PUB/Consumers Association of Canada (Manitoba) (Mr. Harper) 1

Subject: Economic Analysis …

Reference: " the [Wuskwatim] Projects will likely have negligible impact on MH's financial stability and will not require any offsetting increase to domestic electricity rates during the start-up of the Projects" Harper Report page 10

Question:

What is Econalysis Consulting Services' (ECA) assessment of the accuracy of the CEC conclusion, with the benefit of hindsight and the last MH GRA?

Response:

At the time of the CEC assessment the operating statements for the Wuskwatim partnership indicated positive net income results for all years following the in-service of the station even under the Low Export Price scenario (CAC/MSOS/NFAT/S/11 a Table: A.25). In contrast, at the last MH GRA, the forecast operating statement for the Partnership indicated losses in the range of $3 M to $54 M annually for the period up to 2017/18. This change in outlook was primarily due to a material increase in the capital cost of the project (2012-2014 GRA, PUB/MH I-93), in part due to in-service delays, and export prices being below even the low export price scenario postulated at the time of the CEC review (2012-2014 GRA, PUB/MH I-19). In Order 43-13-1, the PUB stated:

> "As for the cost consequences of Wuskwatim on Manitoba Hydro, the current rate increase requests are required to meet the operating losses from Wuskwatim." (page 27)

With the benefit of hindsight one is able to conclude that the CEC assessment regarding the impact of Wuskwatim on domestic electricity rates was overly optimistic.

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Subject: Economic Analysis

Reference: However, such [DSM] Stress Tests only look at the implications for the set of originally proposed development plans and, as such, they are not a full substitute for including alternative levels of DSM as options in the initial design of the development plans to be assessed. Harper Report page 11

Question: What methodology does ECA recommend for assessing DSM in the initial design of development plans? Why? Where is the methodology recommended by ECA used in Canada?

Response:

Ideally, Manitoba Hydro would identify 2-4 portfolios of DSM programming perhaps starting with the current Power Smart Plan and then identifying rational augmentations of the current programs that lead to increasing levels of DSM savings (and associated costs). Each of these DSM portfolios would then be viewed as a "resource option" and, in combination with other resource options used to construct alternative plans for evaluation. This would allow DSM to be considered on an equal footing with other resource options in the planning process.

A similar approach was utilized by BC Hydro in the development of its most recent Integrated Resource Plan.

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Subject: Economic Analysis

Reference: Given this context, the appropriate discount rate for Manitoba Hydro to assign to this source of capital would be the discount rate that customers require in order to be neutral as between contributing to the Corporation's retained earnings now (and on gradual basis) as opposed to at some future point in time (and on a more "impactive" basis). Harper Report page 23

Question: Please quantify [from ECS Table #4] the allowed rate of return on equity for Canadian electric utilities that you suggest is a fair proxy for the discount rate that should be used by MH in its economic analysis of supply alternatives. Please indicate the effect of your recommended discount rate on the alternatives examined by MH if different from 'ESC Table #7'.

Response:

As outlined on pages 21-22, using a 500 basis point premium over the forecast long Canada bond rate and adjusting for the difference between Manitoba Hydro's determination of long-term Canada bond yields and the 30-year Canada bond yield results in a premium of 360 basis points over Manitoba Hydro's cost of debt as opposed to the 300 basis points used by Manitoba Hydro. Using Manitoba Hydro's forecast of long-term Canada bond rates this would produce a return on equity of 9.90%.

This is the value used in the determination of the 5.2% WACC used in Table #7.

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Subject: Economic Analysis

Reference: With the inclusion of “Transfers to the Province” it is no longer purely a “Manitoba Hydro” perspective but is now taking on elements of a broader provincial or societal perspective. This mixing of perspectives raises an immediate issue as to whether or not it is appropriate to continue to apply the 5.05% discount rate to all costs and benefits. ... Overall, it is inappropriate to combine the costs and benefits accruing to Manitoba Hydro with government transfers in the way Manitoba Hydro has done in Section 9.3.3. Harper Report page 26

Question: Please clarify and quantify the effects of your recommendation to separate the costs and benefits accruing to MH from the costs and benefits accruing to the Government.

