Commission of Inquiry Respecting the Muskrat Falls Project

Muskrat Falls: A Misguided Project

Volume 1: Executive Summary, Key Findings and Recommendations

Volume 2: Pre-Sanction Events

Volume 3: Post-Sanction Events

Volume 4: Looking Forward

Volume 5: Appendices

Volume 6: Exhibit Listing

The Honourable Richard D. LeBlanc
Commissioner

March 5, 2020

COMMISSION OF INQUIRY RESPECTING THE MUSKRAT FALLS PROJECT

MUSKRAT FALLS: A MISGUIDED PROJECT

VOLUME 1:

EXECUTIVE SUMMARY, KEY FINDINGS AND RECOMMENDATIONS

The Honourable Richard D. LeBlanc, Commissioner

Submitted to:

The Honourable Siobhan Coady
Minister of Natural Resources
for the Province of Newfoundland and Labrador

March 5, 2020

www.muskratfallsinquiry.ca

About This Report

This Report quotes heavily from testimony and exhibits presented at or to the Commission during the activities of its inquiry. Documentary evidence was catalogued and made available to the public on the Commission's website. When cited in this Report, these public exhibits are referred to by their individual number (for example, P-00001). Similarly, testimony given by witnesses during the public hearings was transcribed and made publicly available at muskratfallsinquiry.ca. Quotes from testimony are cited with a date and transcript page number. Because both types of citations are so numerous in this Report, smaller type was used to reduce their intrusion in the text.

No changes to spelling or punctuation were made in any quoted material. The minimal additions to quotes that were made (for clarity) were inserted [like this].

It should also be noted that, unless otherwise indicated, all monetary figures are in Canadian dollars. As will be explained in more detail in the text, the "Muskrat Falls Project" and "the Project" both refer to the tri-part development that includes the infrastructure and generating station at Muskrat Falls, the Labrador-Island Link and the Labrador Transmission Assets.

For the convenience of the reader, a Glossary of terms, a list of Acronyms and a list of Names and Affiliations has been included in each of the first four volumes of the Report.

This Report is in six volumes.

ISBN 978-1-55146-709-2

Commission of Inquiry Respecting the Muskrat Falls Project

March 5, 2020

The Honourable Siobhan Coady
Minister of Natural Resources
Natural Resources Building
50 Elizabeth Avenue
P.O. Box 8700
St. John's, NL A1B 4J6

Dear Minister Coady:

I am pleased to deliver to you the report of the Commission of Inquiry Respecting the Muskrat Falls Project in response to Order-in-Council 2017-339.

This Report outlines the history of the Muskrat Falls Project based on the evidence presented at the hearings of the Commission.

I would like to thank you and your Cabinet colleagues for entrusting me with this important task. It is my hope that this Report will be of some benefit and assistance to the Province.

Sincerely yours,

Richard D. LeBlanc
Commissioner

Enclosure

5th Floor, Beothuck Building, 20 Crosbie Place, St. John's, NL A1B 3Y8

Tel: 709-729-6076
Toll Free: 1-833-235-7702
Fax: 709-729-6070

Email: admin@muskratfallsinquiry.ca
Website: www.muskratfallsinquiry.ca

TABLE OF CONTENTS

VOLUME 1: EXECUTIVE SUMMARY, KEY FINDINGS AND RECOMMENDATIONS

EXECUTIVE SUMMARY

This Executive Summary outlines the people, policies, issues, actions and decisions involved in the conception, development and execution of the Muskrat Falls Project (the Project), as presented in testimony and submissions to the Commission of Inquiry, which are fully detailed and cited in the volumes that follow. The opinions and interpretations expressed here are based on that evidence and on the more complete discussions in the main sections of this Report.

