

1 **PUB/MPA 1-001**

2 **REFERENCE:**

3 MPA Report Page 8 Line 18

4 **PREAMBLE:**

5 MPA states findings are in reference to an the average probability-weighted present value basis
6 of domestic revenue. It is not clear whether MPA's findings reflect only MH's assumptions.

7 **QUESTION:**

8 Please explain whether MPA agrees with the probability weightings used by Manitoba Hydro in
9 its analysis or whether the probability weightings were adjusted in any fashion. If adjusted
10 please provide the rationale for the adjustment.

11 **RESPONSE:**

12 MPA did not make changes to any of Manitoba Hydro's probability weightings.

13 MPA is not an expert in energy price forecasts or commodity price forecasts, and would not
14 presume to suggest different probability weightings for these variables. While MPA may have
15 views on the probability weightings ascribed to scenarios relating to interest rates and other
16 economic variables, we did not make any amendments when performing weighted average
17 calculations.

18 In order to facilitate analysis, in Appendix C we provided our financial model results separately
19 for each of the 27 scenarios identified by Manitoba Hydro, which would allow any interested
20 party to adjust probability weightings and recalculate the weighted average results, if they so
21 desired. It should be noted, however, that Manitoba Hydro has provided arguments justifying
22 their probability weightings for each set of variables, so any alternative probability weightings
23 should be supported by arguments that are at least as compelling.

24 The generic question of probability-weighted averages raises a more general methodological
25 issue, however: Manitoba Hydro chose to use "High/Reference/Low" sets of related variables
26 for what is essentially a multi-variant minimization problem (i.e., how to minimize ratepayer

1 costs in the face of multiple uncertain factors stretching into the future). These kinds of
2 problems are often tested using “Monte Carlo” analytical techniques, where a large number
3 (i.e., hundreds or thousands) of scenarios are created using probability distributions for each
4 variable, and then all of the options are tested against these scenarios and analyzed to
5 determine the financial characteristics of each option.

6 For example, in the case of Manitoba Hydro’s resource choices, a number of variables appear to
7 be relevant, including annual water flow, interest rates, inflation rates, natural gas prices, MISO
8 market prices, etc. Based on historical experience and expert forecasts, probability distributions
9 could be created for each of these variables (e.g., a formula which provides a result for each
10 variable based on probabilities from 1% to 100%). Commonly available Monte Carlo software
11 calculates a series of “paths” to be tested by selecting a random choice for each variable for
12 each year (e.g., in year 1 of the model, a random choice for each variable is selected, then in
13 year 2 new random choices are then made for all variables, etc.). Hundreds or thousands of
14 paths are created in this manner, each with random choices for the variables in each year.
15 Resource options would then be tested against all of the paths, and many data points are
16 collected for each resource option (e.g., averages, maxima, minima, standard deviations, etc.).
17 Resource options can be thoroughly tested for both likely and extreme scenarios.

18 All analytical methods require judgement: in Manitoba Hydro’s case, the definition of
19 High/Reference/Low scenarios required judgement (especially because of the linking of several
20 variables each into groups referred to as “energy prices”, “economics” and “capital costs”), and
21 the assigning of probability-weightings to each of the cases is obviously an exercise in
22 judgement. In a Monte Carlo model, defining probability distributions for each variable is also
23 an exercise in judgement. There is no perfect solution, but a Monte Carlo style of modeling
24 exercise may have provided additional useful data for analysis in the case of Manitoba Hydro.

25

1 **PUB/MPA 1-002**

2 **REFERENCE:**

3 MPA Report Page 8 Line 28

4 **PREAMBLE:**

5 Plan 1, the "All Gas" plan, ranks relatively poorly when the discount rate is lower at 6%, but
6 better when the discount rate is higher at 10%.

7 **QUESTION:**

8 Please indicate what discount rate would result in a crossover of the All Gas Plan being more
9 beneficial than the preferred development plan.

10 **RESPONSE:**

11 At a 10% discount rate, the All-Gas Plan is superior to the Preferred Plan in 17 of the 27
12 scenarios identified by Manitoba Hydro. Using Manitoba Hydro's probability weightings for all
13 27 scenarios and calculating a single blended average, the NPV of the All-Gas Plan according to
14 our model is \$24,551. The single blended average NPV for the Preferred Plan is \$25,525. This is a
15 gap of 4%.

16 At a 6% discount rate, the gap narrows, since the All-Gas Plan is superior to the Preferred Plan
17 in only 13 of the 27 scenarios. The NPV of the All-Gas Plan according to our model is \$46,325,
18 while the blended average NPV for the Preferred Plan is \$47,241. The gap between the Plans is
19 reduced to 2%.

20 The gap between the Plans disappears at a discount rate of 4.18%.

21

1 **PUB/MPA 1-003(a)**

2 **REFERENCE:**

3 MPA Report Page 37 Line 21

4 **PREAMBLE:**

5 Natural gas prices and the development of a carbon regime have implications on the export
6 prices achieved by Manitoba Hydro as well as the fuel costs incurred from an "All Gas" plan.

7

8 MPA states that building hydroelectric facilities as part of the chosen Resource Plan has the net
9 effect of making Manitoba Hydro's financial results more dependent on export results, whose
10 value will in turn be determined by both the quantity and price. Testing the Resource Plans with
11 respect to the range of potential export/import prices over time is critical to estimating future
12 impacts of the choice being made.

13 **QUESTION:**

14 Please describe the assumptions around the all Gas plan as it relates to export revenue
15 potential and whether MPA believes the assumptions to be reasonable.

16 **RESPONSE:**

17 In the All-Gas Plan, existing firm export contracts are expected to run their course and then not
18 be renewed. This appears to be based on the assumption that expected Manitoba domestic
19 demand will grow to the point that no excess hydroelectric dependable energy will remain
20 available in the province, and that export markets will not be interested in purchasing
21 dependable energy from Manitoba unless it is predominately hydroelectric in nature. An
22 alternative explanation would be a belief of Manitoba Hydro that in the future of an All-Gas
23 Plan, firm export contracts would not be economically attractive.

24 Opportunity exports in the All-Gas Plan, on the other hand, will continue far into the future,
25 entirely dependent on the amount of water flow experienced by the system in any given period
26 of time. In even moderately "wet" years existing hydroelectric facilities can produce more than

1 30,000 GWh of energy in a year, and in the wettest years up to 38,000 GWh. Recent Manitoba
2 domestic demand has been below 25,000 GWh. At a consistent annual growth rate of 1.5% per
3 year, Manitoba domestic demand would reach approximately 30,000 GWh in 14 years, and
4 38,000 GWh in about 30 years.

5 In very “dry” years Manitoba Hydro’s existing hydroelectric facilities could produce as little as
6 22,000 GWh, which means the province would rely on natural gas-fired electricity generation or
7 imports to meet domestic needs. In such dry years it is unlikely that Manitoba Hydro would
8 produce net exports.

9 As should be evident from the previous paragraph, it is already true for Manitoba Hydro that
10 Manitoba domestic demand exceeds dependable hydroelectric energy (since dependable
11 hydroelectric energy is only 22,000 GWh from existing facilities, and recent domestic demand
12 measured at generation has been in excess of 24,000 GWh – domestic load has exceeded
13 dependable hydroelectric energy for about a decade). Manitoba currently meets its dependable
14 energy requirements, including firm export contracts, through a combination of hydroelectric,
15 natural gas-fired, coal-fired, wind-based, and import energy arrangements.

16 Given these circumstances, it is somewhat surprising that no new firm export contracts are
17 assumed for the All-Gas Plan (or a number of the other Plans examined by Manitoba Hydro in
18 the Business Case). If contracts have been available for the past ten years, it is possible that
19 attractive contracts could continue to be available, even in an All-Gas Plan future.

20

1 **PUB/MPA 1-003(b)**

2 **REFERENCE:**

3 MPA Report Page 37 Line 21

4 **PREAMBLE:**

5 Natural gas prices and the development of a carbon regime have implications on the export
6 prices achieved by Manitoba Hydro as well as the fuel costs incurred from an "All Gas" plan.

7

8 MPA states that building hydroelectric facilities as part of the chosen Resource Plan has the net
9 effect of making Manitoba Hydro's financial results more dependent on export results, whose
10 value will in turn be determined by both the quantity and price. Testing the Resource Plans with
11 respect to the range of potential export/import prices over time is critical to estimating future
12 impacts of the choice being made.

13 **QUESTION:**

14 Please indicate whether an "All Gas" plan with a CCGT would be available to supply export
15 markets or firm up hydraulic generation to support export sales. On this basis, should some
16 export revenues be assigned to an "All Gas" scenario?

17 **RESPONSE:**

18 The All-Gas Plan described by Manitoba Hydro includes a combination of single and combined
19 cycle natural gas-fired electricity generation facilities. According to the Business Case, the first
20 CCGT would be in-service in 2031. As stated in the response to PUB/MPA 1-003(a) above, it is
21 somewhat surprising that no new firm export contracts are included in the All-Gas Plan.

22 However, it is not clear that inclusion of a CCGT earlier than 2031 would change this
23 perspective.

24

1 **PUB/MPA 1-004(a)**

2 **REFERENCE:**

3 MPA Report Page 37 Line 21

4 **PREAMBLE:**

5 Natural gas prices and the development of a carbon regime have implications on the export
6 prices achieved by Manitoba Hydro as well as the fuel costs incurred from an "All Gas" plan.

7

8 MPA states that building hydroelectric facilities as part of the chosen Resource Plan has the net
9 effect of making Manitoba Hydro's financial results more dependent on export results, whose
10 value will in turn be determined by both the quantity and price. Testing the Resource Plans with
11 respect to the range of potential export/import prices over time is critical to estimating future
12 impacts of the choice being made.

13 **QUESTION:**

14 Please discuss the implications on the comparative resource plans if export prices are lower
15 than forecast

16 **RESPONSE:**

17 Manitoba Hydro included future export prices in their "Energy" group of variables, which
18 consisted of export prices (both on-peak and off-peak for the MISO market), natural gas prices
19 for consumption in Manitoba, and carbon emissions costs. As a result, they did not test the
20 impact of export prices in isolation. Given that Manitoba's main export market is MISO, and
21 marginal prices in MISO are set by natural gas-fired electricity generation units for some portion
22 of every year, it may be considered reasonable to link these different factors.

23 Please see the MISO 2012 State of the Market Report, Appendix page A-5, where the following
24 information is provided:

1 “Since approximately half of MISO’s generation mix—and the majority of its
 2 baseload capacity—is coal-fired, these units tend to set price in most hours.
 3 Natural gas and oil resources typically only set prices during the highest-load and
 4 ramp-up hours. Hence, these fuel prices have a greater impact on load-weighted
 5 average prices than the percentages suggest.”

6 However, technology changes in unpredictable ways, so it may not necessarily be true in the
 7 future that natural gas prices will continue to be strongly related to MISO prices.

8 Notwithstanding these limitations, it is apparent that some plans are more sensitive to export
 9 prices than others. As noted in Figure 14 (page 53) of our report, export revenues are a much
 10 larger portion of total revenues for the Preferred Plan vs. the All-Gas Plan under all sets of
 11 assumptions. Plans 4 and 6 (which include Keeyask but not Conawapa), would have a level of
 12 export exposure between All-Gas and the Preferred Plan.

13 If the “Economic” and “Capital” sets of variables are held constant at Reference levels, then the
 14 sensitivity of the Plans to the “Energy” set of variables can be examined.

PV of Domestic Revenue Comparison of Sensitivity to Energy Scenarios Economic and Capital Scenarios at Reference (in millions)										
	6.00% Discount Rate					10.00% Discount Rate				
	Plan 1	Plan 4	Plan 6	Plan 12	Plan 14	Plan 1	Plan 4	Plan 6	Plan 12	Plan 14
High	\$44,107	\$41,868	\$42,317	\$42,409	\$41,991	\$23,441	\$22,810	\$22,991	\$23,274	\$23,268
Reference	\$43,791	\$42,878	\$43,301	\$44,727	\$44,230	\$23,623	\$23,476	\$23,633	\$24,285	\$24,148
Low	\$43,695	\$44,192	\$44,585	\$47,375	\$47,037	\$23,724	\$24,017	\$24,169	\$25,122	\$25,037
Sensitivity from Low to High	0.94%	-5.26%	-5.09%	-10.48%	-10.73%	-1.19%	-5.02%	-4.87%	-7.35%	-7.06%

15
 16 These model outputs suggest that those Resource Plans which are export intensive are
 17 significantly more sensitive to low Energy price scenarios. The Preferred Plan (14) requires
 18 domestic Manitoba ratepayers to bear a significantly higher burden (i.e., the NPV of domestic
 19 revenues is higher) if the Energy variables as defined by Manitoba Hydro are low.

20 The requirement that Manitoba ratepayers are responsible for all Manitoba Hydro costs over
 21 time means that export prices have an inverse impact on ratepayers: when export prices are
 22 high, ratepayers benefit, when export prices are low, ratepayers must pay more. The choice of
 23 Resource Plan will make a significant difference to the exposure of ratepayers to export prices.

1 **PUB/MPA 1-004(b)**

2 **REFERENCE:**

3 MPA Report Page 37 Line 21

4 **PREAMBLE:**

5 Natural gas prices and the development of a carbon regime have implications on the export
6 prices achieved by Manitoba Hydro as well as the fuel costs incurred from an "All Gas" plan.

7

8 MPA states that building hydroelectric facilities as part of the chosen Resource Plan has the net
9 effect of making Manitoba Hydro's financial results more dependent on export results, whose
10 value will in turn be determined by both the quantity and price. Testing the Resource Plans with
11 respect to the range of potential export/import prices over time is critical to estimating future
12 impacts of the choice being made.

13 **QUESTION:**

14 Please comment on whether the analysis of export /import price assumptions tested by MH
15 were sufficient

16 **RESPONSE:**

17 MPA cannot provide export views on the validity of the export price assumptions made by
18 Manitoba Hydro. However, another Independent Expert Consultant, Potomac Economics,
19 provided a Report which suggested that alternative export price assumptions might be
20 considered.

21 As noted in PUB/MPA 1-001 above, had Manitoba Hydro made use of a "Monte Carlo" model
22 analysis, they may have been able to test a wider range of assumptions about export prices.
23 This could have provided useful data for consideration by the PUB.

24

1 **PUB/MPA 1-004(c)**

2 **REFERENCE:**

3 MPA Report Page 37 Line 21

4 **PREAMBLE:**

5 Natural gas prices and the development of a carbon regime have implications on the export
6 prices achieved by Manitoba Hydro as well as the fuel costs incurred from an "All Gas" plan.

7

8 MPA states that building hydroelectric facilities as part of the chosen Resource Plan has the net
9 effect of making Manitoba Hydro's financial results more dependent on export results, whose
10 value will in turn be determined by both the quantity and price. Testing the Resource Plans with
11 respect to the range of potential export/import prices over time is critical to estimating future
12 impacts of the choice being made.

13 **QUESTION:**

14 Please provide a sensitivity analysis on export prices and the impact on the ratepayer.

15 **RESPONSE:**

16 Please see the response to PUB/MPA 1-004(a) above.

17

1 **PUB/MPA 1-005(a)**

2 **REFERENCE:**

3 MPA Report Page 34 Lines 14, 28

4 **PREAMBLE:**

5 MPA stated that the Preferred Development Plan and its alternatives were created because of a
6 perceived need for new resources. The timing of that need, however, depends very much on
7 the rate of demand growth in Manitoba. If demand growth is relatively high, the new resources
8 will be required sooner, and if relatively lower, then later. The difference can amount to a few
9 years according to the analysis presented by Manitoba Hydro. One risk is that capital will be
10 spent earlier than necessary, which means that a facility will not be fully utilized for a period of
11 time. This loss of efficiency would be costly to ratepayers but likely only temporarily.

12

13 MPA Also indicates the risk over the longer term related to demand growth one must consider
14 that large extremely long-lived resources are susceptible to becoming stranded assets: facilities
15 which are built to serve a need which never fully materializes, and are therefore inordinately
16 expensive for the purpose that they ultimately serve

17 **QUESTION:**

18 Please indicate whether this risk extends to both Keeyask and Conawapa and explain the
19 significance of a 5% or 10% lower domestic demand

20 **RESPONSE:**

21 In considering the impact of lower than expected domestic demand (in a static resource
22 environment where a Resource Plan choice was already made and paid for), three figures are
23 critical: the average cost per unit energy produced by Manitoba Hydro, the domestic rate per
24 unit energy delivered to customers, and the revenue per unit energy from exports.

25 Cost per unit energy varies inversely from year to year with hydrological output: because
26 incremental cost per additional unit of hydroelectric output is equal to the very low water

1 rental fee paid to government (which in recent years was \$3.34/MWh), the higher output that
2 results from a “wet” year drives down the cost per unit energy for Manitoba Hydro
3 dramatically. On the other hand, interest on outstanding debt is directly related to cost per unit
4 energy, as are increases in typical costs such as wages, equipment, etc. In short, debt-financing
5 large new facilities tends to drive up the cost per unit energy for a substantial period of time,
6 until debt principal can be retired, while “wet” years with substantial hydroelectric output will
7 drive down the cost.

8 Export prices are self-explanatory, and are largely outside the control of Manitoba Hydro, since
9 the MISO market largely sets those prices for Manitoba, and Manitoba does not have
10 substantial market power in the context of MISO.

11 Domestic rates in Manitoba are theoretically required to make up the difference between
12 export revenues and Manitoba Hydro costs, however, this is true only over the long term. In the
13 short term, rates on Manitoba Hydro customers are set periodically through regulatory
14 processes, and are deliberately smoothed over time to avoid significant rate shocks if possible
15 (which is good business practice for customers).

16 A decline in domestic consumption means that in “wet” years with surplus hydroelectric energy
17 more energy can be exported. If export prices are higher than domestic rates, then a decline in
18 domestic consumption is unambiguously positive for Manitoba Hydro, and for Manitoba
19 ratepayers. However, if export prices are lower than domestic rates, then Manitoba Hydro
20 would receive less revenue per unit energy than it otherwise would if domestic consumption
21 were higher. The result would be that domestic ratepayers would be forced to absorb, over
22 time, the loss in revenue represented by the difference between domestic rates and export
23 prices. Since, by assumption, domestic consumption is reduced, it means that the loss in
24 revenue would be spread across a smaller pool of domestic consumption, which results in a
25 requirement for domestic rates to rise even higher. The greater the difference between
26 domestic rates and export prices, the greater the problem caused by falling domestic
27 consumption.