Response:

Mr. Harper’s comments on page 26 were with respect to the appropriateness of combining the NPVs for the cash transfers to the province and the NPVs calculated from Manitoba Hydro’s perspective as is done in Section 9.3.3. The underlying recommendation being that the results presented in Section 9.3.3 should not be relied on in determining which plans not to carry forward for further analysis.

As Manitoba Hydro only eliminated three plans (Plans #8, #9 and #10) from further consideration and the reasoning does not appear to be based on the results from section 9.3.3, this recommendation has no measurable impact on the NFAT economic analysis as it was carried out.

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Subject: Economic Analysis

Reference: In order to look at the Preferred Plan and the alternatives from a customer perspective it is necessary to look at how the costs and benefits – in terms of the electricity bills paid by customers – vary over time in each case. Manitoba Hydro did not undertake such an analysis as part of either its economic evaluation or its multiple account analysis. However, it did address the issue in its interrogatory responses. It is understood that InterGroup, the consultants retained by MIPUG, will be examining this issue. Harper Report page 26

Question: Please provide your recommendation based on your understanding of the MIPUG evidence that has now been filed.

Response:

MIPUG's evidence (Appendix C) suggests that there are distributional issues as between the Provincial Government and Ratepayers.

Under Plan #4, customers are marginally worse off in the early years (i.e. first 25 – per Appendix C, Figure 17) but clearly benefit by the end of the period as compared to Plan #1 – All Gas. In contrast, the Provincial Government's benefits under Plan #4 are positive and growing over the entire period (Appendix C, Figure 26) such that overall total benefits to Government are more than double those to ratepayers (Table 10).

Under Plan #14, the distributional issue is more significant. During most of the period (Appendix C, Figure 17) rate payers are worse off than under Plan #1 while Provincial Government benefits are higher than under Plan #4. The overall result is that by the end of period ratepayer benefits are only 10% of the total benefits accruing to the two parties (Table #10). Indeed, Tables #9 and #10 indicate that any of the Plans involving Conawapa lead to ratepayers being worse off for more than half of the 50 year study period and that their overall benefits at end are only a fraction of those accruing to government.

This would suggest that, should the PUB recommend to government that future in-service dates for Conawapa continue to be protected it should also recommend that government examine means of re-balancing the distribution of benefits so that ratepayers receive a greater portion, particularly in the early years.

A similar issue exists with the development of Keeyask under Plan #4, albeit to a much lesser degree. The PUB may wish to consider a similar recommendation regarding benefit sharing should it recommend that Keeyask be advanced in conjunction with the development of new intertie capacity.

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Subject: Economic Analysis

Reference: These comments are focused on Manitoba Hydro's approach and not the input values or the probabilities used in the various scenarios. Other parties to the proceeding, with greater accessibility to Manitoba Hydro's planning assumptions and cost estimates, are assessing the input assumptions used. Harper Report page 39

Question: Based on your understanding of the filed reports by these 'other parties', how, if at all, does they impact your comments and conclusions. Be specific and quantify your answers where possible.

Response:

Please see the response to PUB/CAC-Harper 8.

PUB/CAC-Harper 7 a)

Subject: Economic Analysis 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. Harper Report page 41

Question: Please explain, qualitatively and quantitatively, the impact of the suggested approach.

Response:

Table #7 from the ECS Report presents the result of economic uncertainty analysis using a common 5.2% discount rate for all scenarios. For convenience, the Table is replicated below (with the headings corrected).

ECS Table #7 (revised) – Probabilistic Analysis Results @ Common 5.2% Discount Rate

