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INTEROFFICE MEMORANDUM

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SUBJECT **TRANSMISSION LINE CORRIDOR REQUIREMENTS TO PROTECT FUTURE GENERATION RELATIVE TO THE PROPOSED LONG POINT NATIONAL PARK**

Introduction

This memo is intended to serve as a discussion paper concerning Manitoba Hydro's posi[CONFIDENTIAL] development of transmission corridors from the nor[illegible]lly, it is in response to the proposed creation of a National Park at Long Point and its implications on existing and future transmission corridors south of Grand Rapids. It also presents a strategy for future corridor development which would influence transmission currently being studied for the Power Resource Plan.

Recommendations

The following are the recommended courses of action:

1. When Manitoba Hydro begins the process of identifying corridor requirements on the east side of Lake Winnipeg for the next Nelson River generating station, two separate and independent corridors should be specified to handle transmission from either the Gull/Birthday, Conawapa or Gillam Island Generating Stations:

   a. One corridor needs to accommodate a future (HVdc) bipole line. See Figure 1.0.

   b. A second corridor needs to accommodate up to two EHV transmission lines. This corridor would provide for a future bipole or two 500 kV (ac) lines (resulting in the widest corridor requirement). See Figure 1.0.

2. Manitoba Hydro needs to proceed now to protect for three corridors on the west side of Lake Winnipeg south of Grand Rapids through the proposed Long Point National Park. These corridors would accommodate and provide for the following transmission lines (from west to east):

   a. The existing Bipole Corridor consisting of 1 future 230 kV line; 230 kV lines G1A & G2A; and Bipole 1 & 2. See Figure 2.1.1.

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Note that G31V which is on the extreme west side of this corridor as it enters the park from the north, diverges further west to form its own corridor as it passes through the National Park. To provide for another future 230 kV circuit on this corridor requires a shift of G31V prior to entering the park. This shift would also eventually be necessary to reduce the park fragmentation and allow for separation of the 500 kV lines away from the Bipole Corridor. See Figure 2.1.2.

b. The modified G31V Corridor consisting of 2 future 500 kV lines; 230 kV line G31V; and a future 230 kV line. See Figure 2.2.

c. A new Island Hopping Corridor west of Grand Rapids over Cross Bay consisting of 2 future 500 kV lines. See Figure 2.3.

3. Manitoba Hydro also needs to consider the potential future development of a corridor west of Cedar Lake to fully accommodate the ultimate transmission requirements for northern generation and to satisfy reliability considerations. This corridor needs to accommodate up to 2 future 500 kV lines. See Figure 3.

Background

Manitoba and Parks Canada, are currently negotiating the establishment of a National Park in the Manitoba Lowlands. These negotiations to establish a Manitoba Lowlands National Park include a Long Point Component located south of Grand Rapids that stretches from the shores of Lake Winnipeg to Lake Winnipegosis along an east/west Long Point axis.

This (Long Point) National Park proposal will have significant implications to existing and future transmission facility development and operation. Manitoba Hydro has therefore entered into consultations with Parks Canada and Manitoba Conservation to ensure these transmission line requirements in the Long Point Component are fully understood and accommodated in these negotiations between Manitoba and Parks Canada.

The purpose of this document is to evaluate our transmission needs and provide justification to support Manitoba Hydro's position in these consultations. Senior Management approval at this stage will be necessary.

This evaluation requires describing in detail existing and future requirements in the Long Point area associated with developing over 5000 MW of hydroelectric potential in Northern Manitoba. This development will necessitate having up to six corridors from the north. Two corridors are needed on the east side of Lake Winnipeg, three on the west side through the Long

Point area, plus one west of Cedar Lake to accommodate the associated transmission lines needed for this generation.

These transmission line corridor requirements will then need to be incorporated into a joint study (Manitoba Hydro/Canada/ Manitoba Conservation) presently being initiated to select, prior to finalizing the National Park boundaries, the most appropriate location(s) for additional new or expanded transmission rights of way through the Long Point area.

Once these transmission line requirements are established, negotiations will proceed to ensure proper legal instruments / agreements are in place to accommodate our transmission line corridor needs before Manitoba transfers the land under the jurisdiction of the National Parks Act.

Possible Implications of National Park Development

A Long Point National Park, based on the current proposed boundary, would result in a total land blockade between Lake Winnipeg and Lake Winnipegosis, south of Grand Rapids. This park could have the effect of blocking all future transmission through this area.

