

PRESENTATION TO THE BCUC INQUIRY INTO THE SITE C PROJECT

– Vancouver, October 14, 2017

My name is David Vardy and my submission to the Commission is a comparison of Muskrat Falls with Site C. I am an economist who served for most of my career as a senior public servant in the government of NL.

Earlier in my career I was a member of the Economics faculty at Queen's University and worked in the federal departments of Finance and Fisheries. I did my graduate training in economics at the University of Toronto and at Princeton University.

Within my home province I served as Secretary to the Cabinet, Chair of the Public Utilities Board, President of the Institute of Fisheries and Marine Technology and Deputy Minister of Fisheries.

My full submission of August 30, 2017 is on the BCUC website.

In both NL and BC hydroelectric power reigns supreme. In BC 90% of capacity is hydroelectric while in NL 64% of Island supply is hydro power and for the province as a whole hydro power is higher than 90% of the total supply, when the giant plant at Churchill Falls is included.

The power capacity of BC Hydro is 10,000 MW while that of Nalcor Energy is 7,500 MW, including Churchill Falls, which is rated at 5,428 MW. Nalcor is the majority shareholder in Churchill Falls, with Hydro Quebec holding 34%.

Most of the energy produced at Churchill Falls is sold to Quebec leaving Island capacity at about 2,000 MW which compares with 10,000 MW in BC.

Unlike BC Hydro Nalcor Energy is not regulated, even though its fully owned subsidiary, NL Hydro, is regulated by the Public Utilities Board.

Muskrat Falls will add 824 MW and 4,900 GWh to the provincial system. While Muskrat Falls is similar in size to Site C its impact on the province is much greater than the impact of Site C on BC. Site C represents 3.5% of your province's GDP and 21% of your net debt, while Muskrat Falls represents 42% of our GDP and 85% of our net provincial debt.

The Muskrat Falls project includes a number of components, additional to the generation plant itself. The generation plant accounts for 54% of the cost while transmission lines represent 46%, a much higher transmission component than that for Site C. Also included in the project is a sub-sea cable crossing under the iceberg infested Strait of Belle Isle. The TL connecting the Island with Nova Scotia is known as the Maritime Link.

The impact of Muskrat Falls on power rates will be enormous, with rates doubling to 22.9 cents per KWh in 2021, the first year of full power. My understanding is that Site C will not trigger large rate increases when it comes on stream in November 2024.

I will highlight some key issues that I think are relevant, relating to the following matters:

1. Planning time frame and intergenerational equity;
2. Underestimation of costs;
3. Overestimation of consumer demand; and
4. The business case for Muskrat Falls.

Planning time frame and intergenerational equity

Nalcor selected a planning horizon of 50 years and advanced the Muskrat Falls project as a long term solution to a perceived energy problem. If we did have an impending energy shortage it would be relieved by 2041 when the Churchill Falls contract with Quebec comes to an end and we have access to its full 5,428 MW production instead of our current access of 525 MW.

In presenting the Muskrat Falls project Nalcor ignored the availability of Churchill Falls power. The time frame for the review in NL should have ended at 2041, without adding further generation costs from 2041 to 2070.

The project required a long payback period to build any kind of business case. Such a long time frame permits costs to be shifted into the future through various devices. Both BC Hydro and Nalcor have used different techniques but the result is the same, namely to reduce current rates and increase future rates and thereby to avoid rate shock.

In the case of Nalcor they have chosen to backend load or defer payment of the costs of generation assets over the 50 year period, while adopting normal cost of service accounting for transmission costs. This means that capital costs expensed for generation assets in the last 20 years (from 2050-2070) are enormous.

With rapid technological change large power plants may be rendered obsolete. In 2069, Muskrat Falls may be superseded by more efficient energy sources but ratepayers will continue to be burdened with the cost of the project. This results from the “backend” loading of generation costs while unit energy costs are levelized over time, in real terms. Will the same be true of Site C where the planning horizon is 70 years? Is it fair to future generations to impose these costs upon them?

Underestimation of cost

Underestimation of cost has been a huge problem at Muskrat Falls. Since the Muskrat Falls project was announced in 2010 there have been seven cost revisions. Including financing costs, but excluding the Maritime Link, the cost estimate went from \$6.2 billion when announced by Premier Danny Williams in November 2010, to \$12.72 billion in June of 2017. The following table comes from the June 2017 report of the Oversight Committee. The increase from \$6.2 billion in 2010 to \$12.72 billion was an increase of 105%, with the largest increase announced by the new President Stan Marshall in June of 2016 at which time he announced that there would

