

MH/CAC - Harper 7 a)

Subject:

Question: Please explain the organizational structure of Econalysis Consulting Services and your position within that structure.

Response:

Econalysis Consulting Services is an Ontario Corporation owned by Ms. Jennifer Anne Ginder. The company currently has four associate consultants, one of whom is Mr. Harper.

Elenchus Research Associates and Econalysis Consulting Services are successor companies resulting from the separation of the two corporate entities in 2003.

MH/CAC - Harper MH 7 b)

Subject:

Question: Please identify the principals of Econalysis Consulting Services.

Response:

See response to MH/CAC-Harper 7 a).

MH/CAC - Harper 7 c)

Subject:

Question: When attempting to contact Mr Harper regarding provision of written materials, Manitoba Hydro noted that the contact information for Econalysis is listed in the Canada 411 directory as "Econalysis Elenchus Consulting Services Inc". Please explain the relationship (current and past) between Econalysis Consulting Services and Elenchus Research Associates.

Response:

See response to MH/CAC-Harper 7 a)

MH/CAC – Harper 8 a)

Subject: Resource Alternatives

Reference: At p. 11 of his report Mr Harper postulates that stress tests are not a full substitute for including alternative levels of DSM as options in the initial design of the development plans and suggests that it would have been practical to consider development plans to meet domestic needs plus current export commitments in where with enhanced DSM Conawapa is the first new major generation placed into service or where new opportunities come into play such as solar.

Question: Mr Harper appears to be suggesting Manitoba Hydro consider proceeding with Conawapa without any new export commitments. Is this correct?

Response:

Mr. Harper notes that, in its NFAT Application, Manitoba Hydro has considered alternative plans that involve the construction of gas-fired generation (either CCGTs or SCGTs) or Wind prior to the Conawapa (i.e. Plans #7, #8 and #9). What Mr. Harper is suggesting in his evidence is that with a sufficient level of DSM the need date for new generation could be delayed such that it is feasible to consider Conawapa as the first major new generation resource and that the implications of such a “plan” were not assessed as part of the current NFAT Application. In this context, Mr. Harper notes that none of Plans #7, #8 or #9 include new export commitments and it would be reasonable to assess the viability of a DSM/Conawapa-based plan on a similar basis.

MH/CAC – Harper 8 b)

Subject: Resource Alternatives

Question: If correct, please comment on the risks to Manitoba Hydro ratepayers of proceeding to construct a large hydro-electric generating station without corresponding commitments to an expanded interconnection and a sale of dependable energy excess to the needs of Manitoba ratepayers during the early years of Conawapa.

Response:

Yes, there are risks associated with proceeding to construct a large hydro-electric generation station without corresponding commitments to an expanded interconnection and a sale of dependable resources. However, it is important to note that, even under Manitoba Hydro’s Preferred Development Plan, a commitment to proceed with construction Conawapa is not required for a number of years and this timeframe could well be longer if future DSM levels were materially increased above currently planned levels (see NFAT Appendix 4.2,

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page 172). It is also important to note that the currently proposed intertie expansion is not likely to be the only opportunity for new interties over the next 10-15 years. Indeed, the Province has recently indicated that Manitoba Hydro is entering into discussions with Saskatchewan for exports of up to 500 MW that would require new inter-ties with that province. Similarly, the contract currently being negotiated with WPS is not the only market arrangement Manitoba Hydro is pursuing (LCA/MH I-018). Finally, while there may be risks associated with a DSM/Conawapa plan, Mr. Harper notes that such a plan would insulate ratepayers from the risks associated with future natural gas prices that the initial construction of gas-fired generation under Plans #7 and #8 exposes them to.

Overall, Mr. Harper's Evidence is that there would be merit in considering such a plan as part of a NFAT review. To recognize some of the aforementioned risks one could consider alternative versions of such a "plan" that did/did not include a firm export contract for any dependable surplus energy. Please also see the response to MH/CAC-Harper 8 a).