The only corridors for Manitoba Hydro transmission would be the existing Bipole corridor (with Bipoles 1 & 2 and 230 kV lines G1A & G2A) and the 230 kV line G31V corridor. Even the existing corridors, which have available land and additional reserved land could be subject to increased and more elaborate environmental licenses, processes and scrutiny.

The issue now is to identify all possible transmission requirements, catering to all possible combinations and scenarios, and to secure one or more additional corridors through the proposed park.

Existing Transmission Corridors & Previous Plans

Two transmission corridors currently exist and are developed south of Grand Rapids. They are (looking north from west to east) the corridor which contains: 230 kV lines G1A and G2A from Grand Rapids to Ashern along with Bipole 1 & 2, hereafter referred to as the 'Bipole Corridor'; and the corridor which contains 230 kV line G31V from Grand Rapids to Dauphin-Vermilion station, hereafter referred to as the 'G31V Corridor'. Both of these two corridors have provision for future additional lines, as seen in Figures 4.1 and 4.2.

At the time of the Conawapa - Bipole 3 project in around 1991, additional corridor options were identified, both on the east side of Lake Winnipeg and on the west side, via Grand Rapids. While the east side was then and is still now Manitoba Hydro's preference for reliability reasons, protecting corridors on the west side is also a priority. Additional corridors will be required in future to transfer some of the potential undeveloped

generation. This would be the case if a future bipole or high voltage ac line had to be directed toward Brandon.

Based on previous studies, two corridor options were considered on the west side for developing another bipole . The first would be the use of the existing Bipole Corridor, which would result in three bipoles on one corridor, where land is available. This was not an acceptable option and was rejected. Locating a bipole on the G31V Corridor was also not any better, since sufficient separation of the corridors does not exist.

The second option would be a new corridor much further west of the existing Bipole Corridor using an island hopping route to provide separation between a future bipole and the existing Bipoles 1 and 2. This route involves locating a future bipole on islands in Cross Bay west of the Grand Rapids generating station to avoid the transmission congestion and the bottleneck at Grand Rapids. This corridor is seen on the shaded area of Map 1. This map shows some of the potential bipole corridor study areas identified in 1991, along with their relationship to the proposed Long Point National Park.

This second option would actually involve relocating Bipole 1 onto this new west corridor allowing for the future bipole to be placed next to Bipole 2. Bipole 2 would then be switched over to use the existing Bipole 1 structures and the future bipole would reside on the former Bipole 2 structures. This elaborate shift would eliminate bipole line crossings and would maintain a 20 km separation between the future and existing bipole corridors. See Figure 4.3.

Protecting Future Transmission Requirements

Assumptions and Guidelines

The issue here is to identify the maximum number of future transmission lines that would be needed to carry all future northern generation to southern Manitoba. This problem is made worse since the National Park would force us to finalize our requirements now and 'never' change our minds later. Unfortunately, this exercise is more than simply matching the transmission load carrying capacity to the potential generation resource development available in the north.

Developing an ultimate corridor requirement south of Grand Rapids through the National Park requires consideration of several issues and constraints, which taken together, compound the requirements and maximize the corridor widths. They are summarized below:

1. Corridor requirements on the east side of Lake Winnipeg are a reliability requirement, but additional west side corridors are required to accommodate future generation development. Both requirements are essential and are

relatively independent of each other. Placing all future transmission on the west side is not an acceptable alternative.

2. The need to protect for all reasonable ac and dc transmission development. One example would be a future bipole or the possibility of 2 - 500 kV ac transmission lines as an alternative. This requires additional corridor width for the additional ac line when compared to the dc scheme. Another example would be if a future bipole was of a different rating compared to the existing Bipoles 1 and 2. If smaller in capacity, more lines would be required to transmit the same amount of power.

3. Make provision in the new corridor(s) for transmission that has land available on existing corridors, but would need to be located on a different corridor for system security reasons.

4. The need to accommodate a different destination for a particular line, such as a bipole to Brandon or into a Western Canadian Grid, rather than assuming that it would go to Riel. This results in a given line appearing in more than one corridor or perhaps on both sides of an existing line to eliminate or reduce the number of crossovers.

5. The need to restrict multiline development on existing corridors which are already relied on for too much of our northern generation transmission capacity.