The Project is a hydroelectric power generation and transmission development that Nalcor Energy (Nalcor), a provincial Crown corporation, sanctioned and built with the authorization of the Government of Newfoundland and Labrador (GNL or the Province). It comprises the following components:

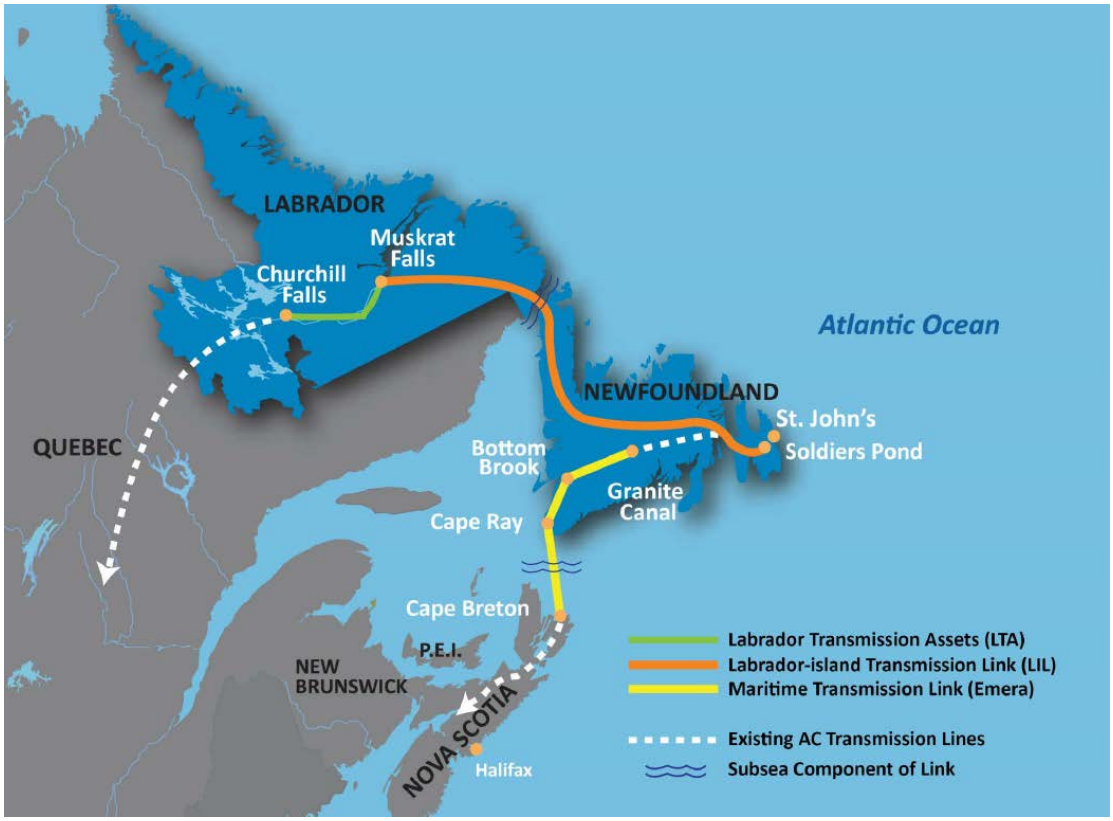
- A dam and 824 megawatt (MW) hydroelectric plant at Muskrat Falls on the Churchill River, Labrador
- A high-voltage direct current (HVdc) transmission line between Muskrat Falls and Soldiers Pond, on the Island of Newfoundland (the Labrador-Island Link or LIL)
- A high-voltage alternating current (HVac) transmission line between Muskrat Falls and the generating plant located at Churchill Falls (the Labrador Transmission Assets or LTA)

In conjunction with the development of the Project, Emera Inc. (a Nova Scotia utility) constructed a high-voltage transmission line between the Island of Newfoundland and Nova Scotia (the Maritime Link or ML) to enable energy generated in this province to be transferred to Nova Scotia.

