

# Manitoba Public Utilities Board

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## Manitoba Hydro Keeyask and Conawapa NFAT MMF to PE Information Request Responses Public IR's



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1 **MMF TO PE IR 1**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** None.

6  
7 **QUESTION:** Referring to page 10 at 37-38, please explain why POWER believes that another System  
8 Performance Assessment should be conducted only after the NFAT Preferred Plan is approved? Shouldn't  
9 approval be based upon an up-to-date System Performance Assessment assuming the full NFAT Preferred  
10 Plan?

11  
12 **REFERENCE:** PE report, p. 10.

13  
14 **RESPONSE:** PE reviewed Manitoba Hydro's 2012 System Performance Assessment that included the  
15 existing system and proposed long term additions out to the year 2022, including Bipole III and Keeyask.  
16 This report provides the basis for PE's assessment of the completeness and reasonableness of the  
17 technical aspects of Manitoba Hydro's existing AC & DC transmission systems. PE's statement at 37 –  
18 38 is that 'MH should conduct another System Performance Assessment, similar to the 2012 effort, once  
19 the NFAT Preferred Plan is confirmed and approved'. PE's intent is to suggest that all NFAT facilities  
20 including changes associated with Conawapa be included at the next opportunity,

21  
22 PE also reviewed Manitoba Hydro's confidential Integrated Transmission Plan for Keeyask and  
23 Conawapa Generation, which covers the Conawapa additions in detail. This report provides the basis for  
24 PE's assessment of the completeness and reasonableness of the technical aspects of Manitoba Hydro's  
25 proposed AC & DC transmission system.

26  
27 PE believes that some additional studies are required as soon as possible to confirm that there is sufficient  
28 margin at the proposed operating limit of the HVDC three-Bipole system, using the anticipated new  
29 Bipole III model.

1 **MMF TO PE IR 2a**

2 **SUBJECT:** Economic Risk

3

4 **PREAMBLE:** Referring to page 11 at 26-27.

5

6 **QUESTION:** Could a spare valve group be added to Bipole I or Bipole II in order to firm up the shortage  
7 of 200 MW of firm transmission HVDC capacity?

8

9 **REFERENCE:** PE report, p. 11.

10

11 **RESPONSE:** This is a concept that PE did not investigate and would not like to speculate at this time.

12 This concept is not part of the NFAT proposal.

1 **MMF TO PE IR 2b**

2 **SUBJECT:** Economic Risk

3

4 **PREAMBLE:** Referring to page 11 at 26-27.

5

6 **QUESTION:** Please explain why Bipole III needs to be added in 2017 in order to firm up 200 MW.

7

8 **REFERENCE:** PE report, p. 11.

9

10 **RESPONSE:** Bipole III was not added to firm up 200 MW of transmission. It was justified under a  
11 separate process as a reliability project. Table 1 in the report was intended to show the progression of  
12 development and the resulting non-firm transmission, assuming a Valve Group over Generation criteria.  
13 However, the existing system is planned under a Pole over Load criteria. PE based its assessment on the  
14 future criteria as described in its planning studies and only recently discussed the implications of Pole  
15 over Load criteria with MH. In essence, the current criterion looks at system capacity to meet firm load.

1 **MMF TO PE IR 3**

2 **SUBJECT:** Economic Risk

3

4 **PREAMBLE:** Referring to page 11, Table 1.

5

6 **QUESTION:** Is the 4750 MW reliability loading limit based on a three-phase fault in the Northern  
7 Collector (AC) System or near the inverter busses at Riel or Dorsey, as described at page 13, lines 26-35,  
8 or on something else?

9

10 **REFERENCE:** PE report, p. 11.

11

12 **RESPONSE:** The 4750 MW reliability loading limit is based on a three-phase fault with normal clearing  
13 near the Northern Collector (AC) System. This is discussed on page 11, line 33 to page 12, line 15.



1 **MMF TO PE IR 4**

2 **SUBJECT:** Economic Risk

3

4 **PREAMBLE:** Referring to page 12 at 9-10.

5

6 **QUESTION:** Please explain whether POWER believes that the analysis of transmission reliability would  
7 be better conducted once the “better model becomes available in 2014.”

8

9 **REFERENCE:** PE report, p. 12.

10

11 **RESPONSE:** The better model refers to Bipole III. The analysis provided by MH is still valid using the  
12 existing generic model. It is expected that a more detailed model will be better suited to confirm the 5479  
13 MW three-Bipole system loading limit proposed by MH.

1 **MMF TO PE IR 5**

2 **SUBJECT:** Economic Risk

3

4 **PREAMBLE:** Referring to page 13, line 4.

5

6 **QUESTION:** There is a mention of Table 11 in the NFAT report. Please provide this table, or designate  
7 the location of this table in greater detail.

8

9 **REFERENCE:** PE report, p. 13.

10

11 **RESPONSE:** Table 11 is provided in the MH confidential Integrated Transmission Plan for Keeyask and  
12 Conawapa Generation report. Table 3 of the PE report at line 16 is an abbreviated version on Table 11.  
13 Since Table 11 was part of a confidential report, PE cannot distribute it. It may be available on request to  
14 MH.

1 **MMF TO PE IR 6a**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to page 13, Table 3.

6  
7 **QUESTION:** Please explain how the “Net with 85 MW firm” amount under Option 3 is only 20 MW,  
8 when the combined total of NCS1 and NCS2 is 207 MW of shortage.