Development Plan	**1**	**3**	**7**	**2**	**4**	**13**	**11**	**6**	**15**	**12**	**5**	**14**
Development Plan Millions 2014 $ - NPV	Plan #1 - All Gas	Plan #3 - Wind/Gas	Plan #7 - SCGT/C26	Plan #2 - K22/Gas	Plan #4 - K19/Gas2 4/250MW	Plan #13 - K19/C25/ 250MW	Plan #11 - K19/C31/ 250MW	Plan #6 - K19/Gas3 1/750MW	Plan #15 - K19/C25/ 750MW	Plan #12 - K19/C31/ 750MW	Plan #5 - K19/Gas2 5/750MW (WPS Sale & INV)	Plan #14 - K19/C25/ 750MW (WPS Sale &Inv)
10th Percentile	-732	-2549	-1035	-800	-477	-2092	-1708	-767	-2341	-1847	-403	-1706
25th Percentile	-514	-1898	-244	-253	112	-807	-487	-159	-933	-564	14	-326
75th Percentile	159	-391	1014	880	1318	1690	1630	1054	1869	1789	1078	2117
90th Percentile	531	280	1548	1623	2128	3035	2647	1862	3323	2919	1646	3257
Expected Value	-124	-1136	272	419	832	459	484	564	496	557	642	821
Ref-Ref-Ref NPV	0	-763	595	774	1210	1037	994	955	1152	1123	967	1417
50th Percentile	-11	-927	398	610	1044	755	721	779	848	839	839	1123

Using Manitoba Hydro's high and low discount rates (3.35% and 6.5%) and adjusting each for 15 basis points described in ECS evidence pages 21-22 – the following tables set out the results of sensitivity analyses based on common discount rates of 3.5% and 6.65% respectively.

PUB/CAC-Harper 7 a: Table #A - Probabilistic Analysis Results @ Common 3.5% Discount Rate

Development Plan		1	3	7	2	4	13	11	6	15	12	5	14
	Millions 2014$ NPV	All Gas	Wind/Gas	SCGT/C26	K22/Gas	K19/Gas24/250MW	K19/C25/250MW	K19/C31/250MW	K19/Gas31/750MW	K19/C25/750MW	K19/C31/750MW	K19/Gas25/750MW (WPS Sale & INV)	K19/C25/750MW (WPS Sale &Inv)
10th Percentile		-1274	-3484	881	638	1251	827	822	999	693	797	1288	1477
25th Percentile		-902	-2934	1663	1265	1912	2403	2409	1662	2423	2469	1885	3175
75th Percentile		788	-473	3303	2632	3370	5889	5394	3101	6359	5820	3045	6662
90th Percentile		927	776	4019	3512	4340	8556	7029	4014	9264	8232	3782	9153
Expected Value		-80	-1352	2481	2100	2826	4342	3921	2545	4627	4222	2547	5023
Ref-Ref-Ref NPV		0	-833	2886	2550	3300	5100	4605	3026	5494	4988	2929	5815
50th Percentile		-40	-1025	2623	2351	3132	4775	4273	2858	5146	4646	2818	5478

PUB/CAC-Harper 7 a: Table #B - Probabilistic Analysis Results @ Common 6.65% Discount Rate

Development Plan		1	3	7	2	4	13	11	6	15	12	5	14
	Millions 2014$ NPV	All Gas	Wind/Gas	SCGT/C26	K22/Gas	K19/Gas24/250MW	K19/C25/250MW	K19/C31/250MW	K19/Gas31/750MW	K19/C25/750MW	K19/C31/750MW	K19/Gas25/750MW (WPS Sale & INV)	K19/C25/750MW (WPS Sale &Inv)
10th Percentile		-550	-2167	-1798	-1407	-1291	-3331	-2735	-1577	-3628	-2917	-1239	-3090
25th Percentile		-464	-1673	-1112	-893	-744	-2169	-1634	-1009	-2350	-1766	-810	-1838
75th Percentile		28	-578	18	108	315	-220	121	65	-175	36	54	153
90th Percentile		342	109	433	734	1026	693	762	792	797	769	623	886
Expected Value		-125	-989	-660	-316	-112	-1270	-964	-366	-1344	-991	-277	-1065
Ref-Ref-Ref NPV		0	-679	-383	-14	215	-788	-540	-24	-799	-524	16	-571
50th Percentile		-67	-749	-548	-169	61	-1046	-783	-189	-1080	-777	-154	-842

Based on the 5.2% discount rate the ECS evidence concluded that:

- It was more beneficial to advance Keeyask with a small intertie than to proceed with any of the no-intertie plans
- The Preferred Plan appears to, at best, offer the same expected result as Plan #4 but with greater risk.