MH/CAC – Harper 8 c)

Subject : Resource Alternatives

Question: Please elaborate on the statement regarding solar generated power that it is expected to become increasingly cost competitive over time. Please identify the basis for your statement, whether it is a general comment or if you have conducted independent analysis. Please comment on whether the projected decline in costs is dependent on the realization of innovations and improvements to the technology which are not currently available nor guaranteed to be available.

Response:

The comment that solar (either utility or customer scale) while currently not competitive is expected to become increasingly so with time is not based any independent analysis but rather a general comment based on sources which include Manitoba Hydro's NFAT Application, Appendix 7.1, page 44. Please also see the evidence of Mr. Dunsky in this proceeding and the evidence of La Capra Associates.

MH/CAC – Harper MH 8 d)

Subject: Resource Alternatives

Question: Please comment on the prudence of an electric service provider charged with providing economical power relying, for current decision-making purposes, on a source of power which at present is significantly more costly but

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who's costs may reduce over time to the point where costs could be in the same range as more traditional power sources such as hydro-electric or gas generation.

Response:

Mr. Harper agrees that it would not be prudent to implement a plan that relied on such sources of power. However, it would be prudent for an electric service provider to implement plans that included the flexibility to react and accommodate such opportunities if and when they arise. One of the purposes of effective integrated resource planning should be to avoid locking in excessively costly sources of supply and to avoid locking out potentially more cost effective offerings.

MH/CAC – Harper 9

Subject: Approach to Economic Evaluation

Reference: Page 19, “Manitoba Hydro’s approach to economic evaluation is generally consistent with accepted practice”

Question: Please advise whether Mr Harper has experience with the use of S curves in performing economic evaluations in other jurisdictions. If so, please comment on whether Manitoba Hydro’s methodology is consistent with that used in these jurisdictions. If not, please explain.

Response:

Mr. Harper has been involved with reviewing supply plans/integrated resource plans with respect to electricity supply in Quebec, Ontario and BC. The use of S-curves has not been a feature of the economic evaluations performed in support of those plans. However, Manitoba Hydro’s application of S-curves does conform with Mr. Harper’s understanding of how S-curves are used and interpreted for decision making purposes.

MH/CAC – Harper 10

Subject: Uncertainty Analysis

Reference: Mr. Harper said at Page 40 – “However, Manitoba Hydro’s overall probabilistic-based risk assessment is fairly simplistic in that only three factors (albeit the three most significant ones) were utilized in the uncertainty analysis and, in each case, only three possible outcomes assigned. In reality there are virtually an infinite set of outcomes for each of the factors and considerably more factors that could be included in the analysis. While the simplicity of Manitoba Hydro’s approach makes it easier for parties to follow the analysis and understand the results (e.g. Manitoba Hydro’s probabilistic quilt) the resulting probability distributions for each Plan are not as robust as they could have been.”

Question:

Recognizing that it is not practical to include all potential risk factors in complete detail, does Mr. Harper see any significant drawbacks to choosing the three most impactful sets of factors and identifying three cases for each set of factors? If yes, please explain.

Response:

There are potentially two drawbacks to choosing only the three most impactful factors and identifying three cases for each. The first is that with only three cases associated with each factor the choice of the specific probability (which in some cases is based on judgment) becomes more important. The second drawback is associated with the fact that the probabilities used for the S-curves are calculated by interpolating between the various cumulative probability values (e.g. if the 2nd lowest value in the cumulative distribution curve is \$100 with probability of 15% and the lowest value has a probability of 10% - then the S-curve is calculated assuming that \$100 has a cumulative probability equal to 17.5% (i.e. $10\% + \frac{1}{2} \times 15\%$). Clearly the more probability observations there are the smaller the span over such interpolations will need to be done and the greater the robustness of the S-curves. This issue only becomes important when the resulting S-curves for the various alternatives come out “close” to each other which is the case for many of the plans assessed in the NFAT.