Because of significant cost overruns and other issues related to the Project's execution, on November 20, 2017, GNL established the Commission of Inquiry Respecting the Muskrat Falls Project (the Commission). The Commission's terms of reference direct it to inquire into:

- Nalcor's consideration of the options (including the reasonableness of assumptions or forecasts) that led it to recommend to GNL the sanction of the Project as the least-cost option for the supply of power to address the electricity needs of Newfoundland and Labrador

- The significant differences between the estimated costs of the Project at the time of sanction ($6.2 billion plus $1.2 billion in financing costs) and the actual construction costs of the Project (currently $10.1 billion plus $2.6 billion in financing costs), including the consideration of the appropriateness of Nalcor's selection and management of contractors and suppliers, the structure and execution of its project management team, its procurement activities, its commercial arrangements and its assessment of financial and other risks
- The reasonableness of the decision to exempt the Project from oversight by the Board of Commissioners of Public Utilities (PUB) and what effect, if any, this exemption had on the development, costs and operation of the Project
- The extent to which Nalcor informed GNL of any risks or problems anticipated with the Project, so that GNL had sufficient and accurate information to approve sanction of the Project, and whether GNL employed appropriate oversight, governance and decision-making processes for the Project



The Muskrat Falls Project and Maritime Link

It is noteworthy that ratepayers on the Island of Newfoundland (the Island), who are responsible for repaying the cost of the Project through electricity rates, face the prospect of greatly increased power bills when the Project comes on-line.

Although it had publicly professed that a business case for the Project would have to be established, in effect GNL had predetermined that the Project would proceed. In so acting, GNL failed in its duty to ensure that the best interests of the province's residents were safeguarded.

Although GNL and Nalcor were united in their shared goal to proceed with the Project, GNL had no capacity or strong inclination to effectively oversee Nalcor. Instead, it placed its faith and trust in the Crown corporation it had created. Before and after Project sanction, Nalcor exploited this trust by frequently concealing information about the Project's costs, schedule and risks.

Nalcor presented the Project to government and the public as the lowest-cost option for supplying electricity to the Island, but the alternatives to it were not fully explored and some were discarded for unjustified reasons. The assumptions on which the Project's economics were based and promoted were not sufficiently tested, and a comprehensive examination of the range of possible outcomes was not undertaken. The cost estimate for the Project was knowingly understated in several ways, resulting in a budget that proved to be inadequate as soon as bids for major contracts were received.

Nalcor knew, or should have known, that the Project budget would be inadequate even before that point, however, and knowingly understated the cost estimates at the time of sanction (referred to as "Decision Gate 3" or "DG3") in December 2012. Nalcor's DG3 estimate was clearly influenced by optimism bias, strategic misrepresentation and political bias.

To a significant extent, the culture and processes at Nalcor were shaped by its first Chief Executive Officer (CEO), Edmund Martin. He had a strong belief in the merits of the Project, which was reflected in the approach of the Project Management Team (PMT). This resulted in a combination of unrealistic optimism, a willingness to misrepresent costs, schedule and risk, and an inability to change course when things were going wrong.

BACKGROUND

Between 2004 and 2007, GNL and Newfoundland and Labrador Hydro (NLH) worked on a comprehensive Energy Plan that would provide strategic direction and policy guidelines for the development of the province's energy resources. On May 8, 2006, Premier Danny Williams announced that Newfoundland and Labrador would undertake the Lower Churchill Project (LCP), namely—development of potential generation assets at Gull Island and Muskrat Falls. Doing so, he said, would maximize the returns to the province and allow us to be "masters of our own destiny."

The Energy Plan was released publicly in September 2007. It announced that the proposed development of the lower Churchill River would be led by a new Energy Corporation. The purpose of the new Crown corporation was to separate the activities of NLH (which were subject to regulatory oversight) from the unregulated activities that were planned to be undertaken by the Energy Corporation's subsidiaries in the hydroelectric and the oil and gas sectors. The Energy Plan was seen as the corporation's mandate document. It included the statement that GNL would "conduct a comprehensive study of all potential long-term electricity supply options in the event that the Lower Churchill project does not proceed."

