CENTRE HELIOS

RESEARCH, ANALYSIS AND EXPERTISE IN ENERGY POLICY

March 14, 2011

Ms. Lesley Griffiths
Mr. Herbert Clarke
Co-Chairs
Lower Churchill Joint Review Panel
160 Elgin Street, Ottawa ON
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Dear Ms. Griffith and Mr. Clarke,

First, let me thank you for the opportunity to present to the Joint Review Panel at the Topical Session on Need, Justification and Rationale, and for the attentive hearing you provided.

In my report, and in my presentation, I stated that, in my opinion, the information provided by the Proponent in its EIS and in its response to your Information requests was not adequate to fully understand the economic implications of the proposed project, either with respect to rate impacts, to the economic benefits to the Proponent and its shareholder, or to the risks and uncertainties affecting both, especially in light of the recent changes to the proposed project resulting from the Emera Partership Agreement.

A great deal of new information was presented at the hearings on March 7 and 8, and in the additional information provided by the Proponent in response to its undertakings. You mentioned at the end of the Topical Session on Need, Justification and Rationale that you would be addressing additional questions to Nalcor Energy within the coming days.

I am writing to respond to the undertaking I made on March 8, to comment on the new information provided, and to make suggestions as to additional information that the Panel could request from the Proponent, with respect to the issues raised during the March 7-8 hearings.

<u>Undertaking regarding in-stream hydropower (kydrokinetic power)</u>

At the hearing on March 8, I undertook to provide you with the Helios Centre's study concerning in-stream hydro generation.

The study, entitled "*La filière de l'hydrolien fluviale : Une introduction* », is attached. As it is in French, I will briefly summarize some of its key points.

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The first section addresses theoretical and economic questions, including the range of unit energy costs that can be expected for this technology, once it achieves technological maturity. Section 1.2.3 ("Calcul des coûts unitaires") explains that, for any installation, the unit cost will depend on the nominal cost per kW of the machine, and of the capacity factor, which in turn will depend on the distribution of current speeds over the year.

If current speed remain at consistently high levels, the turbine can be expected to produce at its nameplate capacity with a very high capacity factor. In unregulated rivers, however, where flows and therefore current speed vary widely within and between years, average capacity factor can be very low. For this reason, sites in regulated watercourses like the Lower Churchill where flows are high (due to diversions from other watersheds into the Smallwood Reservoir upstream) and are maintained relatively constant are ideal.

The following table (from page 13 of the study) describes the range of possible unit costs, based on these two variables. It shows that, if installed unit costs can be kept under $2500/kW, levelized unit costs of 6 to 8 cents/kWh are entirely feasible for a site with regulated flows. As many in-stream hydro turbines are rated at a current speed of 3 m/s (5.8 knots), costs could be even lower if current speeds are above this level. In this regard, it should be noted that, according to Richard Learning, current speeds of 10 knots (5.14 m/s) are common in the Lower Churchill River.[1]

		Investissment requis ($/kW)					
		1500	2000	2500	3000	3500	4000
f.u.	50%	6,5	8,6	10,8	13,0	15,1	17,3
	60%	5,4	7,2	9,0	10,8	12,6	14,4
	70%	4,6	6,2	7,7	9,3	10,8	12,4
	80%	4,1	5,4	6,8	8,1	9,5	10,8
	90%	3,6	4,8	6,0	7,2	8,4	9,6

The second part of the study consists of a technological review of the industry, as of 2008. Since then, there have been several major developments which are not addressed in the study, including the licencing of several commercial installations by the FERC, and the entry of the Quebec firm RSW into the field. Thus, this technological review should not be considered up-to-date.

I am also attaching a one-page description of the RSW pilot project in the St. Lawrence River. I incorrectly stated the capacity of these machines in answer to a question from the panel. The correct capacity is 250 kW each.

Energy efficiency and conservation (Demand-Side Management)

In my comments on the afternoon of March 8, in response to comments by the Proponent, I mentioned the well known conflict of interest that represents a structural constraint on utility DSM programs. As

[1] Transcripts, March 8, p. 316.

this issue was not addressed in my report, I would offer the following information in support of this statement.