MH/CAC – Harper 11

Subject: Uncertainty Analysis

Reference: Mr. Harper said at Page 41 – “This use of different discount rates for the different scenarios means that the cash flows are not being assessed using a common view as to the time preference of costs/benefits and that the NPVs calculated are no longer comparable. The scenarios should all be evaluated using the same discount rate (i.e. time preference). If there are concerns regarding the appropriateness of the time preference value used then this should be addressed through sensitivity analysis whereby all of the scenarios are reassessed using a different discount rate and a determination made as to whether or not this changes the overall conclusions of the economic evaluation.” See also page 63

Question: Mr. Harper recommends using sensitivity analysis instead of probabilistic analysis for evaluating the discount rate. However, if the appropriate discount rate is not known with certainty over the entire time horizon and if different discount rate possibilities are identified, isn't it reasonable to assign likelihoods to them? Please explain what methodology Mr. Harper would suggest for dealing with discount rate uncertainty in the economic analysis?

Response:

For the reasons outlined in his evidence (pages 40-41), it is Mr. Harper's view that assigning likelihoods to differ discount rates and including them as a “factor” in the economic uncertainty evaluation distorts the NPV results such that they are no longer directly comparable.

Please see the response to MIPUG/CAC-Harper 2 for Mr. Harper's suggestions for dealing with discount rate uncertainty in economic analysis.

MH/CAC – Harper 12 a)

Subject: Uncertainty Analysis

Reference: The values for plans 6 and 12 seem inconsistent between Table 7 and Tables 10, 11 & 12, pages 43-45

Question: Please confirm which Table has the appropriate values for plans 6 and 12, and comment as to the effects on the observations and conclusions that rely on the Tables as required.

Response:

In several of the Tables and Figures in Mr. Harper's evidence the Plan numbers assigned to K19/Gas31/750 MW and K19/C31/750 MW were inadvertently reversed. The specific tables and figures affected are:

- Figures #6, #7, #9, #12, and #13
- Tables #7 and #9.

In each case the data/curves shown are with respect to the "plan" as described by its title (and not its number). This mislabelling has no effect on the observations or conclusion presented in the Evidence.

MH/CAC – Harper 12 b)

Subject Uncertainty Analysis

Reference: Pages 49-55

Question: Please provide and explain the detailed assumptions and calculation steps to obtain the values for Opt 250 and Opt 750 in tables 10 & 11.

Response:

Please see the response to MIPUG/CAC-Harper 4

MH/CAC – Harper 12 c)

Subject: Uncertainty Analysis

Reference: Pages 49-55

Question: Please provide and explain the detailed assumptions and calculation steps to obtain the values for the various Paths in tables 12 & 13.

Response:

Please see the response to MIPUG/CAC-Harper 4

MH/CAC – Harper 13

Subject: Multiple Account Benefit Cost Analysis, Residual Asset Value

Reference: The report states: “Costs and benefits in years after 2047 are translated into a residual value and also present valued to 2014 using the 6% discount rate. However...the residual value was calculated using Manitoba Hydro’s 5.05% WWACC as opposed to the 6% discount rate deemed applicable to the Market Valuation account.” . Page 59

Question: Does Mr Harper agree that MANITOBA HYDRO's post 2047 projection's of revenues and expenditures relative to the all gas case is a reasonable way to estimate the 2047 residual value of assets relative to the all gas case? If not, please explain.

Response:

Mr. Harper agrees and notes that this was not the basis for his concerns regarding the market valuation calculations performed by Manitoba Hydro. See the response to MH/CAC-Harper 14.

MH/CAC – Harper 14

Subject: Multiple Account Benefit Cost Analysis, Residual Asset Value

Reference: The report states: “Costs and benefits in years after 2047 are translated into a residual value and also present valued to 2014 using the 6% discount rate. However...the residual value was calculated using Manitoba Hydro’s 5.05% WACC as opposed to the 6% discount rate deemed applicable to the Market Valuation account.” Page 59

Question: Does Mr. Harper agree that calculating the PV of those post 2047 revenues and expenditures at MANITOBA HYDRO's discount rate reflects the residual value from MANITOBA HYDRO's perspective? If not, please explain.

