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Technical Assessment of the Need for the Bipole III Line

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For Manitoba Hydro

By

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Preface

Given that Bipole III is justified for reliability but really required to deliver the 695 MW generated by Keeyask for proposed export contracts to the US, the Bipole III transmission line is not needed for both these purposes.

A technical and economic response from Manitoba Hydro is requested that properly represents the cost of cancelling the line so that Electranix as well as MISO and others, can review and possible challenge the response.

Due to the serious nature of the content of this assessment with a billion dollars at stake, no response from Manitoba Hydro or a reply that lacks technical content or is dismissive will be interpreted that it is valid. Claiming it is too late to stop even if costs spent to date and cancellation charges are significant is not a valid excuse; there is more at stake.

Introduction

Bipole III was justified based on "reliability" by qualitative arguments. For various questionable reasons a controversial west side route was chosen for the overhead transmission line with resulting distress to Metis, First Nations, landowners and the wilderness.

To date the 2300 MW DC Converters have been ordered from Siemens. The northern converter is to be located at Keewatinohk (near where Conawapa is to be constructed) and the southern converter to be placed at Riel Substation (east of St. Vital). More than 100 km of northern right-of-way through mostly forest lands has already been cleared for the overhead Bipole III transmission line (but will recover if the west line is not built).

The 695 MW Keeyask generating station is under construction largely justified for proposed and anticipated contracts with US utilities[1].
This report presents but one option to build Keeyask, the Bipole III converters and the proposed 750 MW AC interconnection to Minnesota (Manitoba Minnesota Transmission Project (MMTP)) without constructing the Bipole III overhead transmission line at all. With an independent review, other options can be investigated.

[1] Will these exports be profitable? 2013/14 exports averaged 4.18 c/kwhr with Waskwatim at 10c/kwhr.

Single Line Diagram

A simple configuration of this option without the Bipole III overhead transmission line is shown in Figure 1:

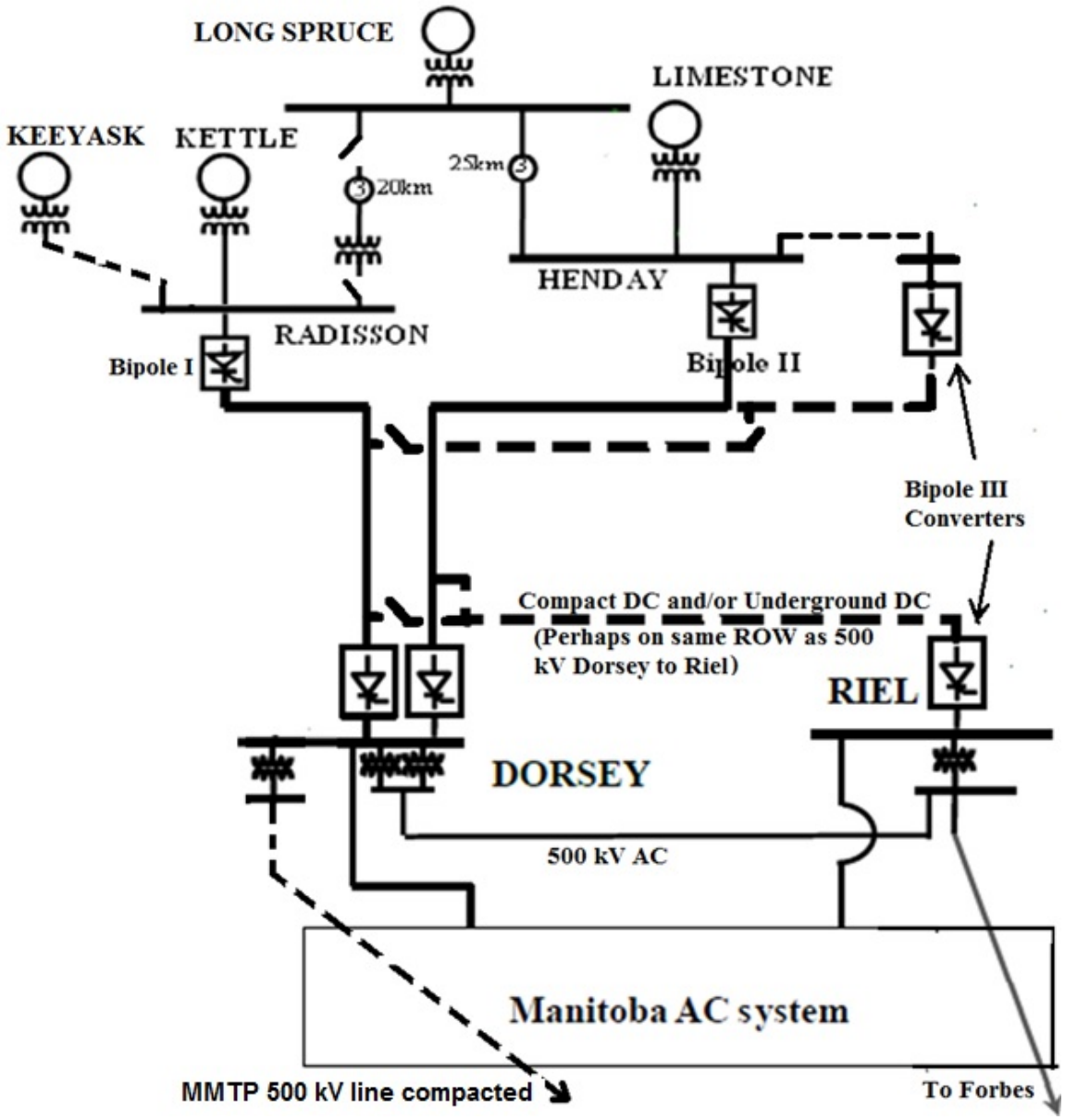

Figure 1: Connection of Bipole III DC converters to existing Bipoles I and II HVDC transmission lines with Keeyask in service and the MMTP line to Minnesota in service for contracts to Minnesota Power and reliability for Manitoba Hydro

The transmission capability of each one of the existing Bipoles I and II overhead transmission lines is about 3,600 MW, and are normally operated at 2,000 MW or less. Hence there is capacity on either of these lines to add the 695 MW power from Keeyask.

Reliability

Since "reliability" is the justification for the Bipole III transmission line, the question arises what reliability is possible if both Bipoles I and II overhead lines are removed from service because of a severe wind or tornado, or even icing?

The reliability statistics Manitoba Hydro presented to the Clean Environment Commission (CEC) to emphasize the vulnerability of the existing Bipoles I and II to simultaneous outage and justify Bipole III are quoted as follows:

"*Studies (Teshmont 2001) have shown that with respect to Dorsey Station, there is a 1 in 29 year probability of outage due to fire and a 1 in 200 year probability of outage due to wide front winds. While mitigation measures have been put in place, which partially address fire vulnerability at Dorsey, there is little that can reasonably be done to mitigate vulnerability to wind and other weather events. The same studies (Teshmont 2001) revealed that the probability of the loss of the Interlake corridor is 1 in 17 years from a tornado, 1 in 50 years from icing and 1 in 250 years from wide front winds.*"[2]

Even despite a more recent reliability assessment[3], the fact remains that Manitoba Hydro submitted in their EIS to the CEC in 2011 a misrepresentation of impact of tornadoes on the existing Bipoles I and II transmission line of 1 in 17 years. Consider the evidence of 133 years of recording tornadoes in Manitoba as shown in Figure 2.