1 In the worst case, if export prices are actually lower than the cost of production in Manitoba
2 (either because low hydroelectric output or very high interest costs, or both, are driving up the
3 cost per unit of energy), then energy would be sold at a loss, and absent significant increases in
4 Manitoba domestic rates, Manitoba Hydro would be at risk to suffer annual financial losses,
5 which might require additional debt burdens to be assumed, further exacerbating the problem.

6 An alternative circumstance occurs in a “dry” period, when Manitoba Hydro would be burning
7 gas or importing power to satisfy customer needs. In that case, lower demand means reducing
8 production costs, and would be beneficial.

9 The result of this analysis is that lower domestic demand in Manitoba is itself neither positive
10 nor negative for ratepayers, considered as a group, from a financial perspective. Obviously, for
11 an individual ratepayer, lowering demand may result in lower costs, assuming that rates do not
12 rise to fully offset the usage reduction. However, the outcome of lower demand for Manitoba
13 ratepayers as a whole will depend powerfully on the relationship between the average cost of
14 energy, domestic rates and export prices.

15 Since the Preferred Plan will likely require rates to rise steadily for twenty years or more,
16 whereas other Plans may face a shorter period of rate increases, the Preferred Plan faces a
17 higher level of risk associated with demand reduction during that period. In the more distant
18 future, after approximately thirty years have passed, the Preferred Plan may result in lower
19 prices in Manitoba than other Plans, meaning that demand-related risks would be more severe
20 for other Plans.

21

1 **PUB/MPA 1-005(b)**

2 **REFERENCE:**

3 MPA Report Page 34 Lines 14, 28

4 **PREAMBLE:**

5 MPA stated the Preferred Development Plan and its alternatives were created because of a
6 perceived need for new resources. The timing of that need, however, depends very much on
7 the rate of demand growth in Manitoba. If demand growth is relatively high, the new resources
8 will be required sooner, and if relatively lower, then later. The difference can amount to a few
9 years according to the analysis presented by Manitoba Hydro. One risk is that capital will be
10 spent earlier than necessary, which means that a facility will not be fully utilized for a period of
11 time. This loss of efficiency would be costly to ratepayers but likely only temporarily.

12

13 MPA Also indicates the risk over the longer term related to demand growth one must consider
14 that large extremely long-lived resources are susceptible to becoming stranded assets: facilities
15 which are built to serve a need which never fully materializes, and are therefore inordinately
16 expensive for the purpose that they ultimately serve.

17 **QUESTION:**

18 Please indicate what a reduction in demand in both the domestic and export markets from that
19 currently forecast would have on the preferred plan and the likelihood of stranded assets.

20 **RESPONSE:**

21 The primary export market for Manitoba Hydro is MISO, and as was noted in our report on page
22 24, the MISO market is much larger than Manitoba Hydro's output. It can be expected – barring
23 a dramatic and fundamental change in conditions – that the MISO market could absorb virtually
24 any level of exports which Manitoba Hydro is capable of producing. Therefore, a reduction in
25 the “demand” of export markets is not a primary risk. However, the *prices* associated with the
26 MISO market are critical with respect to understanding the impact of lower domestic demand

1 in Manitoba, and on the potential for stranded assets, as was discussed in PUB/MPA 1-005(a)
2 above.

3 Other things being equal, it should be assumed that if the MISO market were to see a decline in
4 its internal demand, it would mean that prices in the MISO market would fall. This would be a
5 concern for Manitoba Hydro, since its export revenues also would fall as a result. If Manitoba
6 domestic demand were also lower than currently projected, then Manitoba Hydro would be
7 under even more pressure, since a larger portion of its output would be exported than is
8 currently expected. In order to recoup its costs, Manitoba Hydro would have to seek further
9 rate increases in Manitoba, which could exacerbate any difference already evident between
10 domestic rates and export prices.

11 Rising domestic rates also create a further risk, because they may reduce or eliminate the
12 current competitive advantage that the Province of Manitoba enjoys in electricity rates. A
13 portion of Manitoba's customer base, particularly in the business sector, is both highly sensitive
14 to electricity prices, and able from time to time to consider the possibility of relocating to other
15 jurisdictions. If rising rates were to cause such customers to exit the province, this would have
16 the result of further reducing domestic demand, which would force an even smaller pool of
17 customers to absorb Manitoba Hydro costs through higher rates. While it is true that the "price
18 sensitive and mobile" pool of customers may be relatively small in number, they may be
19 significant in terms of total domestic demand. For example, Manitoba Hydro's top customer
20 class of "Very Large Customers" comprises more than 20% of total energy sales. If even half of
21 these customers are considered potentially able to exit the province if they are concerned
22 about the competitiveness of prices, then a very substantial 10% of total Manitoba load could
23 be at risk.

24

1 **PUB/MPA 1-005(c)**

2 **REFERENCE:**

3 MPA Report Page 34 Lines 14, 28

4 **PREAMBLE:**

5 MPA stated the Preferred Development Plan and its alternatives were created because of a
6 perceived need for new resources. The timing of that need, however, depends very much on
7 the rate of demand growth in Manitoba. If demand growth is relatively high, the new resources
8 will be required sooner, and if relatively lower, then later. The difference can amount to a few
9 years according to the analysis presented by Manitoba Hydro. One risk is that capital will be
10 spent earlier than necessary, which means that a facility will not be fully utilized for a period of
11 time. This loss of efficiency would be costly to ratepayers but likely only temporarily.

12

13 MPA Also indicates the risk over the longer term related to demand growth one must consider
14 that large extremely long-lived resources are susceptible to becoming stranded assets: facilities
15 which are built to serve a need which never fully materializes, and are therefore inordinately
16 expensive for the purpose that they ultimately serve.

17 **QUESTION:**

18 Please explain how Manitoba Hydro should mitigate demand risk with respect to technology
19 changes and other load forecast reliability issues

20 **RESPONSE:**

21 In the long term, only resource planning decisions can mitigate risks associated with technology
22 change and other load forecasting uncertainty. This would mean incorporating into a portfolio
23 of generating assets a variety of technologies with different lifespans, so that over time
24 generation capacity can be more closely associated with actual domestic requirements and
25 economically advantageous export opportunities.

1 In the shorter term, it may be possible to reduce Manitoba Hydro's exposure to fluctuating
2 domestic demand by restructuring customer charges. Currently, the vast majority of Manitoba
3 Hydro's domestic revenue is based on variable charges (i.e., per KWh consumed in a month).
4 Given that a substantial portion of Manitoba Hydro's costs are actually not variable, as they are
5 the result of the transmission, distribution and customer service functions, customers could be
6 charged a much larger fixed portion to reflect this reality. This would result in less exposure by
7 Manitoba Hydro to falling demand. However, at the same time, taking such action would
8 reduce customer incentives to conserve electricity.

9 Another alternative is to target segments of the customer base that are potentially able to exit
10 the province in the face of higher electricity rates, and shield them from rate increases. This
11 would in essence protect Manitoba load from falling, but at the expense of targeting the cost
12 burden to particular ratepayers that do not have the option of exiting the province in response.

13

1 **PUB/MPA 1-006**

2 **REFERENCE:**

3 MPA Report Page 25 Line 8

4 **PREAMBLE:**

5

6 **QUESTION:**

7 Please confirm that Manitoba Hydro's export contracts allow Manitoba Hydro to provide
8 contract electricity from non-hydraulic resources and do not mandate electric loads to be
9 served with hydraulic electricity.

10 **RESPONSE:**

11 MPA's understanding from the agreements made available to us is that they are not specific to
12 any individual facility or type of electricity generation.

13

1 **PUB/MPA 1-007(a)**

2 **REFERENCE:**

3 MPA Report Page 27 Line 21

4 **PREAMBLE:**

5 MPA states that if electricity rates were to rise dramatically, implying the need for a substantial
6 rate increase, large manufacturer might threaten to close their doors and move production to
7 other jurisdictions unless the government moved in to provide assistance. If rates were kept
8 low, and Manitoba Hydro simply absorbed the financial losses for a period of years, then
9 Manitoba Hydro's status as a financial self-supporting entity would be called into question.

10 **QUESTION:**

11 Please elaborate on the factors that credit rating agencies would have to consider to determine
12 a portion of the debt is not supported by MH operations

13 **RESPONSE:**

14 The primary consideration for credit rating agencies is whether Manitoba Hydro is financially
15 self-supporting. Included in such an analysis are the obvious requirements that revenues be
16 sufficient to cover costs over time, including the cost of both operations and required capital.
17 Manitoba Hydro itself reflects this need through its target of ensuring that a 1.2x interest
18 coverage ratio is maintained, and that all business-as-usual capital expenditure requirements
19 can be covered through internally generated funds.

20 A more subtle question is whether the company is subsidized by the Province of Manitoba,
21 rather than truly self-supporting. For example, does the company pay some fair portion of
22 taxes, as would any other electricity entity, whether owned by the Province or not? Since
23 Manitoba Hydro pays water rental fees, capital taxes and other fees and charges, it is clearly
24 not exempt from all government costs. While Manitoba Hydro does not pay income tax, this is
25 in itself not determinative, as there are many types of organizations which are not-for-profit
26 and do not pay income tax, without being considered "subsidized".

1 With respect to capital structure and capital costs, Manitoba Hydro receives the support of a
2 provincial guarantee of substantially all of its long-term debt. This results in a gross cost of debt
3 much lower than a company of its size, with its equity level, cash flows and risk profile might
4 otherwise achieve. However, the government does not provide this guarantee free of charge,
5 but at a cost of 1% of outstanding debt. While there may be questions about the exact level of
6 the debt guarantee fee, the mere fact of a fee is an indication that government is not
7 subsidizing Manitoba Hydro.

8 In the normal course, Manitoba Hydro would meet all of its financial targets, and credit rating
9 agencies would continue to recognize it as financially self-supporting.

10 In the event of financial distress, whether caused by drought, cost overruns, declining export
11 prices, etc., Manitoba Hydro's performance against some of these metrics would suffer.
12 Temporary difficulties, for example caused by a short but sharp drought, would be unlikely to
13 affect the assessment of Manitoba Hydro as financially self-supporting. Prolonged drought, or
14 financial distress caused by capital cost overruns, a significant decline in export market prices,
15 loss of major domestic customers, etc. would raise the question of what steps might be taken
16 to address the financial distress. If domestic rates are increased sufficiently to alleviate the
17 distress, then no change to Manitoba Hydro's status in the eyes credit rating agencies should be
18 expected. If, however, rates are not increased sufficiently, and the Province of Manitoba simply
19 continues to fund Manitoba Hydro through increasing debt, then Manitoba Hydro would be at
20 risk of not being considered to be self-supporting.

21 It is indicative that Moody's Investor Service, in its July 2013 Credit Analysis for the Province of
22 Manitoba, makes specific reference to the fact that Manitoba currently enjoys "one of the
23 lowest electricity rates in North America". If the cost of alleviating a future financial distress
24 situation at Manitoba Hydro is to increase domestic rates to the point where they are no longer
25 enviably competitive, then the financially self-supporting status of Manitoba Hydro may come
26 under further question.

27

1 **PUB/MPA 1-007(b)**

2 **REFERENCE:**

3 MPA Report Page 27 Line 21

4 **PREAMBLE:**

5 MPA states that if electricity rates were to rise dramatically, implying the need for a substantial
6 rate increase, large manufacturer might threaten to close their doors and move production to
7 other jurisdictions unless the government moved in to provide assistance. If rates were kept
8 low, and Manitoba Hydro simply absorbed the financial losses for a period of years, then
9 Manitoba Hydro's status as a financial self-supporting entity would be called into question.

10 **QUESTION:**

11 At what level (order of magnitude) would MPA consider rates would have to rise that might
12 cause a flight of industry or would not be sustainable from a regulatory perspective.

13 **RESPONSE:**

14 As noted in our Report at page 23, Hydro Quebec produces an annual report comparing
15 electricity prices for various classes of customers in different jurisdictions across North America.
16 Manitoba currently enjoys a very strong competitive position in every customer category.
17 Speculation on the conditions under which Manitoba might suffer from customer flight requires
18 an understanding not only of the direction of Manitoba Hydro rates, but also of the future
19 relative rates in other competitive jurisdictions. Across North America, many utilities are
20 currently investing in new facilities, whether hydroelectric, natural gas-fired, wind, solar,
21 biomass, etc., all of which put upward pressure on ratepayer prices. At the same time,
22 significant expenditures for transmission and distribution infrastructure also put pressure on
23 prices. While Manitoba is potentially facing a doubling of rates in the next twenty years if the
24 Preferred Plan is pursued, it is not clear what this will mean in the context of the competitive
25 position of the Province, without substantial analysis of competitive jurisdictions.

26

1 **PUB/MPA 1-007(c)**

2 **REFERENCE:**

3 MPA Report Page 27 Line 21

4 **PREAMBLE:**

5 MPA states that if electricity rates were to rise dramatically, implying the need for a substantial
6 rate increase, large manufacturer might threaten to close their doors and move production to
7 other jurisdictions unless the government moved in to provide assistance. If rates were kept
8 low, and Manitoba Hydro simply absorbed the financial losses for a period of years, then
9 Manitoba Hydro's status as a financial self-supporting entity would be called into question.

10 **QUESTION:**

11 Are there any other circumstances other than a severe drought which might lead to a need to
12 dramatically increase rates that may lead to unsustainable rate increases?

13 **RESPONSE:**

14 As noted in PUB/MPA 1-007(a) above, financial distress could be caused by severe drought,
15 major capital cost overruns or a significant decline in export prices. Any of these circumstances
16 could create very significant upward pressure on domestic rates in Manitoba, which could push
17 the boundaries of what would be considered acceptable from a competitiveness perspective.

18

1 **PUB/MPA 1-008(a)**

2 **REFERENCE:**

3 MPA Report Page 30 Line 10

4 **PREAMBLE:**

5

6 **QUESTION:**

7 Compared to the other resource plans, is there any disproportionate effect on consumers
8 versus the government of Manitoba (rates versus government revenues) with the aggressive
9 DSM case?

10 **RESPONSE:**

11 Aggressive DSM spending is typically undertaken by a utility to encourage a decline in domestic
12 consumption. The effects of such a decline in consumption were discussed in PUB/MPA 1-005,
13 above. The difference in a DSM case is that Manitoba Hydro would actually be spending in
14 order to decrease consumption.

15 The impact on ratepayers would depend, as discussed earlier, on the relationship between the
16 cost per unit of energy produced, domestic rates and export prices. However, in the case of
17 DSM programs, the cost of the programs must also be included in the calculations, as these
18 costs are also passed on to ratepayers.

19 Government derives direct financial benefit from Manitoba Hydro through water rentals and
20 capital taxes. DSM programs would not affect either of these taxes. Indirectly, the government
21 benefits from the economic activity associated with construction of new facilities. Again, unless
22 DSM programs are considered an alternative resource to new facilities, they are not relevant.

23 Principally, DSM program benefits and burdens are borne by ratepayers.

24

1 **PUB/MPA 1-008(b)**

2 **REFERENCE:**

3 MPA Report Page 30 Line 10

4 **PREAMBLE:**

5

6 **QUESTION:**

7 Please file the net present value ratepayer impacts and government impacts when the
8 information has been provided from Manitoba Hydro.

9 **RESPONSE:**

10 MPA is not yet in receipt of additional information from Manitoba Hydro sufficient to carry out
11 such modeling.

12

1 **PUB/MPA 1-009**

2 **REFERENCE:**

3 MPA Report Page 32 Table 7

4 **PREAMBLE:**

5

6 **QUESTION:**

7 Why is the dependable and peak energy from the 308 MW CCGT lower than from the 209 MW
8 SCGT in the various resource scenarios?

9 **RESPONSE:**

10 Table 7 on page 32 of our report contains an error. The figures for dependable and maximum
11 energy production for the single and combined cycle facilities were reversed.

12

1 **PUB/MPA 1-0010(a)**

2 **REFERENCE:**

3 MPA Report Pages 34 Line 14, Page 51 Line 18

4 **PREAMBLE:**

5 Potomac provided an alternative export price forecast for Manitoba Hydro.

6 MPA alludes to technological change that may impact future demand for electricity.

7 MPA states that "For the Preferred Development Plan (14) the difference in rate patterns
8 between the High and Low Demand Assumptions are similar to what is depicted above for the
9 all gas plan, and the inferences that can be drawn are the same. In short, if export prices are
10 higher in the future, then reducing domestic demand is beneficial for Manitoba ratepayers, but
11 if export prices are lower, then reducing domestic demand only raises cumulative rates in
12 Manitoba providing ratepayers without providing ratepayers much benefit

13 **QUESTION:**

14 Please discuss and quantify the implications to Manitoba ratepayers if the Potomac reference
15 export price forecasts were utilized.

16 **RESPONSE:**

17 MPA developed its financial model based on the outputs of Manitoba Hydro's SPLASH model.
18 That model predicts Manitoba energy production, imports and exports based on a variety of
19 assumptions, built up from detailed consideration of all of Manitoba Hydro's individual
20 generation assets, water storage facilities, transmission facilities and water management
21 practices. One critical assumption used in the SPLASH model is peak and off-peak prices for
22 exports and imports. This assumption drives unit-level decisions. MPA has not replicated the
23 SPLASH model, nor can we predict the impact over time on model outputs of adopting a
24 different import/export price curve assumption (e.g., in some situations where water is
25 plentiful, Manitoba Hydro unit decisions would not likely change with different export prices,
26 but in other situations where water is less available and decisions must be made between

1 burning gas, using water or importing, a change in the price curve assumption could have
2 important effects). As a result, we could not perform additional model runs based on Potomac's
3 suggested price curves.

4 However, we would note that Potomac has suggested a reference forward price curve that is
5 somewhat lower than Manitoba Hydro's reference case. Please see PUB/MPA1-004(a) above
6 for a discussion of the relative sensitivity of the various Resource Plans to export prices.