Response:

Mr. Harper agrees that Manitoba Hydro’s calculation of the residual values for the various plans at 5.05% reflects the residual value from Manitoba Hydro’s perspective. Mr. Harper’s issue is that this value (based on Manitoba Hydro’s perspective) is being used in the determination of the Market Valuation for each alternative. However, according to Manitoba Hydro’s NFAT Application (Chapter 13, pages 5 and 22) this account is meant to be valued using a 6% real discount rate reflecting a provincial perspective as opposed to Manitoba Hydro’s WACC.

MH/CAC – Harper 15

Subject: Multiple Account Benefit Cost Analysis, Residual Asset Value

Reference: The report states: “Costs and benefits in years after 2047 are translated into a residual value and also present valued to 2014 using the 6% discount rate. However...the residual value was calculated using Manitoba Hydro’s 5.05% WWACC as opposed to the 6% discount rate deemed applicable to the Market Valuation account.” Page 59

Question: Does Mr. Harper agree that all of the other cash flows in the market value account are an attempt to measure benefits and costs from MANITOBA HYDRO's perspective? If not, please explain.

Response:

Mr. Harper does not agree. As noted in response to CAC/MH I-153 a) the costs and benefits in the market valuation account are from the point of view of Manitoba Hydro and its project partners. Furthermore, the costs and benefits are then discounted at a rate that is meant to reflect “the weighted average societal opportunity cost of capital from a provincial perspective” (Chapter 13, page 22). See also the response to MH/CAC-Harper 14.

MH/CAC – Harper 16 a)

Subject: Multiple Account Benefit Cost Analysis, Residual Asset Value

Reference: Mr. Harper calculates the residual value at a 6% social opportunity cost of capital discount rate. Page 59

Question: Is Mr. Harper aware of recent literature that suggests longer term intergenerational effects should be discounted at lower rates?

Response:

Yes, Mr. Harper is aware of the recent literature. Mr. Harper is also aware that there are varying opinions on the use of such an approach. As an example please see to the 2011 Burgess and Zerbe article referenced in the NFAT Application, Chapter 13, footnote #7.

MH/CAC – Harper 16 b)

Subject: Multiple Account Benefit Cost Analysis, Residual Asset Value

Reference: Mr. Harper calculates the residual value at a 6% social opportunity cost of capital discount rate. Page 59

Question: What impact would applying a lower intergenerational rate have on the residual value (e.g. 3.5% or 2.5% real)?

Response:

The following table sets out the impact of discounting the cash flows after 2047 back to that year at a rate of 3.5% or 2.5% and then discounting this value plus the cashflows up to 2047 back to 2014 at 6%. In preparing this response, it was noted that ECS Table #15 required correction. The revised values based on 6% over the entire period are set out below. Furthermore, ECS has been unable to replicate the values reported by Manitoba Hydro based on its 6%/5.05% discount rates. The Table reports both Manitoba Hydro's values and the values calculated by ECS. All values are based on the Reference case.

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MH/CAC-Harper 16 b): Table A – Market Valuation Using Alternative Discount Rates

Market Valuation Relative to Preferred Plan (Millions 2014\$ - NPV)				
	Preferred Plan	K19/G24/250 MW	K22/Gas	All Gas
Manitoba Hydro's Market Valuation	-	\$17	(\$270.5)	(\$654.1)
Valuation Based on 6% for Entire Planning Period – per ECS Evidence	-	\$214	(\$105)	(\$214)
Valuation Based on 6% for the Entire Planning Period – Revised	-	\$414	\$98	(\$187)
Valuation Based on 6%/5.05%	-	\$292	(\$27)	(\$404)
Valuation Based on 6%/3.5%	-	\$24	(\$304)	(\$878)
Valuation Based on 6%/2.5%	-	(\$210)	(\$545)	(\$1291)