9  
10 **REFERENCE:** PE report, p. 13.

11  
12 **RESPONSE:** PE took it at face value directly from Table 11 in the confidential Integrated Transmission  
13 Plan for Keeyask and Conawapa Generation report.

1 **MMF TO PE IR 6b**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to page 13, Table 3

6  
7 **QUESTION:** Does this mean that Bipole III only reduces the non-firm transmission by 80-180 MW in  
8 2017?

9  
10 **REFERENCE:** PE report, p. 13.

11  
12 **RESPONSE:** Once Bipole III is in service and the new criteria is implemented, there is zero non-firm  
13 transmission until after Conawapa.

14  
15

1 **MMF TO PE IR 7**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** None.

6  
7 **QUESTION:** Please explain in more detail the concept of “on-line valve group sparing over generation.”  
8 Does this mean that one valve group is assumed to be out-of-service, therefore limiting the amount of  
9 firm transmission capacity available on a bipole?

10  
11 **REFERENCE:** PE report, p. 15.

12  
13 **RESPONSE:** In essence, the answer is yes. Here is a bit more detailed explanation of how this works.

14  
15 For planned valve group outages, the power order on the remaining Bipole equipment can be increased up  
16 to maximum loading. For a forced outage, the faulted VG will be bypassed and taken out of service  
17 automatically within milliseconds, and the power transmitted on remaining VGs within the Bipole will be  
18 automatically increased. For example, assume that a single 2000 MW Bipole is connected to a 2000 MW  
19 generator. The Bipole and the Generator are operated at 1500 MW. One valve group is lost (500 MW),  
20 the faulted valve group is bypassed and the power controller increases the power order to 1500 MW. The  
21 firm transmission capacity then is 1500 MW. The Bipole could be loaded beyond 1500 MW, up to 2000  
22 MW, but the last 500 MW would be over non-firm transmission.

---

## 1 MMF TO PE IR 8

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to page 15 at line 10-11.

6  
7 **QUESTION:** Please explain in greater detail what is meant when it is stated: “POWER concurs with the  
8 MH view that on-line valve group sparing over generation is mostly an economic choice, and not  
9 reliability issue.”

10  
11 **REFERENCE:** PE report, p. 15.

12  
13 **RESPONSE:** PE considered the potential economic and reliability impact of 207 MW of non-firm  
14 transmission capacity to deliver all of the northern system generation connected to NCS1 and NCS2.

15  
16 Under the preferred operating mode for Kettle generation, it would not be possible to deliver the full  
17 output of either Keeyask or Conawapa over firm transmission. If the operating mode is changed such that  
18 two of the switchable Kettle generator units were operated on NCS2, then the non-firm transmission on  
19 NCS1/BPI would be near zero and the non-firm transmission on NCS2/BPII & III would be 207 MW.  
20 This would be a better match for the last 200 MW of Conawapa generation, which MH indicated, is  
21 forecasted to have a low capacity factor. MH has correctly pointed out that Conawapa generation is last in  
22 the queue, so Keeyask would have priority access to firm transmission. This operating mode is not  
23 precluded in the preferred plan, Option 2A and provides the flexibility for Keeyask generation to be  
24 delivered over firm transmission as needed. Option 2 provides 300 MW of additional AC transmission,  
25 and provides full valve group over generation sparing and assurance that all of Conawapa and Keeyask  
26 can be delivered over firm transmission. The increase in cost between Option 2A and Option 2 is roughly  
27 \$200 Million. Manitoba Hydro’s preferred option 2A is based on their assessment that Option 2A is a  
28 more cost effective alternative than Option 2.

29  
30 Notwithstanding the need to provide additional studies with the new Bipole III model, both Option 2 and  
31 Option 2A meet the NERC reliability standards. The choice between Option 2 and Option 2A may have  
32 an indirect relationship to reliability. Option 2 off loads the HVDC transmission system by an additional  
33 200 MW, which provides more reliability margin. For all of the above reasons, PE concluded that the  
34 amount of on-line valve group sparing is mostly an economic issue.

1 **MMF TO PE IR 9**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to page 15 at line 10-11.

6  
7 **QUESTION:** Please explain what the worst contingency is for the existing Bipole I and Bipole II system,  
8 and how much transmission capacity is available with the single worst N-1 contingency?

9  
10 **REFERENCE:** PE report, p. 15.

11  
12 **RESPONSE:**

13  
14 The single worst N-1 contingency would be the loss of a single pole. Currently, the HVDC capacity with  
15 the largest pole out of service is 1854 MW plus 1000 MW, or 2854 MW.

---

## 1 MMF TO PE IR 10

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** None.

6  
7 **QUESTION:** Does POWER believe the existing MISO transmission constraints require new  
8 interconnections between Manitoba and MISO? Please explain your answer.

9  
10 **REFERENCE:** PE report.