| Project Capital Budget Comparison - (Billion) | Capital Costs | Financing and Other Costs | Total |
|---|---------------|---------------------------|---------|
| • December 2012 (Sanction) | \$6.20 | \$1.2 | \$7.40 |
| • December 2013 (Financial Close) | \$6.53 | \$1.2 | \$7.73 |
| • June 2014 | \$6.99 | \$1.3 | \$8.29 |
| • September 2015 | \$7.65 | \$1.3 | \$8.95 |
| • June 2016 | \$9.13 | \$2.3 | \$11.43 |
| • December 2016 | \$9.40 | \$2.3 | \$11.70 |
| • June 2017 | \$10.12 | \$2.6 | \$12.72 |

be a slippage in the schedule by two years, delaying full power to the second quarter of 2020. The increase amounted to \$2.48 billion, which included a variety of escalating costs including

those for the powerhouse. The delay in schedule created a major increase in financing cost from \$1.3 billion to \$2.3 billion. The delay was the result of problems by a major contractor who had been awarded the contract to build the powerhouse and associated civil works. This large contract was awarded to an Italian firm which had no previous experience in the Canadian north and had vastly underbid the competition. In December of 2016 Nalcor's CEO announced that the contract with Astaldi had been renegotiated, raising the contract from \$1.1 billion to \$1.83 billion, an increase of 66%.

Nalcor also underestimated the operation and maintenance costs. Their June 2017 update revealed that their earlier cost estimate had been revised from \$39 million to \$109 million, growing to \$143 million in 2021. How does the operating and maintenance cost of Site C compare?

There are many complex reasons for the cost escalation. A former Nalcor employee has stated that cost estimates were falsified in order to secure project sanction. The anonymous engineer said:

"I could not put up with falsifying information anymore.

To begin with, the original cost of \$6.2 billion on which the project was approved was a complete falsification. The estimate was deliberately kept low — below \$7 billion, so as to appear favourable relative to the cost of thermal power generation.

The likely costs were known about three years ago, but Nalcor Management kept it a secret, steadfastly denying that there were major schedule delays and cost overruns, until it was no longer possible to hide the true status with the election of a new Provincial Government."

This led to calls for a forensic audit and a public inquiry. The provincial government will soon be appointing a public inquiry into the escalating costs to determine the reasons. However it is likely that part of the problem stems from the inexperience of Nalcor, a crown corporation created in 2007, whose expertise in the electric power business resides primarily in NL Hydro and which has had no experience in a project of this size and complexity.

With the Upper Churchill project, completed in 1974, ahead of schedule, the project manager was Acres Canadian Bechtel, who brought the project in on budget. Nalcor ought to have similarly engaged an experienced project management firm, rather than taking on the lead project management role itself.

Overestimation of Demand for Power

While costs were vastly underestimated the converse applied to the demand estimates. In the 20 years prior to 2010 energy demand had risen and fallen back again, largely due to the closure of two paper mills and the downsizing of a third. This loss of industrial load was offset by continuation of a trend toward increasing penetration of electric space heating in the residential and commercial sectors. At the beginning of this 20 year period consumption was about 7000 GWh and at the end it was at the same level. Nalcor forecasted (2012) that energy consumption would reach almost 10,000 GWh by 2030. This stands in stark contrast with the June 2017 update from Nalcor which shows energy use falling initially after interconnection and then rising slowly to only 7200 GWh by 2030, as shown below.

It is questionable whether Nalcor has sufficiently measured the impact of rising rates upon demand. Using an elasticity of demand of -0.4 we would expect energy use to drop over time from 7,000 GWh to 4,200 if rates double by 2021 to 22.9 cents per KWh, as forecasted by Nalcor (see chart below from June 2017 update from Nalcor). This would wipe out demand for Muskrat power.