MH/CAC – Harper 17

Subject: Multiple Account Benefit Cost Analysis

Reference: Mr. Harper asserts that "it is not clear to what extent this hybrid use of discount rates" [in the market valuation account] "was employed in evaluating the other Multiple Accounts." Page 60

Question: Does Mr Harper accept that a 6% real rate was used in calculating the monetized present value of the government, employment, greenhouse gasses (GHG), and Criteria Air Contaminant (CAC) net benefits or costs presented in Chapter 13 and summarized in Table 13.9? If not, please explain why and what discount rate does Mr. Harper believe was used?

Response:

It is Mr. Harper's understanding that a 6% real rate was used to calculate the monetized present value for the above factors. Mr. Harper's concern is that this was also his understanding as to the basis for the calculation of the market valuation account based on the descriptions provided in the relevant sections of Chapter 13 (i.e. sections 13.1.2 and 13.3.1) that dealt specifically with this account as well as the response to CAC/MH II-047 a). Assuming the inference in the question is that 6% real was used as the discount rate for these other factors for the entire study period, Mr. Harper accepts that as being the case.

MH/CAC – Harper 18 a)

Subject: Multiple Account Benefit Cost Analysis, Customer Account

Reference: Mr. Harper stated the following with respect to the Multiple Account Benefit Cost Analysis, customer account: “It is not at all clear why customer rate/bill impacts were not expressed in NPV terms, particularly since this was the approach used in Manitoba Hydro’s NFAT Application regarding the Wuskwatim Project¹⁰⁵”. In the footnote 105, Mr. Harper indicates the reference is “Manitoba Hydro, Submission to Manitoba CEC, NFAT the Wuskwatim Project, Chapter 7, page 11”. Page 60

Question: Please confirm your understanding that the analysis in chapter 7, page 11 of the Wuskwatim submission is a financial analysis and not comparable with a multiple-account benefit cost analysis?

Response:

Mr. Harper understands that the analysis in Chapter 7 of the Wuskwatim submission was a financial analysis. However, Mr. Harper notes that the stated purpose of this financial analysis was “to ascertain whether the advancement of the Wuskwatim project would adversely affect Manitoba Hydro’s financial stability during the start-up years and to determine the degree to which the economic benefits could ultimately translate into domestic customer rate savings (*emphasis added*)” (Chapter 7, page 1). This stated purpose for the financial analysis in Wuskwatim submission (as it pertains to customer bill/rate impacts) and reliance on financial analysis to do so is very similar to the stated purpose/approach for the Customer Account in the current NFAT Application as set out in Chapter 13 (page 6):

“This account assesses the consequences of the different plans for Manitoba Hydro customers. It relies on the financial analysis in Chapter 11 that provides estimates of the rate increases in the short to medium and long term that would be required to recover net system costs and meet corporate financial targets.”

MH/CAC – Harper 18 b)

Subject: Multiple Account Benefit Cost Analysis, Customer Account

Reference: Mr. Harper stated the following with respect to the Multiple Account Benefit Cost Analysis, customer account: “It is not at all clear why customer rate/bill impacts were not expressed in NPV terms, particularly since this was the approach used in Manitoba Hydro’s NFAT Application regarding the Wuskwatim Project¹⁰⁵”. In the footnote 105, Mr. Harper indicates the reference is “Manitoba Hydro, Submission to Manitoba CEC, NFAT the Wuskwatim Project, Chapter 7, page 11” Page 60

Question: Please confirm your understanding that the document filed in the Wuskwatim application M. Shaffer & Associates Ltd., “Social Net Benefits of Advancing the Wuskwatim Project”, August 2003, which is comparable to the multiple-account benefit cost analysis in chapter 13 of the current NFAT submission, does not express customer rate/bill impacts in NPV terms?

Response:

Not confirmed. Unlike Chapter 13 in the current NFAT Application, the referenced document by M. Shaffer & Associates Ltd. did not include a “Customer Account” and therefore did not address the issue of how to express customer rate/bill impacts.

