003 for double contingencies and in 2009 for single contingencies.

Additional transmission facilities or other remedial measures would be required to address the above deficiencies. It is noted, however, that with two generating units at Lakeview TGS or equivalent generation at the proposed Sithe-Southdown Project, the deficiencies would not occur until beyond 2010.

- The availability criteria for the Mississauga/Oakville load supplied via 230 kV circuits L23CK and L24CR is not met in 2002 and beyond. It is noted that the affected load is estimated at approximately 500-550 MW from 2002 to 2010. The criteria for a two-circuit outage calls for restoration of supply within ½ hour for loads between 250 MW and 500 MW and continuous supply for loads over 500 MW. Corrective measures are required to meet the availability criteria listed in Section 8.1.

115 kV System

The availability criteria for double-circuit contingencies affecting flows on 115 kV circuits K6J and H2JK are not met in 2003 and beyond. If the rating of 115 kV circuit H2JK (cable section out of Hearn GS) can be restored to its design rating of 218 MVA, post-contingency load transfers from the Manby sector to the Leaside sector can extend the adequacy until about 2005. Beyond that date, reinforcement of the transmission system in the Manby sector would be necessary.



LEGEND
 LINE RATINGS ARE IN AMPS
 OVERHEAD: (CONT/EMERG)
 CABLE: (COMPANION IN / OUT) UNLESS OTHERWISE NOTED
 * TWO CABLES
 — EQUIPMENT PROPOSED FOR REMOVAL (C2,C3&C4 ARE CURRENTLY NOT OPERABLE)