11  
12 **RESPONSE:** Yes. PE believes that in order to increase the existing MH – US transfer capability by 750  
13 MW, new facilities will be required. Existing constraints were discussed in the PE report pages 20 - 24.  
14 Note that PE did not conduct any independent studies of MISO transmission constraints but took its  
15 information from the following sources:

- 16  
17
- 18 • NFAT Business Case
  - 19 • Manitoba Hydro responses to Power Engineers Oct 24 2013
  - 20 • NFAT Confidential - Group Facility Study MHEM 1100/750/250 MW Export/Import Firm Point  
21 to Point Transmission Service Requests, dated October 2, 2013
  - 22 • Minnesota Power filing MPUC Docket No. E-015/CN-12-1163, application for Certificate of  
23 Need for the Great Northern Transmission Line
  - MP Dorsey - Iron Range 500 kV Report.pdf from MAPCON docket 12-1133, Appendix N

24  
25 Line 37 -41 on page 20 of the PE report states: The existing Riel-Forbes 500 kV line rating of 1732 MW  
26 is based on the Roseau series capacitor current rating of 2000 A. This limit can be reached during steady  
27 state (pre-contingency) loading caused by loop flow during heavy North Dakota exports into MISO. Loss  
28 of the Dorsey to Forbes 500 kV line triggers the HVDC reduction Special Protection Scheme (SPS) and  
29 represents the largest single contingency for MISO.

30  
31 Lines 15-42 on page 22 quote findings by Minnesota Power in their Certificate of Need Filing, where  
32 they considered the possibility of upgrading the existing Dorsey to Forbes 500 kV line in lieu of  
33 developing a new 500 kV line. The expected impacts of this approach would be to increase the HVDC  
34 reduction via the Special Protection Scheme to 2165 MW. This was deemed to be undesirable due to  
35 increased risk to the reliability of the system and an increase in the largest single contingency in the  
36 MISO system.



1 **MMF TO PE IR 11**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to page 23, line 32 to page 24, line 1.

6  
7 **QUESTION:** Please provide and/or describe the supporting documents Manitoba Hydro provided for its  
8 contention that the “price for energy delivered from Manitoba to US delivery points is substantially lower  
9 than US prices.”

10  
11 **REFERENCE:** PE report, pp. 12 & 24.

12  
13 **RESPONSE:** PE did not conduct an independent analysis of MH or MISO prices. PE has no supporting  
14 documents with respect to pricing.

1 **MMF TO PE IR 12**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to page 28.

6  
7 **QUESTION:** Please describe the “reserve sharing pool” in terms of members, costs to Manitoba Hydro,  
8 and provide any documentation provided to POWER concerning Manitoba Hydro’s costs and/or benefits  
9 of the reserve sharing pool in the past.

10  
11 **REFERENCE:** PE report, page 28.

12  
13 **RESPONSE:** PE does not have access to such information. PE did ask for information to support the  
14 notion that there could be a dependency on reserve sharing for valve group outages, but has not received  
15 any historical information or predictions for future dependency after Keeyask or Conawapa. Reserve  
16 sharing pool membership and the costs to Manitoba hydro were not critical to our analysis. PE’s intent in  
17 its report was to expose the apparent inconsistency in the confidential “Integrated Transmission Plan for  
18 Keeyask and Conawapa” report where an HVDC Task Force recommended that a minimum spare  
19 capacity over generation equal to the nominal rating of the largest valve group be provided and  
20 maintained for further north-south transmission expansion for new generation assuming a single northern  
21 collector system. For economic reasons, MH has decided not to invest in full valve group sparing after  
22 splitting the Northern Collector System and the addition of Conawapa.

1 **MMF TO PE IR 13**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to page 28 at 15-17.

6  
7 **QUESTION:** Please reconcile the statement “If adequate spare capacity over generation is to be  
8 maintained on each collector system, it does not appear necessary to switch Kettle units to NCS2” with  
9 the statement at page 28 that “the preferred operating plan never totally eliminates non-firm transmission  
10 for connected generation for both NCS 1 and NCS 2 simultaneously.”

11  
12 **REFERENCE:** PE report, p. 28.

13  
14 **RESPONSE:** The first statement refers to providing full spare valve group over generation equal or  
15 greater to the largest valve group. That would require an North-South AC Transmission upgrade of 300  
16 MW (Option 2) instead of 100 MW as proposed in the NFAT preferred plan (Option 2A). Option 2 would  
17 provide a full valve group spare over generation, without Kettle generation switching.

18  
19 The last statement refers to the stated preferred operating mode for Kettle generation, which leaves 105  
20 MW of non-firm transmission on NCS1 and 102 MW of non-firm on NCS2. As previously noted, Kettle  
21 generation switching cannot eliminate non-firm transmission on both NCS1 and NCS2 simultaneously.

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## 1 MMF TO PE IR 14a

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** The response to MMF/MH II-016e states: "Manitoba Hydro has historically adopted the "a  
6 dc pole reserve over load criteria" stated in the 1986 Transmission Planning Criteria (H&TPD 86-1), as  
7 quoted "The present Criteria is to maintain a dc pole reserve toward meeting the Manitoba Firm load  
8 demand in conjunction with existing southern system generation under median flows". This criteria was  
9 applied to the development of Limestone generation.

10  
11 The reserve criteria is under continuous review by Manitoba Hydro. The past operating experience  
12 (significant outages of HVdc valve groups) and increasing economic benefit received from power exports  
13 have led to the criterion of maintaining "on-line valve group spare over generation" to cover valve group  
14 outages. This "spare valve" criterion is considered to provide optimum reliability and economic benefits.  
15 The reserve criteria is currently under further investigation for the split Northern Collector System  
16 associated with Conawapa."

