

# **Hydropower Transmission in Manitoba:**

## **Current Status and Future Planning**

**January 2005**

**Manitoba Wildlands**

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# Hydropower Transmission in Manitoba

## North-South Transmission

The bulk of Manitoba Hydro's generation capacity is located 750 km (465 miles) north of Winnipeg. Major transmission infrastructure is thus required to bring the power from the generation sites to the market. The company's plans for major expansion of northern generation require plans for major new transmission corridors as well.

According to a 2000 confidential Manitoba Hydro memo obtained by Manitoba Wildlands, the crown utility may require up to 10 new north-south transmission lines in six different corridors if it pursues its full expansion aspirations. The memo was obtained from Parks Canada under the Access to Information Act.

Transmission expansion would include two corridors (swathes of land housing one or more transmission lines up to several hundred feet wide) on the East Side of Lake Winnipeg, two down the center of the province and an expansion of a third (through the Interlake Region), and one on the west side of the province, west of Cedar Lake and Lake Manitoba.<sup>1</sup>

**Background:** Approximately 70% of Manitoba Hydro's total electricity production is currently sent from northern dams to the Winnipeg area via a pair of transmission lines—known as Bipole I & II—in a single 900 kilometer long corridor.<sup>2</sup> This concentration of transmission can make Manitoba Hydro's system vulnerable to extreme weather events (ice storms and tornadoes) and compromise system security and reliability. In addition the Bipoles are currently operating near maximum capacity (and beyond optimum capacity when considered from an efficiency stand point).<sup>3</sup> The term "Bipole" refers to High Voltage Direct Current (HVDC) transmission infrastructure used (and to some extent pioneered) by Manitoba Hydro.

Manitoba Hydro has identified 8790 MW worth of potential hydro development, and has stated an interest in developing 5000 MW of this potential.<sup>4</sup> The new lines would be designed to accommodate the 5000 MW, as noted in the confidential 2000 Hydro memo.

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<sup>1</sup> Manitoba Hydro Interoffice Memorandum from W. N. Zurba to C. V. Thio, June 27, 2000. Obtained from Parks Canada under the Access to Information Act.

<sup>2</sup> Sources: Report on Public Hearings: Wuskwatim Generation and Transmission Projects, Manitoba Clean Environment Commission, Sept. 2004, p.18; and Manitoba Hydro [http://www.hydro.mb.ca/our\\_facilities/ts\\_nelson.shtml](http://www.hydro.mb.ca/our_facilities/ts_nelson.shtml).

<sup>3</sup> Manitoba Hydro reports that if the power now transmitted via Bipoles I & II were spread out over three Bipoles, gained efficiencies equivalent to 86 MW would be achieved by way of less energy loss in transmission. Source: MABE Outlook 2005: Energy, Feast or Famine?, Manitoba Association for Business Economics, no date, p. 11; [www.cabe.ca/chapters/MABE/conference2005/20041110EnergyOutlook.pdf](http://www.cabe.ca/chapters/MABE/conference2005/20041110EnergyOutlook.pdf).

<sup>4</sup> Source: MABE Outlook 2005: Energy, Feast or Famine?, Manitoba Association for Business Economics, no date, p. 18; [www.cabe.ca/chapters/MABE/conference2005/20041110EnergyOutlook.pdf](http://www.cabe.ca/chapters/MABE/conference2005/20041110EnergyOutlook.pdf). The Manitoba Hydro website lists the potential capacity of Conawapa at 1380 MW not the 1250 MW listed in the MABE Outlook 2005; [http://www.hydro.mb.ca/issues/transmission\\_projects/transmission\\_projects.shtml](http://www.hydro.mb.ca/issues/transmission_projects/transmission_projects.shtml).

Reference to the possibility of 5000 MW worth of hydro expansion can be found in the confidential

The proposed 200 MW Wuskwatim Dam would not be dependent on major new north-south transmission, but the proposed Gull/Keeyask (620 MW) and Conawapa (1380 MW) dams would require a Bipole III.<sup>5</sup> (Wuskwatim project descriptions include new transmission segments and an upgraded station which connect to lines described in the Hydro memo) And development of the full 5000 MW could require the full suite of new corridors and lines discussed in the 2000 Hydro memo cited above.

While Wuskwatim, Gull/Keeyask and Conawapa could potentially come into service between 2010 and 2017, full development of the 5000 MW, if it were to happen, could take many years.

### **Siting Factors**

**Separation:** In order to achieve system security and reliability, geographical separation between major transmission lines is required. While it may be most convenient and least expensive to site all north-to-south transmission along a single wide corridor, this would mean a major ice storm or tornado could debilitate the province's energy distribution system. Thus, separation is a primary concern when siting transmission. During a summer storm in 1996, tornado-like winds downed both bipoles knocking out 75% of Manitoba Hydro's generation ability. Though service interruption was minimized, the event illustrated the vulnerability of the system.