FIGURE 1
MANBY TS : REMOVAL OF SYNCHRONOUS CONDENSERS

FIGURE 2
Manby West Voltage Profile

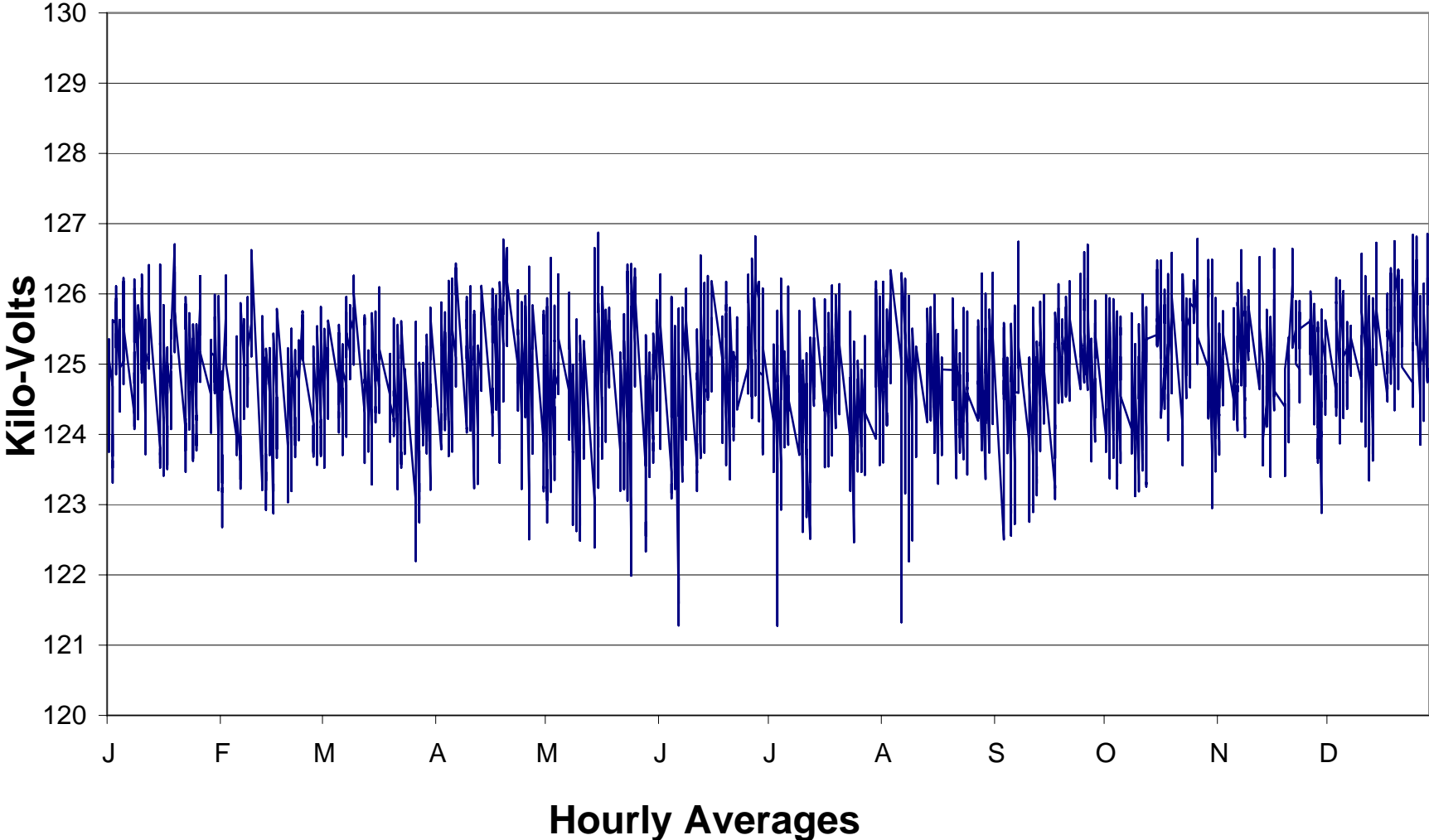
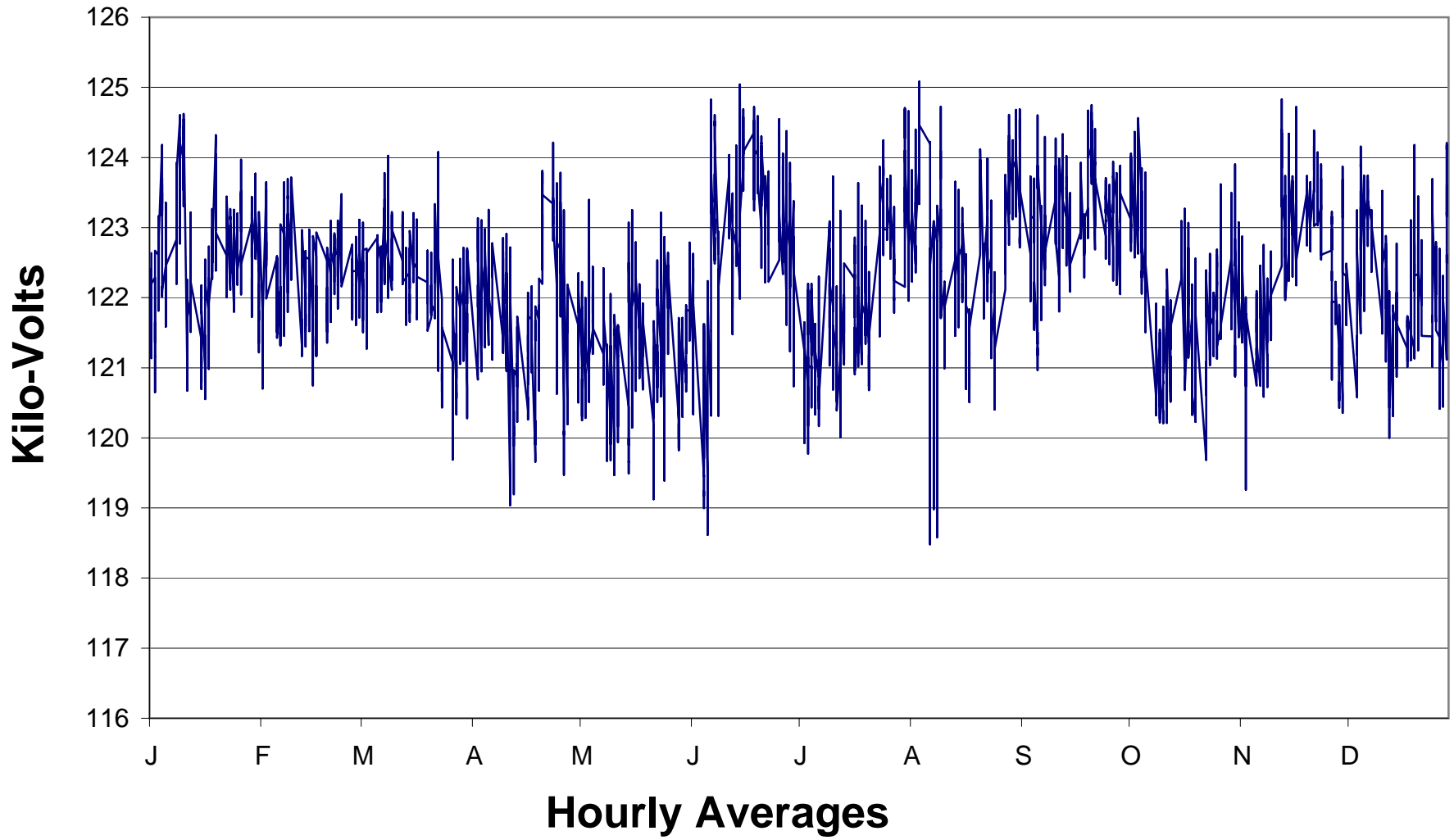