[2] Manitoba Hydro Environmental Impact Statement to CEC dated1st December 2011, Bipole III Project, Chapter 2: Need and Alternatives, p2-3
[3] Manitoba Hydro Report: "Weather Hazard and Reliability Assessment for the Preliminary Preferred Route of the Bipole III HVDC Transmission Line", by Teshmont, January 2012

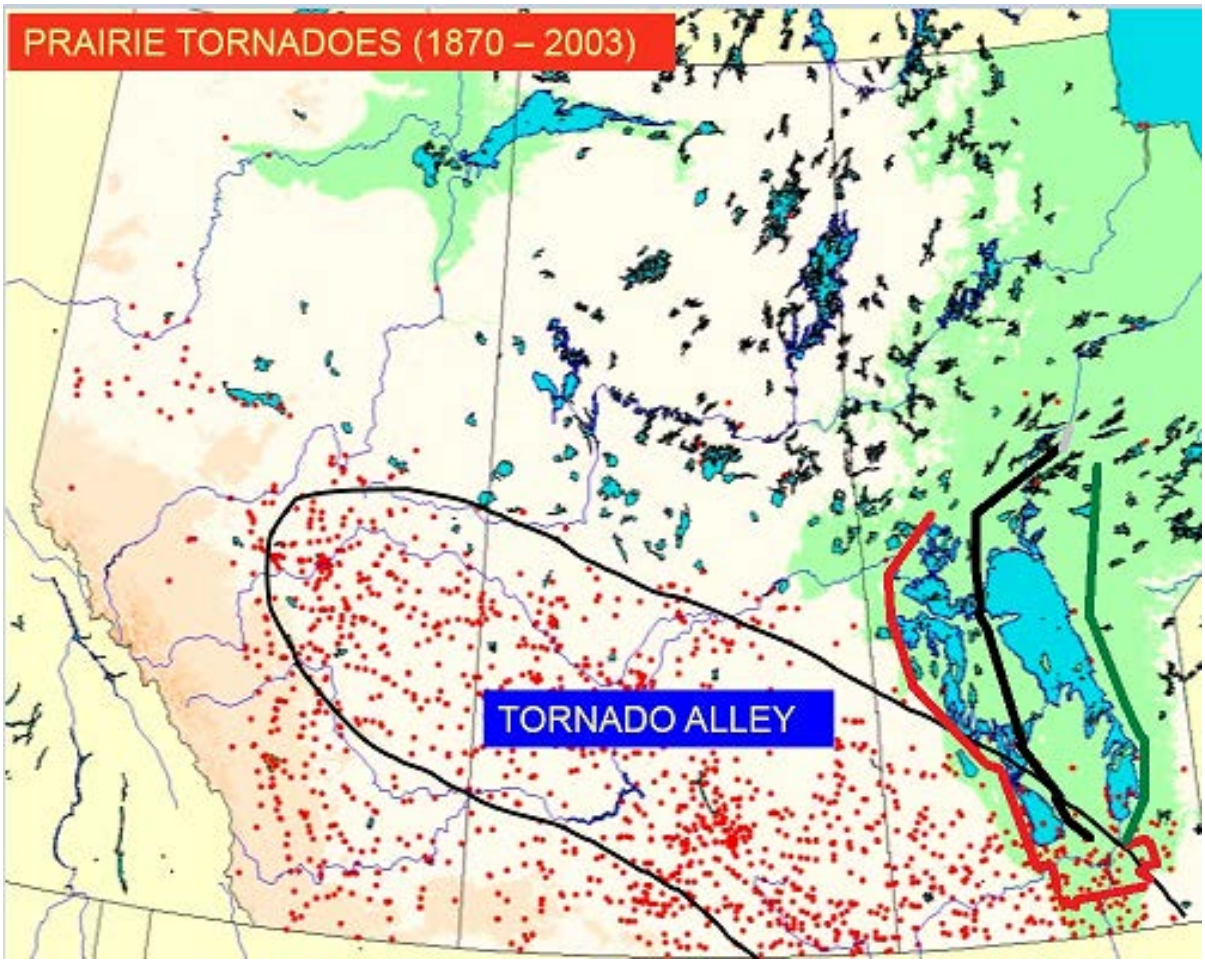

Figure 2: Tornado Alley[4]

The route of the existing Bipoles I and II transmission lines is shown in black. The proposed route of the Bipole III transmission line is shown in red. By simple estimation if the black line is determined to be impacted by tornadoes 1 in 17 years, then the proposed Bipole III transmission line will be exposed to a much greater rate of tornadoes – perhaps once per year.