The *Energy Corporation Act* was amended in 2008 to define how the new corporation's subsidiaries would operate. In December 2008, the Energy Corporation was officially named Nalcor Energy.

Meanwhile, in 2005, Edmund Martin had been appointed as President and CEO of NLH. He took on the same positions with the new energy Crown corporation, upon its creation. Mr. Martin's 25-year career in the oil industry had consisted mainly of the management of financial, business and other commercial matters. It appears that he did not have any direct involvement in significant engineering, construction or project management endeavours, nor any prior experience with hydroelectric or transmission line projects.

Also in 2005, Gilbert Bennett was appointed Vice-President, Lower Churchill Project, with a mandate to initiate its early planning. Mr. Bennett had no prior experience in hydroelectric or transmission line projects and had no experience in construction management. He had not worked on any megaprojects prior to joining Nalcor.

Edmund Martin selected Paul Harrington as the Project Director for the Lower Churchill Project. Although Mr. Harrington had some experience working on megaprojects, he had no previous experience as the lead project manager or project director of a megaproject. He had no previous experience in either the construction of hydroelectric or transmission projects, nor the pre-sanction assessment of strategic risks for megaprojects. His scope of work and level of responsibility at Nalcor would be significantly greater than at any position he had previously held.

All of the core members of the PMT hired also came from the oil and gas industry. With the exception of Deputy Project Director Ron Power, none of them had any experience in hydroelectric generation or transmission projects.

In May 2010, the Québec energy regulator issued a decision that rejected Nalcor's application to transmit power from a proposed Gull Island development through Québec's energy grid. This was a turning point for the LCP. Without either long-term customers for power or an ability to transmit to export markets, a 2,250 MW development at Gull Island was not feasible. At this point, attention within GNL and Nalcor shifted to the smaller site (Muskrat Falls) and the Maritime Route (transmission across the Island of Newfoundland and from there to the Maritime provinces), which Premier Danny Williams had always preferred over the Québec route.

Nalcor next prepared a plan to build an 824 MW generating station at Muskrat Falls. Since this would create more energy than was needed by the Island, a larger plan was developed. It involved partnering with Emera to deliver power to Nova Scotia via a subsea link, and from there to other mainland markets. Discussions about the potential for such an arrangement had been ongoing since 2008, when Nalcor had signed a Memorandum of Understanding with Emera.

On November 18, 2010, the Williams Government announced that the LCP would become a reality. Nalcor would construct the Project (which included the Muskrat Falls generating station, the Labrador Transmission Assets and the Labrador-Island Link) for an estimated $5 billion and Emera would finance and build the Maritime Link. The ML would cost an estimated $1.2 billion, about 20% of the total costs, and would entitle Emera to 20% of the energy output of Muskrat Falls. This arrangement is referred to as the "20-for-20 principle."

A "Decision Gate" process had been created to track the steps in developing the LCP. With the announcement in November 2010, the Project passed through the second gate

(DG2). Up to this time, GNL had emphasized the economic, environmental and strategic benefits of developing the Project, which included avoiding the geographic stranglehold of Québec. The Project was also stated to be the least-cost long-term option for meeting projected provincial electricity demands. From November 2010 forward, however, the emphasis shifted to promoting the Project as the way to satisfy Island energy needs at the lowest cost.

Some efforts were made to test other options for meeting that demand, but it is clear that GNL and Nalcor never seriously considered any option other than the Project. Over the next two years, they worked closely together to advance the Project to the point where it could be formally sanctioned.

GNL made all the regulatory and legislative changes needed by Nalcor to execute the financing strategy and reached an agreement with Canada for financial assistance in the form of a federal loan guarantee. Nalcor's business case for Muskrat Falls was built around replacing the aging Holyrood thermal generating station (Holyrood). Nalcor developed the official cost estimate for the Project and reached formal agreements with Emera. The Project was sanctioned in December 2012.