7

1 **PUB/MPA 1-010(b)**

2 **REFERENCE:**

3 MPA Report Pages 34 Line 14, Page 51 Line 18

4 **PREAMBLE:**

5 Potomac provided an alternative export price forecast for Manitoba Hydro.

6 MPA alludes to technology change may impact future demand for electricity.

7 MPA States

8 For the Preferred Development Plan (14) the difference in rate patterns between the High and
9 Low Demand Assumptions are similar to what is depicted above for the all gas plan, and the
10 inferences that can be drawn are the same. In short if export prices are higher in the future,
11 then reducing domestic demand is beneficial for Manitoba ratepayers, but if export prices are
12 lower, than reducing domestic demand only raises cumulative rates in Manitoba providing
13 ratepayers without providing ratepayers much benefit

14 **QUESTION:**

15 Please discuss and quantify the implications to Manitoba ratepayers if the Potomac reference
16 export price forecast were utilized and there was a 10% reduction in domestic demand over
17 what is currently forecast

18 **RESPONSE:**

19 As discussed in PUB/MPA 1-005, reductions in domestic demand have impacts on ratepayers
20 based on the relationship between domestic rates and export prices. Insofar as Potomac is
21 suggesting that export prices are likely to be lower than forecast by Manitoba Hydro, this is
22 likely to compound the risk for Manitoba ratepayers.

23

1 **PUB/MPA 1-011(a)**

2 **REFERENCE:**

3 MPA Report Page 34 Line 34

4 **PREAMBLE:**

5 MPA states the reason for long-term change in direction could be many, but most easily
6 conceived our some change in technology which allows consumers to dramatically reduce their
7 consumption...

8 **QUESTION:**

9 Please discuss the types of technological changes that may dramatically impact demand

10 **RESPONSE:**

11 MPA is not an expert in technology, and cannot provide an expert opinion on this matter.

12 It should be apparent, however, that both electricity production and electricity consumption
13 technology has been changing dramatically over recent decades. The precipitous decline in
14 photovoltaic costs, and the significant decline in electricity consumption from lighting caused
15 by the advent of CFL and LED lighting technologies are simply indicators of the broader changes
16 that have been taking place.

17 From a financial perspective, any technological change which might dramatically reduce
18 domestic demand, or dramatically reduce prices in the MISO market, would be a risk factor for
19 Manitoba Hydro if it chose to pursue the Preferred Plan and build substantial long-lived
20 electricity generation capacity.

21

1 **PUB/MPA 1-011(b)**

2 **REFERENCE:**

3 MPA Report Page 34 Line 34

4 **PREAMBLE:**

5 MPA states the reason for long-term change in direction could be many, but most easily
6 conceived our some change in technology which allows consumers to dramatically reduce their
7 consumption...

8 **QUESTION:**

9 Please discuss the implications on both domestic and export demand related to technological
10 change that brings about grid parity and discuss how the changes in demand in both the
11 domestic and export markets may impact ratepayers and the Province.

12 **RESPONSE:**

13 “Grid parity” is the idea that an individual electricity consumer could potentially self-generate
14 for their own needs at substantially the same cost as an electricity provider, and therefore
15 effectively cease being a customer (the impact from the electricity company perspective is the
16 same as spontaneous conservation, except the customer often remains connected to the grid
17 as a backup or part-time alternative to the self-generation).

18 It is MPA’s understanding that legislation in Manitoba is very strict with respect to customer
19 self-generation, potentially limiting the likelihood of this risk in the province. In the MISO
20 market, however, the possibility of grid parity from a variety of technologies is real, certainly in
21 the medium to long term. For example, continued improvements in cost and efficiency may
22 result in photovoltaic arrays being as cheap as daytime grid energy, and natural gas-fired
23 combined heat and power facilities for industrial or commercial purposes could soon be
24 competitive with traditional purchased energy options.

- 1 The result of any such eventuality would likely be to drive down, or at least prevent the further
- 2 growth in prices in the MISO market. Given the sensitivity of various Resource Plans to export
- 3 prices, any potential for such a future outcome is a risk.

1 **PUB/MPA 1-012(a)**

2 **REFERENCE:**

3 MPA Report Page 37

4 **PREAMBLE:**

5 Over the last 10 years MH improved the financial value of its system by importing power at off-
6 peak hours and holding back hydroelectric generation. Manitoba Hydro then sold power into
7 the exports system at value prices. This apparently has been MH's stated objective.

8 Actual operations have typically tended to maximize off-peak summer sales at low prices and
9 import off-peak in winter at higher prices when necessary. NEB data reflects this.

10 **QUESTION:**

11 Provide MPA's assessment of MH's 2002/03 exports and imports leading up to the 2003/04
12 drought.

13 **RESPONSE:**

14 The 2003/4 fiscal year was very challenging for Manitoba Hydro, as its domestic electricity
15 generation fell to 19,400 GWh, from over 29,000 GWh the year before. Manitoba was a net
16 energy importer in that year. In the 2002/3 Annual Report, Manitoba Hydro noted that its main
17 drainage basin, the Nelson-Churchill system, had suffered below normal precipitation in 12 of
18 the 18 months from October 2001 to April 2003 (please see the 52nd Annual Report, page 31).
19 Nevertheless, Manitoba Hydro generated substantial excess energy for export in 2002/3.

20 Notably, during the drought year of 2003/4, Manitoba Hydro delivered on its firm export
21 contracts, and did not declare "adverse water", as it could have. A commercial decision was
22 apparently taken to fulfil contracts, even though the result was a net loss for the year.

23 Fortunately for Manitoba Hydro, water levels in 2004/5 were well above normal, allowing for
24 the replenishing of reservoirs, and a return to financial health.

1 This episode is indicative of the risks that operators of hydroelectric systems face. While it is
2 often inappropriate to second guess operational decisions taken, all stakeholders should be
3 aware of the high degree of uncertainty that pertains to any decisions affected by water flows.

4

1 **PUB/MPA 1-012(b)**

2 **REFERENCE:**

3 MPA Report Page 37

4 **PREAMBLE:**

5 Over the last 10 years MH improved the financial value of its system by importing power at off-
6 peak hours and holding back hydroelectric generation. Manitoba Hydro then sold power into
7 the exports system at value prices. This apparently has been MH's stated objective.

8 Actual operations have typically tended to maximize off-peak summer sales at low prices and
9 import off-peak in winter at higher prices when necessary. NEB data reflects this.

10 **QUESTION:**

11 Provide MPA's assessment of MH's 2006/07 export and imports which led to an interim rate
12 increase in February 2007 to cover net revenue shortfalls.

13 **RESPONSE:**

14 Detailed operational decisions with respect to water management and electricity exports are
15 outside the scope of MPA's expertise.

16

1 **PUB/MPA 1-012(c)**

2 **REFERENCE:**

3 MPA Report Page 37

4 **PREAMBLE:**

5 Over the last 10 years MH improved the financial value of its system by importing power at off-
6 peak hours and holding back hydroelectric generation. Manitoba Hydro then sold power into
7 the exports system at value prices. This apparently has been MH's stated objective.

8 Actual operations have typically tended to maximize off-peak summer sales at low prices and
9 import off-peak in winter at higher prices when necessary. NEB data reflects this.

10 **QUESTION:**

11 Confirm that since 2004/05 MH has in most years made minimal use of imports.

12 **RESPONSE:**

13 Water flows in every year during the period in question were above the historical average, and
14 in some cases far above the historical average. Manitoba Hydro was fortunate that imports
15 were not required in any year to satisfy domestic demand or firm export contracts.

16 Review of Manitoba Hydro's operational performance in managing its system with respect to
17 the potential to maximize exports are outside the scope of MPA's expertise.

18

1 **PUB/MPA 1-013(a)**

2 **REFERENCE:**

3 MPA Report Page 38

4 **PREAMBLE:**

5 KP has indicated different capital cost assumptions should be utilized.

6 MPA provides examples of Wuskwatim and other major infrastructure projects that came in at
7 a cost well above estimates.

8 MPA also indicates that it is important to test the performance of Resource Plans in the face of
9 different construction cost scenarios.

10 **QUESTION:**

11 Please indicate whether or not MPA believes that MH has adequately tested the performance
12 of Resource Plans in the face of different construction cost scenarios and the Wuskwatim
13 experience.

14 **RESPONSE:**

15 In the scenarios provided by Manitoba Hydro, “Capital Cost” variables were grouped together,
16 including those pertaining to labour and construction cost escalation.

17 Assuming the Reference scenario for the “Economic” and “Energy” groups of variables, the total
18 projected capital spending from the twelve years 2014/15 to 2025/6 inclusive can be examined
19 based on Low/Reference/High “Capital Costs”. For the Preferred Plan, these are (in millions):

20	Low:	\$21,801
21	Reference	\$23,176
22	High	\$24,946

23 This twelve-year period in the Preferred Plan would encompass the construction of Bipole III,
24 Keeyask, the 750 MW interconnection with the United States, and Conawapa, as well as
25 associated transmission for the two generation projects. The difference from the Low to High

1 cases is approximately 14.5%. The difference from Reference to High cases is approximately
2 7.6%.

3 Given the experience in major infrastructure projects around the world historically, and given
4 Manitoba's own experience with the Wuskwatim project, this range does not capture a truly
5 damaging cost overrun scenario.

6

1 **PUB/MPA 1-013(b)**

2 **REFERENCE:**

3 MPA Report Page 38

4 **PREAMBLE:**

5 KP has indicated different capital cost assumptions should be utilized.

6 MPA provides examples of Wuskwatim and other major infrastructure projects that came in at
7 a cost well above estimates.

8 MPA also indicates that it is important to test the performance of Resource Plans in the face of
9 different construction cost scenarios.

10 **QUESTION:**

11 Please utilize KP's Capital Cost assumptions and provide the results of the ratepayer analysis on
12 that basis.

13 **RESPONSE:**

14 The Knight Piesold Report provides a carefully nuanced review of the Manitoba Hydro capital
15 cost assumptions. As such, it does not lend itself to a relatively simple "scenario" that could be
16 analyzed through MPA's financial model. In our report, MPA provides ratepayer impact
17 sensitivities for cost overruns on Conawapa in nominal dollar terms, and below in PUB/MPA 1-
18 013(c) we provide additional sensitivities on cost overruns.

19

1 **PUB/MPA 1-013(c)**

2 **REFERENCE:**

3 MPA Report Page 38

4 **PREAMBLE:**

5 KP has indicated different capital cost assumptions should be utilized.

6 MPA provides examples of Wuskwatim and other major infrastructure projects that came in at
7 a cost well above estimates.

8 MPA also indicates that it is important to test the performance of Resource Plans in the face of
9 different construction cost scenarios.

10 **QUESTION:**

11 Please indicate the impact on the ratepayer analysis and the Province of alternative capital
12 cost assumptions, including sensitivities around higher capital cost, such as capital costs being
13 25%, 50% or 100% higher than currently budgeted.

14 **RESPONSE:**

15 The following tables depict the impact of increasing the capital cost of both the Keeyask and
16 Conawapa generating stations by the specified amounts in the Ref/Ref/Ref scenario of the
17 Preferred Plan.

18 As will be noted, the increases to NPV of Manitoba ratepayer costs are substantial, as would be
19 expected from such significant cost overruns.

PV of Domestic Revenue

Average Impact of Additional Capital Expenditures on Keeyask and Conawapa

Preferred Development Plan

Additional capital outlay relative to base capital cost (real 2014 \$)

NPV @ 6.0%

(\$ in millions)

	Additional Capital Cost			
	0%	25%	50%	100%
PV of domestic revenue	\$44,230	\$46,032	\$47,976	\$51,356
Increase relative to nil increase	0.0%	4.1%	8.5%	16.1%

1

PV of Domestic Revenue

Average Impact of Additional Capital Expenditures on Keeyask and Conawapa

Preferred Development Plan

Additional capital outlay relative to base capital cost (real 2014 \$)

NPV @ 10.0%

(\$ in millions)

	Additional Capital Cost			
	0%	25%	50%	100%
PV of domestic revenue	\$24,148	\$24,730	\$25,292	\$26,162
Increase relative to nil increase	0.0%	2.4%	4.7%	8.3%

2

3

1 **PUB/MPA 1-014(a)**

2 **REFERENCE:**

3 MPA Report Page 42 Line12

4 **PREAMBLE:**

5 MPA states that " The model results in total risk-adjusted present value cost to ratepayers over
6 a 48-year period that are all within the maximum of 5% of each other. In many ways, this is a
7 remarkable result. The 14 Resource Plans are radically different in their choices of
8 infrastructure elements, use of fuels, orientation towards exports, etc., and yet the differences
9 do not appear to translate beyond the marginal.

10 MPA cites other factors resulting in similar analytical outcomes.

11 **QUESTION:**

12 Please elaborate on the factors that impact the similar results and whether it is appropriate to
13 consider some common costs in evaluating alternative plans in particular sunk costs and
14 transmission investments.

15 **RESPONSE:**

16 In the Business Case, Manitoba Hydro describes \$1.3 billion in sunk costs on the Keeyask and
17 Conawapa projects as of June 2014. These costs are presumed to be real expenditures of
18 dollars, and are assumed to appear in Manitoba Hydro's balance sheet under "Construction in
19 Progress".

20 In the All-Gas Plan, these sunk costs must be written off. Manitoba Hydro chooses to do so in
21 five equal annual installments. Another option would be to write off the expenditures in one
22 installment. Regardless, these expenditures must be addressed financially (and from an
23 accounting perspective), because if the Keeyask and Conawapa facilities will not be built, the
24 expenditures provide no expected future value and should be removed from the company's
25 books.

1 A significantly larger issue is the planned construction of the Bipole III transmission line, at a
2 cost greater than \$3 billion. This facility will improve reliability on the Manitoba high voltage
3 transmission grid, and immediately reduce grid losses, reportedly providing the equivalent of
4 over 90 MW of additional useable power to Manitoba Hydro (239 GWh of energy per year,
5 according to the Demand/Supply tables provided in Appendix 4.1 of the Business Case).

6 Coincidentally, the construction of the Bipole III transmission line will also make possible the
7 transmission of supply from the Conawapa generation facility, if it is built. Absent Bipole III, a
8 decision to build Conawapa would entail a substantial expenditure on new transmission
9 capacity, similar to Bipole III or some other configuration.

10 In the All-Gas Plan, however, there is no further advantage from Bipole III beyond the reliability
11 improvements and the reduced grid losses. Nonetheless, the All-Gas Plan must absorb the
12 economic consequences of the Bipole III cost, which is one of the reasons why the differences
13 in ratepayer impact between the All-Gas Plan and other Plans are less dramatic than they
14 otherwise might be.

15

1 **PUB/MPA 1-014(b)**

2 **REFERENCE:**

3 MPA Report Page 42 Line12

4 **PREAMBLE:**

5 MPA states that " The model results in total risk-adjusted present value cost to ratepayers over
6 a 48-year period that are all within the maximum of 5% of each other. In many ways, this is a
7 remarkable result. The 14 Resource Plans are radically different in their choices of
8 infrastructure elements, use of fuels, orientation towards exports, etc., and yet the differences
9 do not appear to translate beyond the marginal.

10 MPA cites other factors resulting in similar analytical outcomes.

11 **QUESTION:**

12 How would the comparative analysis in Figures 6 & 7 change if such costs were assigned to
13 projects to which they relate?

14 **RESPONSE:**

15 Sunk costs for Keeyask and Conawapa cannot be addressed in any alternative way in substance
16 (though they could be expensed in one year rather than five).

17 The cost of Bipole III could only be managed differently if it were assumed that the project
18 would not proceed if the All-Gas Plan were selected as the Resource Plan for the future. In this
19 case, the ratepayer cost associated with the All-Gas Plan would decline significantly, but
20 ratepayer costs related to the other Plans would remain the same. However, it must be noted
21 that the Bipole III project has received government approval and is apparently already
22 underway, with substantial expenditures made this fiscal year.

23

1 **PUB/MPA 1-014(c)**

2 **REFERENCE:**

3 MPA Report Page 42 Line12

4 **PREAMBLE:**

5 MPA states that " The model results in total risk-adjusted present value cost to ratepayers over
6 a 48-year period that are all within the maximum of 5% of each other. In many ways, this is a
7 remarkable result. The 14 Resource Plans are radically different in their choices of
8 infrastructure elements, use of fuels, orientation towards exports, etc., and yet the differences
9 do not appear to translate beyond the marginal.

10 MPA cites other factors resulting in similar analytical outcomes.

11 **QUESTION:**

12 Please file the comparative analysis excluding sunk cost recovery.

13 **RESPONSE:**

14 As noted in PUB/MPA 1-014(a) above, sunk cost recovery is not optional. According to
15 statements of the Province of Manitoba, alternative treatment of Bipole III (please see the
16 Terms of Reference for the NFAT Review) is also out of scope.

17 As a practical matter, the SPLASH model runs upon which MPA has based its financial model
18 include the completion of Bipole III on schedule, along with the 90 MW and 239 GWh/year of
19 benefits from reduced losses. Any assumption that Bipole III will not proceed would require
20 new runs of the SPLASH model to take into account these changes. Simply removing billions of
21 dollars from the All-Gas Plan capital expenditures would not provide an accurate assessment of
22 what the All-Gas Plan would result in for ratepayers absent Bipole III (the reduction to
23 ratepayer costs would be overestimated).

24 Finally, given that the Bipole III project has been approved and is apparently underway, it
25 should be assumed that there are substantial sunk costs already associated with this project,
26 which would have to be taken into account in any revised scenario. According to Manitoba

- 1 Hydro's Capital Expenditure Plan 2012, spending on Bipole III should have reached
- 2 approximately \$800 million by the end of fiscal year 2013/14. Given these issues, it is unclear
- 3 exactly what could be analyzed as a financial scenario with sunk cost recovery "excluded".
- 4

1 **PUB/MPA 1-014(d)**

2 **REFERENCE:**

3 MPA Report Page 42 Line12

4 **PREAMBLE:**

5 MPA states that " The model results in total risk-adjusted present value cost to ratepayers over
6 a 48-year period that are all within the maximum of 5% of each other. In many ways, this is a
7 remarkable result. The 14 Resource Plans are radically different in their choices of
8 infrastructure elements, use of fuels, orientation towards exports, etc., and yet the differences
9 do not appear to translate beyond the marginal.

10 MPA cites other factors resulting in similar analytical outcomes.

11 **QUESTION:**

12 Please file the comparative ratepayer impact analysis, including the respective Appendix C
13 Table PV of Domestic Revenue excluding the impacts of Bipole III and sunk cost for the gas
14 plans and provide commentary on the changes.

15 **RESPONSE:**

16 Please see the response to PUB/MPA 1-014(c).

17

1 **PUB/MPA 1-015**

2 **REFERENCE:**

3 MPA Report Page 41 Figure 6

4 **PREAMBLE:**

5 In Figure 6, MPA provides several "reference, high, low" economic scenarios.

6 **QUESTION:**

7 Please expand on the explanation of "reference, high, low" economic scenarios, perhaps with
8 an example of how different levels of inflation rate, exchange rate and interest rates interact in
9 a particular economic scenario and comment on the reasonableness of the relationships.