6. The need to provide for a physical separation of corridors involving major transmission, so that a bipole is not in close proximity to another bipole. This would preclude development of a corridor which would accommodate two bipoles. It also would require that transmission is developed so that the existing Bipoles 1 and 2 which are on a common corridor, have future facilities in place which can minimize the impact of a failure of this major corridor.

7. The need to minimize the MW's transmitted on a given corridor that would be affected by a loss of that corridor. Mitigating the loss of these MW's can be expensive, particularly if the amount of power being lost is significant. This is one of the considerations when looking at compliance to NERC reliability standards. This requirement would translate into more corridors being required, each transmitting less power.

The existing situation with Bipoles 1 and 2 on a common corridor with additional 230 kV transmission lines cannot be repeated. A limit needs to be set for the MW's that should be transmitted on any future corridor and this limit

will be affected by the percent of total power that this corridor carries in relation to the total system generation being delivered. This limit, in practical terms, would be in the order of the rating of a single bipole, from 1500-2500 MW, which includes provision for some other transmission on the same corridor.

8. The eventual need to develop a corridor recommendation and justification that balances the requirement for additional corridors through Long Point while recognizing the preference for a Lake Winnipeg east side corridor for the next major generating station on the Nelson River.

Based on meeting the first six of these constraints, a preliminary corridor assessment was developed which could protect our requirements. This would translate into a maximum corridor width, as far as land requirements are concerned. Application of the seventh and eighth constraints were dealt with in the final section of this document.

Grand Rapids Bottleneck

A Transmission & Stations Division report TS 81-2, prepared in 1981 entitled 'Engineering Report on Proposed Transmission Line Corridors in the Grand Rapids Area' looked at the corridor requirements in the Grand Rapids area. It identified up to 5 additional EHV transmission lines that would be required to be routed through the Grand Rapids 'bottleneck'. These 5 lines include two bipoles and three 500 kV ac transmission lines. All of these lines would have to go south through the proposed National Park.

The requirements identified hereafter for future transmission are based on protecting these 5 lines. No additional studies were conducted to refine these requirements at this time.

Looking only at the Long Point requirements (for now), the shear number of transmission lines, would suggest another corridor be developed in addition to the existing G31V and Bipole Corridors. This corridor would be an expansion of the previously identified island hopping route option, hereafter referred to as the 'Island Hopping Corridor'.

Map 2 shows the transmission corridor concept developed in Report TS 81-2 for these five lines. It is shown in 'blue' on this map. Clearly, the need for the additional Island Hopping Corridor, shown in 'Red' is necessary to alleviate the congestion at Grand Rapids if only the 'Blue route' is available. It was this rationale in 1991 that lead to the serious consideration of the Island Hopping Corridor to improve the separation between future transmission and the existing two bipoles.

The 'Blue Route' is simply too close to the Bipole Corridor and therefore poses a problem with reliability. Another corridor is needed to gain some separation.

While the Island Hopping Corridor is suitable for some future lines to alleviate congestion at Grand Rapids, it would not be viable or economic for all of these circuits. Use of the 'Blue Route' would still be necessary for some of the lines, in particular the 500 kV ac.

This leads to utilization of the G31V Corridor to solve these two concerns of Bipole Corridor proximity and limits on the Island Hopping Corridor. Map 2 shows this solution, with a variation of the 'Blue Route' shown in 'Green'. This 'Green route' would provide some separation for these 500 kV lines from the Bipole Corridor. It is this variation which would become the 'modified' G31V Corridor recommendation.

Development of the Corridors

Any future bipole that is required to be routed west of Lake Winnipeg should be located on the Island Hopping Corridor.

If another subsequent bipole is also added, land is available on the existing Bipole Corridor for another line. This addition would, however, result in three bipoles on the same corridor, an unrealistic situation from a reliability perspective.

A better alternative would be to have these two future bipoles on the Island Hopping Corridor for maximum separation from the existing Bipole Corridor. This situation, while better, would also be undesirable as it produces a condition which is potentially similar to the current problem of Bipoles 1 and 2 on the same corridor. A condition we are seeking to alleviate with a corridor on the east side of Lake Winnipeg.

Simply duplicating this condition on the Bipole Corridor with another corridor is not acceptable since the existing situation has too much generation associated with it. A second double bipole corridor would also impact too much generation.