FIGURE 3
Manby East Voltage Profile



**TABLE 1
FORECAST LOADS AT TRANSFORMER STATIONS
IN THE AREA OF MANBY TS**

STATION	SUMMER PEAK LOAD (MVA)								
	2002	2003	2004	2005	2006	2007	2008	2009	2010
115 kV Transformer Stations Supplied from Manby TS (East) (1)									
Fairbank TS	179	176	178	184	186	186	188	190	192
Runnymede TS	113	113	116	112	114	115	116	117	118
Wiltshire TS	103	101	99	100	102	102	104	105	105
SUBTOTAL	395	390	393	396	402	403	408	412	415
115 kV Transformer Stations Supplied from Manby TS (West) (1)									
Strachan TS	107	113	119	129	133	136	140	145	147
John TS	318	318	311	313	319	326	332	339	345
SUBTOTAL	425	431	430	442	452	462	472	484	492
230 kV Transformer Stations Supplied from the Richview TS x Manby TS Circuits (1)									
Horner TS	165	168	170	173	175	178	181	183	186
Manby TS	240	244	248	253	256	260	264	268	272
SUBTOTAL	405	412	418	426	431	438	445	451	458
230 kV Stations in Mississauga and Oakville Supplied from the Richview TS x Lakeview GS Circuits (2)									
SUBTOTAL	550	560	570	580	585	590	600	605	610
TOTAL	1,775	1,793	1,811	1,844	1,870	1,893	1,925	1,952	1,975

NOTES

- (1) Based on Load Forecast submitted by Hydro One Networks
(2) Estimated values based on historical values and assumed escalation.

TABLE 2
ASSESSMENT OF SYSTEM VOLTAGES

MONITORED ITEM	MINIMUM ACCEPTABLE VOLTAGE	VOLTAGE LEVEL (kV) OR % CHANGE (1)											
		C1+C3 In Service			C1+C3 Out of Service			C1+C3+SC21 Out of Service			C1+C3+SC22 Out of Service		
		2002	2006	2010	2002	2006	2010	2002	2006	2010	2002	2006	2010
STEADY STATE VOLTAGE													
Richview 230 kV	238 kV (in accordance with the IMO's SCOs)	243	242	241	242	241	240	239	239	238	239	239	238
Manby 230 kV		243	242	241	242	241	240	239	239	238	239	239	238
Manby West 115 kV	116 kV (in accordance with the IMO's SCOs)	124	121	120	121	120	118	121	119	117	120	119	117
Manby East 115 kV		125	125	124	123	123	121	122	122	120	122	122	121
Wiltshire TS 115 kV	113 kV (as per Market Rule Requirements in Chapter 4, Appendix 4.4)	124	124	122	122	122	120	121	121	119	121	121	119
Windsor TS 115 kV		120	119	117	118	117	115	117	116	113	117	116	114
ABRUPT VOLTAGE CHANGES													
Capacitor Switching (2)	Maximum 4% (as per Market Rule Requirements in Chapter 4, Appendix 4.4)	Less than 4%											
Line Contingency (3)	Maximum 10% (as per Market Rule Requirements in Chapter 4, Appendix 4.4)	Less than 10%											