10 **RESPONSE:**

11 The High/Reference/Low economic scenarios in Manitoba Hydro's probability scheme
12 encompass variables such as inflation, interest rates and Canada-US exchange rates. Each set is
13 meant to capture a potential average for the next 48 years.

14 The inflation rates assumed in the three cases are approximately 1%, 2% and 3%. If a dollar is
15 inflated at 1% for 48 years, the result is approximately \$1.60. At 2% the result is approximately
16 \$2.50, and at 3% one dollar grows to approximately \$4.00. Inflation is extremely powerful over
17 the long term, so the inflationary assumptions strongly affect the calculated NPV of ratepayer
18 costs.

19 Since ratepayer costs are discounted by the same factor regardless of which Economic scenario
20 is tested, the NPVs are dramatically different depending on the Economic scenario chosen. As a
21 result, MPA chose to depict the results separately for the three Economic scenarios for each
22 plan, rather than presenting a blended average figure.

23

1 **PUB/MPA 1-016**

2 **REFERENCE:**

3 MPA Report Page 41, Page 75 Line 7

4 **PREAMBLE:**

5

6 **QUESTION:**

7 How should intergenerational considerations be taken into account in evaluating the preferred
8 development plan versus other alternatives within the next 20 or 30 years.

9 **RESPONSE:**

10 The choice of Resource Plan has fairly significant intergenerational consequences for ratepayers
11 in Manitoba, both in terms of the course of expected rates, and the risks being borne by
12 different generations of ratepayers based on the choice made.

13 As we have noted, the choice of discount rate – or time value of money – affects the rank-
14 ordering of the Resource Plans from a ratepayer cost perspective. However, discount rate does
15 not affect certain other rank orderings of the Resource Plans. For example, regardless of the
16 discount rate chosen, the Preferred Plan generates more revenue for the government than
17 most of the other Plans. Similarly, regardless of the discount rate chosen, the Preferred Plan
18 will generate more construction jobs and regional economic development than other Plans.
19 Again regardless of the discount rate chosen, it is clear that rates will rise higher under the
20 Preferred Plan than other Plans for the next 25 years. While it may be true that after 25 years
21 have passed the Preferred Plan may begin to see rate declines, that outcome depends on the
22 accuracy of a variety of assumptions including the level of demand in Manitoba, the prices
23 available in export markets, and the lack of radical technological change. These are also
24 intergenerational comparisons that must be taken into account when making judgements
25 about the Resource Plans.

1 As was stated in our report, evaluation of options for long term Resource Plans is ultimately
2 about judgement. Intergenerational considerations cannot be determined with regard to
3 simple mathematical formulas, but can and should be investigated in a variety of ways.

4

1 **PUB/MPA 1-017(a)**

2 **REFERENCE:**

3 MPA Report Pages 41,43,48 (Lines 7,18)

4 **PREAMBLE:**

5 MPA states for every year the model is extended beyond 48 years, the more the rank orders of
6 the resource plans will change in favor of plan 14 and plan 12, particularly with the lower
7 discount rate of 6%. However, with the higher discount rate of 10%, the shifting of the rank
8 ordering will slow down and eventually stopped because of the rapidly declining importance of
9 those future years.

10

11 MPA further states: The second half of the 48 year time period is inherently more uncertain
12 than the first half, in the sense that future conditions are harder to predict so far in advance:
13 technology is always changing, economic growth patterns change, climate may be changing,
14 etc., So making accurate predictions about any variables [fuel costs, export cause, construction
15 cost, efficiency of equipment in the future, etc.] is that much more difficult.

16 **QUESTION:**

17 Please comment on the appropriateness of utilizing net present value analysis over a 78 year
18 time frame.

19 **RESPONSE:**

20 It is impossible to predict the economic conditions of the future 78 years hence. It is only
21 necessary to compare the technology of 1936 to 2014 to realize the absurdity of such an
22 exercise (television, internet, jet plane, satellites, air conditioning, microwaves, cell phones,
23 natural gas turbine, nuclear reactor, solar panel, CFLs, LEDs, etc.), much less the political and
24 economic history of the time period (WWII, the oil shocks, "stagflation", the Cold War,
25 development of China since the Cultural Revolution and its impact on world commodity prices,
26 etc.).

1 Typically, financial models extend out between 5 and 25 years, depending on their subject
2 matter and purpose. Beyond that period, a “terminal value” is meant to capture the value of
3 cash flows for all future years (or, alternatively, the potential market value of an asset at that
4 time). A variety of strategies can be used to calculate terminal value, and generally several are
5 used to determine a range for consideration. The size of the terminal value compared to the
6 cash flows in the modeled period is generally an important indicator of the risk being taken in
7 the venture or asset being modeled.

8 Extending a model to 78 years is merely one way of capturing the “terminal value” of the
9 Resource Plans beyond a reasonable forecasting period. It should be given no more weight than
10 other possible terminal value strategies. It is notable that Manitoba Hydro’s typical financial
11 modeling – the Integrated Financial Forecast and Capital Expenditure Forecast that are
12 produced annually – only extend for 20 years. Most of the underlying forecasts that are
13 included in the Business Case and its supporting documents – forecasts for natural gas prices,
14 MISO market prices, commodity prices, interest rates, inflation rates, etc. – are also in the
15 range of 5 to 20 years in length. Beyond those ranges, projections are simply extended in
16 straight lines to 78 years. Even the SPLASH model used by Manitoba Hydro to forecast the
17 operation of the corporation’s major assets extends only 35 years.

18 By applying various sets of scenario assumptions to the 78-year model, Manitoba Hydro has
19 attempted to provide the equivalent of a range of terminal value assumptions. However, the
20 exclusive use of the 78-year period has obscured the fact that each Plan would have a different
21 relationship between terminal value and modeled cash flows if the model was only 25 years in
22 length, for example. By highlighting the expected paths of ratepayer revenues over time, and
23 through the use of different discount rates, we have tried to provide an alternative view on this
24 issue.

25

1 **PUB/MPA 1-017(b)**

2 **REFERENCE:**

3 MPA Report Pages 41,43,48 (Lines 7,18)

4 **PREAMBLE:**

5 MPA states for every year the model is extended beyond 48 years, the more the rank orders of
6 the resource plans will change in favor of plan 14 and plan 12, particularly with the lower
7 discount rate of 6%. However, with the higher discount rate of 10%, the shifting of the rank
8 ordering will slow down and eventually stopped because of the rapidly declining importance of
9 those future years.

10

11 MPA further states: The second half of the 48 year time period is inherently more uncertain
12 than the first half, in the sense that future conditions are harder to predict so far in advance:
13 technology is always changing, economic growth patterns change, climate may be changing,
14 etc., So making accurate predictions about any variables [fuel costs, export cause, construction
15 cost, efficiency of equipment in the future, etc.] is that much more difficult.

16 **QUESTION:**

17 Please refile Figures 4 and 7 based on a 20 year and 30 year time frame and provide
18 comparative commentary.

19 **RESPONSE:**

20 Please see the tables on the following pages.

Average Probability Weighted PV of Domestic Revenue

High, Ref and Low Economics
(\$ in millions)
(2015-2034)

Economics Scenario	Development Plan				
	1	4	6	12	14
NPV @ 6.00%					
Reference	\$25,414	\$25,573	\$25,635	\$25,817	\$25,897
High	\$28,483	\$29,903	\$30,124	\$31,279	\$31,990
Low	\$21,704	\$21,687	\$21,695	\$21,737	\$21,774

1

Average Probability Weighted PV of Domestic Revenue

High, Ref and Low Economics
(\$ in millions)
(2015-2034)

Economics Scenario	Development Plan				
	1	4	6	12	14
NPV @ 10.00%					
Reference	\$17,860	\$17,947	\$17,978	\$18,067	\$18,115
High	\$19,988	\$20,783	\$20,899	\$21,485	\$21,866
Low	\$15,509	\$15,506	\$15,510	\$15,530	\$15,554

2

3 The tables above depict the financial model results for the first 20-year period, without
4 consideration of terminal values. The PVs for each Plan are probability-weighted averages of
5 the nine possible combinations of Energy Price and Capital Cost scenarios.

6 It should be noted that the All-Gas Plan (Development Plan 1) implies lower ratepayer costs in
7 both the High and Reference economics scenarios at both the 6% and 10% discount rates. In
8 the Low economics scenario, Plans 4 and 6 (which include Keeyask but not Conawapa) are
9 effectively equal to the All-Gas Plan, and the Preferred Plan (Development Plan 14) is much
10 closer to equivalence.

11 It should also be noted that the choice of discount rate over the course of the first 20 years has
12 relatively modest impact on the PV calculation, and does not appear to affect the rank ordering
13 of the Plans.

Average Probability Weighted PV of Domestic Revenue

High, Ref and Low Economics
(\$ in millions)
(2015-2044)

Economics Scenario	Development Plan				
	1	4	6	12	14
NPV @ 6.00%					
Reference	\$33,932	\$34,203	\$34,557	\$36,102	\$36,001
High	\$38,626	\$39,645	\$40,233	\$43,731	\$44,487
Low	\$28,672	\$28,459	\$28,584	\$28,924	\$28,850

1

Average Probability Weighted PV of Domestic Revenue

High, Ref and Low Economics
(\$ in millions)
(2015-2044)

Economics Scenario	Development Plan				
	1	4	6	12	14
NPV @ 10.00%					
Reference	\$21,230	\$21,369	\$21,515	\$22,136	\$22,116
High	\$23,963	\$24,627	\$24,892	\$26,430	\$26,844
Low	\$18,266	\$18,188	\$18,237	\$18,372	\$18,354

2

3 These tables depict the results of financial modeling for the first 30-year period, again without
4 consideration of terminal values.

5 The rank ordering is essentially the same as for the initial 20-year period, with the All-Gas Plan
6 superior in the High and Reference economics scenarios, but Plans 4 and 6 slightly superior in
7 the Low economics scenario.

8 Interestingly, the superiority of the All-Gas Plan 1 over Plan 4 in the Reference and High
9 scenarios actually improves slightly in the 30-year timeframe vs. the 20-year timeframe (e.g., in
10 the Reference economics scenario, for the 20-year period Plan 1 has a 0.6% advantage, vs. 0.8%
11 in the 30-year period). This may be related to the exact timing of investments in new single and
12 combined-cycle natural gas facilities in the various Plans.

1 **PUB/MPA 1-018**

2 **REFERENCE:**

3 MPA Report Page 41 Figure 7

4 **PREAMBLE:**

5 In Figure 6, MPA provides a ranking based on a discount rate of 6% and 10%.

6 **QUESTION:**

7 Please provide an updated Figure 7 rank ordering of resource plans utilizing an 8% discount
8 rate.

9 **RESPONSE:**

Average Probability Weighted PV of Domestic Revenue					
High, Ref and Low Economics					
(\$ in millions)					
(2015-2062)					
Economics Scenario	Development Plan				
	1	4	6	12	14
NPV @ 8.00%					
Reference	\$31,354	\$31,119	\$31,379	\$32,457	\$32,241
High	\$37,584	\$37,392	\$37,759	\$39,380	\$39,492
Low	\$26,109	\$25,721	\$25,846	\$26,156	\$25,990

10

11 Based on an 8% discount rate for the 48-year modeling period, Plan 4 is superior to all other
12 Plans across all three Economic scenarios. The All-Gas Plan (Development Plan 1) is slightly
13 superior to Plan 6 at Reference economics (but so slightly as essentially to be the same), while it
14 is superior in the High economics scenario, but inferior in the Low economics scenario. The
15 Preferred Plan (Development Plan 14) ranks behind Plans 1, 4 and 6 in all three economic
16 scenarios.

1 **PUB/MPA 1-019(a)**

2 **REFERENCE:**

3 MPA Report Page 76 Line 27

4 **PREAMBLE:**

5 MPA states: An extremely important intergenerational decision is embedded in the choice of
6 Resource plan, as cost to Ratepayers will be distributed very differently over time

7 **QUESTION:**

8 Please elaborate on the intergenerational decision that is required to be made.

9 **RESPONSE:**

10 As depicted in Figure 10 of our Report (page 47), the expected rate paths of the Plans vary
11 significantly over time. In the first quarter (about 12 years) of the modeled period, rates rise
12 steadily regardless of which Plan is chosen. For the second quarter there is a marked difference
13 between Plans 1 and 6 on one side, and Plan 14 on the other: by year 24, rates in Plans 1 and 6
14 reach approximately 60% to 120% above 2013 rates, while in Plan 14 the range is 100% to
15 150%. In the third and fourth quarters the pattern is different, with rates rising steadily in Plan
16 1, remaining more or less flat in Plan 6, and declining in Plan 14.

17 Regarding certainty and risk, there is much greater certainty with respect to the rate path in the
18 first quarter of the time period, and declining certainty about the rate path with each
19 subsequent period, given the steadily falling likelihood of accurately predicting the future.

20 In bald terms, the choice is between ratepayers enjoying lower rates in the second quarter of
21 the modeled period with relatively more certainty, versus enjoying lower rates in fourth quarter
22 of the modeled period with relatively less certainty of doing so (in the third quarter, average
23 rates are about the same across the Plans, though moving in different directions).

24 Figure 10 was based on the Ref/Ref/Ref scenario, which is only one of the twenty-seven
25 scenarios produced by Manitoba Hydro. In the other scenarios, the relative differences
26 between the Plans vary, and the percent increase over 2013 rates depends very much on the

1 choice of economics scenarios (inflation and interest rates, etc.), but the general direction of
2 the rate paths is similar.

3 The grounds upon which to make this choice are not clear, and a case can be made for each
4 option. Nevertheless, because a choice between Resource Plans is required, this choice will be
5 made as part of the decision process.

6 An analogy could be made to personal choices about setting aside money for university when a
7 baby is born, or beginning to save for retirement at age 25: the financial benefits of these kinds
8 of decisions can be calculated, but they involve future and uncertain gratification at the
9 expense of real costs in the near term. Some people choose to follow these paths, and others
10 do not. In the case of Manitoba Hydro's Resource Plan, the choice will be made and all
11 ratepayers will bear the burden of the choice, whatever it may be, because it by definition
12 applies to all ratepayers (except those with the mobility to leave the Province).

13 Mention should be made of the fact that while the model period is 48 years, assets included in
14 each Resource Plan will have useful lives extending well beyond the boundaries of the model.
15 This suggests that a terminal value should be added for the period beyond 48 years. However,
16 in financial terms this terminal value is of potentially limited import: at a 6% discount rate, a
17 terminal value in year 48 would be divided by a factor of 15 to provide a present value, and at a
18 10% discount rate the terminal value in year 48 would be divided by a factor of 88. This means
19 that the ability of the difference in terminal values between the Plans to affect the rank-
20 ordering of the Plans is limited in the case of a 6% discount rate, and virtually non-existent in
21 the case of a 10% discount rate.

22 Again, to make an analogy to personal life, some people make decisions based on the future
23 welfare of their grandchildren, and others do not.

24

1 **PUB/MPA 1-019(b)**

2 **REFERENCE:**

3 MPA Report Page 76 Line 27

4 **PREAMBLE:**

5 MPA states: An extremely important intergenerational decision is embedded in the choice of
6 Resource plan, as cost to Ratepayers will be distributed very differently over time.

7 **QUESTION:**

8 Please provide the NPV on domestic revenue for each of the 5 plans based on a 20, 30, 40 year
9 term Based on a 6% and 10% discount rate.

10 **RESPONSE:**

11 20 and 30-year NPVs are presented above in PUB/MPA 1-017, and 48-year NPVs are presented
12 in our Report.

13

1 **PUB/MPA 1-019(c)**

2 **REFERENCE:**

3 MPA Report Page 76 Line 27

4 **PREAMBLE:**

5 MPA states: An extremely important intergenerational decision is embedded in the choice of
6 Resource plan, as cost to Ratepayers will be distributed very differently over time.

7 **QUESTION:**

8 Please provide a table ranking each plan on the basis of ratepayer impacts under each time
9 frame.

10 **RESPONSE:**

11 Please see the response to PUB/MPA 1-017 for a ranking of the Plans.

12

1 **PUB/MPA 1-020**

2 **REFERENCE:**

3 MPA Report Page 48 Line 24

4 **PREAMBLE:**

5 MPA states that "Water power is a very inexpensive fuel, so that at some point facilities like
6 Conawapa always become very attractive assets for ratepayers of the day; an important
7 question is whether ratepayers today and in the near future do or should care about the
8 welfare of ratepayers decades away."

9 **QUESTION:**

10 Please discuss whether in-service fixed costs, excluding fuel costs and the realized export
11 prices, have some bearing on whether a hydroelectric facility like Conawapa is an attractive
12 asset versus other alternatives.

13 **RESPONSE:**

14 As discussed in CAC/MPA 1-006, it is possible for hydroelectric facilities to become financially
15 stranded, even though operating costs are relatively minimal.

16 Capital costs of construction, particularly if largely debt-financed, represent cash flows that
17 must be recovered in the future. Prevailing rates of interest at the time of construction (and
18 whenever principal must be refinanced) will have a powerful impact on the ultimate long-term
19 cost of the energy produced by the facility. If revenues are not sufficient to pay the cost of
20 interest on outstanding debt (either because export prices decline or drought dramatically
21 reduces the output of the facility), then debt costs can force domestic rates up to unsustainable
22 levels. The alternative to such rate increases would be the stranding of debt, and the
23 assumption of the debt burden by its guarantor, in Manitoba's case the taxpayers of Manitoba.

24 Lower capital cost alternatives do not typically face this risk, however, the operating costs of
25 the energy produced in other types of facilities is usually dramatically higher.

1 **PUB/MPA 1-021(a)**

2 **REFERENCE:**

3 MPA Report Page 49 Line 11

4 **PREAMBLE:**

5 MPA stated that changing Manitoba Hydro's demand does not actually affect the total cost to
6 ratepayers over 48 years very much.

7 **QUESTION:**

8 Confirm that a 10% reduction in Domestic load implies domestic rates being 10% higher than
9 currently forecast.

10 **RESPONSE:**

11 In addition to the 2012 Reference demand curve used by Manitoba Hydro, MPA modeled the
12 "Low" and "High" 2012 demand curves provided by Manitoba Hydro, for the All-Gas and
13 Preferred Development Plan Ref/Ref/Ref cases. The rate paths for the Reference demand curve
14 case were presented in Figure 10 of our Report (which depicts the rate path results using the
15 Reference 2012 demand curve for Plans 1, 6 and 14). In addition, Figure 12 depicts the rate
16 paths for the All-Gas plan under the same assumptions, except using the High and Low 2012
17 demand curves.