The 500 kV line options involve a combination of potential 500 kV lines from generation on the upper Nelson, such as Red Rock and Whitemud generating stations as well as possible ac options to complement bipole transmission from generating stations on the lower Nelson River.

To accommodate the previously identified transmission for generation capacity requirements of two bipoles and three 500 kV ac transmission lines, the following two scenarios are required:

- Scenario 1: Two Bipoles and Three - 500 kV Lines
- Scenario 2: One Bipole and Five - 500 kV Lines

This second scenario is based on needing at least two 500 kV lines to match the capability (capacity and reliability) of a single bipole line. If only one more bipole is added, the three 500 kV lines would at least need to be increased to five to handle the capacity required. This second scenario would be the worst case from the perspective of the number of future lines and resulting corridor width.

Depending on the need for a 500 kV switching station in the Grand Rapids area and its location, it may be advantageous to locate some of the 500 kV lines on the G31V Corridor, especially if separation is required from the bipole(s) on the Island Hopping Corridor.

A total of one to three 500 kV lines would be required on the G31V Corridor independent of the number of bipoles developed. A 500 kV line could also be located along the Bipole Corridor. Land is available on the Bipole Corridor for at least two 500 kV lines. This should be the maximum number on this corridor.

Table 1, below, shows the corridor requirements with two bipoles added. Option 1.1 would provide for the two future bipoles to be added on a separate corridor, away from the Bipole Corridor and no additional transmission lines added to that corridor. Options 1.2 and 1.3 progressively add one and two 500 kV lines respectively to the Bipole Corridor and are therefore not as attractive. Option 1.3 would provide the worst case for the Bipole Corridor regarding corridor width.

Options 1.4 to 1.6 each have only one bipole added to the Island Hopping Corridor which is preferable. These options, however, are compromised by adding a bipole and even another 500 kV line to the Bipole Corridor, which has the land available. Adding another bipole to the Bipole Corridor is unacceptable for reliability reasons. Option 1.5 would be the least attractive regarding system reliability, based on Figure 5.0 depicting the lines on the Bipole Corridor.

Options 1.7 to 1.9 are the only ones which do not add another bipole to the Bipole Corridor and do not place the two future bipoles on the Island Hopping Corridor. Option 1.7 would be the best choice, since no additional future transmission is placed on the Bipole Corridor or added to the bipole on the Island Hopping Corridor. These three options, however, require yet another corridor to be established. Our preferred location for this fourth corridor would be on the east side of Lake Winnipeg.

A fourth corridor through Long Point would not be practical and the east side of Lake Winnipeg offers the greatest separation possible for locating another bipole.

Table 1
Scenario 1 - Two Bipoles and Three 500 kV Lines

Option	Island Hopping Corridor	G31V Corridor - Indicating Lines Added	Bipole Corridor - Indicating Lines Added	Another Corridor - (east side of Lake Winnipeg)
1.1	2 - bipoles	3 - 500 kV Lines	No Additional Lines	
1.2	2 - bipoles	2 - 500 kV Lines	1 - 500 kV Line	
1.3	2 - bipoles	1 - 500 kV Line	2 - 500 kV Lines	
1.4	1 - bipole	3 - 500 kV Lines	1 - bipole	
1.5	1 - bipole	2 - 500 kV Lines	1 - 500 kV Line, 1 - bipole	
1.6	1 - bipole 1 - 500 kV Line	2 - 500 kV Lines	1 - bipole	
1.7	1 - bipole	3 - 500 kV Lines	No Additional Lines	1 - bipole
1.8	1 - bipole	2 - 500 kV Lines	1 - 500 kV Line	1 - bipole
1.9	1 - bipole 1 - 500 kV Line	2 - 500 kV Lines	No Additional Lines	1 - bipole

If only one future bipole is added west of Lake Winnipeg (Scenario 2), it should be on the Island Hopping Corridor. With the subsequent bipole replaced by 2 - 500 kV lines, they too could be located on the Island Hopping Corridor for maximum separation from the existing bipoles. This is particularly the case if some of these lines are heading west toward Brandon. The problem with having a bipole and two 500 kV lines together is that they effectively represent the capacity of about two bipoles. Placing that much transmission together, as in Scenario 1, was not a desirable option.

Looking at the corridor options available at Long Point, indicates that adding more transmission to the G31V Corridor, i.e. a fourth 500 kV line, would also put nearly two bipoles of capacity on this corridor. Adding up to two 500 kV lines to the

Bipole Corridor would also increase its capacity too much. As these options were not desirable when Scenario 1 was evaluated (Table 1), they are not repeated in this exercise.