17  
18 "It appears that Manitoba Hydro has greatly relaxed its concerns with risks posed by a contingency outage  
19 of a single pole of a Bipole now that it has secured approval for construction of Bipole III, It now  
20 contends that in response to CAC/MH II-013b:

21  
22 "The loss of 900-1000MW pole is a low probability event (< 1%) as stated in Appendix 13 of the NFAT  
23 submission, therefore it is not considered to be an economically attractive option to cover for this loss  
24 with an additional spare HVdc capability when evaluating the firm transfer capability of the HVdc  
25 system."

26  
27 **QUESTION:** Please cite the portions of the NERC criteria governing single and multiple contingencies  
28 that permits a transmission owner to ignore a single contingency that is a low probability event (< 1%).  
29

30 **REFERENCE:** MMF/MH II-016e and CAC/MH II-013b.

31  
32 **RESPONSE:** The NERC standards do not permit a transmission owner to ignore a single contingency  
33 that is a low probably event.  
34

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## 1 MMF TO PE IR 14b

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** The response to MMF/MH II-016e states: "Manitoba Hydro has historically adopted the "a  
6 dc pole reserve over load criteria" stated in the 1986 Transmission Planning Criteria (H&TPD 86-1), as  
7 quoted "The present Criteria is to maintain a dc pole reserve toward meeting the Manitoba Firm load  
8 demand in conjunction with existing southern system generation under median flows". This criteria was  
9 applied to the development of Limestone generation.

10  
11 The reserve criteria is under continuous review by Manitoba Hydro. The past operating experience  
12 (significant outages of HVdc valve groups) and increasing economic benefit received from power exports  
13 have led to the criterion of maintaining "on-line valve group spare over generation" to cover valve group  
14 outages. This "spare valve" criterion is considered to provide optimum reliability and economic benefits.  
15 The reserve criteria is currently under further investigation for the split Northern Collector System  
16 associated with Conawapa."

17  
18 "It appears that Manitoba Hydro has greatly relaxed its concerns with risks posed by a contingency outage  
19 of a single pole of a Bipole now that it has secured approval for construction of Bipole III, It now  
20 contends that in response to CAC/MH II-013b:

21  
22 "The loss of 900-1000MW pole is a low probability event (< 1%) as stated in Appendix 13 of the NFAT  
23 submission, therefore it is not considered to be an economically attractive option to cover for this loss  
24 with an additional spare HVdc capability when evaluating the firm transfer capability of the HVdc  
25 system."

26  
27 **QUESTION:** Has POWER seen, and accepted the results of, MH's further investigation of the reserve  
28 criteria for the split Northern Collector System associated with Conawapa?

29  
30 **REFERENCE:** MMF/MH II-016e and CAC/MH II-013b.

31  
32 **RESPONSE:** PE has not seen the results of any further investigation of the reserve criteria for the split  
33 Northern Collector System associated with Conawapa.

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## 1 MMF TO PE IR 14c

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** The response to MMF/MH II-016e states: "Manitoba Hydro has historically adopted the "a  
6 dc pole reserve over load criteria" stated in the 1986 Transmission Planning Criteria (H&TPD 86-1), as  
7 quoted "The present Criteria is to maintain a dc pole reserve toward meeting the Manitoba Firm load  
8 demand in conjunction with existing southern system generation under median flows". This criteria was  
9 applied to the development of Limestone generation.

10  
11 The reserve criteria is under continuous review by Manitoba Hydro. The past operating experience  
12 (significant outages of HVdc valve groups) and increasing economic benefit received from power exports  
13 have led to the criterion of maintaining "on-line valve group spare over generation" to cover value group  
14 outages. This "spare valve" criterion is considered to provide optimum reliability and economic benefits.  
15 The reserve criteria is currently under further investigation for the split Northern Collector System  
16 associated with Conawapa."

17  
18 "It appears that Manitoba Hydro has greatly relaxed its concerns with risks posed by a contingency outage  
19 of a single pole of a Bipole now that it has secured approval for construction of Bipole III, It now  
20 contends that in response to CAC/MH II-013b:

21  
22 "The loss of 900-1000MW pole is a low probability event (< 1%) as stated in Appendix 13 of the NFAT  
23 submission, therefore it is not considered to be an economically attractive option to cover for this loss  
24 with an additional spare HVdc capability when evaluating the firm transfer capability of the HVdc  
25 system."

26  
27 **QUESTION:** If so, please explain the basis for that acceptance and provide all documents related to,  
28 arising from or used in arriving at that acceptance.

29  
30 **REFERENCE:** MMF/MH II-016e and CAC/MH II-013b.

31  
32 **RESPONSE:** PE has not seen the results of any further investigation of the reserve criteria for the split  
33 Northern Collector System associated with Conawapa.

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## 1 MMF TO PE IR 14d

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** The response to MMF/MH II-016e states: "Manitoba Hydro has historically adopted the "a  
6 dc pole reserve over load criteria" stated in the 1986 Transmission Planning Criteria (H&TPD 86-1), as  
7 quoted "The present Criteria is to maintain a dc pole reserve toward meeting the Manitoba Firm load  
8 demand in conjunction with existing southern system generation under median flows". This criteria was  
9 applied to the development of Limestone generation.

10  
11 The reserve criteria is under continuous review by Manitoba Hydro. The past operating experience  
12 (significant outages of HVdc valve groups) and increasing economic benefit received from power exports  
13 have led to the criterion of maintaining "on-line valve group spare over generation" to cover valve group  
14 outages. This "spare valve" criterion is considered to provide optimum reliability and economic benefits.  
15 The reserve criteria is currently under further investigation for the split Northern Collector System  
16 associated with Conawapa."