NOTES

- (1) All cases assume that there is no generation at Lakeview GS and the proposed Sithe-Southdown Project. Operating with two Lakeview units or with the Sithe-Southdown Project in-service would improve the 230 kV voltages by about 1-3 kV and the 115 kV voltages by about 1-2 kV.
- (2) Based on switching one of the two 230 kV, 336 MVAR capacitor banks at Manby TS and monitoring voltage at the Manby 115 kV buses.
- (3) Based on critical double element contingencies with voltage monitored at Wiltshire TS and Windsor TS.

The voltage criteria is met in all cases; some only marginally. The shaded areas indicated cases where the voltage is at the minimum value or within 1 kV above the minimum.

**TABLE 3
LOAD MEETING CAPABILITY ANALYSIS - 230 kV CIRCUITS**

MONITORED SYSTEM ELEMENT		CRITICAL CONTINGENCY	CONDUCTOR SAG TEMP LIMIT (OC)	SUMMER RATING (Amperes) (1)	SUMMER PEAK LOADING (AMP) (2)											
					2002				2006				2010			
CIRCUIT	SECTION				Precont	Postcon	Precont	Postcon	Precont	Postcon	Precont	Postcon	Precont	Postcon	Precont	Postcon
NOTE: Lakeview GS is assumed to be retired in 2005					Lakeview: 0 Sithe: 0 (3)	Lakeview: 600MW Sithe: 0 (4)		Lakeview: 0 Sithe: 0 (3)		Lakeview: 0 Sithe: 800 MW (5)		Lakeview: 0 Sithe: 0 (3)		Lakeview: 0 Sithe: 800 MW (5)		
SINGLE ELEMENT CONTINGENCIES																
R1K	Richview TS x Manby TS	R13K	134	1210 / 1570 / 2140	730	1200	560	970	750	1240	470	810	820	1340	550	970
R2K	Richview TS x Manby TS	R15K	134	1210 / 1570 / 2140	890	1430	580	940	940	1510	640	1020	1020	1630	680	1100
R13K	Richview TS x Manby TS	R1K	134	1210 / 1570 / 2140	720	1200	560	970	740	1240	460	810	810	1340	550	970
R15K	Richview TS x Manby TS	R2K	134	1210 / 1570 / 2140	880	1430	580	940	930	1510	630	1020	1010	1630	680	1100
L24CR	Richview TS x Applewood Jct.	L23CK	127	1840 / 2400 / 3390	730	990	330	810	770	1140	170	400	830	1190	180	350
DOUBLE ELEMENT CONTINGENCIES (6)																
R1K	Richview TS x Manby TS	R13K+R15K	134	1210 / 1570 / 2140	730	1340	560	1080	750	1390	470	920	820	1520	550	1080
R2K	Richview TS x Manby TS	L22K+R15K (7)	134	1210 / 1570 / 2140	890	1480	580	1130	940	1570	640	1240	1020	1690	680	1340
		R13k+R15K	134	1210 / 1570 / 2140	890	1550	580	1040	940	1640	640	1100	1020	1770	680	1190
R13K	Richview TS x Manby TS	L23CK+R1K (7)	134	1210 / 1570 / 2140	720	1180	560	1180	740	1180	460	1190	810	1260	550	1270
		R1K+R2K	134	1210 / 1570 / 2140	720	1340	560	1080	740	1390	460	920	810	1520	550	1080
R15K	Richview TS x Manby TS	L21K+R2K (7)	134	1210 / 1570 / 2140	880	1480	580	1290	930	1560	630	1340	1010	1690	680	1450
		R1K+R2K	134	1210 / 1570 / 2140	880	1550	580	1040	930	1640	630	1100	1010	1770	680	1190
L24CR	Richview TS x Applewood Jct.	L22K+L23CK	127	1840 / 2400 / 3390	730	1140	330	880	770	1220	170	420	830	1270	200	380