Table 2, below, shows the corridor requirements with one bipole added. Option 2.1 outlines the base case development which places a bipole and two 500 kV lines together. This is clearly not a desirable option.

Option 2.2 would provide some relief, but it also places additional transmission onto the Bipole Corridor, which would not fully alleviate the situation, making one corridor better at the expense of another.

The only two options which are viable are Options 2.3 and 2.4, which require the development of a fourth corridor. As we have seen with Scenario 1, this corridor is best located on the east side of Lake Winnipeg.

Based on having to protect for Scenario 2, with five 500 kV lines, without full knowledge of how each corridor would be developed, requires reserving the maximum width for each corridor independently. This could lead to protecting collectively for up to eight 500 kV lines on the four corridors (two on Island Hopping, three on G31V, one on the Bipole and two on the East Side Corridor). The preferred corridor for a particular 500 kV line would depend on its origination point, its destination and if it is replacing a potential bipole line.

Table 2
Scenario 2 - One Bipole and Five - 500 kV Lines

Option	Island Hopping Corridor	G31V Corridor - Indicating Lines Added	Bipole Corridor - Indicating Lines Added	Another Corridor - (east of Lake Winnipeg)
2.1	1 - bipole 2 - 500 kV Lines	3 - 500 kV Lines	No Additional Lines	
2.2	1 - bipole 1 - 500 kV Line	3 - 500 kV Lines	1 - 500 kV Line	
2.3	1 - bipole	3 - 500 kV Lines	No Additional Lines	2 - 500 kV Lines
2.4	2 - 500 kV Lines	3 - 500 kV Lines	No Additional Lines	1 - bipole

There is also a requirement for additional 230 kV transmission south of Grand Rapids. A second 230 kV line is envisioned from Grand Rapids to Dauphin-Vermilion station. This line would most likely parallel the existing line G31V (Grand Rapids to Dauphin-Vermilion) and would best be situated on the G31V Corridor.

Another 230 kV line is also possible in the direction of Ashern. This line would best be located on the Bipole Corridor, adjacent to line G1A. To accommodate this future 230 kV line, existing 230 kV line G31V, which enters the park (on its north boundary) situated on the extreme west side of the Bipole Corridor and later diverges further west to form its own corridor as it passes through the National Park, as shown on Map 2, is relocated to its own independent corridor, shown in 'Green'.

Figure 2.1.2 shows this line change and the relationship of the lines on the Bipole and G31V Corridors. This conceptual diagram illustrates the details which were previously discussed when the need for a separate G31V Corridor for 500 kV development was identified to overcome the Grand Rapids 'bottleneck' problem.

Relocating existing G31V permits the Bipole Corridor to handle the additional 230 kV line to Ashern without expansion.

These additional 230 kV lines were not shown on Tables 1 or 2 for clarity in discussion of the 500 kV/bipole sighting issues.

Table 3, below, however, does show the 230 kV requirements in addition to the maximum line requirements derived from the evaluation of Tables 1 and 2. The options indicated are the ones which generate the worst case width for each corridor in each scenario, based on taking into consideration reliability issues.

Table 3
Worst Case Corridor Width Requirements

Scenario	Island Hopping Corridor	G31V Corridor - Indicating Lines Added	Bipole Corridor - Indicating Lines Added
1	1 - bipole 1 - 500 kV Line (Options 1.6 & 1.9)	**3 - 500 kV Lines 1 - 230 kV Line (Options 1.1, 1.4 & 1.7)**	**1 - 500 kV Line 1 - 230 kV Line (Options 1.2 & 1.8)**
2	**2 - 500 kV Lines (Option 2.4)**	**3 - 500 kV Lines 1 - 230 kV Line (Options 2.1 - 2.4)**	**1 - 500 kV Line 1 - 230 kV Line (Option 2.2)**

It can also be seen that Scenario 2 produces the worst case for the Island Hopping Corridor, since two 500 kV lines require a wider corridor than a bipole and one 500 kV line (See Figure 6.0 compared with Figure 2.3). The worst cases for each corridor are indicated by the 'bold' text entries.