17  
18 "It appears that Manitoba Hydro has greatly relaxed its concerns with risks posed by a contingency outage  
19 of a single pole of a Bipole now that it has secured approval for construction of Bipole III, It now  
20 contends that in response to CAC/MH II-013b:

21  
22 "The loss of 900-1000MW pole is a low probability event (< 1%) as stated in Appendix 13 of the NFAT  
23 submission, therefore it is not considered to be an economically attractive option to cover for this loss  
24 with an additional spare HVdc capability when evaluating the firm transfer capability of the HVdc  
25 system."

26  
27 **QUESTION:** Has the change in reserve criteria been adopted for application to the MH system prior to  
28 the in-service date of Conawapa?

29  
30 **REFERENCE:** MMF/MH II-016e and CAC/MH II-013b.

31  
32 **RESPONSE:** MH has stated that the new Valve Group over Generation criteria will be adopted after  
33 Bipole III with a single collector system.

---

## 1 MMF TO PE IR 14e

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** The response to MMF/MH II-016e states: "Manitoba Hydro has historically adopted the "a  
6 dc pole reserve over load criteria" stated in the 1986 Transmission Planning Criteria (H&TPD 86-1), as  
7 quoted "The present Criteria is to maintain a dc pole reserve toward meeting the Manitoba Firm load  
8 demand in conjunction with existing southern system generation under median flows". This criteria was  
9 applied to the development of Limestone generation.

10  
11 The reserve criteria is under continuous review by Manitoba Hydro. The past operating experience  
12 (significant outages of HVdc valve groups) and increasing economic benefit received from power exports  
13 have led to the criterion of maintaining "on-line valve group spare over generation" to cover valve group  
14 outages. This "spare valve" criterion is considered to provide optimum reliability and economic benefits.  
15 The reserve criteria is currently under further investigation for the split Northern Collector System  
16 associated with Conawapa."

17  
18 "It appears that Manitoba Hydro has greatly relaxed its concerns with risks posed by a contingency outage  
19 of a single pole of a Bipole now that it has secured approval for construction of Bipole III, It now  
20 contends that in response to CAC/MH II-013b:

21  
22 "The loss of 900-1000MW pole is a low probability event (< 1%) as stated in Appendix 13 of the NFAT  
23 submission, therefore it is not considered to be an economically attractive option to cover for this loss  
24 with an additional spare HVdc capability when evaluating the firm transfer capability of the HVdc  
25 system."

26  
27 **QUESTION:** Has MH committed to conduct and report on the results of that further investigation before  
28 the NFAT hearing closes?

29  
30 **REFERENCE:** MMF/MH II-016e and CAC/MH II-013b.

31  
32 **RESPONSE:** PE has not seen the results of any further investigation and does not know what  
33 commitments MH has made.



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**MMF TO PE IR 14e-i**

**SUBJECT:** Economic Risk

**PREAMBLE:** The response to MMF/MH II-016e states: "Manitoba Hydro has historically adopted the "a dc pole reserve over load criteria" stated in the 1986 Transmission Planning Criteria (H&TPD 86-1), as quoted "The present Criteria is to maintain a dc pole reserve toward meeting the Manitoba Firm load demand in conjunction with existing southern system generation under median flows". This criteria was applied to the development of Limestone generation.

The reserve criteria is under continuous review by Manitoba Hydro. The past operating experience (significant outages of HVdc valve groups) and increasing economic benefit received from power exports have led to the criterion of maintaining "on-line valve group spare over generation" to cover valve group outages. This "spare valve" criterion is considered to provide optimum reliability and economic benefits. The reserve criteria is currently under further investigation for the split Northern Collector System associated with Conawapa."

"It appears that Manitoba Hydro has greatly relaxed its concerns with risks posed by a contingency outage of a single pole of a Bipole now that it has secured approval for construction of Bipole III, It now contends that in response to CAC/MH II-013b:

"The loss of 900-1000MW pole is a low probability event (< 1%) as stated in Appendix 13 of the NFAT submission, therefore it is not considered to be an economically attractive option to cover for this loss with an additional spare HVdc capability when evaluating the firm transfer capability of the HVdc system."

**QUESTION:** If not, please state why not.

**REFERENCE:** MMF/MH II-016e and CAC/MH II-013b.

**RESPONSE:** PE has not seen the results of any further investigation and does not know what commitments MH has made.

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## 1 MMF TO PE IR 14e-ii

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** The response to MMF/MH II-016e states: "Manitoba Hydro has historically adopted the "a  
6 dc pole reserve over load criteria" stated in the 1986 Transmission Planning Criteria (H&TPD 86-1), as  
7 quoted "The present Criteria is to maintain a dc pole reserve toward meeting the Manitoba Firm load  
8 demand in conjunction with existing southern system generation under median flows". This criteria was  
9 applied to the development of Limestone generation.

10  
11 The reserve criteria is under continuous review by Manitoba Hydro. The past operating experience  
12 (significant outages of HVdc valve groups) and increasing economic benefit received from power exports  
13 have led to the criterion of maintaining "on-line valve group spare over generation" to cover value group  
14 outages. This "spare valve" criterion is considered to provide optimum reliability and economic benefits.  
15 The reserve criteria is currently under further investigation for the split Northern Collector System  
16 associated with Conawapa."

