

1 **SUBJECT: Gas Generation Capital Cost**

2
3 **REFERENCE: Appendix 9.3 Economic Evaluation Documentation; Section: 2.1.3; Page**
4 **No.: 36; GAC/MH I-108**

5
6 **PREAMBLE:** Manitoba Hydro's response to GAC/MH I-008 states: "The nominal
7 escalation rate for natural-gas fired generation is based upon cost drivers associated
8 with a natural-gas fired generation plant from the period 2012/13-21/22 as obtained
9 from IHS Global Insight."

10
11 **QUESTION:**

12 Please provide a copy of the referenced HIS Global Insight report and indicate where in the
13 report this nominal escalation rate is specified.

14
15 **RESPONSE:**

16 The response to this Information Request would require disclosure of IHS Global Insight's
17 Confidential Information and cannot be provided.

1 **SUBJECT: Wind Transmission Capital Cost**

2
3 **REFERENCE: Appendix 7.3 Life Cycle Greenhouse Gas Assessment Overview; Page No.:**
4 **333; GAC/MH I-012**

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6 **PREAMBLE:** Manitoba Hydro's response to GAC/MH I-012 states: "The estimate for the
7 transmission capital costs associated with a generic 65 MW on-shore wind project in
8 Manitoba used in the analysis was \$21 Million (2012 dollars). When the \$21 Million
9 capital cost is included in the levelized cost calculation it results in a \$5/MWh increase in
10 the overall levelized cost."

11
12 **QUESTION:**

13 Were the same units costs (\$ of transmission cost per MW of wind capacity) applied to all wind
14 projects? If not, please provide the costs used, and details of how they were derived.

15
16 **RESPONSE:**

17 The transmission costs used in the LCOE analysis for 65 and 100 MW wind farms are as follows
18 and reflect stage II transmission assumptions:

- 19 • 65 MW - \$0.32 million/MW
20 • 100 MW - \$0.36 million/MW

21 The transmission costs differ for the two wind farms due to the inadvertant omission of an 11%
22 contingency which was to have been included in the estimate for the 65 MW wind farm. The
23 11% transmission cost contingency is included in the levelized cost analysis for the 100 MW
24 wind farm.

1 **SUBJECT: Wind LCOE**

2
3 **REFERENCE: Chapter 7: Screening of Manitoba Resource Options; Section: 7.3; Page**
4 **No.: 39**

5
6 **QUESTION REFERENCE: GAC/MH I-001c**

7
8 **PREAMBLE:** Table 7.6 gives the Levelized Cost of Energy (LCOE) of wind as \$86/MWh in
9 2014 dollars. Manitoba Hydro's response to GAC/MH I-001c states "The levelized cost
10 for a 100 MW on-shore wind project at the reference capital cost of \$2100/kW without
11 transmission is \$75/MWh. ... after the submission of the NFAT filing it was identified
12 that the capital cost for the wind resource option used throughout the filing was
13 approximately 5% higher than it should have been."

14
15 **QUESTION:**

16 Please confirm that the new LCOE of \$75/MWh is in 2014 dollars, and is inclusive of all costs
17 that should be considered in screening resource options, and thus is directly comparable to the
18 \$86/MWh amount shown in Table 7.6. If so, please explain how a 5% change in capital costs
19 translates into a 13% change in total costs. If not, please explain what further adjustments need
20 to be made either to the \$75/MWh amount or to the \$86/MWh amount to make them directly
21 comparable to the LCOEs shown in Table 7.6 for Keeyask and Conawapa of \$60/MWh and
22 \$67/MWh respectively.

23
24 **RESPONSE:**

25 Not confirmed.

26
27 The LCOE of \$75/MWh quoted in the response to GAC/MH I-001c does not include a
28 transmission component and is provided in 2012 dollars. This value therefore cannot be
29 compared to the LCOE values presented in Table 7.6 as the values in this table include
30 transmission and are provided in 2014 dollars.

- 1 The levelized cost of a 65 MW wind farm has been revised from \$86/MW.h to \$84/MW.h (2014
- 2 dollars including transmission) and is directly comparable to the LCOE values listed in table 7.6
- 3 for Keeyask and Conawapa. Refer to tab 22 of LCA-MH I-308 Att 1.xlsx which is an attachment
- 4 to IR LCA/MH I-308 for inputs, assumptions and calculations used to derive the \$84/MW.h
- 5 levelized cost.