MH/CAC – Harper 19

Subject: Multiple Account Benefit Cost Analysis, Customer Account

Reference: Mr. Harper stated the following with respect to the Multiple Account Benefit Cost Analysis, customer account: “It is not at all clear why customer rate/bill impacts were not expressed in NPV terms,...” Page 60

Question: Does Mr Harper agree that the present value of the revenues and expenditures to Manitoba Hydro provides an indicator of the present value implication for customers, since rates are determined to recover costs? If not, please explain.

Response:

Mr. Harper agrees it provides an “indicator” but, by no means, an accurate one. Indeed, the referenced quote from Chapter 7 of the Wuskwatim Submission provided in the response to MH/CAC-Harper 18 a) supports the view that economic benefits are not perfectly aligned with customer bill/rate savings. Reasons for this are that while rates are determined so as to recover costs, the impact of accounting policies (e.g. capitalization policies which use rates that differ from the discount rates in the economic analysis) and financial policies (e.g. net income setting policies that focus on financial integrity) will lead to differences between the NPV derived from the economic analysis and the NPV implications for customers’ bills.

MH/CAC – Harper 20

Subject: Multiple Account Benefit Cost Analysis, Customer Account

Reference: Mr. Harper stated the following with respect to the Multiple Account Benefit Cost Analysis, customer account: “It is not at all clear why customer rate/bill impacts were not expressed in NPV terms,...” Page 60

Question: Please confirm that it is standard practice in the economic valuation of alternative generation and transmission expansion plans or projects to calculate the net present value of utility expenditures less export sales revenues to capture the impact for customers?

Response:

Mr. Harper agrees that it is standard practice in economic evaluations of alternative generation and transmission expansion plans or projects to calculate the net present value of utility expenditures (i.e. costs) less export sales revenues (i.e. benefits). The response to MH/CAC-Harper 19 addresses the question of whether the results of such economic evaluations capture the bill impact for customers.

MH/CAC – Harper 21

Subject: Multiple Account Benefit Cost Analysis, Customer Account

Reference: Mr. Harper stated the following with respect to the Multiple Account Benefit Cost Analysis, customer account: “It is not at all clear why customer rate/bill impacts were not expressed in NPV terms,…” Page 60

Question: Can Mr Harper point to any utility practice in other jurisdictions that would calculate a present value impact to customers plus a present value net costs to the utility and combine them to determine overall net benefits? If so, please provide.

Response:

No. Mr. Harper also notes that his evidence does not propose that overall benefits be calculated in this way.

MH/CAC – Harper 22

Subject: Multiple Account Benefit Cost Analysis, Customer Account

Reference: Mr. Harper stated the following with respect to the Multiple Account Benefit Cost Analysis, customer account: “It is not at all clear why customer rate/bill impacts were not expressed in NPV terms...”

Question: Please explain the difference between distributional and efficiency effects in benefit-cost analysis. Page 60

Response:

As discussed on pages 15-16 of Mr. Harper’s evidence, economic evaluations (i.e. benefit-cost analyses) are carried out from a particular perspective and serve to identify the most efficient alternative from that particular perspective. When the perspective taken is that of a particular stakeholder, the analysis only takes into account the costs and benefits attributable to that stakeholder and the results could be different if the alternatives were viewed from a different (stakeholder’s) perspective. In order to determine the overall economic efficiency benefits of different alternatives, decision makers (particularly those associated with government-related decisions) generally undertake benefit-cost analyses from a fairly broad (e.g. societal) perspective. However, what such an approach does not do is consider that the distribution of the costs and benefits and the resulting net benefits to the various stakeholders involved may differ amongst the alternatives. These distributional effects can lead to situations where the alternative that is best from an overall (societal) perspective is not the best from the perspective of particular stakeholders and, indeed, may have negative overall consequences despite there being overall net benefits from the alternative, such that there are winner and losers. In principle, the winners should be able to compensate the losers such that everyone is better off. However, in practice this may not occur.