To take just one example, this conflict of interest was cited by the California Ratepayer Advocate (a governmental agency)[2] in defence of its policy position that energy efficiency programs should be managed by a non-profit organization, rather than by utilities:

> DRA agrees that energy efficiency is essential in both off-setting traditional fossil fuel procurement and addressing climate change issues. However, DRA does not believe that California's investor owned utilities are best positioned to maximize energy efficiency savings given their inherent conflict of interest in requiring them to sell less of their product and reduce ratebase.
>
> This was recently demonstrated by the utilities in the 2010 long-term procurement proceeding where the utilities decline to support long-term energy efficiency objectives. And the utilities current energy efficiency focus on short-lived CFL light bulbs has created diminishing EE savings after 2012. This demonstrates that the hundreds of millions of dollars in shareholder bonuses are not incenting the utilities to prioritize energy efficiency over fossil fuel. As a matter-of-fact, it shows that the utilities want to spend billions on energy efficiency programs and build new power plants as well.
>
> ***DRA's policy position:*** End utility shareholder bonus program for Energy Efficiency programs and transfer funding for most EE programs to a non-profit organiztion.[3] (underlining added)

A number of regulatory tools exist to neutralize this conflict of interest, when utilities continue to provide energy efficiency services directly. A summary of these approaches, generally referred to as "decoupling", can be found in a report published by the American Council for an Energy-Efficient Economy (ACEEE), entitled *Aligning Utility Interests with Energy Efficiency Objectives: A Review of Recent Efforts at Decoupling and Performance Incentives* (attached).[4] The first section of the background chapter is entitled: "Traditional Utility Ratemaking Provides a Disincentive for Utilities to Provide Customer Energy Efficiency Programs". A copy of this study is attached, as is a presentation by Richard Sedano of the Regulatory Assistance Project entitled, "Regulatory Barriers to Energy Efficiency."

This phenomenon can be seen in Nalcor's most recent Annual Report, which states: "Sales to Newfoundland Power increased by 151.4 gigawatthours (GWh), mainly as a result of load growth on the

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[2] The California Division of Ratepayer Advocates states, "*Our statutory mission is to obtain the lowest possible rate for service consistent with reliable and safe service levels. In fulfilling this goal, DRA also advocates for customer and environmental protections.*" http://www.dra.ca.gov/DRA/

[3] http://www.dra.ca.gov/DRA/energy/ee/

[4] M. Kushler, D. York and P. Witte, *Aligning Utility Interests with Energy Efficiency Objectives: A Review of Recent Efforts at Decoupling and Performance Incentives*, ACEEE Report #U061 (2006) http://energyohio.pbworks.com/f/m42w.pdf

Newfoundland Power system resulting in an increase of $12.7 million in revenue."[5] In other words, load growth in Newfoundland led to increased revenues for Nalcor's regulated subsidiary NLH, which otherwise saw a decrease in revenues.[6]

In response to an Undertaking, the Proponent produced the Marbek study referred to in IR#JRP.146.[7] A few comments are in order:

- The avoided cost used in preparing the study was 9.8¢/kWh. This figure is substantially lower than the current cost of operating Holyrood ($140/MWh[8]), according to the evidence presented, despite Mr. Bennett's suggestion to the contrary.[9] This 40% increase in the avoided cost of course means that more expensive CDM measures would now be cost effective, resulting in substantially higher potential energy savings than those identified by Marbek.

- This report was produced in response to PUB Order 8 (2007), concerning NLH's 2007 general rate application.[10] The order also required NLH to produce, by June 30, 2008, "a report outlining its five-year strategic plan with respect to energy conservation initiatives, including a description, timing, and cost of the program elements to be implemented by Hydro and a copy of the CDM Potential Study". I have requested a copy of this report from the PUB, but have not yet received a response.

- The same order addressed the usefulness of Integrated Resource Planning for NLH in the following terms:

> The Board remains convinced that an IRP undertaken as part of a generic process as described in Order No. P. U 14(2004) is an important planning tool and would enhance the information available to the Board and other parties regarding future generation and supply options in the Province. The Board will convene a meeting of stakeholders including Hydro and the parties to this proceeding to discuss the scope of an IRP process with the timing of such an exercise to be determined by the Board.[11]

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[5] Nalcor Energy, 2009 Business and Financial Report, p. 27.

[6] Ibid.

[7] Marbek Resource Consultants, Ltd., Conservation and Demand Managements (CDM) Potential, Newfoundland and Labrador, January 31, 2008.

[8] Transcripts, March 8, p. 184.

[9] Ibid. p. 219.

[10] Available on PUB website, http://n225h099.pub.nf.ca/orders/order2007/pu/pu8-2007.pdf.

[11] Ibid., p. 60.

However, given the imminent release of the government's energy plan, the Board chose not to establish at that time a process with respect to the commencement of an IRP exercise. It is not clear whether or not an IRP process is currently underway or planned at NLH or NP.

Unit costs for Muskrat Falls power

It is quite surprising that, at this stage of the EA proceedings, there is still confusion as to the unit costs of power produced by the proposed Project. Unfortunately, the information produced by the Proponent at the hearings and in its undertakings does not resolve this confusion.