Now since there are existing high voltage AC transmission lines in "Tornado Alley" that do not experience anywhere near such a high frequency of destructive tornado exposure, then it is straight forward to surmise that the

[4] http://www.bipoleiiicoalition.ca/Commissioners_Report_.pdf .See page 43 of the "Independent Inquiry into Manitoba Hydro's Expansion Plan – Commissioner's Report" by Graham Lane CA, May 26, 2014

1 in 17 years for tornadoes blowing over Bipoles I and II is an absurdity. Unfortunately, this absurdity was submitted as evidence to the CEC for justifying the need for the Bipole III line for reliability.

It is however possible that simultaneous outage of Bipoles I and II will occur as they did on September 5th, 1996, fortunately without loss of power to Manitobans. What will be the reliability of electricity supply to Manitobans if the Bipole III transmission line is built as presented in Figure 1?

With only Bipoles I and II in service, Manitoba Hydro submitted a chart to the CEC showing that for one third of the time in 2017/18, supply to Manitobans would need to be curtailed with a probability of not meeting the load for 1/3rd of the time with simultaneous outage of Bipoles I and II. This is reproduced in Figure 3[5].

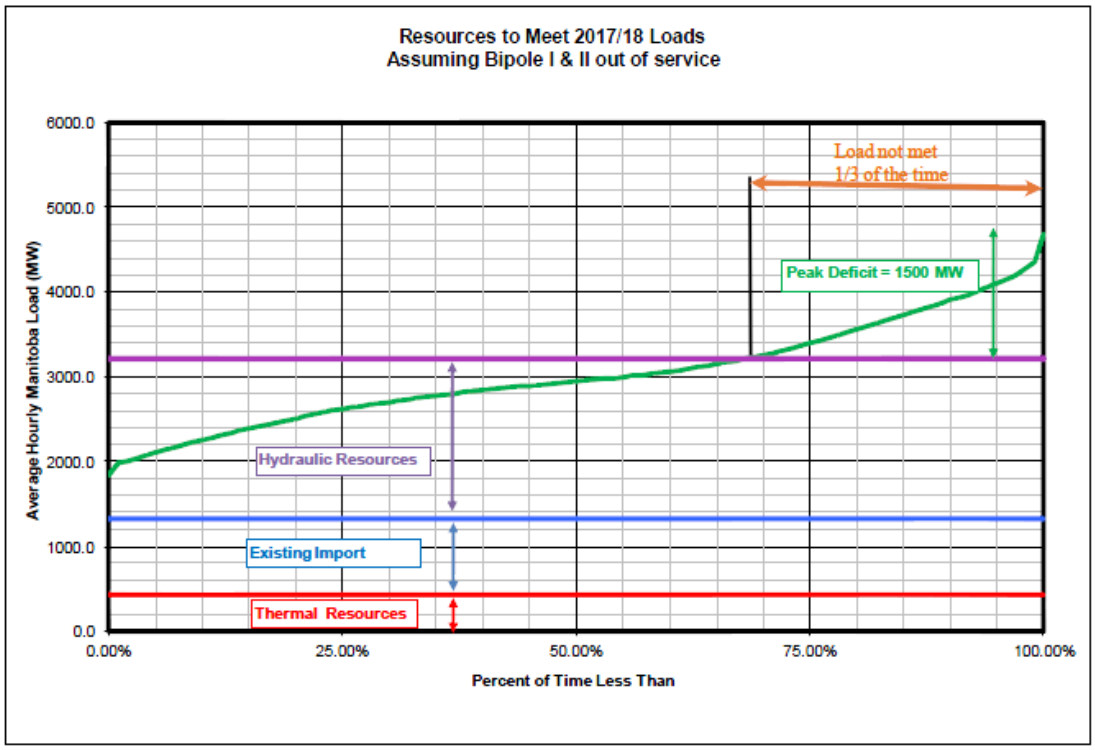

Figure 2.2-2: 2017/2018 Load Duration Curve for a Catastrophic Outage of HVdc

Figure 3: Manitoba's justification for Bipole III for reliability

[5] Manitoba Hydro Environmental Impact Statement to CEC dated1st December 2011, Bipole III Project, Chapter 2: Need and Alternatives, Figure 2.2-2