17  
18 "It appears that Manitoba Hydro has greatly relaxed its concerns with risks posed by a contingency outage  
19 of a single pole of a Bipole now that it has secured approval for construction of Bipole III, It now  
20 contends that in response to CAC/MH II-013b:

21  
22 "The loss of 900-1000MW pole is a low probability event (< 1%) as stated in Appendix 13 of the NFAT  
23 submission, therefore it is not considered to be an economically attractive option to cover for this loss  
24 with an additional spare HVdc capability when evaluating the firm transfer capability of the HVdc  
25 system."

26  
27 **QUESTION:** If so, when will the report on that investigation be provided to interveners?

28  
29 **REFERENCE:** MMF/MH II-016e and CAC/MH II-013b.

30  
31 **RESPONSE:** PE has not seen the results of any further investigation and does not know what  
32 commitments MH has made.

1 **MMF TO PE IR 15a**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to page 15.

6  
7 **QUESTION:** Why does Power consider MH's choice of valve group sparing over “a dc pole reserve over  
8 load criteria” to be "mostly an economic choice, and not a reliability issue?"

9  
10 Won't the use of valve group sparing provide a laxer reliability standard than would “a dc pole reserve  
11 over load criteria?”

12  
13 **REFERENCE:** PE report, p. 15.

14  
15 **RESPONSE:** PE did not make this assertion. PE agreed with MH that the amount of valve group sparing  
16 is mostly an economic issue and not a reliability issue. This was in the context that Option 2 provides full  
17 valve group sparing at a higher cost than Option 2A which only provides partial valve group sparing over  
18 generation. PE believes that both options meet NERC reliability standards.

19  
20 No. The NERC reliability standards remain the same.

1 **MMF TO PE IR 15b**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to page 15.

6  
7 **QUESTION:** Have MISO and NERC considered, and/or concurred in the use of, valve group sparing  
8 over "a dc pole reserve over load criteria" in judging the firmness of power imported from Manitoba?

9  
10 **REFERENCE:** PE report, p. 15.

11  
12 **RESPONSE:** PE has no knowledge of MISO and NERC considerations regarding the use of either  
13 criterion.

1 **MMF TO PE IR 15c**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to page 15.

6  
7 **QUESTION:** If so, please provide all documents related to, arising from or used in that consideration by  
8 MISO and/or NERC.

9  
10 **REFERENCE:** PE report, p. 15.

11  
12 **RESPONSE:** PE has no knowledge of MISO and NERC considerations regarding the use of either  
13 criterion.

1 **MMF TO PE IR 16a**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Page 11 states that firm transmission is determined with respect to loss of one valve group  
6 on each Bipole.

7  
8 **QUESTION:** Why is the standard for firmness based on the outage of one valve group instead of loss of  
9 one pole of the Bipole with the greatest capacity (the “a dc pole reserve over load criteria”)?

10  
11 **REFERENCE:** PE report, p. 11.

12  
13 **RESPONSE:** The PE report, page 11, at 19-20 states that PE ‘made an assumption here that the largest  
14 valve group outage for the combined system drives the determination of firm transmission capacity and  
15 not the individual HVDC Bipoles’. The Valve Group over Generation criteria defines how much firm or  
16 non-firm transmission is available. This is explained in the confidential ‘Integrated Transmission Plan for  
17 Keyask and Conawapa Generation’ report, MH explains that “In the context of HVdc transmission, the  
18 capacity is considered firm when a spare valve group over generation is provided to cover for the most  
19 frequent outages”.

1 **MMF TO PE IR 16b**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Page 11 states that firm transmission is determined with respect to loss of one valve group  
6 on each Bipole.

7  
8 **QUESTION:** Does use of the one valve group criterion satisfy NERC reliability criteria. If so please  
9 explain how.

10  
11 **REFERENCE:** PE report, p. 11.

12  
13 **RESPONSE:** The PE report, page 11, at 19-20 states that PE ‘made an assumption here that the largest  
14 valve group outage for the combined system drives the determination of firm transmission capacity and  
15 not the individual HVDC Bipoles’. The Valve Group over Generation criteria defines how much firm or  
16 non-firm transmission is available. This is explained in the confidential ‘Integrated Transmission Plan for  
17 Keyask and Conawapa Generation’ report, MH explains that “In the context of HVdc transmission, the  
18 capacity is considered firm when a spare valve group over generation is provided to cover for the most  
19 frequent outages”. On-line valve group sparing and the choice to utilize non-firm transmission capacity  
20 do not impact reliability.

21  
22

1 **MMF TO PE IR 16c**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Page 11 states that firm transmission is determined with respect to loss of one valve group  
6 on each Bipole.

7  
8 **QUESTION:** Why did POWER make the assumption that the largest valve group outage for the  
9 combined system drives the determination of firm transmission capacity?

10  
11 **REFERENCE:** PE report, p. 11.

12  
13 **RESPONSE:** The PE report, page 11, at 19-20 states that PE ‘made an assumption here that the largest  
14 valve group outage for the combined system drives the determination of firm transmission capacity and  
15 not the individual HVDC Bipoles’. The Valve Group over Generation criteria defines how much firm or  
16 non-firm transmission is available. In the confidential ‘Integrated Transmission Plan for Keeyask and  
17 Conawapa Generation’ report, MH explains that “In the context of HVdc transmission, the capacity is  
18 considered firm when a spare valve group over generation is provided to cover for the most frequent  
19 outages”. Informal conversations with MH confirmed that the criteria would be applied to the combined  
20 Bipole system, rather than individual Bipole systems.