With respect to Muskrat Falls generation, we have learned that:

1) The project costs are $2.9 billion (2017 $), taking into account generation only (transcript, March 7, p. 111);

2) The levelized unit energy cost (LUEC) for generation only is 7.7 cents per kWh (transcript, March 8, p. 2);

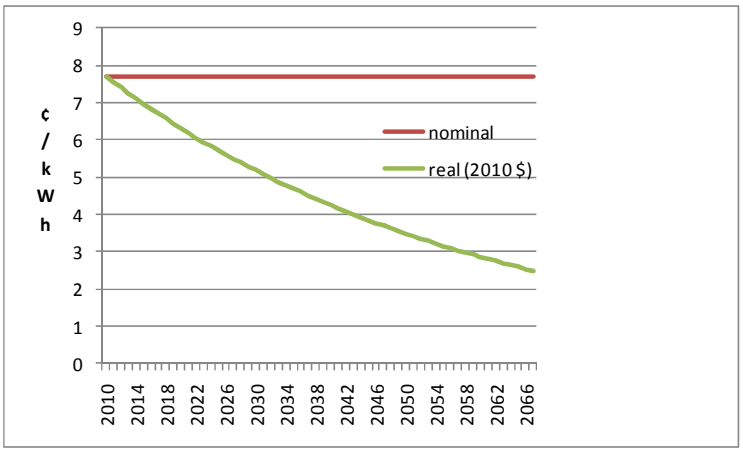
3) This figure is expressed in nominal dollars (transcript, March 8, p. 218);

4) This figure applies to the energy coming out of Muskrat Falls; the cost increases to 14.3 cents delivered to the Island (transcript, March 8, p. 278);

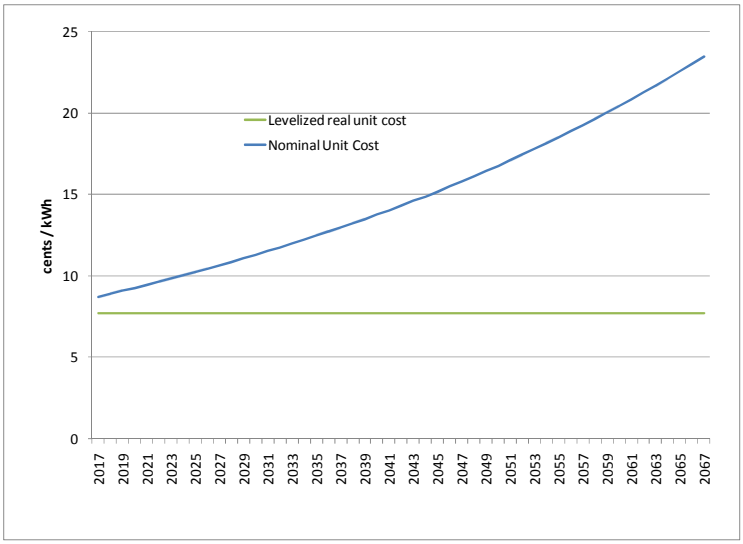
5) The revenues to the Proponent from sales to Island consumers will be based on a rate of 7.58 cents (2010 $), increasing with inflation (U-17 and U-27);

I have tried to reconcile these statements with each other, without success.

Statements 2 and 3 mean that, were the Proponent to receive 7.7 cents for every kWh produced, in the year when it is produced without adjustment for inflation, the resulting revenues would be sufficient to repay the total construction costs (including financing costs during construction). As the real value of 7.7 cents will decline year to year, due to inflation, the constant-dollar value of this revenue stream would also decline over time, as shown in the following graph.



Instead, in U-17 and U-27 (Statement 5), the Proponent shows the price charged for Muskrat Falls power *increasing* year to year, as shown in the following graph:



Thus, the statement that the levelized cost of 7.7 cents/kWh is a nominal levelized cost is inconsistent with the Proponent's treatment of the cost data. This treatment rather suggests that the LUEC provided is a **real** levelized cost.

The relationships between capital cost and real and nominal levelized costs are explained in a study I prepared, together with James Litchfield and Roy Hemmingway, for the Great Whale environmental assessment in 1994.[12] As this study is not easily available, I have attached the relevant pages and the title page and table of contents. I would be pleased to provide a copy of the full study, if it is of interest to the Panel.

As we explained on page 25, "Even though the levelized real cost of a new resource may be not greater than today's average system cost, the resource may lead to substantial rate increases when it is commissioned." It is the *nominal* unit cost "that must be recovered in rates, in order to make annual payments (principal and interest) on the debt incurred in building the project". (p. 27)

To the best of my knowledge — and assuming, based on the foregoing, that the cost figures provided are stated in real (constant) dollars — the Proponent has not yet provided a straight-forward estimate of the current-dollar (nominal) unit cost of the project, either in actual or in levelized (average) terms. As noted above, nominal unit costs are the only indicator of actual rate impacts.