Figure 3 is what Manitoba Hydro submitted to the CEC in their EIS to help justify the claim that Bipole III was needed for reliability, ignoring the Manitoba Minnesota Transmission Project (MMTP) which is the real reason Keeyask is being constructed to enable export of its power to the US.

What is a more realistic situation? A simple qualitative assessment is provided. Figure 3 is revised from Manitoba Hydro's Environmental Impact Statement (EIS) to the CEC, Chapter 2 but now with the MMTP line in service. MISO confirmed that with MMTP in service they could supply Manitoba Hydro 2500 MW emergency import.

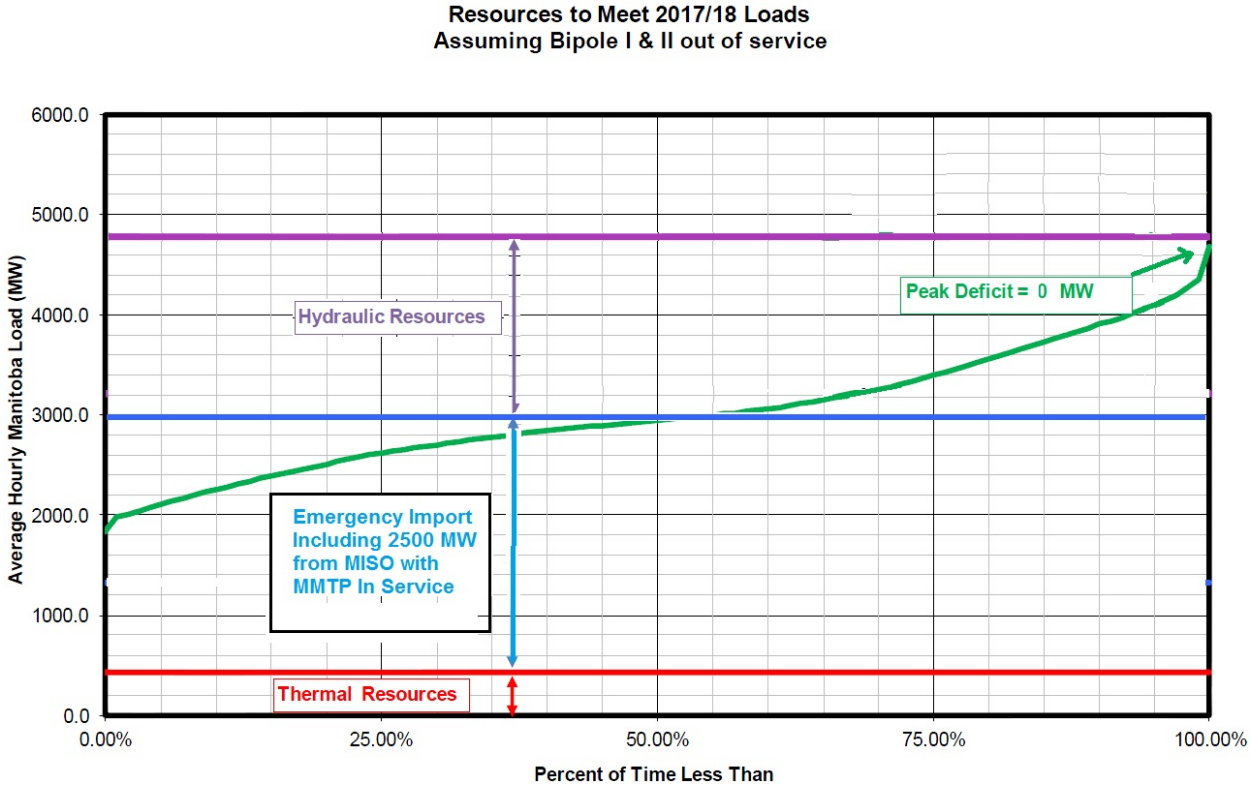

Figure 4: 2017/2018 Load Duration Curve for a catastrophic outage of HVDC without the Bipole III overhead transmission line and MMTP in service