NOTES

- (1) Ratings shown are (Continuous / Emergency / 15 Minutes). Continuous ratings are based on a conductor operating temperature of 93°C. Emergency ratings are based on a conductor operating temperature of 127°C or the conductor sag limit, whichever is less.
- (2) Assumes Manby TS synchronous condensers not in service.
- (3) Assumes Lakeview GS 230 kV bus is solid and Richview TS 230 kV bus is solid
- (4) Assumes Lakeview GS 230 kV bus is split and Richview TS 230 kV bus is solid
- (5) Assumes Lakeview GS 230 kV bus is split and Richview TS 230 kV bus is split
- (6) Outages considered are those resulting from stuck breaker conditions or outage of two circuits on the same tower line
- (7) Breaker Failure Contingency

**TABLE 4
MANBY EAST SYSTEM
LOAD MEETING CAPABILITY ANALYSIS
115 kV CIRCUITS AND AUTOTRANSFORMERS (SINGLE ELEMENT CONTINGENCIES)**

MONITORED SYSTEM ELEMENT		CRITICAL CONTINGENCY	CONDUCTOR SAG TEMP LIMIT (°C)	SUMMER RATING (Amperes) (1) (2)	SUMMER PEAK LOADING (AMPS) (3)			
					2002		2010	
					Precont.	Postcont.	Precont.	Postcont.
115 KV CIRCUITS								
CIRCUIT	SECTION							
K1W	Manby TS x St Clair Jct	K3W	150	710 / 910 / 1170	390	560	470	680
K3W	Manby TS x St Clair Jct	K1W	150	710 / 910 / 1170	390	560	470	680
K11W	Manby TS x Runnymede TS	K12W	150	710 / 910 / 1170	450	670	540	810
K12W	Manby TS x Runnymede TS	K11W	150	710 / 910 / 1170	450	670	540	810
230 - 115 KV AUTOTRANSFORMERS								
T7		T8	—	1190 / 1465 / 1680 / 1840	550	850	660	1020
T8		T7 or T9	—	1190 / 1765 / 2185 / 2230	580	860	690	1030
T9		T8	—	1190 / 1465 / 1680 / 1840	550	850	660	1020

NOTES

- (1) Ratings for overhead circuits are for (Continuous / Emergency / 15 Minutes). Continuous ratings are based on a conductor operating temperature of 93°C. Emergency ratings are based on a conductor operating temperature of 127°C or the conductor sag limit, whichever is less.
- (2) Ratings for autotransformers are for (Continuous / 10-day / 2-hr / 15-min)
- (3) Assumes Manby TS synchronous condensers not in service.

**TABLE 5
MANBY EAST SYSTEM
LOAD MEETING CAPABILITY ANALYSIS
115 kV CIRCUITS AND AUTOTRANSFORMERS (DOUBLE ELEMENT CONTINGENCIES)**

MONITORED SYSTEM ELEMENT		CRITICAL CONTINGENCY (1)	CONDUCTOR SAG TEMP LIMIT (°C)	SUMMER RATING (Amperes) (2) (3)	SUMMER PEAK LOADING (AMPS) (4)					
					2002		2006		2010	
					Precont.	Postcont.	Precont.	Postcont.	Precont.	Postcont.
115 KV CIRCUITS										
CIRCUIT	SECTION									
K1W	Manby TS x St Clair Jct	K11W + K12W	150	710 / 910 / 1170	390	600	430	660	470	720
K3W	Manby TS x St Clair Jct	K11W + K12W	150	710 / 910 / 1170	390	600	430	660	470	720
K11W	Manby TS x Runnymede TS	K1W + K3W (5)	150	710 / 910 / 1170	450	460	500	510	540	550
K12W	Manby TS x Runnymede TS	K1W + K3W (5)	150	710 / 910 / 1170	450	460	500	510	540	550
230 - 115 KV AUTOTRANSFORMERS (5)										
T7	T8 + T9	—		1190 / 1465 / 1680 / 1840	550	1720	610	1900	660	2070
T9	T7 + T8	—		1190 / 1465 / 1680 / 1840	550	1720	610	1900	660	2070