18 The following table shows the assumed Manitoba domestic demand for the year 2037, which is
19 the 24th year of the model:

Manitoba Adjusted Load		
GWh		
Year 24 (2037)		
All Gas		
Low	Ref	High
32,009	35,118	38,226
Preferred Development Plan		
Low	Ref	High
32,164	35,273	38,382

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It should be noted that regardless of the Plan selected (All-Gas or Preferred), Manitoba domestic demand is nearly the same. Moreover, the Low demand expectation is approximately 9% lower than Reference, and High is approximately 9% higher.

Referring back to Figure 12 from our report, it should be apparent that the expected range of customer rates relative to 2013 is very different for each of the demand assumptions:

- In the All-Gas Low demand case, rates in year 24 are approximately 100% to 150% higher than 2013
- In the All-Gas Reference demand case, rates in year 24 are approximately 70% to 120% higher than 2013
- In the All-Gas High demand case, rates are 40% to 90% higher than 2013.

All of the cases use the same economic, energy and capital cost assumptions (interest rates, construction costs, export prices, etc.). The only difference is the course over 24 years of domestic Manitoba Load. There appears to be approximately a 30% difference in cumulative customer rate increases over 2013 between each of the demand curve cases, over the course of 24 years, based on a load difference of approximately 9%. In terms of the year 2037, this translates into approximately a 15% difference between the High demand and Reference demand customer rates at the time, so a 9% change in total domestic demand causes approximately a 15% difference in customer rates, as of year 24 of the model, assuming the Reference economic, energy and capital cost variables.

1 Note that the result could be different if the energy prices assumptions are altered, because the
2 relationship between export/import prices and domestic rates would be different, as discussed
3 in PUB/MPA 1-005. However, as Manitoba Hydro did not provide SPLASH model runs for High
4 and Low demand with alternative energy assumptions, we could not test the impact of such a
5 change.

6

1 **PUB/MPA 1-021(b)**

2 **REFERENCE:**

3 MPA Report Page 49 Line 11

4 **PREAMBLE:**

5 MPA indicates Changing Manitoba demand was not actually affect the total cost to ratepayers
6 over 48 years very much, if all other variables are kept constant; the difference in total cost to
7 ratepayers between high and low Manitoba demand futures is not more than about 2% in any
8 of the cases

9 **QUESTION:**

10 Confirm that the advent of shale gas may lower average export revenue rates in 2033 by 20%
11 over the next 20 to 30 years with the result that additional export sales would earn about \$.02-
12 \$.03/kWh less than the previously anticipated domestic sales

13 **RESPONSE:**

14 MPA is not an expert in the forecasting of future electricity prices in the MISO market or the
15 impact of shale gas on future natural gas prices, and cannot provide a view on this issue.

16

1 **PUB/MPA 1-022**

2 **REFERENCE:**

3 MPA Report Page 51 Line 16

4 **PREAMBLE:**

5 MPA states that "Unfortunately, Manitoba Hydro did not provide SPLASH data for such
6 alternative export prices combined with High and Low demand assumptions, so the inference
7 cannot be thoroughly tested.

8 **QUESTION:**

9 Please clarify how variations in export prices were determined in the absence of scenarios
10 provided by MH at different export price forecasts.

11 **RESPONSE:**

12 Manitoba Hydro provided SPLASH model outputs for High/Reference/Low energy prices
13 combined with a variety of other variables. However, SPLASH outputs for High/Reference/Low
14 *demand* were provided only with Reference energy prices. As a result, MPA could not perform
15 financial modeling which combined varying demand estimates with varying energy price
16 estimates.

17 Based on the sensitivity of the Plans to Energy Prices with Reference demand expectations, and
18 based on the sensitivity of the Plans to varying Demand with Reference energy prices, the
19 impact of simultaneously varying demand and energy prices can only be inferred.

20

1 **PUB/MPA 1-023(a)**

2 **REFERENCE:**

3 MPA Report Pages 52, 53 (Line 11), 74 & 75

4 **PREAMBLE:**

5 MPA states that for government, higher exports mean that more of its revenue from Manitoba
6 Hydro is actually coming from export jurisdictions rather than ratepayers, which means that
7 other things being equal, the province as a whole should be receiving a net benefit.

8 **QUESTION:**

9 Please quantify the net benefit to the Province, excluding the transfer from ratepayers in the
10 high, reference and low export scenarios.

11 **RESPONSE:**

12 Please see the tables on the following page.

13 As depicted on the tables, varying the assumed future energy prices does not affect the fees
14 and taxes that the government will receive for water rentals or capital taxes. These are
15 essentially the same whether energy prices are High, Reference or Low. Debt guarantee fees
16 are actually inversely related to energy prices for the Preferred Plan as well as Plan 12: with
17 higher energy prices, Manitoba Hydro has higher revenue and can pay off debts faster,
18 therefore reducing debt guarantee fees. However, for the other Plans, the higher assumed cost
19 of natural gas drives up costs for Manitoba Hydro, reduces net income and therefore the ability
20 to quickly retire debt.

21

22

23

24

25

Average Probability Weighted PV of Revenue to the Province of Manitoba

(2015-2062)

(\$ in millions)

Revenue

NPV @ 6.00%

	Development Plan				
	1	4	6	12	14
Reference Energy					
Water Rentals	1,702	1,883	1,878	2,035	2,092
Provincial Debt Guarantee	2,583	2,979	3,018	3,485	3,695
Capital Taxes	1,581	1,871	1,879	2,228	2,274
High Energy					
Water Rentals	1,701	1,884	1,879	2,035	2,092
Provincial Debt Guarantee	2,659	2,995	3,020	3,434	3,540
Capital Taxes	1,577	1,873	1,882	2,233	2,279
Low Energy					
Water Rentals	1,701	1,881	1,878	2,028	2,085
Provincial Debt Guarantee	2,645	3,141	3,203	3,762	4,062
Capital Taxes	1,591	1,877	1,889	2,225	2,271

1

Average Probability Weighted PV of Revenue to the Province of Manitoba

(2015-2062)

(\$ in millions)

Revenue

NPV @ 10.00%

	Development Plan				
	1	4	6	12	14
Reference Energy					
Water Rentals	972	1,057	1,055	1,108	1,140
Provincial Debt Guarantee	1,536	1,803	1,829	2,058	2,221
Capital Taxes	915	1,083	1,089	1,238	1,291
High Energy					
Water Rentals	971	1,057	1,055	1,107	1,140
Provincial Debt Guarantee	1,544	1,786	1,809	2,017	2,145
Capital Taxes	913	1,083	1,090	1,239	1,291
Low Energy					
Water Rentals	971	1,056	1,054	1,105	1,137
Provincial Debt Guarantee	1,585	1,894	1,932	2,192	2,382
Capital Taxes	920	1,086	1,094	1,238	1,289

2

1 **PUB/MPA 1-023(b)**

2 **REFERENCE:**

3 MPA Report Pages 52, 53 (Line 11), 74 & 75

4 **PREAMBLE:**

5 MPA states for government, higher exports mean that more of its revenue from Manitoba
6 Hydro is actually coming from export jurisdictions rather than ratepayers, which means that
7 other things being equal, the province as a whole should be receiving a net benefit.

8 **QUESTION:**

9 Please discuss the risks versus rewards balance between ratepayers and the Province with
10 respect to payments versus rates under adverse scenarios.

11 **RESPONSE:**

12 Both ratepayers and the Government of Manitoba benefit when export prices are higher, other
13 things being equal. For government, the “balance of trade” between the province and external
14 jurisdictions improves when export prices are higher, while for ratepayers higher export prices
15 means domestic rates can be lower than they otherwise would be. However, it should be noted
16 that government does not benefit in cash terms when export prices are higher: as per the
17 tables above, direct government revenues from Manitoba Hydro do not change substantially
18 with export price changes.

19 If export prices fall, the reverse is true, with ratepayers forced to pay more for Manitoba Hydro
20 electricity, and the balance of trade declining for the Province. Again, however, the direct
21 government revenues from Manitoba Hydro are not affected. The impact on the Province of
22 Manitoba is felt through the indirect economic impact of ratepayers being forced to pay higher
23 rates for electricity over time, which is a general drag on economic performance (akin to a loss
24 in purchasing power by all ratepayers).

25

1 **PUB/MPA 1-023(c)**

2 **REFERENCE:**

3 MPA Report Pages 52, 53 (Line 11), 74 & 75

4 **PREAMBLE:**

5 MPA states for government, higher exports mean that more of its revenue from Manitoba
6 Hydro is actually coming from export jurisdictions rather than ratepayers, which means that
7 other things being equal, the province as a whole should be receiving a net benefit.

8 **QUESTION:**

9 Please supplement figure 13 on page 52 to include a total of the government revenue and
10 include the amount of the revenue from domestic ratepayers and from exports under a
11 reference, high and low export scenario. Please also include the range of domestic rate
12 increases and comment on risk versus reward to ratepayer versus the Province.

13 **RESPONSE:**

14 Please see the table on the following page.

15 For each of the five Resource Plans, the PV of domestic ratepayer revenue is provided for the
16 full 48-year span of the model. PVs are provided for High/Reference/Low energy prices,
17 assuming Reference economic and capital cost variables in all cases.

18 In addition, the corresponding PV of Manitoba Hydro export revenues, Manitoba Hydro total
19 payments to government, and relative proportions based on exports are provided for each
20 case.

21

**PV of Domestic Ratepayer Revenue, Export Revenue, and Government of Manitoba Revenue Owing to Exports
All Gas and Preferred Development Plan, and Plans 4/6/12**
Reference Economics and Capital
Energy at High, Reference and Low
(2015 - 2062)
NPV @ 6.00%

	All Gas			Development Plan 4		
	High	Ref	Low	High	Ref	Low
PV of domestic ratepayer revenue	\$44,107	\$43,791	\$43,695	\$41,868	\$42,878	\$44,192
Export revenue % of total revenue	11.9%	9.5%	6.4%	21.1%	16.5%	10.7%
PV of export revenue	\$5,255	\$4,144	\$2,793	\$8,830	\$7,085	\$4,728
PV of Govt of MB revenue	\$5,937	\$5,866	\$5,937	\$6,751	\$6,733	\$6,899
PV of Govt of MB revenue due to exports	\$707	\$555	\$379	\$1,424	\$1,113	\$738

	Development Plan 6			Development Plan 12		
	High	Ref	Low	High	Ref	Low
PV of domestic ratepayer revenue	\$42,317	\$43,301	\$44,585	\$42,409	\$44,727	\$47,375
Export revenue % of total revenue	20.2%	16.0%	10.7%	24.5%	19.4%	12.8%
PV of export revenue	\$8,531	\$6,932	\$4,754	\$10,372	\$8,660	\$6,068
PV of Govt of MB revenue	\$6,781	\$6,775	\$6,969	\$7,703	\$7,747	\$8,015
PV of Govt of MB revenue due to exports	\$1,367	\$1,085	\$743	\$1,884	\$1,500	\$1,027

	Preferred Development Plan		
	High	Ref	Low
PV of domestic ratepayer revenue	\$41,991	\$44,230	\$47,037
Export revenue % of total revenue	26.2%	20.9%	14.3%
PV of export revenue	\$10,993	\$9,234	\$6,709
PV of Govt of MB revenue	\$7,911	\$8,061	\$8,417
PV of Govt of MB revenue due to exports	\$2,071	\$1,683	\$1,201

- 1
- 2 As can be noted, High energy prices (which includes export prices and natural gas prices, as well
- 3 as carbon taxes) cause domestic ratepayer costs to fall for all Plans except All Gas. Also, export
- 4 revenues are higher with higher energy prices, across all Plans.
- 5 Total revenue for the Government of Manitoba does not change substantially between
- 6 High/Reference/Low energy prices for each Plan, but varies between Plans, with higher
- 7 revenues associated with plans that include new hydroelectric facilities (i.e., Plans 4 and 6 have
- 8 higher government revenues than All Gas, while Plans 12 and the Preferred Plan have higher
- 9 revenues than Plans 4 and 6, which include Keeyask but not Conawapa).
- 10 For the Preferred Plan, the increase in domestic ratepayer costs from High energy prices to Low
- 11 energy prices is closely matched by the decrease in export revenues (domestic ratepayer
- 12 revenues are actually slightly greater than the loss in export revenue). Decline in export prices
- 13 essentially transfer costs from export customers to domestic customers in these cases.
- 14 For the All-Gas Plan, declining energy prices cause both domestic ratepayer costs and export
- 15 revenues to fall. This is likely because the “energy price” variables include both natural gas and

- 1 export price variables. When natural gas prices are lower, Manitoba Hydro production costs at
- 2 natural gas-fired generating stations are also lower.

- 3 From the government's perspective, a decline in energy prices is negative in all scenarios except
- 4 All-Gas, since domestic ratepayers must pay more for their electricity, and the province's
- 5 balance of trade also deteriorates. In the All Gas Plan, while the balance of trade deteriorates,
- 6 domestic ratepayers are actually better off.

- 7

1 **PUB/MPA 1-024(a)**

2 **REFERENCE:**

3 MPA Report Pages 51 (Line 18), 53 Figure 14

4 **PREAMBLE:**

5 Potomac provided an alternative export price forecast for Manitoba Hydro.

6 MPA alludes to technology change may impact future demand for electricity.

7 MPA States:

8 “For the Preferred Development Plan (14) the difference in rate patterns between the High and
9 Low Demand Assumptions are similar to what is depicted above for the "All Gas" plan (1) , and
10 the inferences that can be drawn are the same. In short if export prices are higher in the future,
11 then reducing domestic demand is beneficial for Manitoba ratepayers, but if export prices are
12 lower, than reducing domestic demand only raises cumulative rates in Manitoba , without
13 providing ratepayers much benefit”

14 **QUESTION:**

15 Please comment on the sensitivity to Manitoba ratepayers impact if electricity price forecasts
16 were lower than what is forecast.

17 **RESPONSE:**

18 Please see PUB/MPA 1-004 above for a discussion of the sensitivity of the Resource Plans to
19 export price levels.

20

1 **PUB/MPA 1-024(b)**

2 **REFERENCE:**

3 MPA Report Pages 51 (Line 18), 53 Figure 14

4 **PREAMBLE:**

5 Potomac provided an alternative export price forecast for Manitoba Hydro.

6 MPA alludes to technology change may impact future demand for electricity.

7 MPA States

8 For the Preferred Development Plan (14) the difference in rate patterns between the High and
9 Low Demand Assumptions are similar to what is depicted above for the "All Gas" plan (1) , and
10 the inferences that can be drawn are the same. In short if export prices are higher in the future,
11 then reducing domestic demand is beneficial for Manitoba ratepayers, but if export prices are
12 lower, than reducing domestic demand only raises cumulative rates in Manitoba , without
13 providing ratepayers much benefit

14 **QUESTION:**

15 Please provide an update to the average export revenue as a percentage of total revenue
16 reflecting the Potomac Report and comment on the changes

17 **RESPONSE:**

18 MPA's financial model is based on the detailed output of the Manitoba Hydro SPLASH model.
19 While we were provided with SPLASH model outputs based on High/Reference/Low energy
20 prices, these did not include Potomac's proposed forward price curves. In PUB/MPA 1-004
21 above, we provide data on the sensitivity of ratepayer costs to energy prices. Given that
22 Potomac suggests in their report that energy price expectations should be lower for each of the
23 High/Reference/Low cases than the forecasts provided by Manitoba Hydro, it is possible to
24 extrapolate as to the impact on ratepayers under each of the Plans. Given the negative
25 sensitivity of the Preferred Plan to lower energy prices (i.e., in a lower energy/export price
26 environment Manitoba ratepayers must pay more for their electricity over time), it can be

- 1 inferred that Potomac's forward price curves for exports would reduce the attractiveness of the
- 2 Preferred Plan as compared to the other Plans.
- 3

1 **PUB/MPA 1-025**

2 **REFERENCE:**

3 MPA Report Page 52 Lines 18-19

4 **PREAMBLE:**

5

6 **QUESTION:**

7 Given the apparent importance of export prices on all NPV, please explain why export prices
8 were blended in some fashion with natural gas prices in the modeling of NPV.

9 **RESPONSE:**

10 As noted in PUB/MPA 1-004(a) above, there is a relationship between natural gas prices and
11 export prices because of the impact of natural gas on the setting of marginal prices in the MISO
12 market, at least some of the time. However, while this relationship is directly proportional, it is
13 only partial (because other factors besides the price of natural gas set prices in the MISO
14 market some of the time). As noted in PUB/MPA 1-001, had Manitoba Hydro made use of a
15 “Monte Carlo” model to examine Resource Plans, it should have been possible to separately
16 address a wider range of variables.

17

1 **PUB/MPA 1-026**

2 **REFERENCE:**

3 MPA Report Page 53, footnote 29

4 **PREAMBLE:**

5 MPA states that "Note that since Manitoba Hydro's "Energy Prices" set of variables includes
6 both export prices AND natural gas

7 prices, for the All Gas Plan (1), higher prices means that exports are more valuable, but
8 domestic production costs rise with fuel prices, with the two effects cancelling each other out
9 to a great degree. The same is true in a lower prices environment, where lower export prices
10 reduce export revenues, but lower gas prices reduce production costs.

11 Since in the Preferred Development Plan (14) there is far less reliance on natural gas generation
12 in Manitoba, the export price impact dominates and the difference between the high price and
13 low price environment is very noticeable.

14 **QUESTION:**

15 Please confirm that the blending of gas prices [fuel cost] with electricity export prices [sales
16 revenue] into a single "energy price" variable for analytical purposes masks differences
17 between alternative development plans that may be significant – for example, if exports
18 electricity prices and gas prices become less strongly correlated.

19 **RESPONSE:**

20 As noted in PUB/MPA 1-001 above, this is a general methodological issue with the way
21 Manitoba Hydro has approached the testing of the Resource Plans it has identified. While
22 natural gas prices and MISO market prices are today somewhat correlated, the degree of
23 correlation is not necessarily stable over the next 48 years. The choice of methodology prevents
24 testing of potential changes in relationships between the variables.