THE BUSINESS CASE FOR MUSKRAT FALLS

Normally, the complex question of least-cost power for consumers would be answered by the Public Utilities Board, this province's utility regulator. But the Project had been exempted from PUB oversight by an Order in Council in 2000. So providing the justification for choosing the Project as the best option fell to its proponent, Nalcor.

The business case for the Project consisted of this proposition: that between two generation plans—the Isolated Island Option and the Interconnected Island Option (which had the Project as the main component)—the latter would cost less in the long term.

To arrive at this conclusion, Nalcor compared the two generation plans by applying a Cumulative Present Worth (CPW) analysis, which measured the estimated incremental costs of each option through time until 2067. If these options had been the two best choices to provide electricity for the province, this would have been a reasonable way to determine the least-cost option. However, it is questionable whether they were the two best options.

THE SCREENING PROCESS

Nalcor used a screening process to determine which generation sources were viable. Nuclear, coal, solar, tidal and biomass generation were all screened out in this first step for legitimate reasons.

Other than Muskrat Falls, five other electricity-generating components passed through the screening and were used to design the two generation options that were then quantified and tested. They included:

1. **Capital investments** to extend the life of the Holyrood thermal generating station. This would involve the installation of scrubbers and precipitators to reduce pollution, enabling Nalcor to use a cheaper kind of fuel.
2. **Simple-cycle combustion turbines**, which are mechanically simple and can be started up quickly. This makes them useful for peak loads and backup generation but less cost-effective when used for long periods.
3. **Combined-cycle combustion turbines**, which are more complex and expensive but use fuel more efficiently over long periods.
4. **Three Island hydro sites:** Island Pond, Round Pond and Portland Creek.
5. **Wind generation**, which is intermittent and non-dispatchable.

Nalcor assembled two plans. The Interconnected Island Option included the Project and the Isolated Island Option did not. The details of these plans were determined using a computer program called Strategist, a software tool commonly used by public utilities to optimize their generation plans.

Several other options were then screened out using questionable justification, as the following sections outline.

Deferral to 2041

One alternative to the Project would have been to wait until 2041, when the Upper Churchill Contract expires and power could be purchased from Churchill Falls at a

relatively low rate. Since Nalcor had determined that the Isolated Island Option was cheaper until the mid-2030s, the alternative of deferring to 2041 ought to have been given serious consideration.

During its planning exercises prior to DG2, Nalcor had used Strategist to develop a generation plan centred on 2041 Churchill Falls power. That scenario assumed that extending Holyrood's life to 2041 would cost $233 million and that, after 2041, energy would be available from Churchill Falls at New York market prices.

Using these inputs, the CPW of waiting for 2041 came out higher than the CPW for the Interconnected Island Option, but lower than that of the Isolated Island Option. This result underlines the inappropriateness of screening out Churchill Falls power post-2041 as an option. Building a generation plan around 2041 Churchill Falls power availability may well have been difficult, but it avoided the upfront capital cost of the Interconnected Island Option as well as the associated high fuel costs of the Isolated Island Option after 2041.

The Recall Block

The Recall Block is 300 MW of power from Churchill Falls that a Nalcor subsidiary, Churchill Falls (Labrador) Corporation, is entitled to sell to NLH. About 220 MW of this power is needed to meet peak loads for Labrador in the winter and the excess is resold through a booking on Hydro-Québec's transmission system. Nalcor screened out the Recall Block as a power-supply option because the 80 MW spare firm capacity was not enough to replace the significant winter capacity of Holyrood. While this calculation is true, the assessment is incomplete. The Recall Block could have been a valuable component of a generation plan even if it did not fully replace Holyrood's power output.

Imports of Electricity from Québec

Nalcor considered power imports from New York or New England in its screening process, but did not consider power imports from Québec.

In 2010, Hydro-Québec faced a possible shortage of winter capacity. Negotiations with Hydro-Québec could have led to a discussion about the development of the entire lower Churchill River, including Gull Island. Hydro-Québec could have used its own large domestic and export market to justify and support development of Gull Island, thereby offering this province's ratepayers low-cost energy.