**Geography:** The major lakes between northern dams and southern markets are a significant obstacle. The area between the lakes at Grand Rapids is a particular constraint because of the distance between the two bodies of water is not very wide.

**Aboriginal lands:** A new corridor down the East Side would traverse the traditional territories of as many as 12 First Nations. Recent Supreme Court of Canada decisions establish a stringent requirement for thorough meaningful consultation with Aboriginal peoples when a development could infringe on Aboriginal rights. Each intended new transmission corridor or Bipole would traverse traditional territories.

**National Park:** A proposed national park that would stretch from Lake Manitoba right across to Lake Winnipegosis, south of Grand Rapids is also a consideration. Once the park is in place, Manitoba Hydro could be shut out of any further Interlake transmission beyond what they negotiate for prior to finalization of park boundaries.

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Manitoba Hydro document obtained (p. 2), at <http://www.gov.mb.ca/est/energy/power/statistics.html>, and in the leaflet: The Hydro Province, Manitoba Hydro Public Affairs, no date.

<sup>5</sup> Source: Submission to the Manitoba Clean Environment Commission: Need for and Alternatives to The Wuskwatim Project, Overview, Manitoba Hydro, April 2003 p.8; [www.hydro.mb.ca/issues/transmission/projects/wuskwatim/Overview.pdf](http://www.hydro.mb.ca/issues/transmission/projects/wuskwatim/Overview.pdf).

**World Heritage Site (WHS):** Similarly, a proposed UNESCO World Heritage Site on the East Side of Lake Winnipeg could affect any new transmission corridors east of Lake Winnipeg. (This issue is not discussed in the 2000 Hydro memo as the WHS proposal occurred subsequently.) Siting BiPole III is just one risk regarding new transmission corridors on the east side. Future dams along rivers at the top of Manitoba's east side would also require transmission corridors.

**Export interconnections:** Currently Manitoba is pursuing the possibility of a major sale of electricity to Ontario. This eastward inclination could make routes down the east side of the province advantageous, and a route west of Cedar Lake less likely. If westward export to coal-dependant Saskatchewan were a priority—as it may be at some point in the future—Manitoba Hydro's evaluation of options would look different.

**Costs:** Generally, the shorter the line the less expensive it will be. Factors such as terrain, environmental effects, and compensation to impacted peoples also come into play.

**Social and environmental considerations:** Transmission corridors result in loss of habitat, forest fragmentation, and the spraying of toxic herbicides required to prevent re-growth of trees under wires. The existing Bipole I, II corridor occupies 10,800 hectares (26,700 acres) of land, much of it boreal forest, along a 900 km stretch. However, the full suite of biological and ecological impacts from the BiPole I, II corridor extends far beyond the actual right-of-way of the corridor<sup>6</sup>.

New transmission infrastructure and corridors would require the disruption of comparable amounts of forest. Of particular concern is the possibility of corridors that would bisect the area east of Lake Winnipeg, which is one of the largest areas of undisturbed boreal forest remaining on earth.

**Crossovers:** Crossing one transmission line over another is to be avoided when possible.

## Transmission Options

According to the 2000 confidential Manitoba Hydro memo, the optimal route for new transmission is on the East Side. This route would be shortest, it would achieve maximum separation from existing Bipoles, and it would position Manitoba Hydro to export to Ontario.

The Interlake route is much less desirable primarily due to security and reliability concerns (lack of separation), though the island hopping corridor provides some

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<sup>6</sup> *Potential Impacts of Wuskwatim Hydro Project on boreal biodiversity* (presentation by Dr. Erin Bayne to the Clean Environment Commission, March 18, 2004)

[http://energymanitoba.org/presentations/E\\_Bayne\\_PowerPoint\\_.pdf](http://energymanitoba.org/presentations/E_Bayne_PowerPoint_.pdf); *Woodland Caribou and the Wuskwatim Hydroelectric project* (presentation by Dr. James Schaefer to the Clean Environment Commission, April 14, 2004) [http://energymanitoba.org/presentations/j\\_schaefer\\_presentation.pdf](http://energymanitoba.org/presentations/j_schaefer_presentation.pdf)

separation. The western route is undesirable due to the much greater distance and because of its poor positioning vis-à-vis exports to Ontario. Positioning vis-à-vis Saskatchewan exports isn't addressed in the 2000 memo.

The 2000 confidential Manitoba Hydro memo emphasizes the value of Manitoba Hydro ensuring all options remain open to it (particularly given the possibility of the establishment of the national park).