25

1 **PUB/MPA 1-027(a)**

2 **REFERENCE:**

3 MPA Report Page 61 Line 18

4 **PREAMBLE:**

5 MPA states :

6 In a "normal situation, Manitoba Hydro's guidelines target not only an interest coverage ratio
7 of at least 1.2, but also coverage of typical capital spending requirements from internally
8 generated funds. If the company were not able to meet this objective during a one or two-year
9 drought, it would be unlikely the credit rating agencies would reassess their position on the
10 ability of Manitoba Hydro to be self-sustaining. However if drought conditions continued, and
11 rates were not allowed to rise sufficiently to meet these interest and capital costs, than the
12 shortfall in meeting them would become a focus for attention.

13 **QUESTION:**

14 Please provide a comparative analysis of the impact on net income and financial ratios of a
15 severe 5 year and severe 7 year drought in the 2030's. Please provide the analysis on the basis
16 of the indicated annual rate increase, and where the indicated rate increase is capped at no
17 more than twice the rate of inflation.

18 **RESPONSE:**

19 MPA is in process of extracting the data from our financial model, and will provide it as soon as
20 possible.

21

1 **PUB/MPA 1-027(b)**

2 **REFERENCE:**

3 MPA Report Page 61 Line 18

4 **PREAMBLE:**

5 MPA states :

6 In a "normal situation, Manitoba Hydro's guidelines target not only an interest coverage ratio
7 of at least 1.2, but also coverage of typical capital spending requirements from internally
8 generated funds. If the company were not able to meet this objective during a one or two-year
9 drought, it would be unlikely the credit rating agencies would reassess their position on the
10 ability of Manitoba Hydro to be self-sustaining. However if drought conditions continued, and
11 rates were not allowed to rise sufficiently to meet these interest and capital costs, than the
12 shortfall in meeting them would become a focus for attention.

13 **QUESTION:**

14 For the analysis in (a) please indicate the level of potential MH debt which could be
15 unsupported

16 **RESPONSE:**

17 MPA is in process of extracting the data from our financial model, and will provide it as soon as
18 possible.

19

1 **PUB/MPA 1-027(c)**

2 **REFERENCE:**

3 MPA Report Page 61 Line 18

4 **PREAMBLE:**

5 MPA states :

6 In a "normal situation, Manitoba Hydro's guidelines target not only an interest coverage ratio
7 of at least 1.2, but also coverage of typical capital spending requirements from internally
8 generated funds. If the company were not able to meet this objective during a one or two-year
9 drought, it would be unlikely the credit rating agencies would reassess their position on the
10 ability of Manitoba Hydro to be self-sustaining. However if drought conditions continued, and
11 rates were not allowed to rise sufficiently to meet these interest and capital costs, than the
12 shortfall in meeting them would become a focus for attention.

13 **QUESTION:**

14 Please Indicate the potential level of Government support required in each alternative.

15 **RESPONSE:**

16 MPA is in process of extracting the data from our financial model, and will provide it as soon as
17 possible.

18

1 **PUB/MPA 1-027(d)**

2 **REFERENCE:**

3 MPA Report Page 61 Line 18

4 **PREAMBLE:**

5 MPA states :

6 In a "normal situation, Manitoba Hydro's guidelines target not only an interest coverage ratio
7 of at least 1.2, but also coverage of typical capital spending requirements from internally
8 generated funds. If the company were not able to meet this objective during a one or two-year
9 drought, it would be unlikely the credit rating agencies would reassess their position on the
10 ability of Manitoba Hydro to be self-sustaining. However if drought conditions continued, and
11 rates were not allowed to rise sufficiently to meet these interest and capital costs, than the
12 shortfall in meeting them would become a focus for attention.

13 **QUESTION:**

14 Please elaborate on the amount of reserves the Province should establish for the Preferred
15 Development Plan and alternatives given the drought impacts determined.

16 **RESPONSE:**

17 MPA is in process of extracting the data from our financial model, and will provide it as soon as
18 possible.

19

1 **PUB/MPA 1-028(a)**

2 **REFERENCE:**

3 MPA Report Page 70 Line 113

4 **PREAMBLE:**

5 The Preferred Development Plan will lead to new debt having to be guaranteed by the Province
6 of Manitoba.

7 **QUESTION:**

8 Please illustrate the growth in the Manitoba economy versus debt levels for the past 5 years,
9 provide a projection based on current spending trends and indicate the relative debt to GDP
10 ratio for Manitoba.

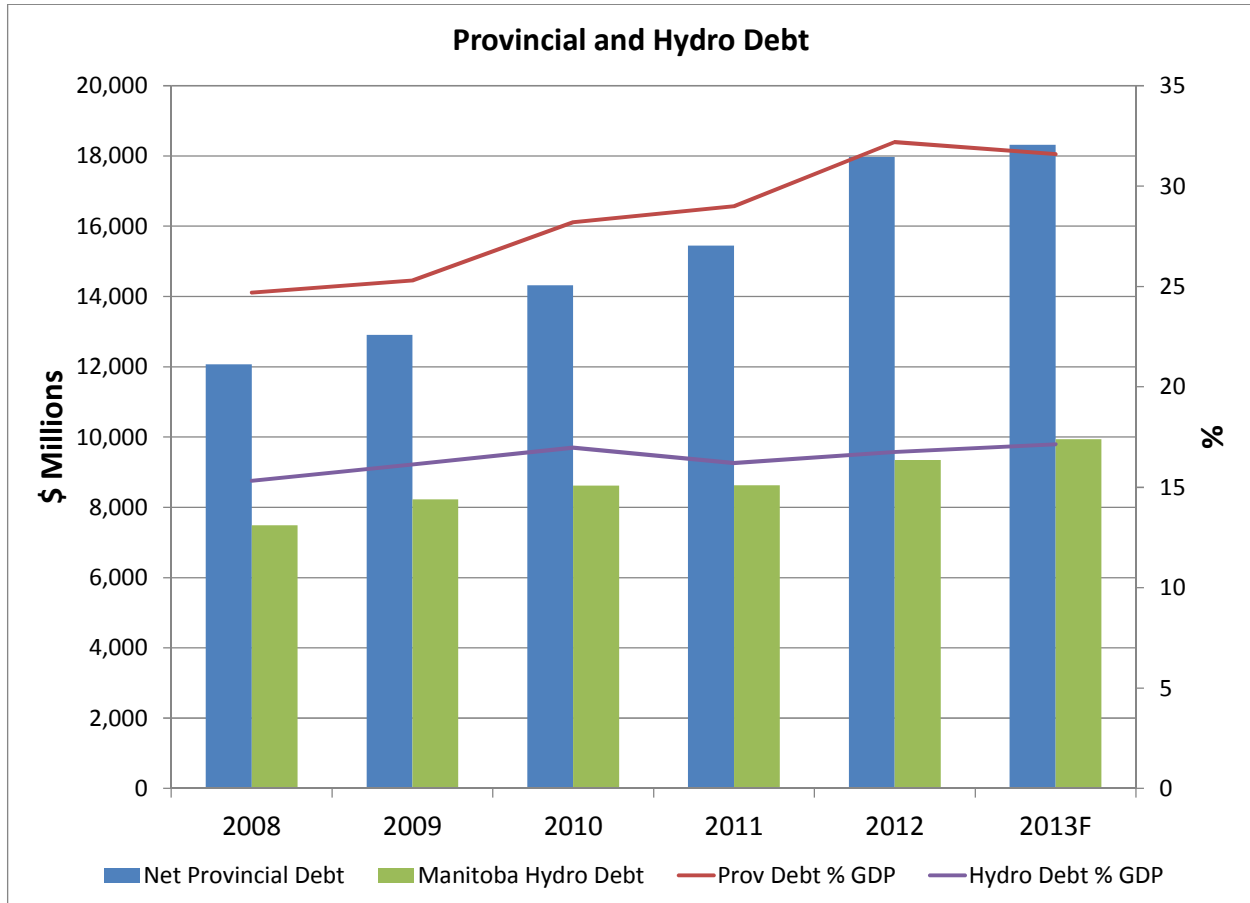
11 **RESPONSE:**

12 Please see the chart on the following page.

13 Manitoba debt levels have been rising over the past five years (represented by the blue
14 columns), and have also been rising relative to provincial GDP (represented by the red line),
15 since debt levels have been rising faster than provincial GDP has been growing. Provincial
16 nominal GDP grew by approximately 18% between 2007 and 2012 (calendar years), while debt
17 grew by approximately 50% between fiscal 2007/8 and 2012/13.

18 Provincial debt typically grows because of annual government operating deficits, investments in
19 infrastructure, or both. During the recession, both operating deficits and infrastructure
20 spending drove up Provincial debt. As of 2013/14, the Province's operating budget is expected
21 to be in balance, with a target for overall budget balance in 2016/17. Given that GDP is
22 expected to continue to grow, this should mean that growth in Provincial debt as a percentage
23 of GDP should first flatten and then decline. However, substantial infrastructure spending plans
24 and requirements over the next 10 years may continue to make the achievement of overall
25 budget balance challenging.

- 1 Over the 10 years from 2002 to 2012, Manitoba’s nominal GDP grew by approximately 50%, but
- 2 half of that growth was from inflation (real GDP grew by 25% over the decade, Please see
- 3 Statistics Canada CANSIM 384-0038 for detail on provincial GDP).



4

5 (Source, Moody’s Investor Service Credit Reports for July 2011 and July 2013)

- 6 The chart also depicts the size of Manitoba Hydro debt, and its relation to GDP. Manitoba
- 7 Hydro’s debt has been growing less rapidly than the Province’s, but this will change with the
- 8 aggressive spending plans of the next decade.

1 **PUB/MPA 1-028(b)**

2 **REFERENCE:**

3 MPA Report Page 70 Line 113

4 **PREAMBLE:**

5 The Preferred Development Plan will lead to new debt having to be guaranteed by the Province
6 of Manitoba.

7 **QUESTION:**

8 Please discuss the relative magnitude of the current Preferred Development Plan borrowings
9 relative to the provincial public sector economy .

10 **RESPONSE:**

11 As of 2013 (according to Moody's Investor Service, please see the July 23rd, 2013 Credit
12 Analysis), and as depicted in the chart above in PUB/MPA 1-028(a), Manitoba Hydro was
13 responsible for approximately one third of the Province of Manitoba's total direct and indirect
14 debt (approximately \$10 billion out of \$30 billion).

15 Assuming Manitoba Hydro adds approximately \$16 billion of debt through execution of the
16 Preferred Plan over the next ten years, Manitoba Hydro's portion of the Province's net debt
17 should be expected to grow significantly. The Province's net debt grew significantly from 2008
18 to 2013, but growth in the Province's net debt is expected to moderate, because of the return
19 to balanced budgets in the next few years. While continued spending on infrastructure will
20 push Provincial debt higher, the Province would have to add twice as much debt as Manitoba
21 Hydro every year for the relative shares of total debt to remain the same (i.e., given today's
22 two-to-one ratio between Provincial net debt and Manitoba Hydro debt, if Manitoba Hydro
23 adds \$16 billion of debt over 10 years, the Province would have to add \$32 billion over ten
24 years to keep the same two-to-one ratio, which is extremely unlikely according to public
25 statements made by the government and recent trends).

1 If, for example, the Province added approximately \$10 billion to its tax-supported debt while
2 Manitoba Hydro added \$16 billion in debt, then Manitoba Hydro's proportion of total Provincial
3 debt would reach approximately 45%.

4 From a debt to GDP perspective, much obviously depends on the pace of nominal GDP growth.
5 Over the 10 years from 2002 to 2012, Manitoba's nominal GDP grew 50%, from \$37 billion to
6 \$58 billion. If the economy grows by a similar dollar amount over the next ten years to \$79
7 billion, then Manitoba Hydro's debt alone could represent 33% of Manitoba's GDP. On the
8 other hand, if Manitoba's GDP grows by 50%, as it did in the past ten years, reaching \$87 billion
9 in ten years, then Manitoba Hydro's debt would represent 30% of GDP (from the forecasted
10 2013 level of about 17%).

11 In the event that Manitoba Hydro would face financial distress in the mid-2020s, when its debt
12 is at its peak, this may represent a challenge for the Province as a whole.

1 **PUB/MPA 1-029(a)**

2 **REFERENCE:**

3 MPA Report Page 66 Line 8

4 **PREAMBLE:**

5 MPA has calculated the implied Long Canada Bond rate used by MH in its analysis and has
6 provided some historical perspective on Long Canada Bond rates.

7

8 MPA states that Manitoba Hydro has assigned probabilities of 35% for high, 50% for reference,
9 and 15% for low with respect to the cost of debt. By reference to the historical record, there
10 does not appear to be a strong support for the reference scenario, and some support for the
11 high scenario, but little if any support for the low scenario as it is constructed, at least with
12 respect to the cost of debt.

13 **QUESTION:**

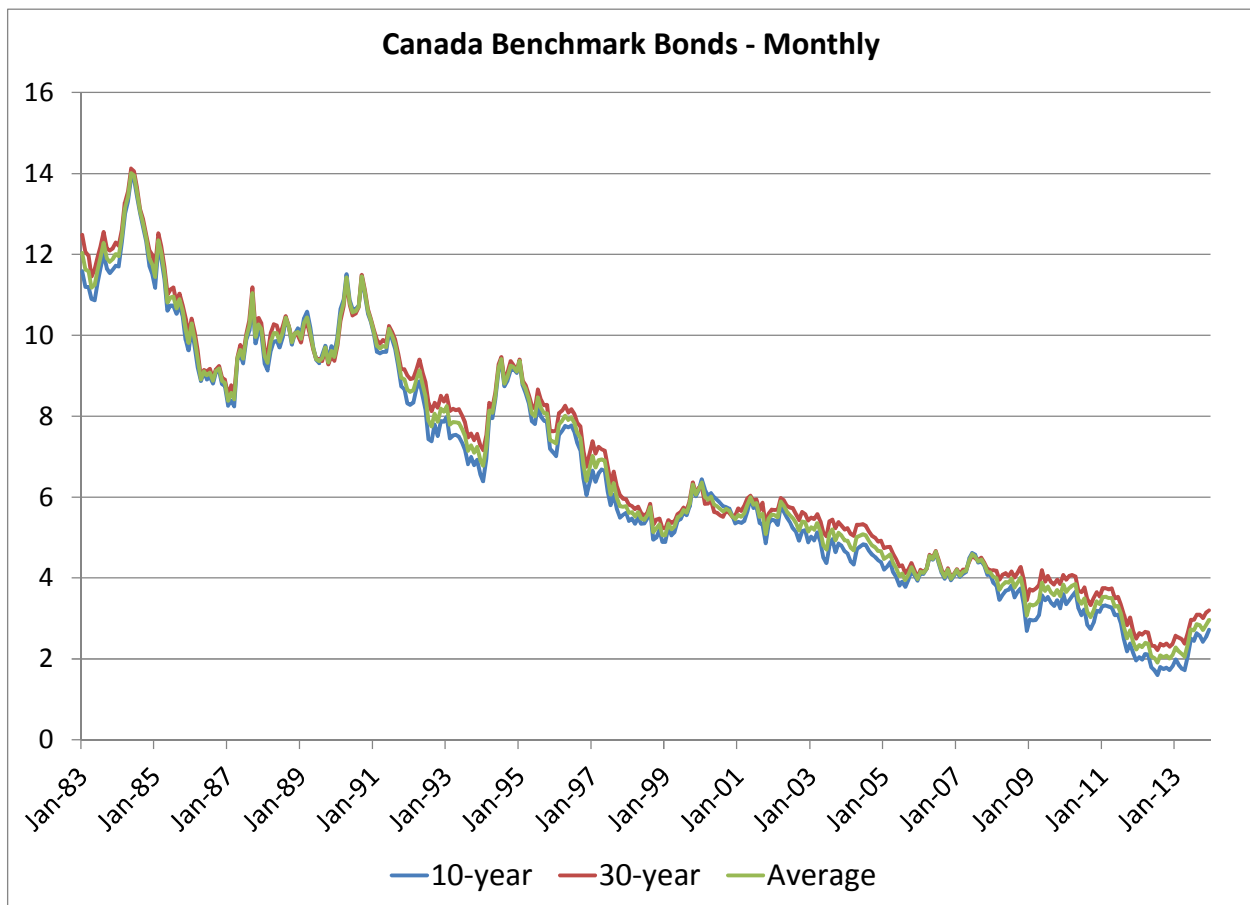
14 In light of the observations on long-term debt rates, please indicate what MPA believes should
15 be the probability weighting related to the cost of debt.

16 **RESPONSE:**

17 As noted in Figure 19 of our report, Manitoba Hydro assumed High, Reference and Low costs of
18 debt of 8.95%, 6.30%, and 3.65%, respectively. These nominal debt costs include the Province
19 of Manitoba debt guarantee fee, currently set at 1%, and the spread above Canada bonds
20 which applies to Manitoba bonds (which we assumed might range from 0.30% to 0.70%, though
21 historically the range has been from approximately 0.20% to more than 1.50%).