NOTES

- (1) Outages considered are those resulting from stuck breaker conditions or outage of two circuits on the same tower line
- (2) Ratings for overhead circuits are for (Continuous / Emergency / 15 Minutes). Continuous ratings are based on a conductor operating temperature of 93°C. Emergency ratings are based on a conductor operating temperature of 127°C or the conductor sag limit, whichever is less.
- (3) Ratings for autotransformers are for (Continuous / 10-day / 2-hr / 15-min)
- (4) Assumes Manby TS synchronous condensers not in service.
- (5) This contingency results in the loss of supply to Fairbank TS and the DESN at Wiltshire TS, initially. However in determination of the post contingency flows on K11W and K12W, it was assumed that supply to the Wiltshire DESN is restored by opening the K1W and K2W line switches and reclosing the circuit breakers at Wiltshire TS. Under this configuration, the remaining K11W and K12W supply circuits would be supplying Runnymede TS and Wiltshire TS.
- (6) Shaded areas indicate loading is above the 10-day LTR for autotransformers.

**TABLE 6
MANBY WEST SYSTEM
LOAD MEETING CAPABILITY ANALYSIS
115 kV CIRCUITS AND AUTOTRANSFORMERS (SINGLE ELEMENT CONTINGENCIES)**

MONITORED SYSTEM ELEMENT		CRITICAL CONTINGENCY	CONDUCTOR SAG TEMP LIMIT (°C)	SUMMER RATING (Amperes) (1) (2)	SUMMER PEAK LOADING (AMPS) (3)			
					2002		2010	
					Precont.	Postcont.	Precont.	Postcont.
115 KV CIRCUITS								
CIRCUIT	SECTION							
K6J	Manby TS x Riverside Jct (limiting Section)	H2JK	150	850 / 1090 / 1470	540	790	660	1000
H2JK	Manby TS x Riverside Jct (limiting Section)	K6J	150	850 / 1090 / 1470	540	790	660	1000
K13J	Manby TS x Riverside Jct (limiting Section)	K6J or H2JK	150	710 / 910 / 1170	480	680	580	850
K14J	Manby TS x Riverside Jct (limiting Section)	K6J or H2JK	140	710 / 910 / 1120	480	680	580	850
230 - 115 KV AUTOTRANSFORMERS								
T1		T2	-	1190 / 1760 / 2225 / 2225	690	1040	830	1290
T2		T1	-	1190 / 1950 / 2225 / 2225	680	1040	830	1290
T12		T1	-	1190 / 1410 / 1615 / 1795	670	1030	820	1270

NOTES

- (1) Ratings for overhead circuits are for (Continuous / Emergency / 15 Minutes). Continuous ratings are based on a conductor operating temperature of 93°C. Emergency ratings are based on a conductor operating temperature of 127°C or the conductor sag limit, whichever is less.
- (2) Ratings for autotransformers are for (Continuous / 10-day / 2-hr / 15-min)
- (3) Assumes Manby TS synchronous condensers not in service.

**TABLE 7
MANBY WEST SYSTEM
LOAD MEETING CAPABILITY ANALYSIS
115 kV CIRCUITS AND AUTOTRANSFORMERS (DOUBLE ELEMENT CONTINGENCIES)**

MONITORED SYSTEM ELEMENT		CRITICAL CONTINGENCY (1)	CONDUCTOR SAG TEMP LIMIT (0C)	SUMMER RATING (Amperes) (2) (3)	SUMMER PEAK LOADING (AMPS) (4)					
					2002		2006		2010	
					Precont.	Postcont.	Precont.	Postcont.	Precont.	Postcont.
115 KV CIRCUITS										
CIRCUIT	SECTION									
K6J	Manby TS x Riverside Jct (limiting Section)	K13J + K14J	150	850 / 1090 / 1470	540	1080	590	1210	660	1360
H2JK	Manby TS x Riverside Jct (limiting Section)	K13J + K14J	150	850 / 1090 / 1470	540	1080	590	1210	660	1340
K13J	Manby TS x Riverside Jct (limiting Section)	K6J + H2JK	150	710 / 910 / 1170	480	815	530	860	580	920
K14J	Manby TS x Riverside Jct (limiting Section)	K6J + H2JK	140	710 / 910 / 1120	480	815	530	860	580	920
230 - 115 KV AUTOTRANSFORMERS										
T1, T2, T12		Loss of two autotransformers was not considered since there is no single stuck breaker situation that would result in this condition and hence the likelihood of its occurrence would be extremely low.								