The memo reflects a reluctance to add more lines to the existing Bipole corridor (though Manitoba Hydro has the rights to land that would accommodate another line along that corridor). (A scenario adding to this corridor is included; see chart of possible scenarios below and maps in Appendix A) It also states that Manitoba Hydro does not intend to put two Bipoles in a single corridor again; separation is required.

The maximum capacity to be sited in a single corridor is to be in the order of one Bipole (“1500 – 2500 MW”). In this regard, the memo refers to the need for Manitoba Hydro to comply with the reliability standards of the North American Electrical Reliability Council (NERC).<sup>7</sup> The underlying principle is that if Manitoba Hydro wants to participate in export and import of electricity (interconnections with regional grids) it must meet certain standards. Reliability concerns have grown considerably since the memo was written in 2000.

The memo includes a third corridor between the lakes, one that would by-pass the Grand Rapids “bottleneck” via an “Island Hopping” route. Such a route would follow a path of islands across Cedar Lake west of Grand Rapids and maintain a 20 km separation from the existing Bipole corridor at Grand Rapids. Further south, this line would cross over the existing Bipole corridor and continue southward following a route west of the existing corridor. The memo also identifies proposed transmission lines for a mid Interlake corridor, which was tripled in width spring 1999.

All of these options for transmission through the Interlake region will affect the proposed Lowlands National Park (please refer to maps in Appendix A). Currently, the Chitek Lake Park Reserve (under interim protection from development) is already impacted by Manitoba Hydro’s transmission plans; the park reserve contains a corridor area that allows for a hydro transmission line to dissect the park reserve. (Mid-Interlake corridor) The Island Hopping corridor would further dissect the park reserve.

The memo affirms Manitoba Hydro’s desire to “protect for” five lines through the proposed park area as a way of keeping all options open.

North-south transmission would terminate either at the Dorsey Converter Station just northwest of Winnipeg, at the proposed Riel Converter Station just to the east of Winnipeg, or, in the case of a western corridor, at a converter station in the Brandon area.

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<sup>7</sup> For more information on NERC visit <http://www.nerc.com/>.

**Possible scenarios listed in Manitoba Hydro 2000 confidential memo**

<b>Cedar Lake Corridor</b>	<b>Island Hopping Corridor</b>	<b>Existing Non-bipole Interlake Corridor*</b>	<b>Existing Bipole Corridor*</b>	<b>East Side Corridor 1</b>	<b>East Side Corridor 2</b>
2 500 kv lines**	1 Bipole	2 500 kv lines & 1 230 kv line	1 230 kv line	1 Bipole	1 Bipole
2 500 kv lines	2 500 kv lines	1 500 kv line & 1 230 kv line	1 230 kv line	1 Bipole	2 500 kv lines

\* Lines listed are new lines that would be added to the existing lines.

\*\* Two 500 kv AC lines are roughly equivalent in capacity to 1 Bipole.

**Current status**

The current position of Manitoba Hydro and the Manitoba Government vis-à-vis transmission options is unclear. After a major push to clear the way for transmission down the East Side, the provincial government has more recently down-played East Side options, suggesting other options are also under consideration. As the 2000 confidential Manitoba Hydro memo makes clear, the utility must concern itself not only with the next project on the drawing board but with “protecting for” all future transmission options it may wish to pursue.

As part of the East Side Planning Initiative (ESPI) (for an area encompassing a large portion of the province east of Lake Winnipeg), the Government of Manitoba instructed Manitoba Hydro to back away from public meetings with communities along the east side regarding plans for a Bipole. The utility was asked to refrain from external planning activities until the conclusion of the land use planning process. As of January 2005, the ESPI is not complete, however as a result of the ESPI status report of November 2004, the Minister of Conservation forwarded the recommendations in the report that relate to

Bi-Pole III to Manitoba Hydro and “the utility is currently reviewing alternate routing options”<sup>8</sup>.

Publicly stated federal government support, and pressure from environmental groups and the First Nations involved, caused the Government of Manitoba to take a position on the proposed World Heritage Site. According to a December 2004 press release<sup>9</sup>, the Manitoba Government fully supports the nomination of the 43,000 square kilometre WHS.

The process to establish the Lowlands National Park in Manitoba’s Interlake region is also moving forward and is at odds with Manitoba Hydro’s stated desire to “protect for” transmission corridor options in the area. According to the March 2004 joint Canada-Manitoba press release and Memorandum of Understanding (MOU), the two levels of government are committed to negotiating a national park establishment agreement by May 2005<sup>10</sup>. However, once again it is not clear what implications this has for Manitoba Hydro’s transmission corridor plans.

### **Transmission for Export**

In addition to north-south transmission, interconnections with other provinces and states are an essential part of Manitoba Hydro’s current operations and future plans.