One can only speculate about what might have come from negotiations with Hydro-Québec. A mutually beneficial deal was always possible. However, Nalcor's decision to screen out negotiations with Québec altogether is another example of its failing to adequately consider all potentially viable options.

Grand Banks Natural Gas

Newfoundland and Labrador has abundant offshore natural gas that has never found a commercial market. This was screened out as a supply option, a decision that was questioned publicly, notably by Dr. Stephen Bruneau. Natural gas was originally screened out based on a 2001 report on a plan for exporting it to North American markets, which concluded it would only make economic sense if huge volumes of gas were produced, much more than would be need to supply the Island. Dr. Bruneau believed, however, that a smaller system for domestic use could be less costly and be justified with a lower-volume of production.

The key issue with natural gas is one of trust. All the publicly available information suggested that Dr. Bruneau's views were potentially viable and worth investigating. If so, the next step would have been a more formal dialogue with the oil producers to determine what price they would have charged to make natural gas available. Perhaps the price would have been prohibitive, perhaps not. Nalcor's response to this proposition, however, was that its private relationship with the oil companies revealed that the opportunity was not viable. According to Nalcor, oil companies would not have been willing to part with the associated natural gas at any reasonable price for reasons they were unwilling to publicly disclose.

Nalcor's position cannot be evaluated from information available publicly—it is pure assertion and its credibility depends on having confidence that Nalcor was using best efforts to explore all potential alternatives to the Project. Based on the evidence, however, it is difficult to have this confidence. If anything, it appears that Nalcor impeded an appropriate assessment of the natural gas option and unreasonably excluded Grand Banks natural gas as a supply alternative.

In addition, GNL made no apparent effort to deal directly with Husky or other potential gas producers. This is surprising, especially since GNL's own Energy Plan had directed that natural gas options should be explored. As a result, Nalcor's exclusion of Grand Banks natural gas as a supply alternative was unreasonable.

Liquefied Natural Gas

This option was screened out at DG2 on a relatively thin rationale based on the uncertainty of liquefied natural gas (LNG) prices in the global market. In 2012, a consultant looked at it in addition to its work on Grand Banks natural gas. Based on estimates of the capital and operating costs, together with an estimate of the long-term price of LNG, the CPW of an LNG plan was estimated to be competitive with the Isolated Island Option.

It is now impossible to determine the actual cost of the LNG option. It was at least competitive with, and potentially significantly cheaper than, the cost of the Isolated Island Option. To determine whether the consultant's or Nalcor's CPW estimate was the most accurate, Nalcor would have had to contact potential LNG suppliers, seek quotes and invest resources to obtain a better estimate of regasification costs. This work was never done.

The decision not to investigate LNG further in the face of the information that was available at the time undermines the narrative that Nalcor and GNL were impartially seeking the lowest-cost option. The decision to screen out LNG as a supply option was unreasonable.

Additional Wind Generation

At DG3, a limit of 10% was placed on the amount of wind generation that could be used to fulfill the Island's energy requirements. Although the literature review identified uncertainty about implementing wind penetrations above 10%, it also suggested that this uncertainty would be resolved within the near future and that the most likely outcome was that higher penetrations would be possible. The literature review did not suggest that 10% was a probable long-term ceiling on wind penetration. Rather, it indicated some uncertainty about what the long-term ceiling would be and about the kind of system changes that would be needed to support higher penetrations.

Nalcor also did not consider additional hydro-generation options, such as Bay d'Espoir Unit 8 or Cat Arm Unit 3, when it concluded that increasing wind penetrations would raise reservoir levels and thus both increase the risk of spill and reduce generation efficiency. Nalcor's current CEO, Stan Marshall, testified that these other generation options would likely have enabled additional wind to be economically added to the Isolated Island Option. It was unreasonable to limit the Isolated Island Option to 10% wind penetration forever since 10% was unlikely to be the long-term limit.