Table 3 also indicates that Options 1.2, 1.8 and 2.2 require placement of a 500 kV line on the Bipole Corridor (See Figure 7.0). While this is a worst case, it is not desirable from a reliability perspective and will therefore not be carried forward as part of the recommendations. As a result, the following three preliminary initial corridors were developed for the Long Point National Park. They consist of the following lines (from west to east):

1. The existing Bipole Corridor consisting of 1 future 230 kV line; 230 kV lines G1A & G2A; and Bipole 1 & 2. See Figure 2.1.1.
2. The modified G31V Corridor consisting of 2 future 500 kV lines; 230 kV line G31V; a future 230 kV line; and a future 500 kV line. See Figure 8.
3. The new Island Hopping Corridor consisting of 2 future 500 kV lines. See Figure 2.3.

<u>Corridor Requirements South of the Park</u>
Consideration so far has been related to the transmission line corridors as they enter the park and their width within its boundaries. This section will touch on the 'bigger' picture and provide for some consideration after the park requirements have been determined.

The existing Bipole Corridor, as it travels south through the Interlake Region comes closer to Lake Manitoba, effectively cutting off the G31V (500 kV) Corridor. The 230 kV lines on this corridor, including 230 kV line G31V will have branched off to the west before this point is reached. The remaining 500 kV lines will, however, need to cross to the available land to the east to make their way south. This will involve a crossing of the Bipole and the G31V (500 kV) Corridor.

The method being recommended here is to have the 500 kV lines pass under Bipoles 1 and 2 at several staggered locations separated by some distance and independent bipole dead-end structures. This method would also need to apply to any 500 kV lines on the Island Hopping Corridor which may need to swing east, south of the park, if they are not destined for Brandon.

Corridor Requirements Incorporating East Lake Winnipeg
We have seen that even with adding one new (Island Hopping) corridor through the Long Point area, producing a requirement for three corridors through the proposed park, reliability issues still dictate another fourth corridor is needed. It is

also not possible for this fourth corridor to pass through the Grand Rapids 'bottleneck'.

The addition of a corridor on the east side of Lake Winnipeg, offers the best opportunity for providing this corridor to accommodate the transmission requirements from the north.

Looking at the East Side Corridor requirements, it would need to expand to accommodate additional future transmission. This expanded requirement is based on the previous analysis which shows that a bipole and two 500 kV lines would need to be considered for the East Side Corridor. Previously it was designated only for a single line, Bipole 3, during the Conawapa project.

If more than one future bipole is needed to be directed to Winnipeg, it too would be best located on the east side of Lake Winnipeg.

The greatest improvement in reliability would be to maximize the separation of transmission away from the Grand Rapids 'bottleneck' and place as much transmission as possible on the east side. This would suggest that the placement of two bipoles needs to be protected on this side of the lake. This action would balance the number on the west, affording the maximum separation benefit.

Having two bipoles on the east side, however, does not guarantee the removal of the requirement for one bipole from the Long Point area. As we know plans may change and up to three future bipoles may be necessary, each requiring its own separate corridor. This could result from decisions to reduce the capacity of one or more future bipoles to improve reliability or to match their capacity to the output of individual generating stations or to provide spare capacity to offload the Bipole Corridor which has too much generation associated with it. A bipole in the direction of Brandon may also be necessary, independent of the total number of bipoles currently envisioned. In any case protecting for two bipoles on the east side of Lake Winnipeg is necessary and is independent of the previous Long Point evaluation.

Given the need for two bipoles, each would require its own separate and independent corridor on the east side of Lake Winnipeg.

If, however, one of the generating stations is developed using ac transmission, two ac transmission lines would be needed to replace one of the bipoles. This would increase the total number of lines to three, one bipole and two 500 kV ac lines. The corridor requirements would change to a separate corridor for one bipole and another separate corridor for the two 500 kV lines. It is this situation which would produce a worst case

corridor width scenario and is recommended be protected for the two East Side Corridors.

The provision for two 500 kV lines on the east side of Lake Winnipeg also does not guarantee the same equivalent reduction of two 500 kV lines through the Long Point area. This is because 500 kV transmission is less likely to be located on the east side of the lake. This assessment is based on their need for intermediate switching stations, requiring access for major equipment and with the potential remoteness of their location, there is a reduced likelihood of connections to the underlying 230 kV network. This makes the use of an East Side Corridor less attractive for 500 kV development, but does not rule it out.

As a result, Table 3 is modified to incorporate the addition of two East Side Corridors, producing Table 4, below.