At the lower discount rate of 3.5%:

- Advancing Keeyask and a small inter-tie continues to be more beneficial than any of the no-inter-tie plans.
- However, Plan #14 and indeed all of the 750 MW plans with Conawapa have a higher expected values than Plan #4

At the higher discount rate of 6.65%:

- Advancing Keeyask and a small inter-tie is more beneficial than any of the plans with no inter-tie.
- However, Plan #4 is significantly superior to Plan #14 and indeed superior to all of the plans with a 750 MW intertie.

This would suggest that uncertainty regarding the discount rate does not impact the result that there are net benefits attributable to advancing Keeyask with some increased inter-tie capability. It does, however, have implications for appropriate size of the intertie and the type of generation that should be developed after Keeyask.

PUB/CAC- Harper 7 b)

Subject: Economic Analysis

Reference: 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. Harper Report page 41

Question: Please quantify and explain the discount rate that you recommend should be used (if different from what ESC used in Table #7) and also explain the impacts that the discount rate would have on the analysis of the alternatives.(if different from ESC Figure #9).

Response:

Please see the response to PUB/CAC-Harper 3.

PUB CAC-Harper 8

Subject: Economic Analysis

Reference: The use of the higher (5.55%) discount rate does not change the ranking of the Plans but it does decrease the differences between their values. This only serves to emphasize the need to carefully consider the reasonableness of the economic and project specific assumptions underlying the Plans. In this regard the reports of the Independent Experts Consultants and intervenors are critically important.
Both Manitoba Hydro's and this Report's economic evaluation analysis support advancing Keeyask to 2019 and the construction of new intertie facilities. However, it will be important for the PUB to revisit these conclusions taking into account the advice it receives from its Independent Consultants and intervenors regarding the input assumptions used in the analysis. Harper Report page 57 and 65

Question: How, if at all, do the now filed IEC Reports impact your conclusions. Please be specific and quantify your response where possible.

Response:

Mr. Harper is unable to answer this question at this point in time. He has not had an opportunity to fully review all of the IEC Reports. He is also concerned that, even after he is able to do so, the redactions in some of the reports make it difficult to determine how different the IEC Experts' findings regarding the critical input assumptions (e.g. export prices) are from Manitoba Hydro's planning assumptions and that, without recourse to Manitoba Hydro' system modelling capability it would be difficult to draw any specific conclusions as to the overall effect of any such changes.

Mr. Harper will consider the appropriateness of supplementing this answer once he has had an opportunity to more fully review the reports of the IECs.

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Subject: Economic Analysis

Reference: Finally, given the long study period used (78 years) considerations of intergenerational equity become important. However, this is an issue that Manitoba Hydro did not explore in its economic evaluation analysis. Harper Report page 62

Question: Explain and quantify your conclusions on 'inter-generational equity'.

Response:

As explained on page 16 of the ECS Evidence, economic evaluations are performed over the entire life of the project/initiative and focus on overall costs and benefits. For projects with long time horizons, issues about inter-generational equity can arise if the alternative that's shown to be the most "economic" over the long-term is not the most economic over shorter timeframes, in that the near term generation may be paying more while the overall benefits accrue to future generations.

In the context of the current NFAT Application, the economic evaluation (when performed over the 78 year study period using a 5.2% discount rate – see ECS Table #7) shows that:

- Plan #2 (K22/Gas) is preferable to Plan #1 (All Gas),
- Plan #4 (K19/Gas/250) is preferable to all of the plans without an Intertie, and
- Plan #14 (Preferred Plan) has an expected value similar to that for Plan #4.

However, if the economic evaluation is limited to a shorter timeframe the results change as follows:

	Expected NPV Relative to All Gas Reference Case (Millions 2014 $)			
Plan	20 Years	35 Years	50 Years	78 Years
Plan #1 – All Gas	0	0	0	0
Plan #2 – K22/Gas	-1,403	-362	212	543
Plan #4 – K19/Gas/ 250	-1.065	43	613	956
Plan #14 – Preferred Plan	-3,860	-1142	146	945

As the preceding table indicates:

- Plan #2 is only superior to Plan #1 after more than 35 years
- Plan #4 is superior to Plan #2 after less than 35 years
- Plan #14 does not start to approach the economic value of Plan #4 until close to the end of the study period.

Overall, Plan #4 is the most economic plan for more than half the study period. In contrast, while Plan #14 has close to the same economic value over the full study period, it poses material inter-generational issues which need to be recognized in the decision making process.