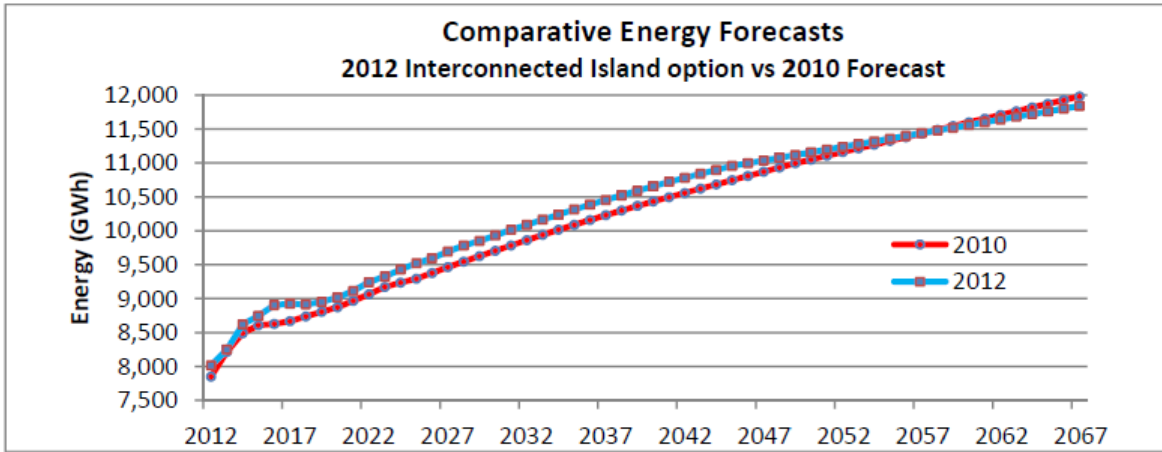
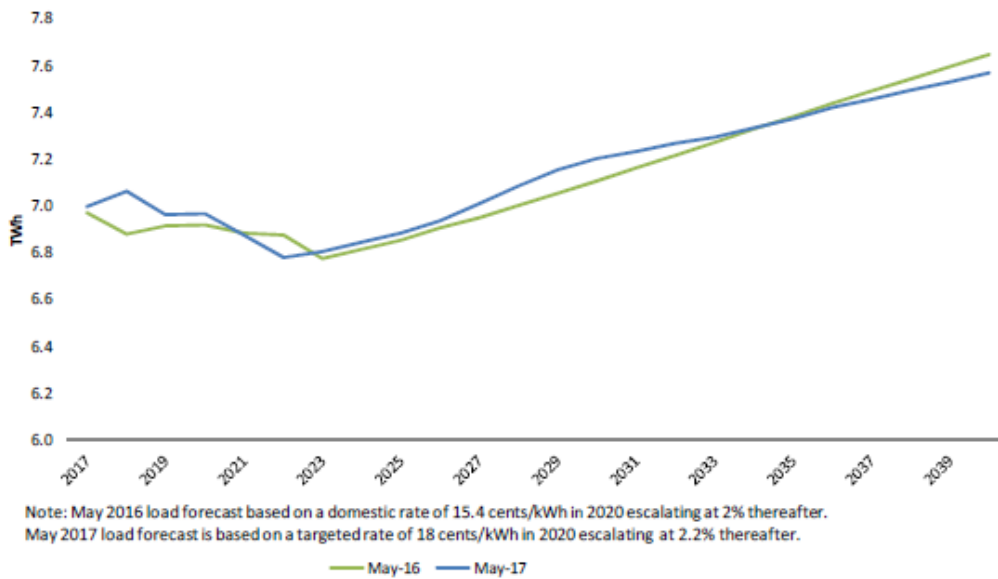
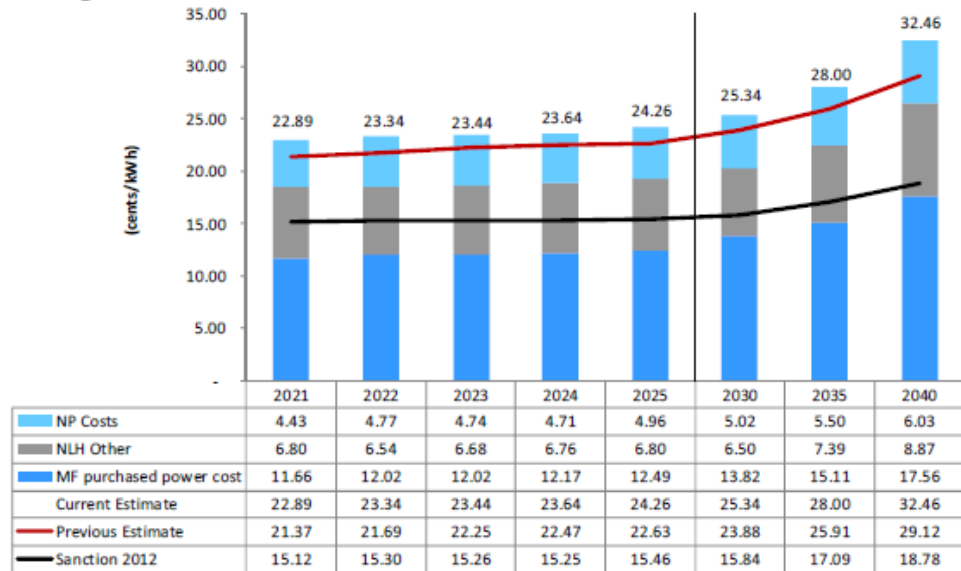


Figure 4: Comparative Energy Forecasts - the 2012 Interconnected Island option versus 2010 Load Forecast

NL Hydro Island Interconnected Sales



Island Interconnected Domestic Rate Projections



Current wholesale and domestic rates are 7.5 cents/kWh and 11.7 cents/kWh (excluding HST), respectively.