Small Hydro

The Island of Newfoundland has abundant hydro resources. In addition to NLH's existing hydro-generation assets, which provide the lion's share of the Island's energy and capacity, NLH has identified hundreds of potential hydroelectric generation sites.

The three Island hydro sites that passed Nalcor's initial screening (Island Pond, Round Pond and Portland Creek) were hard-coded very early into the Isolated Island Option analyzed by Strategist. This suggests that additional hydro options may also have been cost-effective additions to the Isolated Island Option. Nevertheless, Nalcor screened out other potential hydro sites at both DG2 and DG3.

Conservation and Demand Management

Conservation and Demand Management (CDM) are measures to persuade consumers to use less electricity and CDM efforts were encouraged in the province's 2007 Energy Plan. In some jurisdictions, utilities must consider such measures, but NLH has never adopted this kind of planning or considered CDM as an alternative to generation. NLH considered CDM too speculative to rely on because if CDM did not work as well as hoped, the Island (as an isolated system) would be unable to import electricity to meet full demand and thus blackouts would occur.

While the uncertainty about results of CDM measures in an isolated-island grid is an important factor, this is not a reason to entirely dismiss CDM as a viable alternative to generation planning. CDM could have reasonably been included during screening, at least on a conservative basis. However, NLH failed to consider CDM either in its load forecast or as an offset to large fuel expenditures.

NLH's treatment of CDM—ignoring it, basically—was doubly flawed. It failed to consider ongoing CDM in future load forecasts and it failed to consider expanding CDM efforts as an alternative to generation expansion and increased fuel expenditures. Both flaws are significant in light of the structure of the Island's electrical load and the sensitivity of the Project's business case to the load forecast.

Time Frames and Forecasts

The Project required a large upfront capital investment but, once built, it would produce abundant power with relatively low operating costs for a long period of time.

Given the Project's long-term nature, Nalcor chose to evaluate its cost over a 50-year period beginning in the year that the Project was to be completed. Nalcor felt that the 50-year period was a time frame long enough to yield a more reasonable comparison to the alternatives. At the time of the analysis, first power was expected in 2017. In 2010, this led to a 57-year evaluation period from DG2 (2010) or a 55-year evaluation period from DG3 (2012).

Using a long time frame in forecasting and planning has a major disadvantage—it relies on assumptions about the distant future. Some of these assumptions are used as explicit forecasts of critical parameters, such as load forecasts, construction costs and fuel prices. Others are implicit assumptions about society and technology.

It is not possible to forecast accurately a half-century into the future. It is, of course, possible to produce estimates, but even precise ones will be inaccurate. A CPW analysis that is extended so far into the future becomes a mix of reliable estimates in the early years and nothing more than guesswork in later years.

Reasonable assumptions cannot eliminate uncertainty. There are significant limits to the accuracy of a forecast of electrical loads 55 years into the future. This can easily be seen by turning the 55-year time frame backward and imagining a forecast that predicted loads for 2012 from the perspective of 1957—before the development of an interconnected Island power grid, modern appliances and computer/device use, rural electrification, or the developments at Bay d'Espoir, Churchill Falls or Holyrood.

The real uncertainty about fuel forecasts grows with each year you move into the future. Nalcor's long-term projection understated the uncertainty implicit in the type of fuel forecast it used.

INTEGRATED RESOURCE PLANNING

Integrated Resource Planning (IRP) is a process that many utilities use to plan power generation to meet forecast needs. Developed in other jurisdictions in recent decades, the approach is used to make major utility decisions.

The Project's Joint Review Panel recommended that Nalcor conduct an IRP analysis. A draft report by Navigant Consulting Ltd. in 2011 also made a similar recommendation. Years before Project sanction, the PUB had attempted to investigate how, or if, it should integrate IRP into its own analysis methods. Nalcor's suggestion that the policy to develop

the Lower Churchill Project was a justification for not pursuing IRP is puzzling. The LCP decision was one of the most expensive and significant generation planning decisions in the province's history. If there was ever a decision that justified the full scrutiny of a modern planning process, such as IRP, this was it. Deciding not to pursue IRP because of the LCP exemplifies putting the cart before the horse.