1 **SUBJECT: Wind LCOE**

2
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4 **No.: 39; GAC/MH I-001c**

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7 2014 dollars. Manitoba Hydro's response to GAC/MH I-001c states "The levelized cost
8 for a 100 MW on-shore wind project at the reference capital cost of \$2100/kW without
9 transmission is \$75/MWh. ... after the submission of the NFAT filing it was identified
10 that the capital cost for the wind resource option used throughout the filing was
11 approximately 5% higher than it should have been."

12
13 **QUESTION:**

14 Please confirm that the cost categories included in this LCOE (\$75/MWh, or whatever the
15 adjusted amount is) include, and are limited to:

- 16 • Project capital costs
- 17 • Project operating costs
- 18 • Transmission costs
- 19 • Wind integration costs

20 If some of the cost categories listed above are not included in the LCOE, please identify them. If
21 additional cost categories are included, please identify such cost categories.

22
23 **RESPONSE:**

24 Please see Manitoba Hydro's response to LCA/MH I-308.

1 **SUBJECT: Wind LCOE**

2
3 **REFERENCE: Chapter 7: Screening of Manitoba Resource Options; Section: 7.3; Page**
4 **No.: 39**

5
6 **PREAMBLE:** Table 7.6 gives the Levelized Cost of Energy (LCOE) of wind as \$86/MWh in
7 2014 dollars. Manitoba Hydro's response to GAC/MH I-001c states "The levelized cost
8 for a 100 MW on-shore wind project at the reference capital cost of \$2100/kW without
9 transmission is \$75/MWh. ... after the submission of the NFAT filing it was identified
10 that the capital cost for the wind resource option used throughout the filing was
11 approximately 5% higher than it should have been."

12
13 **QUESTION:**

14 Please explain whether, and if so how, transmission losses are taken into account in the
15 calculation of the wind LCOE (whether this is \$75/MWh or the adjusted amount). In the
16 explanation, please include the quantity of losses assumed in percentage terms.

17
18 **RESPONSE:**

19 Manitoba load is primarily in the southern portion of the province, and as a result, wind
20 generation would be located in the south as well. Since load and generation occur in close
21 proximity, the transmission losses have been assumed to be negligible. Therefore transmission
22 losses are not considered in the calculation of LCOE for wind generation.

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7 2014 dollars. Manitoba Hydro's response to GAC/MH I-001c states "The levelized cost
8 for a 100 MW on-shore wind project at the reference capital cost of \$2100/kW without
9 transmission is \$75/MWh. ... after the submission of the NFAT filing it was identified
10 that the capital cost for the wind resource option used throughout the filing was
11 approximately 5% higher than it should have been."

12
13 **QUESTION:**

14 Please confirm that a real discount rate of 5.05% was used in calculating the wind LCOE
15 (whether this is \$75/MWh or the adjusted amount). If some other discount rate was used,
16 please provide it, and explain why it was considered appropriate.

17
18 **RESPONSE:**

19 A real discount rate of 5.05% is used in the calculation of wind LCOE values.

1 **REFERENCE: Question GAC/MH I-42, GAC/MH I-053 and GAC/MH I-061**

2

3 **QUESTION:**

4 If Manitoba Hydro did not believe that the amount of electric space heating and the amount of
5 electric water heating would increase over the next 20 years, would Manitoba Hydro have any
6 expectation of the proposed projects being needed for domestic load? If so, please state the
7 year these resources would be needed and provide the basis for that opinion.

8

9 **RESPONSE:**

10 If Manitoba Hydro were to assume no increase in the percentage of electric space heating or in
11 the percentage of electric water heating (i.e. saturation of electric space heating remain at
12 36.3% and saturation of electric water remained at 49.0%) over the forecast horizon as outlined
13 under the 2013 Load Forecast, included as Appendix D of the submission, growth is roughly
14 estimated to be reduced approximately 470 GW.h by 2032/33.

15

16 Manitoba Hydro's load is forecast to grow at 420 GW.h per year. As shown on the 2012 NFAT
17 No New Resources Dependable Energy Supply and Demand Table located on page 19 of
18 Appendix 4.2 of the submission, the dependable energy deficit in 2031/32 is 3,456 GW.h. For
19 the Preferred Development Plan a reduction in Manitoba load of 470 GW.h over this time
20 period would not impact the requirement for Keeyask G.S. in 2019 or Conawapa G.S. in 2025,
21 but could delay the requirement for natural-gas fired generation from 2041 to 2042.