1 **MMF TO PE IR 16d**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Page 11 states that firm transmission is determined with respect to loss of one valve group  
6 on each Bipole.

7  
8 **QUESTION:** Please provide all documents related to, arising from or used in arriving at that assumption.

9  
10 **REFERENCE:** PE report, p. 11.

11  
12 **RESPONSE:** The PE report, page 11, at 19-20 states that PE ‘made an assumption here that the largest  
13 valve group outage for the combined system drives the determination of firm transmission capacity and  
14 not the individual HVDC Bipoles’. The assumption is based on the confidential ‘Integrated Transmission  
15 Plan for Keeyask and Conawapa Generation’ report. PE is not authorized to distribute this document.

16  
17

1 **MMF TO PE IR 17**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to pages 11-12.

6  
7 **QUESTION:** Why does the 4750 MW stability limit in Table 1 no longer apply after the split of the NCS  
8 system? Is it because no single fault can affect both NCS1 and NCS2?

9  
10 **REFERENCE:** PE report, pp. 11 & 12.

11  
12 **RESPONSE:** Splitting the NCS bus reduces HVDC loading below the 4750 MW.

1 **MMF TO PE IR 18a**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to pages 13-14, POWER recommends restudying any crossing of the 59.3 Hz  
6 threshold to determine if there is sufficient margin in the studies to avoid Underfrequency load shedding.

7  
8 **QUESTION:** Has MH committed to conduct and report on the results of that study before the NFAT  
9 hearing closes?

10  
11 **REFERENCE:** PE report, pp. 13 &14.

12  
13 **RESPONSE:** PE does not know at this point what additional studies MH will commit to providing before  
14 the NFAT hearing closes.

1 **MMF TO PE IR 18b**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to pages 13-14, POWER recommends restudying any crossing of the 59.3 Hz  
6 threshold to determine if there is sufficient margin in the studies to avoid Underfrequency load shedding.

7  
8 **QUESTION:** If not, please state why not.

9  
10 **REFERENCE:** PE report, pp. 13 &14.

11  
12 **RESPONSE:** PE does not know the answer as to MH's commitment. MH has indicated that they are  
13 anticipating that an updated model would be available in 2014, but was not specific as to exactly when a  
14 new model would become available or when new studies would be completed.

1 **MMF TO PE IR 18c**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to pages 13-14, POWER recommends restudying any crossing of the 59.3 Hz  
6 threshold to determine if there is sufficient margin in the studies to avoid Underfrequency load shedding.

7  
8 **QUESTION:** If so, when will the report on that study be provided to interveners?

9  
10 **REFERENCE:** PE report, pp. 13 &14.

11  
12 **RESPONSE:** PE does not know the answer as to MH commitments

1 **MMF TO PE IR 19**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to pages 13-14, POWER recommends restudying any crossing of the 59.3 Hz  
6 threshold to determine if there is sufficient margin in the studies to avoid Underfrequency load shedding.

7  
8 **QUESTION:** Please recalculate the results for firm and non-firm transmission capability in Tables 1, 2,  
9 3, 4, 5, 12, 13 and 14 using as the standard for firmness loss of one pole of the Bipole with the greatest  
10 capacity (i.e., the “a dc pole reserve over load criteria”).

11  
12 **REFERENCE:** PE report, pp. 13 &14.

13  
14 **RESPONSE:** PE based its assessment of the reliability of the proposed AC & DC transmission system  
15 using the new Valve Group over Generation criteria that MH said will be in place after Bipole III. It  
16 would serve no useful purpose for PE to assume a different standard. PE’s current understanding of the  
17 pole over load criteria is based on informal conversations with MH. In those discussions, MH explained  
18 that the ‘Pole over load criteria defines the System capacity to meet Manitoba firm load as the sum of the  
19 southern system generation plus the HVDC capacity less the largest pole. The pole over load criteria does  
20 not limit the amount of firm generation currently in the northern collector system’. In other words, the  
21 pole over load criteria determines system capacity to meet load. It does not determine the firmness of  
22 transmission.

1 **MMF TO PE IR 20a**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to pages 16-17, regarding participation in US transmission facilities.

6  
7 **QUESTION:** Please state the extent to which POWER investigated MH's ability to become, and/or MH's  
8 consideration of becoming, a Transmission Owner under the MISO tariffs ("OATT") with respect to  
9 transmission facilities located in Manitoba and/or in the United States.

10  
11 **REFERENCE:** PE report, pp. 16 &17.

12  
13 **RESPONSE:** PE's report pages 23-24 cover the topic of MH transmission ownership of US transmission.  
14 See 'MISO Transmission Constraints that require Manitoba Hydro's financial participation in US  
15 transmission projects'. POWER did not investigate MH's ability to become, and/or MH's consideration of  
16 becoming, a Transmission Owner under the MISO tariffs.

1 **MMF TO PE IR 20b**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to pages 16-17, regarding participation in US transmission facilities.

6  
7 **QUESTION:** Provide all documents related to, arising from or used in conducting that investigation.

8  
9 **REFERENCE:** PE report, pp. 16 &17.