Manitoba Hydro currently has 12 interconnections that together provide capacity to import about 850 MW and export about 2,600 MW of energy.<sup>11</sup>

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<sup>8</sup> Source: Government of Manitoba press release of December 13, 2004  
<http://www.gov.mb.ca/chc/press/top/2004/12/2004-12-13-03.html>

<sup>9</sup> Source: Government of Manitoba press release of December 3, 2004  
<http://www.gov.mb.ca/chc/press/top/2004/12/2004-12-03-04.html>

<sup>10</sup> Source: Government of Canada press release of March 19, 2004 [http://www.pc.gc.ca/apps/cp-nr/release\\_e.asp?id=776&andor1=nr](http://www.pc.gc.ca/apps/cp-nr/release_e.asp?id=776&andor1=nr)

<sup>11</sup> Source: Hydrogram, Vol. 33, Issue number 23, Manitoba Hydro (no date); accessed at <http://www.cttam.com/Archives/TechLink/techlink-fall-2003.html> (Certified Technicians and Technologist Association of Manitoba).

## Manitoba's Interconnections<sup>12</sup>

### Ontario

Two 230 kV lines	Seven Sisters Station to Kenora	began operation 1970
One 230 kV line	Seven Sisters Station to Kenora	1956

### Saskatchewan

One 230 kV line	Dauphin to Yorkton	began operation 1972
One 230 kV line	Brandon to Boundary Dam	1960
One 230 kV line	The Pas to E.B. Campbell	1979
Two 115 kV lines	Flin Flon to Island Falls	1983

### United States

One 230 kV line	Glenboro to Rugby, North Dakota	began operation 2002
One 230 kV line	Winnipeg to Grand Forks	1970
One 230 kV line	Winnipeg to Duluth	1976
One 500 kV line	Winnipeg to Minneapolis	1980

### Transmission to Ontario

A push is on to provide Ontario—which is facing energy shortfalls in coming years—with 1500 MW of power from northern Manitoba. This would require construction of the proposed Conawapa dam (1380 MW, \$3.4 billion) on the Nelson River, a major new transmission line from northern Manitoba and another major line connecting Manitoba to the southern Ontario grid (possibly at Sudbury). Building Conawapa to add to the energy resource necessary for export to Ontario does not mean that the energy for that export contract would come only from Conawapa.

In a June 2003 Memorandum of Understanding, the premiers of Manitoba and Ontario set out a concerted plan for steps that could lead to an “energy transfer” between the provinces and associated transmission line.<sup>13</sup>

A \$2 million September 2004 joint feasibility study found that the transfer could lead to “significant” benefits, that there are “no insurmountable obstacles” and that the project should “move into its next stage.”<sup>14</sup>

The recommended next stage would involve detailed engineering and cost analysis, especially regarding transmission line options, comprehensive consultations, the initiation of commercial negotiations, and political and policy decisions. In a September 30, 2004

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<sup>12</sup> Sources: Hydrogram, Vol. 33, Issue number 23, Manitoba Hydro (no date); accessed at <http://www.cttam.com/Archives/TechLink/techlink-fall-2003.html> (Certified Technicians and Technologist Association of Manitoba); and dates from Manitoba Hydro [http://www.hydro.mb.ca/about\\_us/history/history\\_timeline.html](http://www.hydro.mb.ca/about_us/history/history_timeline.html).

<sup>13</sup> The Memorandum can be found at [http://manitobawildlands.org/docs/Ont\\_MB\\_Hydro\\_MOU.doc](http://manitobawildlands.org/docs/Ont_MB_Hydro_MOU.doc).

<sup>14</sup> The Study can be found at [http://www.gov.mb.ca/est/energy/pdf/clean\\_energy\\_transfer.pdf](http://www.gov.mb.ca/est/energy/pdf/clean_energy_transfer.pdf).

press release, the Manitoba Government indicated that Manitoba and Ontario would proceed with a detailed technical study to follow-up on the feasibility study.<sup>15</sup>

The premiers are lobbying the federal government to contribute to the high cost of transmission infrastructure connecting Manitoba with Ontario markets, a project often referred to as an “east-west grid”. Manitoba Premier Gary Doer made this sentiment clear in a speech to a business crowd at the Empire Club in Toronto on October 2, 2004.<sup>16</sup>

An east-west grid would traverse the territory of numerous Aboriginal peoples and thus significant consultation issues would arise.

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<sup>15</sup> The release can be found at <http://www.gov.mb.ca/chc/press/top/2004/09/2004-09-30-02.html>.

<sup>16</sup> The speech can be found at [http://manitobawildlands.org/docs/Doer\\_at\\_Empire2Oct2004.doc](http://manitobawildlands.org/docs/Doer_at_Empire2Oct2004.doc).