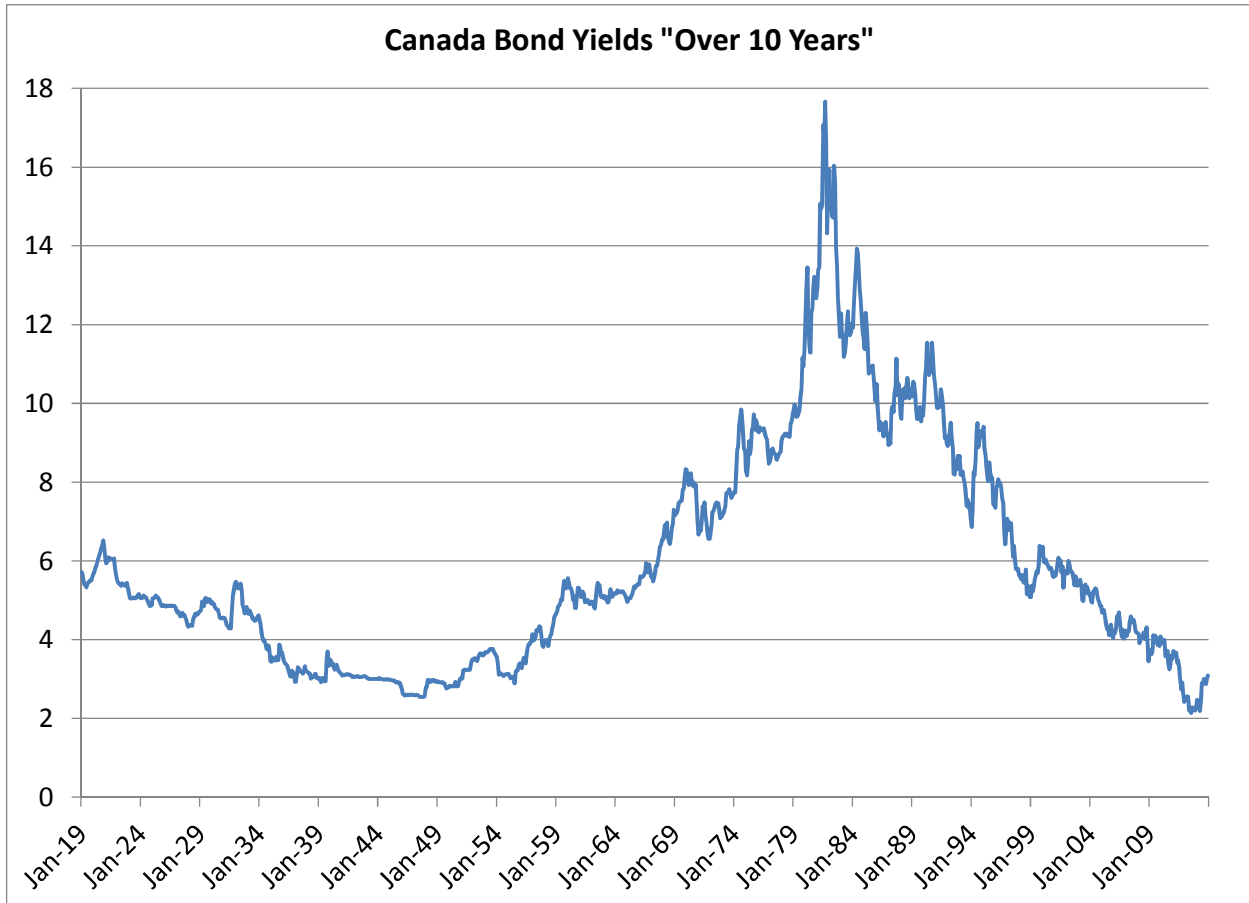
22 Manitoba Hydro points out that they have used a 20-year bond term in their modeling, and
23 MPA followed suit. In fact, 20 years is an atypical period for bond term issuance in Canada,
24 which are more often found in 10-year and 30-year lengths. However, 20 years may well be a
25 useful average if it is assumed that Manitoba Hydro might choose to manage its bond portfolio
26 through a combination of 10 and 30-year bond issues.

1 Monthly data is publicly available from the Bank of Canada and Statistics Canada for 10-year
 2 Canada bonds (Statistics Canada Cansim series V122543) dating back to 1983. Monthly data for
 3 30-year bonds is available dating back to 1976 (Statistics Canada Cansim series V122544). For
 4 the period 1983 to 2013, an average of these two bonds can be calculated.



5
 6 Much older monthly data is available for a different measure, the average of “Over 10 Years”
 7 bonds (Statistics Canada Cansim series V122487, and also available through the Bank of
 8 Canada). This measure takes into account the fact that the Bank of Canada measures and tracks
 9 its portfolio of many bonds at any given time, and provides an average yield for all of the bonds
 10 with a term longer than 10 years. Comparison of this data series to the average of the 10-year
 11 and 30-year bonds depicted above shows that over the period between 1983 and 2013, the
 12 “Over 10-years” measure and the average of the 10 and 30 year bonds are within 15 basis
 13 points of each other, on average. This suggests that the “Over 10-years” data series may be a

1 useful benchmark to use for the purposes of examining the interest rates that Manitoba Hydro
 2 selected in its modeling. The “Over 10 Years” monthly data is available back to 1919.



3
 4 Bearing in mind that both MPA and Manitoba Hydro’s financial models are for a 48 year term,
 5 and the High, Reference and Low interest rates are assumed to be possible average interest
 6 rates for the entire 48 year period, it is useful to consider the actual history of Canada Long
 7 bonds. The 48-year moving average of the “Over 10 Year” bonds ranges from 4.1% to 7.9%
 8 (average is 6.3%, with a standard deviation of 1.4%). This is not surprising considering the
 9 period of very high interest rates from 1973 to 1995, during which Canada Long Bond rates
 10 were generally higher than 8% (note that almost all of the possible 48-year moving averages
 11 capture some part of this period). If that entire 22-year period is “excised” from history, then
 12 the 48-year moving average ranges from 4.1% to 4.6% (average of 4.4%, with a standard
 13 deviation of 0.17%).

14 Even considering a much shorter period of 20 years instead of 48 years (the shorter period
 15 allows for the avoidance of the 1973 to 1995 period for more of the calculations), the moving

1 average ranges from 3.1% to 10.5%. If the period from 1973 to 1993 is ignored, then the 20-
2 year moving average ranges from 3.1% to 5.3%.

3 Manitoba Hydro's choice of debt costs implies long-term Canada bond yields of approximately
4 7.25%, 4.80% and 2.35%, according to MPA's analysis, as presented in section 5.1.1 of our
5 report. Based on the available historical data, we observe very little historical and empirical
6 support for any probability of a 48-year average interest rate of 2.35%, or any level below 3%
7 (the low end of the 20-year moving averages is 3.1%). On a 48-year basis, it may be argued that
8 4% might be considered a lower boundary, if the entire historical record is taken into account.

9 It should be noted that Manitoba Hydro did not isolate interest rates in its analysis, but rather
10 grouped interest rates with inflation and Canada-US exchange rates. As a result, it is not
11 appropriate to suggest a probability distribution for the High, Reference and Low "Economics"
12 variables solely on the basis of interest rates. However, to the extent that interest rates form an
13 important part of the group of "Economics" variables, we believe that there is little support for
14 assigning 15% probability to the Low scenario.

1 **PUB/MPA 1-029(b)**

2 **REFERENCE:**

3 MPA Report Page 66 Line 8

4 **PREAMBLE:**

5 MPA has calculated the implied Long Canada Bond rate used by MH in its analysis and has
6 provided some historical perspective on Long Canada Bond rates.

7

8 MPA states that Manitoba Hydro has assigned probabilities of 35% for high, 50% for
9 reference, and 15% for low with respect to the cost of debt. By reference to the historical
10 record, there does not appear to be a strong support for the reference scenario, and some
11 support for the high scenario, but little if any support for the low scenario as it is constructed,
12 at least with respect to the cost of debt

13 **QUESTION:**

14 Please indicate what long term debt rate should be used in the low, reference and high case in
15 the analysis and explain why the rates should be used.

16 **RESPONSE:**

17 Based on the information provided in the response to PUB/MPA 1-029(a), above, we believe
18 that a case could be made for assuming three scenarios founded upon long Canada bonds at
19 3.00%, 5.00% and 7.00%. The 1% Manitoba debt guarantee fee should be added to these
20 interest rates, as would an assumed Manitoba/Canada bond spread (possibly 0.3%, 0.6% and
21 0.9% to reflect the historical range as depicted in Figure 22 of the MPA report). This would
22 result in Manitoba Hydro debt costs ranging from 4.30% to 6.60% to 8.90%. In effect, the Low
23 scenario would be substantially more expensive than the scenario crafted by Manitoba Hydro,
24 while the Reference and High scenarios are basically consistent with the choices made by
25 Manitoba Hydro.

26

1 **PUB/MPA 1-030(a)**

2 **REFERENCE:**

3 MPA Report Page 66 Line 29

4 **PREAMBLE:**

5 MH has used a 4.5% equity risk premium in determining its WACC.

6

7 MPA states that given Manitoba Hydro's high degree of exposure to hydrology risk, its financial
8 exposure to market export prices, and the ambitious construction program including the
9 preferred development plan, the general issue can be raised with respect to what would
10 represent a reasonable equity risk premium.

11 **QUESTION:**

12 Please indicate whether MPA believes the equity risk premium used by MH is appropriate. If
13 not appropriate, what would MPA believe the equity risk premiums should be and MPA's
14 rationale for its selection.

15 **RESPONSE:**

16 In the calculation of its WACC, Manitoba Hydro has adopted the position that equity should be
17 priced at 3% above the effective cost of debt in each of the High/Reference/Low economic
18 scenarios. Based on MPA's calculations, this amounts to approximately 4.5% above the cost of
19 long Canada bonds.

20 An equity risk premium at this level would be at the extreme low end of the range for regulated
21 North American utilities, as discussed in section 5.1.1 of our Report. As noted, an Ontario
22 Energy Board review of this issue concluded that an equity risk premium of 5% above long
23 Canada bonds would be appropriate for regulated "wires" companies (which in Ontario are
24 subject to a 60:40 debt to equity capital structure, and are fully rate-regulated).

1 Since Manitoba Hydro’s cash flows fluctuate dramatically with hydrology and export prices, and
2 Manitoba Hydro’s target equity ratio is a comparatively thin 25%, the use of an equity risk
3 premium as low as 4.5% is notable. On the other hand, Manitoba Hydro is governed by “cost of
4 service” legislation, which nominally requires Manitoba ratepayers to bear all of Manitoba
5 Hydro’s costs, and Manitoba Hydro benefits from a Province of Manitoba guarantee of
6 substantially all of its debt.

7 Assuming the legislation is accepted at face value and domestic rates could rise to whatever
8 level were required at any given time to maintain Manitoba Hydro solvency, under any
9 circumstances, then a legitimate question is whether an “equity risk premium” is applicable?
10 On its face, the legislation coupled with the provincial debt guarantee suggests that there is no
11 risk to equity, and hence the premium should be 0%. In reality, however, rates do not rise and
12 fall annually, but are smoothed over time. This suggests that equity returns should be built into
13 rate structures to provide a cushion for inevitable swings in cash flow that derive from non-
14 controllable events, such as hydrology and export prices. Moreover, the possibility of prolonged
15 financial distress also suggests that equity premiums (and a healthy equity ratio target) are
16 required.

17 Finally, in the context of the Resource Plans being considered, where in most cases much more
18 than 75% of capital expenditures will actually be debt funded (which is why the debt ratio is
19 expected to rise dramatically above 75% for the next 20 years), a higher equity premium that
20 translates to higher rates will encourage the rebuilding of retained earnings to a healthy level.

21 In our view, the equity risk premium for Manitoba Hydro should be at least 5% above Canada
22 Long Bonds, and we argue should be targeted to 6% for all of the reasons discussed.

23 Combining our views on interest rates and the equity premium results in the following views on
24 WACC:

Alternative WACC Calculation

	Ratio	Nominal			Inflation			Real		
		High	Ref	Low	High	Ref	Low	High	Ref	Low
Debt	75%	8.90%	6.60%	4.30%	3.00%	2.00%	1.00%	5.73%	4.51%	3.27%
Equity	25%	13.00%	11.00%	9.00%	3.00%	2.00%	1.00%	9.71%	8.82%	7.92%
WACC	100%	9.93%	7.70%	5.48%				6.72%	5.59%	4.43%

1

2 As compared to Manitoba Hydro’s suggested WACC calculation (9.70%, 7.05% and 4.40%), our
 3 views lead to a substantially higher Low scenario, a moderately higher Reference scenario, and
 4 a High scenario that is almost identical to Manitoba Hydro.

5 The practical impact of assuming a higher equity risk premium and hence a higher WACC in our
 6 financial models would be that in all scenarios rate increases continue at double the rate of
 7 inflation for a period longer than they otherwise would. However, subsequent rate pressures in
 8 the face of shocks would be moderated.

9 In terms of the impact on choices between Resource Plans, driving up the WACC would tend to
 10 comparatively favour Plans which are less capital intensive. Consistent with the analysis in our
 11 report, in the High economics scenario, where WACC is higher, the Preferred Plan performs
 12 worse comparatively to other Plans than when the WACC is lower (in the Low economics
 13 scenario).

1 **PUB/MPA 1-030(b)**

2 **REFERENCE:**

3 MPA Report Page 66 Line 29

4 **PREAMBLE:**

5 MH has used a 4.5% equity risk premium in determining its WACC.

6

7 MPA states that given Manitoba Hydro's high degree of exposure to hydrology risk, its financial
8 exposure to market export prices, and the ambitious construction program including the
9 preferred development plan, the general issue can be raised with respect to what would
10 represent a reasonable equity risk premium.

11 **QUESTION:**

12 Please indicate how the revised equity risk premium would manifest itself in the reference and
13 high discount rate used in the NPV analysis.

14 **RESPONSE:**

15 Please see the response to PUB/MPA 1-030(a) above.

16

1 **PUB/MPA 1-030(c)**

2 **REFERENCE:**

3 MPA Report Page 66 Line 29

4 **PREAMBLE:**

5 MH has used a 4.5% equity risk premium in determining its WACC.

6

7 MPA states given Manitoba Hydro high degree of exposure to hydrology risk, its financial
8 exposure to market export prices, and the ambitious construction program including the
9 preferred development plan, the general issue can be raised with respect to what would
10 represent a reasonable equity risk premium

11 **QUESTION:**

12 How would a change in probability weighting and discount rates impact on the ratepayer
13 impacts for the five plans.

14 **RESPONSE:**

15 Please see the response to PUB/MPA 1-030(a) above.

16

1 **PUB/MPA 1-031**

2 **REFERENCE:**

3 MPA Report Page 66 Line 29

4 **PREAMBLE:**

5 MPA refers to an Ontario Energy Board study entitled "Report of the Board on the Cost of
6 Capital for Ontario's Regulated Utilities" Ontario Energy Board, EB-2009-
7 0084.

8 **QUESTION:**

9 Please clarify whether the Ontario Energy Board cost of capital study was directed towards
10 "wires" utilities rather than generation utilities. Please differentiate the risk profiles of a "wires"
11 utility versus a vertically integrated generation utility like Manitoba Hydro in the determination
12 of discount rates.

13 **RESPONSE:**

14 Yes, the OEB report refers principally to low risk "wires" utilities. Please see the discussion in
15 PUB/MPA 1-030(a) above.

16

1 **PUB/MPA 1-032(a)**

2 **REFERENCE:**

3 MPA Report Pages 68 (Line 31), 69 (Line 3)

4 **PREAMBLE:**

5 MPA states that: "MH is simply a price taker in the MISO market , whether it is taking prices in
6 short-term contracts, or longer-term market for bilateral arrangements with specific
7 counterparties. The value of long-term contracts negotiated any time are likely, as Potomac
8 Energy, another independent expert consultant to the PUB has argued in their report, to be
9 based on the cost of new entry into the MISO market [or in other words, the cost of
10 constructing new supply resources in the MISO market at the time a contract is negotiated]. As
11 a result, the long-term firm contracts are not mitigating market risk or exposure for Manitoba
12 Hydro, but merely apportioning the market risk accepted in pursuing the Preferred
13 Development Plan."

14

15 MPA further states that "Manitoba Hydro is acting as a merchant investor, taking substantial
16 market risk based on expectations, or bets, about the future."

17 **QUESTION:**

18 Please indicate the implications on risk of Manitoba Hydro's Preferred Development Plan
19 compared to alternatives, and whether the discount rate applied to each analysis is
20 appropriate given the magnitude of the proposed plan.

21 **RESPONSE:**

22 All commercial opportunities are fundamentally concerned with the balance between risk and
23 reward. Typically, investors considering a potential investment are interested in five basic
24 questions:

- 1 • the amount of capital that must be put at risk (because capital is usually a scarce
2 resource, and also because investors are concerned about the allocation of their total
3 portfolio of available capital),
- 4 • the total return that is expected on that capital (most investors have a minimum target
5 level of return they seek, a “hurdle” rate for their investments),
- 6 • the length of time for which the capital is required (this is associated with the scarcity
7 of capital resources and portfolio allocation over time),
- 8 • the degree of risk associated with the venture (which can be measured by both the
9 uncertainty associated with the total return, and the variability of the expected returns
10 over time), and
- 11 • the availability of alternative investment opportunities (which both represent a
12 comparative or market cost of capital benchmark, and alternative portfolio allocation
13 opportunities).

14 Comparing commercial opportunities in the context of these questions is generally focused on
15 the balance between total return opportunity and risk, with limitations created by the portfolio
16 issues of maximum capital at risk for specific lengths of time. For example, an investor may only
17 be willing to put a certain percentage of their portfolio into a single venture, and may have
18 minimum requirements for the liquidity of their assets (e.g., 10 or 20 years). Investors will
19 typically rely on portfolio limitations to quickly discard opportunities that are inappropriate,
20 and then concentrate on total return vs. risk measurements. If two opportunities have the
21 same average expected total return, then the opportunity with less variability and volatility will
22 obviously be superior. If two opportunities face approximately similar variability and volatility,
23 then the option with the higher expected return is the obvious choice. A more challenging –
24 and most common – situation is where one option has a higher expected return but also higher
25 variability and volatility. Choosing between a lower returning but “safer” investment and a
26 higher returning but “riskier” investment is the essence of commercial choices. Financial
27 modeling features – such as present values, discount rates, averages, standard deviations,

1 maximum and minimum ranges, etc. – are merely mathematical tools that are used to
2 illuminate the fundamental commercial choices that investors must make commercial
3 judgements about.

4 In the case of Manitoba Hydro and its Resource Plan options, this typical investment construct
5 appears on the surface to be inappropriate. For example, given the cost of service nature of the
6 corporation’s mandate, and the government guarantee on Manitoba Hydro’s debt, it would
7 appear that capital is neither limited, nor subject to a minimum return requirement, nor
8 constrained by time. Conceivably, Manitoba Hydro could borrow as much capital as it chooses,
9 for any planned length of time, without concern about the returns on that capital since
10 ratepayers are required by law to make good on costs (and no profits are ever distributed by
11 Manitoba Hydro in any case).

12 In reality, Manitoba Hydro is not so unconstrained. It is obligated to make plans to provide
13 service to customers as efficiently as possible, and at reasonable cost. This requirement to
14 minimize costs replaces, in some sense, the hurdle rate that a typical investor faces. Also, while
15 its capital resources are theoretically unlimited, the Province is definitely affected by the
16 exposure to a large amount of debt through operation of the guarantee. As a result, estimating
17 the magnitude of debt guarantee exposure and the likelihood that it would be realized is an
18 important part of comparing the options facing Manitoba Hydro.