MH/CAC - Harper MH 23 a)

Subject: Multiple Account Benefit Cost Analysis, Customer Account

Reference: Mr. Harper stated the following with respect to the Multiple Account Benefit Cost Analysis, customer account: "It is not at all clear why customer rate/bill impacts were not expressed in NPV terms,..."

Question: To the extent that the rate impacts in Chapter 13 were being used to illustrate distributional effects, does Mr. Harper agree that the cumulative effects on rates over time as shown is a better indicator (provides more information) than a single present value number. If not, please explain. Page 60

Response:

No, Mr. Harper does not agree. In Mr. Harper's view comparing the NPV of customer bills over a period of time for various alternatives is a better indicator (i.e. provides more information) than comparing the cumulative rate increase associated with each alternative over the same time period. The cumulative rate impact/increase measure only looks at the level of rates at the end of period under consideration and allows for no distinction as to when the increases occur during period of time in question. For example, consider two alternatives that both result in 25% rate increases over 10 years. The first alternative involves rate increases of 5% per annum (ignoring for simplicity the impact of compounding) in each of the first five years but no increases thereafter. The second alternative involves no rate increases for the first five year but 5% per annum increases in each of the last five years of the period. The cumulative rate impact measure will be the same for each (25%) even though customers will have paid significantly more in total bills over the 10 year period under the first alternative. In contrast, the NPV calculation does recognize when the rate increases occur during the period and, therefore, is a better measure of the bill/rate impacts over the period being considered.

MH/CAC – Harper 23 b)

Subject: Multiple Account Benefit Cost Analysis, Customer Account

Reference: Mr. Harper stated the following with respect to the Multiple Account Benefit Cost Analysis, customer account: "It is not at all clear why customer rate/bill impacts were not expressed in NPV terms,..." Page 60

Question: What discount rate would Mr. Harper recommend for the present value calculation he suggests should be calculated and why?

Response:

Ideally any discounting of customer bill/rate impacts for purposes of assessing customer impacts would be done at the time preference for money applicable to

Manitoba Hydro's domestic ratepayers. Mr. Harper is not aware of any authoritative work related to the determination of such a value or, more broadly, for electric ratepayers in general.

A review of the relevant references cited by Manitoba Hydro in NFAT Chapter 13 indicates that time preference rates are frequently linked to interest rates for savings. Marvin Shaffer, in his Multiple Account Benefit-Cost analysis text (pages 122 and 126) cites various values for time preference rates in the 1.5% to 4.1% range. This range is generally consistent with the 3.5% savings rates used by Burgess & Zerbe (NFAT Application, Chapter 13, Footnote #7), although these were derived on a different basis. The Ontario Power Authority, in its 2007 IPSP filing with the OEB, used a 4% real discount rate, which was meant to be reflective of resident savings rates (EB-2007-0707, Exhibit D/Tab 3/Schedule 1/Attachment 1)

One of the principles underlying the aforementioned approach is that consumers are net savers and therefore receiving/not receiving funds sooner versus later will impact on savings. However, there are segments of society (and also ratepayers) where this is not case. For residential customers, this could include low income households and indebted households where the time preference rate is likely to be higher. Indeed, in such cases the "rate" could be considerably higher if based on the interest rate charged on credit cards or late payment of hydro bills. Also, it overlooks the fact that in the case of electricity ratepayers a large portion of the revenue comes from businesses (e.g. in Manitoba Hydro's case – over 50%) and not households where delayed "consumption" may well be represent delayed investment in business activities. The real return on equity used in ECS's revised Manitoba Hydro WACC calculation is in the order of 8% real and reflects the return expectations for a relatively low risk investment.

Overall this would suggest that the appropriate time preference rate is somewhere in the range of 3% - 8%. For purposes of an initial calculation a discount rate of 5.5% would seem reasonable. However, given the range some sensitivity analysis would be in order.