10  
11 **RESPONSE:** PE's report pages 23-24 cover the topic of MH transmission ownership on US  
12 transmission. See 'MISO Transmission Constraints that require Manitoba Hydro's financial participation  
13 in US transmission projects'. POWER did not investigate MH's ability to become, and/or MH's  
14 consideration of becoming, a Transmission Owner under the MISO tariffs.



1 **MMF TO PE IR 20c**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to pages 16-17, regarding participation in US transmission facilities.

6  
7 **QUESTION:** Please state whether MH's participation in new facilities to be located in the United States  
8 would be participant funded transmission facilities and/or would qualify as Network Upgrades and entitle  
9 MH to receive transmission revenues.

10  
11 **REFERENCE:** PE report, pp. 16 &17.

12  
13 **RESPONSE:** PE's report pages 23-24 cover the topic of MH transmission ownership. See MISO  
14 Transmission Constraints that require Manitoba Hydro's financial participation in US transmission  
15 projects. Any new participation in the line would reduce MH ownership by requiring participant funding  
16 on a pro-rata basis.

17  
18 PE has not investigated whether or not MH's participation would qualify as Network Upgrades and entitle  
19 MH to receive transmission revenues.

20  
21

1 **MMF TO PE IR 20c-i**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to pages 16-17, regarding participation in US transmission facilities.

6  
7 **QUESTION:** If not, please state why not.

8  
9 **REFERENCE:** PE report, pp. 16 &17.

10  
11 **RESPONSE:** PE's report pages 23-24 cover the topic of MH transmission ownership. See 'MISO  
12 Transmission Constraints that require Manitoba Hydro's financial participation in US transmission  
13 projects'. PE has not been asked nor has it investigated whether or not MH's participation would qualify  
14 as Network Upgrades and entitle MH to receive transmission revenues.

15  
16 Alternative Answer: See response to IR 20c.

1 **MMF TO PE IR 20c-ii**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to pages 16-17, regarding participation in US transmission facilities.

6  
7 **QUESTION:** If so, please state the transmission owner revenues MH could expect to receive as a result  
8 of owning each of those transmission facility upgrades (broken down by major project (Dorsey-  
9 Blackberry-US and Manitoba sections). Please include estimates of congestion revenues.

10  
11 **REFERENCE:** PE report, pp. 16 &17.

12  
13 **RESPONSE** PE's report pages 23-24 cover the topic of MH transmission ownership. See MISO  
14 Transmission Constraints that require Manitoba Hydro's financial participation in US transmission  
15 projects. PE has not been asked nor has it investigated whether or not MH's participation would qualify  
16 as Network Upgrades and entitle MH to receive transmission revenues.

17  
18 Alternative Answer: See response to IR 20c.

1 **MMF TO PE IR 20d**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to pages 16-17, regarding participation in US transmission facilities.

6  
7 **QUESTION:** Please state whether MH's participation in new transmission facilities under the NFAT to  
8 be located in Manitoba would qualify as Network Upgrades for purposes of the MISO OATT and entitle  
9 MH to receive transmission revenues.

10  
11 **REFERENCE:** PE report, pp. 16 &17.

12  
13 **RESPONSE:** Manitoba Hydro's transmission plans within Manitoba are covered PE's report pages 24-  
14 28. See 'MANITOBA HYDRO TRANSMISSION PLANS – WITHIN MANITOBA'. The PE scope of  
15 work was to provide an analysis and justification of Manitoba Hydro's need for additional North-South  
16 AC transmission when Conawapa comes on-line.

17  
18 PE has not been asked nor has it investigated whether MH's participation in new transmission facilities  
19 under the NFAT to be located in Manitoba would qualify as Network Upgrades for purposes of the MISO  
20 OATT and entitle MH to receive transmission revenues.

1 **MMF TO PE IR 20d-i**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to pages 16-17, regarding participation in US transmission facilities.

6  
7 **QUESTION:** If not, please state why not.

8  
9 **REFERENCE:** PE report, pp. 16 &17.

10  
11 **RESPONSE:** PE's report pages 23-24 cover the topic of MH transmission ownership. See MISO  
12 Transmission Constraints that require Manitoba Hydro's financial participation in US transmission  
13 projects. PE has not been asked nor has it investigated whether MH's participation in new transmission  
14 facilities under the NFAT to be located in Manitoba would qualify as Network Upgrades for purposes of  
15 the MISO OATT and entitle MH to receive transmission revenues.

1 **MMF TO PE IR 20d-ii**

2  
3 **SUBJECT:** Economic Risk

4  
5 **PREAMBLE:** Referring to pages 16-17, regarding participation in US transmission facilities.

6  
7 **QUESTION:** If so, please state the transmission owner revenues MH could expect to receive as a result  
8 of owning each of those transmission facility upgrades (broken down by major project (HVDC, N-S AC  
9 upgrades, Dorsey-Blackberry).

10  
11 **REFERENCE:** PE report, pp. 16 &17.

12  
13 **RESPONSE:** PE's report pages 23-24 cover the topic of MH transmission ownership. See MISO  
14 Transmission Constraints that require Manitoba Hydro's financial participation in US transmission  
15 projects. PE has not been asked nor has it investigated whether MH's participation in new transmission  
16 facilities under the NFAT to be located in Manitoba would qualify as Network Upgrades for purposes of  
17 the MISO OATT and entitle MH to receive transmission revenues.

18  
19 Alternative Answer: See response to IR 20di.