However, based on the prices per MWh indicated in U-27, it seems that the average *nominal* cost of the project – the average value of the blue Nominal Unit Cost line in the above graph — is over $149/MWh.

[12] J. Litchfield, L. Hemmingway and P. Raphals. 1994. *Integrated Resource Planning and the Great Whale Public Review*. Great Whale Environmental Assessment: Background Paper No. 7, Great Whale Public Review Support Office, 105 pp.

As financing costs are generally greater in the early years of a major capital project, one could expect the nominal costs in the first decades to be greater than this levelized (average) value, and those in later decades to be lower.

If applied to the full output of the Muskrat Falls generating station, the Price per MWh figures provided in U-27 would result in over $37 billion in revenues over 50 years. Discounted at 8%, this results in a present value of over $6.5 billion, far more than the construction costs. A discount rate of over 15% is required to align the present value of these future revenues in line with total construction costs. The Proponent's statement that this revenue forecast is based on a rate of return similar to a regulated utility[13] therefore needs further explanation.

The hypothesis that the price charged to Island consumers will continue to escalate at the rate of inflation, while Nalcor's costs decrease, also requires further examination.

It is my understanding that, for the Proponent's decision-making process, no analysis of actual cashflow is required until Gateway 3, prior to project sanction. However, if the Panel is interested in understanding the impact of the Muskrat Falls project on power rates on the Island, it is necessary to examine this question now.

The Proponent is correct to state that the willingness of its shareholder to defer ("backload") its return on equity would affect the potential rate impacts. However, the testimony from Mr. Paddon of the Department of Finance suggests that the Province is expecting an adequate return on its equity investment once the project is in operation:[14]

MR. PADDON: The profits -- I mean, you had seen the slide for the previous proponent that at some point in time you could be talking about a billion dollars a year in terms of excess cash. Now, that's some time down the road.

But at the same time, I mean, once operations start there's still a reasonable amount of revenue that would be available, one, to service any debt that we incur to invest in the province,

[13] Supply Alternatives Analysis, p. 15.

[14] Transcript, v. 7, March 9, pp. 96-97.

> and then the residuals available for spending priorities of the government.
>
> The rate of return that we would expect on the project would be sufficient, one, to service our debt, and two, to provide reasonable revenue to be distributed throughout the economy, wherever that may be.

In the absence of an explicit commitment by the Province to defer its return on equity, one must assume that project revenues will need to be sufficient to meet these payments. Thus, one must assume that year-to-year revenues must be sufficient to meet payments on both debt and equity.

Additional questions

The Panel has indicated that it intends to direct additional questions to the Proponent in order to achieve greater clarity on these issues. To assist the Panel, I would like to suggest the following questions:

1. Please provide the detailed calculations used to derive the unit cost figures mentioned (7.7¢/kWh for generation only, and 14.3 ¢/kWh delivered to the Island[15]), including all data and assumptions necessary to reproduce the calculations.

2. Do the Price per MWh figures provided in U-27 represent the price at which power would be sold from Nalcor to NLH? If not, please specify what meaning should be given to these figures.

3. Please provide a year-by-year financial analysis after commissioning, that includes, as a minimum, the following elements:

    a. Costs, including debt and equity payments, depreciation, O&M, and other costs,

    b. Revenues (per MWh) and total,

    c. Debt balance,

    d. Undepreciated equity.

    Given the fact that financing arrangements have not yet been finalized, several scenarios may be presented to provide the Panel with an understanding of the various possible arrangements.

4. For each scenario provided in response to the previous question, please indicate the year-by-year per-MWh cost to be passed on to Island ratepayers, including both generation and transmission (Island Link) costs.

[15] Transcript, March 8, p. 276.

5. Please explain how the costs to Island customers would be different if the Muskrat Falls project were included in the rate base of NLH for regulatory purposes.

6. Please provide a summary of the current status of conservation and demand managements programs of NLH and of NP for Island consumers, including:

    a. Most recent plans submitted to PUB for approval, and relevant PUB decisions

    b. Current program budget ($/yr) and objectives (kW and MWh savings per year)

    c. Expected evolution of budget and objectives over the coming years.

7. Please provide a summary of the current status of integrated resource planning processes of NLH and of NP for Island consumers.

Philip Raphals
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Attachments:

1) La filière hydrolienne – Une Introduction (Centre Hélios)
2) Article on RSW instream hydro pilot project
3) Aligning Utility Interests with Energy Efficiency Objectives
4) Regulatory Barriers to DSM
5) PUB Order PU 8 (2007)
6) Litchfield, Raphals, Hemmingway, IRP and Great Whale Public Review (excerpts)