Figure 4 indicates that the Bipole III overhead transmission line is not needed for reliability if the network is configured similar to what is shown in Figure 1.

In discussion on this issue with Mr. Dale Osborn, Consulting Advisor for Policy and Economic Studies at MISO in a meeting of 30 October 2014 in Montreal, he confirmed to the author that with MMTP in place, MISO could supply up to 2500 MW emergency power to Manitoba Hydro. This is reflected in Figure 4 above. He urges Manitoba Hydro to confirm this. If from Manitoba Hydro's study, the 2500 MW or so is not possible, then in its response to this assessment, explain why not and what is possible from their perspective for MISO to review.

If an effective Demand Side Management program is instigated as required by the Public Utilities Board of Manitoba[6], then the peak load shown in Figures 3 and 4 will be less and so this must be taken into account in Manitoba Hydro's response.

MMTP AC Interconnection

This 500 kV AC interconnection, required for export of Keeyask power and energy to Minnesota Power should be constructed as a compact AC line design in sensitive areas. It could then go road side or rail side, have a lower tower height and profile, a lower lightning shadow, lower wind forces and if roadside, could be easily accessed by Manitoba Hydro construction and maintenance crews. The compact transmission sections would be less stressful to impacted land owners.

It is important to note that the Manitoba Metis Federation (MMF) put forward in its report to the PUB NFAT to build such a new interconnection to the US for reliability but this was excised at the insistence of Manitoba Hydro under NDP government rules[7]. This dramatically demonstrates how limited and restricted any ideas of worth are dismissed.

[6] Needs For And Alternatives To (NFAT) Review of Manitoba Hydro's Preferred Development Plan – Final Report, June 20, 2014, Page 19.
[7] Manitoba : The Public Utilities Board Act, Order No. 22/14, March 4, 2014

Refurbishing Bipole II Converters

The existing Bipole II converters need refurbishing by the end of this decade. With the Bipole III converters operating on one or the other of the existing Bipole I and II transmission lines, then a way will be possible to undertake its refurbishment.

Conclusion

The Bipole III overhead transmission line is not needed for reliability with the MMTP line in service, and Keeyask power and energy can still be delivered for export to the US with the Bipole III DC converters connected to one of the existing Bipoles I or II transmission lines. By doing this, approximately $1.6 billion dollars in capital expenditure may be saved minus moneys already spent and cancellation fees leaving perhaps $1 billion. Such potential for saving cannot easily be dismissed[8], particularly with the near term non-profitability of the questionable Preferred Development Plan[9].

Finally, a more collaborative and open approach to Manitoba's electric energy development is essential and cannot be dismissed as was the MMF proposal for an interconnection to the US to achieve reliability of electricity supply to Manitobans. It is with a spirit of collaboration that this assessment is submitted and an informed response requested.

Acknowledgement

Contributions are recognized from Art Derry, a former Vice President of Manitoba Hydro

[8] Shutting down 24 rural service centres for savings of several tens of millions of dollars is paltry by comparison, plus the impact of upsetting the IBEW in the process.

[9]The fundamental architecture of Manitoba Hydro's electricity network, which is based on the idea of a top-down radial transmission system predicated on unidirectional energy flows from large power plants, is increasingly becoming obsolete. The economies of scale that once favored such monopoly models no longer hold, as markets now favor distributed and decentralized generators, energy storage and rates that are more customized and based on local availability and timing. However, the Manitoba Hydro AC transmission and distribution network remains essential for the electric energy supply to Manitobans in the future.