NOTES

- (1) Outages considered are those resulting from stuck breaker conditions or outage of two circuits on the same tower line
- (2) Ratings for overhead circuits are for (Continuous / Emergency / 15 Minutes). Continuous ratings are based on a conductor operating temperature of 93°C. Emergency ratings are based on a conductor operating temperature of 127°C or the conductor sag limit, whichever is less.
- (3) Ratings for autotransformers are for (Continuous / 10-day / 2-hr / 15-min)
- (4) Assumes Manby TS synchronous condensers not in service.
- (5) Shaded areas indicate loading is above the emergency rating of the circuit

**TABLE 8
SUPPLY AVAILABILITY ANALYSIS**

CRITICAL CONTINGENCY	ELEMENTS OVERLOADED NOTE (2)	LOAD AFFECTED (NOTE 1)								
		2002	2003	2004	2005	2006	2007	2008	2009	2010
230 KV TRANSMISSION CIRCUITS										
R2K	R15K								165 to 170 MW (3)	
R15K	R2K									
R1K or R13K or L24CR or L23CK	–	No load affected								
R1K + R2K	R15K								1500 to 1800 MW (4)	
R13K + R15K	R2K									
L23CK + L24CR	–	500 to 550 MW (5)								
L22K + L23CK	–	No load affected								
R2K + L21K	R15K								1700 to 1800 MW (6)	
R15K + L22K	R2K									
115 KV TRANSMISSION CIRCUITS AND AUTOTRANSFORMERS										
All 115kV Single Contingency Line Outages	–	No load affected (See Section 8.3.2.1)								
K13J + K14J	K6J + H2JK								380 to 450 MW (7)	
K6J + H2JK	K13J + K14J									
K1W + K3W	–	250 to 270 MW (9)								
K11W + K12 W	–	100 to 110 MW (10)								
One Manby TS Autotransformer	–	No load affected (See Section 8.3.2.6)								
Two Manby TS Autotransformers (T7+T8) or (T7+T9)	–	355 to 375 MW (11)								

NOTES

- (1) The shaded areas indicate cases where the availability criteria specified in Section 8.1 are not met. Unshaded areas indicate cases where some load interruption may occur but supply can be restored within the time frame specified in the availability criteria and hence the criteria is met. Blank unshaded areas indicate cases where no load interruptions would occur (ie no load is affected) and hence the availability criteria is met.
- (2) Based on circuit ratings and loading shown in Tables 2, 4 and 6.
- (3) This represents the load supplied by Horner TS. See Section 8.3.1.1.
- (4) This represents the entire load supplied from the Richview x Manby x Lakeview 230 kV circuits. See Section 8.3.1.2.
- (5) This represents the Mississauga and Oakville Load that normally supplied from the L23CK and L24CR circuits. See Section 8.3.1.4.
- (6) This represents the load supplied from the Richview x Manby x Lakeview 230 kV circuits. See Section 8.3.1.3. Because these contingencies are caused by stuck breaker conditions, restoration of supply is required within 2 hours. Since it is expected that one circuit can be restored by switching, the availability criterion is met.
- (7) This represents the load supplied by Strachan TS and John TS. See Section 8.3.2.2.
- (8) This represents the load supplied by Strachan TS. See Section 8.3.2.3.
- (9) This represents the load supplied by Fairbank TS and Wiltshire TS. Availability level is marginal. See Section 8.3.2.4.
- (10) This represents the load supplied by Runnymede TS. See Section 8.3.2.5.
- (11) This represents the load supplied by the Manby West autotransformers. See Section 8.3.2.6.