2011-12 Review by joint environmental panel and by PUB on Reference from NL government

The Muskrat Falls project was exempted from the jurisdiction of the PUB but in 2011, as a result of an intervention to which I was a party, the government made a limited reference to the Board. The reference asked the Board to decide between Muskrat Falls and the Isolated Island option, a combination of small on-Island hydro sites and thermal generation. The cost estimates presented to the Board were based on 5-10% of the engineering work and were Class 4 estimates. The demand projections were unrealistically high, in a province which had lost 80,000 people because of the collapse of fish stocks. The consultants to the Board were Manitoba Hydro International (MHI) who were persuaded by Nalcor and its consultants to endorse the project, as was the Consumer Advocate.

In the Board’s report to government the following quote is made from testimony by my colleague Ron Penney and me:

(Mr. Vardy): The mitigation of risk is a key issue to be addressed in this hearing. There is risk associated with all options, not just one. Some of the risks are controllable; some are not. Some can be anticipated and known; others are unknown. We can never be assured that all risks have been identified and minimized. However, we must attempt to ensure that system planning takes all risk factors into account. We believe that in a project of this magnitude, all available expertise and information should be mobilized. The major risks as we have identified them are as follows; capital cost overruns, volatile oil and gas prices, over-estimation of load growth, under-estimation of load growth from emerging new industrial users of electricity, volatile electricity prices in potential export markets for electricity produced in Newfoundland and Labrador, changes in demography which may impact upon load growth, decline in family formation and new home construction, and changes in the usage of electricity, and finally, physical risks such as storms and icebergs scouring on the Strait of Belle Isle.

Mr. Vardy further stated:²³⁵

(Mr. Vardy): The isolated island alternative contains a series of smaller projects which allow Newfoundland Hydro to move forward and supply power, maintain system reliability, and thereby provide ample time to mitigate the risk associated with Muskrat Falls and to explore other options. The Muskrat Falls Project is of such a scale and nature that once a decision has been made, there is no turning back. We cannot make piecemeal adjustments. The cost of Muskrat Falls is all up front and inescapable.

Our recommendation is that Government take short to medium term energy decisions which will allow sufficient time for the province to complete its due diligence on Muskrat Falls.

The Board concluded it could not render a recommendation based on the incomplete information filed in the hearing.

The information provided by Nalcor in the review is not detailed, complete or current enough to allow the Board to determine whether the Interconnected Option represents the least-cost option for the supply of power to Island Interconnected customers over the period of 2011-2067, as compared to the Isolated Island Option.

The PUB did not reach a conclusion and remained agnostic on the options. The joint environmental panel on the Lower Churchill reported in August 2011 and was equally unconvinced of the merits of the project. They stated as follows:

The Panel concludes that Nalcor's analysis that showed Muskrat Falls to be the best and least cost way to meet domestic demand requirements is inadequate and an independent analysis of economic, energy and broad-based environmental considerations of alternatives is required.

Is there any similarity between the situation faced in 2012 by the NL PUB and that faced by the BCUC today?

Marc Eliesen, who was at the helm of BC Hydro from 1992 to 1994, outlined why he believes the only financially responsible course of action is to cancel the \$8.8 billion project and remediate the Peace River site in order to minimize Site C's negative impact on BC Hydro customers and taxpayers.

"There never was a business case for the start-up of construction of Site C, and there is not a business case to support its continuation or postponement."

This is similar to comments made by former Fortis CEO Stan Marshall after he took on the role of CEO of Nalcor Energy in 2016. When asked whether Muskrat Falls was a "boondoggle" he

confirmed that it was and said that he never supported the project because it was speculative, overbuilding capacity, instead of increasing capacity incrementally to meet demand.

In my written submission to the BCUC I made 14 recommendations and I remain committed to all of them but will conclude, for brevity, with only three.

1. The BCUC must be vigilant to reflect the interests of present and future generations. The present generation has an obligation to protect our assets, including our environment, for future generations. We also have an obligation to pay for the services we consume, including electric power, and not to foist our costs upon future generations through byzantine financial arrangements which amortize costs well beyond the lifetime of people living today, as epitomized by the 70 year time horizon in BC for Site C and the 50 year horizon adopted in NL for Muskrat Falls, combined with backend loading of costs.

2. Do not overbuild the system; build according to your need. This is particularly appropriate in an era of rapid technological change when we need to design a system that is adaptable to change. For NL, Muskrat Falls was far too large for our needs and far too expensive.

3. Ensure that project costs and schedules are tightly controlled. As noted earlier the cost estimates for Muskrat Falls have been revised seven times to date. The largest project, for the powerhouse and other civil works, was awarded for \$1.1 billion and has been renegotiated to \$1.83 billion. The original contract was not a lump sum contract. Instead it was cost plus, the more labour used the higher the cost.

Thank you for the opportunity to make this presentation. My full submission is on the record and I will be pleased to answer your questions.

David Vardy

St. John's, NL