19 The role of the discount rate, in the Manitoba Hydro context, should in the view of MPA be
20 focused on the time value of money to ratepayers. Whereas for a typical investor, the discount
21 rate could either represent the investor’s hurdle rate if calculating the expected present value
22 of the investment, or if calculating IRR rather than total return it could represent the total cost
23 of capital for the project (based on the actual capital structure of the project and the expected
24 cost of debt), neither of these uses appears to be appropriate in the current case. Since
25 minimizing cost to ratepayers is a priority, use of the discount rate seems better focused on the
26 comparison of ratepayer costs over time. As discussed in CAC/MPA 1-007(b), it is not clear that
27 there is a compelling case to be made for any single discount rate, given the heterogeneity of
28 the ratepayers and stakeholders implicated by the NFAT. As a result, MPA applied two different

1 discount rates to the outputs of our financial modeling to better understand what the
2 implications of differing time values of money would be for the rank ordering of the Resource
3 Plans.

4 This leaves the issue of risk. In the context of Manitoba Hydro and the Resource Plan options,
5 risk is represented by the variability of the total expected costs to ratepayers, the volatility of
6 those costs over time, and both the magnitude of stranded debt exposure of the Province of
7 Manitoba and the likelihood that the exposure will actually materialize.

8 As was noted in our report, of the Plans reviewed, the Preferred Plan appears to be not only
9 most sensitive to export prices (as shown in PUB/MPA 1-004(a) above), but also most sensitive
10 to hydrology, and highly sensitive to the various economic variables, such as interest rates.
11 Since none of these are within the control of Manitoba Hydro, it would be fair to argue that the
12 Preferred Plan entails more “risk” for ratepayers than the other Plans. In addition, since the
13 magnitude of debt exposure is greater for the government in the Preferred Plan, but the
14 likelihood of exposure seems to be similar to the other Plans (since severe drought causes
15 significant financial distress under all Plans), the Preferred Plan appears to be riskier for
16 government as well.

17 These risks must be balanced against other features and benefits of the various Plans (such as
18 their relative merits in creating jobs, delivering revenue to government, and creating potential
19 legacy benefits for future generations beyond the 48-year period MPA reviewed, etc.) in order
20 to arrive at a commercial judgement about the overall desirability of each Plan.

21 Based on this line of analysis, we do not believe that the discount rate need be adjusted when
22 considering different Resource Plans, however, we do believe that specific attention is required
23 to the variability and volatility of expected returns in order to better capture and understand
24 the degree of risk in each Plan.

25

1 **PUB/MPA 1-032(b)**

2 **REFERENCE:**

3 MPA Report Pages 68 (Line 31), 69 (Line 3)

4 **PREAMBLE:**

5 MPA states that : "MH is simply a price taker in the MISO market , whether it is taking prices in
6 short-term contracts, or longer-term market for bilateral arrangements with specific
7 counterparties. The value of long-term contracts negotiated any time are likely, as Potomac
8 Energy, another independent expert consultant to the PUB has argued in their report, to be
9 based on the cost of new entry into the MISO market [or in other words, the cost of
10 constructing new supply resources in the MISO market at the time a contract is negotiated]. As
11 a result, the long-term firm contracts are not mitigating market risk or exposure for Manitoba
12 Hydro, but merely apportioning the market risk accepted in pursuing the Preferred
13 Development Plan."

14

15 MPA further states that "Manitoba Hydro is acting as a merchant investor, taking substantial
16 market risk based on expectations, or bets, about the future."

17 **QUESTION:**

18 Please indicate what portion of the risk is being borne by MH ratepayers versus the Province
19 and discuss the implications on discount rates that relate to each.

20 **RESPONSE:**

21 As noted in PUB/MPA 1-023(a) above, total government revenue does not vary significant with
22 export prices (government revenues vary depending on the Plan selected, but within each Plan,
23 export prices are not significant to government revenues).

24 Ratepayers, however, are significantly affected by the future path of export prices, and of the
25 Resource Plans examined, the Preferred Plan is most sensitive to export prices (as shown in
26 PUB/MPA 1-023(c) above). Ratepayers are therefore primarily bearing the burden of risk

1 related to export prices. As discussed, however, government is indirectly sensitive to this risk,
2 since higher costs paid for electricity by domestic ratepayers reduces their overall purchasing
3 power for other goods (for business ratepayers, paying more for electricity potentially means a
4 reduction in profits, and hence in corporate income taxes to government, for example).

5 As discussed in PUB/MPA 1-032(a), we do not believe that recognition of these risks need be
6 reflected in discount rates in the financial modeling, as long as they are otherwise recognized in
7 the evaluation of the Resource Plans.

8

1 **PUB/MPA 1-032(c)**

2 **REFERENCE:**

3 MPA Report Pages 68 (Line 31), 69 (Line 3)

4 **PREAMBLE:**

5 MPA states that : "MH is simply a price taker in the MISO market , whether it is taking prices in
6 short-term contracts, or longer-term market for bilateral arrangements with specific
7 counterparties. The value of long-term contracts negotiated any time are likely, as Potomac
8 Energy, another independent expert consultant to the PUB has argued in their report, to be
9 based on the cost of new entry into the MISO market [or in other words, the cost of
10 constructing new supply resources in the MISO market at the time a contract is negotiated]. As
11 a result, the long-term firm contracts are not mitigating market risk or exposure for Manitoba
12 Hydro, but merely apportioning the market risk accepted in pursuing the Preferred
13 Development Plan."

14

15 MPA further states that "Manitoba Hydro is acting as a merchant investor, taking substantial
16 market risk based on expectations, or bets, about the future."

17 **QUESTION:**

18 Is the current balance of risk between MH ratepayers and the Province properly aligned?

19 Explain.

20 **RESPONSE:**

21 As discussed in PUB/MPA 1-032(b) above, it can be argued that government and ratepayers are
22 aligned with respect to export price risks, since lower export prices cause higher domestic rates,
23 which is also indirectly a burden on government.

24

1 **PUB/MPA 1-032(d)**

2 **REFERENCE:**

3 MPA Report Pages 68 (Line 31), 69 (Line 3)

4 **PREAMBLE:**

5 MPA states that : "MH is simply a price taker in the MISO market , whether it is taking prices in
6 short-term contracts, or longer-term market for bilateral arrangements with specific
7 counterparties. The value of long-term contracts negotiated any time are likely, as Potomac
8 Energy, another independent expert consultant to the PUB has argued in their report, to be
9 based on the cost of new entry into the MISO market [or in other words, the cost of
10 constructing new supply resources in the MISO market at the time a contract is negotiated]. As
11 a result, the long-term firm contracts are not mitigating market risk or exposure for Manitoba
12 Hydro, but merely apportioning the market risk accepted in pursuing the Preferred
13 Development Plan."

14

15 MPA further states that "Manitoba Hydro is acting as a merchant investor, taking substantial
16 market risk based on expectations, or bets, about the future."

17 **QUESTION:**

18 Please indicate whether MH has applied the proper analytical tools in assessing the degree of
19 certainty or the returns for the Preferred Development Plan.

20 **RESPONSE:**

21 In financial terms, "risk" is concerned with both the degree of uncertainty associated with total
22 returns from a venture, and the expected volatility of those returns over time (predictability of
23 returns generally being considered a good thing in commercial terms).

24 In Manitoba Hydro's business case, Resource Plans were tested against a variety of scenarios
25 encompassing possible futures, and the financial outcomes of those futures for ratepayers were
26 examined. The emphasis in this part of their analysis was on calculating the probability-

1 weighted expected cash flows, or in other words, the total returns to the notional investor.
2 However, there was little emphasis placed on comparing the sensitivity of the Resource Plans to
3 all of the variables being considered.

4 In both Figures 10.5 and 10.7 of the Business Case, Manitoba Hydro provides vertical depictions
5 of the range of possible financial outcomes for ratepayers based on the 15 Resource Plans
6 examined (Figure 10.5 is a “scatter plot” of the scenario outcomes for each Plan, but without
7 probability weighting; Figure 10.7 is a “box and whisker” chart which adds information about
8 probability weighting and the weighted average result for each Plan). However, there is no
9 discussion in either case of the relationship of these plots to the definition of risk: i.e., to the
10 fact that the *length* of the lines or boxes is an element of analytical importance just as much as
11 the weighted average is. Shorter length means less variability in outcome, which typically
12 signifies less *risk*.

13 As stated in PUB/MPA 1-032(a), typical investors will be most challenged in choosing between
14 one option with a higher average expected return but also higher risk measured in variability,
15 and a second option with a lower average expected return but lower risk measured in
16 variability. This is the essence of “risk-reward” choices. In reviewing the Resource Plans
17 available to it, Manitoba Hydro did not address this basic choice clearly. Figure 10.7 would have
18 been an obvious point at which to address the risk-reward choice, but the issue was not made
19 explicit. For example, in reviewing that Figure, it is immediately noticeable that the “box and
20 whisker” for Plans 2, 4, 5, 6, and 7 are *all* captured *within* the range of Plan 14. Every one of
21 these Plans represents a “lower return in exchange for less risk” choice as compared to Plan 14.

22 Manitoba Hydro did examine sensitivity of some of the Resource Plans to issues such as
23 drought, but did not address the relative sensitivity of the Resource Plans to the many variables
24 included in the scenarios, such as interest rates, export prices, capital cost overruns, etc.

25 From the perspective of government, and the exposure of the government to its debt
26 guarantee, the Business Case does address the issue of potential losses that might be suffered
27 during a severe drought (the subject of losses is somewhat obscured by the focus on a

1 cumulative five-year decline in retained earnings as the metric of choice). However, while
2 retained earnings are an important measure of financial health, Manitoba Hydro’s own financial
3 policies focus on debt interest coverage ratio, equity ratio, and the ability to cover normal
4 course capital costs through internal cash flow. The risk that these metrics may suffer during a
5 drought-caused period of financial distress, and that through this metrics there may be
6 implications for the Province, is not covered.

7 Finally, Manitoba Hydro assumed throughout its analysis that “average” hydrology would occur
8 in every year (with the exception of the specific analysis of drought impacts). As a result, the
9 annual and medium term volatility of cash flows based on hydrology was largely ignored. This
10 lack of focus on volatility, and the possibility that different Resource Plans would be affected
11 differently by hydrology is particularly striking given the history of water flows in Manitoba.
12 Since volatility is another important component of risk analysis, this oversight adds to the
13 impression that risk measurement, as a separate valuable analytical issue from the prediction of
14 expected total returns, was given somewhat less attention in the Manitoba Hydro Business
15 Case than might have been hoped for.

1 **PUB/MPA 1-033(a)**

2 **REFERENCE:**

3 MPA Report Pages 71 (Line 17), 77

4 **PREAMBLE:**

5

6 **QUESTION:**

7 Please indicate the financial implications and potential for Manitoba distress, if below average
8 water flow were to occur for a sustained period as a flip-side to the higher than average
9 waterflows which has occurred over the last 20 years.

10 **RESPONSE:**

11 All of the twenty-year periods on record that have average water flows low enough to be a
12 “flip-side” to the high water flows of the the last two decades contain at least one severe
13 drought.

14 The drought scenario examined in PUB/MPA 1-027 above, is in fact one such two decade period
15 that would be a “flip-side” to the last twenty years. The discussion provided in that question
16 suggests the potential for distress.

17

1 **PUB/MPA 1-033(b)**

2 **REFERENCE:**

3 MPA Report Pages 71 (Line 17), 77

4 **PREAMBLE:**

5

6 **QUESTION:**

7 Please indicate what the implications would be for an all gas plan versus the preferred
8 development plan of the scenario set out in part (a).

9 **RESPONSE:**

10 Please see PUB/MPA 1-027.

11

1 **PUB/MPA 1-033(c)**

2 **REFERENCE:**

3 MPA Report Pages 71 (Line 17), 77

4 **PREAMBLE:**

5

6 **QUESTION:**

7 Please indicate what the implications are to the Province and in turn Manitoba Hydro related
8 to borrowing cost if there is a credit rating downgrade.

9 **RESPONSE:**

10 The assumption in financial markets is that a credit rating downgrade of a government typically
11 results in a wider credit spread between that government's bonds and those of other
12 governments. In the case of a Province such as Manitoba, that credit spread is measured
13 against the Government of Canada.

14 As noted in section 5.3.1 of our Report, however, it is not immediately apparent that credit
15 ratings do or have been primary drivers of the credit spread of the province, particularly as
16 compared to general financial trends. While substantially more detailed work – outside the
17 scope of our work in this NFAT process – would be required to definitely provide an answer to
18 the relative impact of credit ratings on the spread, anecdotal evidence surrounding the last
19 several rating changes suggests that either the ratings have only minimal effect, or perhaps that
20 the ratings actions are merely confirmations of market perceptions that have already been
21 formed and given effect through changes in the spread (as noted in our report, two agencies
22 raised Manitoba's ratings in 2003, *after* the spread had already declined in 2002).

23 In addition, there is the complicating factor that the three agencies currently providing ratings
24 for Manitoba do not appear to agree in their views, either in terms of absolute ratings, or in
25 relative ratings for Manitoba as compared to other Canadian provinces. There are any number
26 of potential reasons for this divergence, but the existence of the divergence creates the

1 possibility that agencies may have different reactions to any course of events in Manitoba,
2 including financial challenges potentially faced by Manitoba Hydro.

3 If, in the end, there was a capital markets perception of financial distress at Manitoba Hydro
4 that was severe enough to impact the Province as a whole, and that impact on the Province was
5 severe enough to incrementally downgrade the financial health of the Province, then a
6 widening of the credit spread would potentially result. The practical impact of such a scenario
7 would be that any new debt issue, including refinancing of existing debt, would face a higher
8 cost in the capital markets, equal to the widening of the spread. Given the long term nature of
9 many bond issues, that higher spread would be embedded in the interest costs for years to
10 come (for example, if the credit spread widened by 25 basis points, and the Province was
11 issuing or refinancing \$2 billion in 10-year bonds at that time, then interest costs would be \$5
12 million higher than otherwise every year for ten years). Until such time as the credit spread
13 narrowed, that extra cost would be built into every new bond issue or refinancing, with an
14 accumulating impact over time.

15

1 **PUB/MPA 1-034(a)**

2 **REFERENCE:**

3 MPA Report Page 75 Line 20

4 **PREAMBLE:**

5 MPA states that "While the Preferred Development Plan is virtually guaranteed to require a
6 doubling of electricity rates over the next 20 years, it holds the promise of actual rate declines
7 in the following period and beyond."

8 **QUESTION:**

9 Unlike the "guarantee", is the "promise" less certain because it is predicated on load growth
10 and export price assumptions beyond 20 years?

11 **RESPONSE:**

12 In the Reference economics scenario, where inflation is in the range of 2% per year (which is
13 the widespread consensus estimate), then under many scenarios domestic rates should decline
14 beyond the first 20 years. However, hydrology is a major source of volatility, since poor
15 hydrology in the first 20 years could lengthen the period during which rates must rise, and
16 delay the period when rates fall. Similarly, if domestic demand is lower than expected, or
17 export prices are lower than expected, then the period of rising rates will continue longer than
18 20 years before rate declines begin.

19 Short of a "perfect storm" of significant capital cost overruns, low domestic demand, poor
20 hydrology and collapsing export prices (all of which would combine to cause severe financial
21 distress at Manitoba Hydro, forestalling any possible rate declines), there will always be a point
22 sometime in the third decade of the model when domestic rates begin to fall in the Preferred
23 Development Plan. The fundamental issue is debt costs, and whenever a significant portion of
24 debt principal is retired, domestic rate benefits will follow.

25 In a High economics scenario, where inflation is assumed to be closer to 3% per year and
26 interest rates much higher than currently, domestic electricity rates (and everything else) will

1 rise much higher than 100% over 2013 before eventually falling. Only in a Low economics
2 scenario, where inflation holds at 1% per year on average for decades (which would be
3 historically abnormal) would prices not rise by 100% before turning around.

4

1 **PUB/MPA 1-034(b)**

2 **REFERENCE:**

3 MPA Report Page 75 Line 20

4 **PREAMBLE:**

5 MPA states that "While the Preferred Development Plan is virtually guaranteed to require a
6 doubling of electricity rates over the next 20 years, it holds the promise of actual rate declines
7 in the following period and beyond."

8 **QUESTION:**

9 Please elaborate on the scenarios that would prevent the promise of lower rates in the future
10 being fulfilled.

11 **RESPONSE:**

12 Please see PUB/MPA 1-034(a).

13

1 **PUB/MPA 1-035**

2 **REFERENCE:**

3 MPA Report Page 76 Line 30

4 **PREAMBLE:**

5 MPA states that "Plan 4 and 6, which were largely indistinguishable from each other, resulted in
6 cost to ratepayers that appear to be lower than other resource plans in many scenarios, if only
7 marginally; this suggests that proceeding with Keeyask may be a prudent step to take at this
8 time, but a more thorough review of the proposal to build Conawapa as part of the Preferred
9 Development Plan should be undertaken closer to its final commitment date.

10 **QUESTION:**

11 Please elaborate on what additional review steps would be required to make the decision to
12 proceed with Conawapa.

13 **RESPONSE:**

14 Given the sensitivity of the Preferred Plan to a number of variables, at a minimum a thorough
15 updating of expectations with respect to those variables should be required, coupled with
16 rigorous financial modeling analysis of potential outcomes. These factors should include:

- 17 • export prices
- 18 • domestic demand
- 19 • interest rates
- 20 • construction costs (especially in light of experience gained by that point in time with
21 Bipole III, and if it goes ahead, Keeyask), and
- 22 • hydrology (especially given progressively improving climate change models and
23 predictions).

24 In addition, the Conawapa option should be compared to a set of optimized variations of
25 combinations of imports, increased DSM and gas facilities. All of these options should, if

1 possible, be tested using “Monte Carlo” modeling, which would allow for testing of both a
2 wider range of scenarios, and provide sensitivity information against all of the relevant variables.
3 Finally, and crucially, a comparative electricity competitiveness study should be undertaken
4 which examines the changing competitive position that would result from the different options
5 being considered by Manitoba Hydro. Since many other jurisdictions are investing in their
6 electricity systems, whether by choice or the necessity created by ageing infrastructure, it will
7 be important to understand Manitoba Hydro’s leeway to raise prices before economic losses to
8 the Province occur, due to electricity price competition from other jurisdictions. Given the
9 number and importance of business customers in particular in Manitoba that are both sensitive
10 to electricity prices and mobile in the medium term (in the sense that they could take their
11 operations elsewhere if they believed that electricity prices may become unfavourable), it is
12 crucial to understand the potential impact on such customers of increasing electricity prices for
13 a ten to twenty year period. The potential loss of such customers is particularly serious because
14 they only make investment decisions periodically. If Manitoba were to lose electricity-sensitive
15 business customers during its period of price increases, there is no guarantee that those or
16 similar customers would find it convenient to return when prices begin to fall again.

17