Table 4
Corridor Requirements with Two East Side Corridors

Scenario	Island Hopping Corridor	G31V Corridor - Indicating Lines Added	Bipole Corridor - Indicating Lines Added	East Side Corridor #1	East Side Corridor #2
1	1 - bipole 1 - 500 kV Line	**3 - 500 kV Lines** **1 - 230 kV Line**	**1 - 230 kV Line**	**1 - bipole**	1 - bipole
2	**2 - 500 kV Lines**	**3 - 500 kV Lines** **1 - 230 kV Line**	**1 - 230 kV Line**	**1 - bipole**	**2 - 500 kV Lines**

The corridor requirements set out in Table 4, however, do not fully address the concerns of item 7 in the Assumptions and Guidelines section. Specifically, the Island Hopping Corridor could transmit in excess of 2500 MW (in Scenario 1) and the G31V Corridor could also carry that much power (with three 500 kV lines). The G31V Corridor is also too close in proximity to the Bipole Corridor.

Simply creating another corridor around Grand Rapids and splitting the transmission on the G31V Corridor would not be enough. There is insufficient land available for an effective separation.

A further overriding consideration is that too much power would still be fed through the Grand Rapids 'bottleneck'. This includes Bipoles 1 and 2 plus the G31V Corridor 500 kV transmission. The lines on the Island Hopping Corridor also contributes to the amount of transmission being directed through this limited space, despite its separation from the other two corridors.

Manitoba Hydro therefore needs to consider the potential future development of another corridor to fully resolve all of the reliability issues. It is recommended that this corridor be situated west of Cedar Lake, hereafter referred to as the 'Cedar Lake Corridor'. Its development would result in the corridor requirements specified in Table 5, below.

Table 5
Final Corridor Requirements

Scenario	Cedar Lake Corridor	Island Hopping Corridor	G31V Corridor - Indicating Lines Added	Bipole Corridor - Indicating Lines Added	East Side Corridor #1	East Side Corridor #2
1	**2 - 500 kV Lines**	1 - bipole	**2 - 500 kV Lines 1 - 230 kV Line**	**1 - 230 kV Line**	**1 - bipole**	1 - bipole
2	**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**

A comparison of Tables 4 and 5 above shows that by adding the Cedar Lake Corridor the following transmission reliability improvements are realized:

1. The Island Hopping Corridor no longer has a 500 kV line next to a bipole, reducing the total MW's on this corridor.

2. The G31V Corridor 500 kV transmission line requirement is reduced by at least one line, reducing the total MW's on this corridor and the exposure of another 500 kV line near to the Bipole Corridor.

3. The need for another corridor in the Grand Rapids area is eliminated where limited space is available for adequate separation of the corridors.

4. The total MW's being transmitted through the Grand Rapids / Long Point area is reduced by adding the Cedar Lake Corridor. This creates three corridor routes for northern generation, east and west of Lake Winnipeg and west of Cedar Lake.

The only consideration not yet considered is the cost of using the Cedar Lake Corridor. It would be the most costly to develop, since it would involve longer transmission distances and would only be suitable for transmission to Brandon and for interconnections to the west. As such, it would most likely be the last corridor to be developed, depending on the eventual transmission scenario that evolves.

Scenario 1, with its minimum of two future bipoles allows for two to be located on the two East Side Corridors and for another bipole to be placed on the Island Hopping Corridor, should it need to have a westerly terminus in the south. This scenario requires at least three 500 kV lines which could be accommodated on the four line provisions indicated on the Cedar Lake and G31V Corridors. Other 500 kV line locations are possible on the Island Hopping Corridor (if no bipole is located there) and on one of the East Side Corridors (if only two bipoles, with one on the Island Hopping Corridor).

Scenario 2, has its minimum of one future bipole located on the East Side Corridor. This scenario requires at least five 500 kV lines which could be accommodated on the seven line provisions indicated on the Island Hopping, G31V, East Side and Cedar Lake Corridors. A second bipole is also possible by replacing two 500 kV lines on either the Island Hopping or the other East Side Corridor.

As a result the requirements for the three corridors through the Long Point National Park become those identified in Recommendation 2. This is based on providing for the worst case scenario for each individual corridor, indicated in 'bold' text in Table 5. These lines are shown in Figures 2.1.1, 2.2 and 2.3.

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Attachments
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