The decision to pursue the LCP ought to have been the conclusion of a rigorous analysis. Instead, a rigorous analysis was not performed because of the decision to pursue the LCP. Furthermore, it is disingenuous for Nalcor to attempt to justify the decision not to invest in exploring alternatives to the LCP in the name of the Energy Plan. The Energy Plan called for alternatives to be canvassed.

Because NLH and Nalcor effectively obstructed the establishment of an IRP framework, it is not possible to know what would have resulted from such a process, but we know that the process used was inadequate and left decision makers and the public with a distorted sense of the costs, benefits and risks. Today, we face a worst-case scenario of low fuel prices, low load, large cost overruns and major delays. Before the Project was sanctioned, the present scenario was not even imagined as a possibility, but it might well have been if the analytical process had been robust.

SENSITIVITY ANALYSES

At DG2, Nalcor also used many sensitivity analyses to determine which of the two options was least cost. These analyses measured if, and by how much, a particular CPW changed in response to various factors and parameters.

The CPW preference for the Interconnected Island Option was large, but it was highly sensitive to changes in fuel price, load and capital costs. Adding more wind integration and Churchill Falls power after 2041 also significantly reduced the CPW gap between the two options.

In addition, these sensitivities displayed the limitations typical of a sensitivity analysis. Only a few combinations or scenarios were run, and none was run that would probe the disaster or worst-case scenario outcomes for either the Isolated Island or Interconnected Island options. For example, while the sensitivity analysis showed that a high fuel price/high load scenario would be very unfavourable for the Isolated Island Option, it did not indicate exactly how unfavourable it would be.

No sensitivity was run in which the Isolated Island Option was favoured, even though many possible combinations of circumstances would have existed that would plainly favour that option. The reluctance to display any scenario in which the Isolated Island Option was preferred reveals a fundamental analytical flaw.

At DG3, the sensitivities assessed by Nalcor were fewer and even more limited than those tested at DG2. Nalcor's DG3 analysis shared all the deficiencies of its DG2 analysis and failed to include sensitivities of load forecasts, as well as the possibility of a failure to sanction the Maritime Link or the inability to secure the Federal Loan Guarantee (FLG).

THE COST OF THE PROJECT

The Project cost estimates prepared for DG2 and DG3 had four components:

1. Base estimate
2. Contingency (tactical risk)
3. Management reserve (strategic risk)
4. Escalation allowance

The base estimate component included the "most likely costs for known and defined scope" of the Project at each decision gate. To determine the base estimate, the Project was divided into distinct packages of work and the cost of each was estimated. Based on experience as well as data from other projects, the estimators determined the cost of labour, materials and equipment that would be required. To reflect costs that had not yet been fully defined, the estimators added allowances to the quantities in the base estimate.

The second and third components of the cost estimate were contingency and management reserve. Contingency covers what Nalcor called tactical risks and management reserve covers strategic risks. These concepts are best understood together. Nalcor took its definitions of these concepts from the Westney Consulting Group, which Nalcor engaged in 2007 to help with its risk analysis.

The fourth component of the cost estimate is the escalation allowance. This provides for increases in labour costs and material prices over the course of construction. In addition to taking into account general inflation, the escalation allowance incorporates the impact that a large project has on regional or local prices.

The Base Estimate

The DG3 base cost estimate, prepared by SNC-Lavalin Inc. (SNC) and Nalcor, was not of the highest quality and accuracy, as would have been an expected requirement of the estimate prepared for Project sanction. It was biased on the low side for the following reasons:

- Nalcor intervened directly to reduce the SNC estimate by approximately $379 million; included in this amount was a reduction of $134 million in costs resulting from the unilateral decision of PMT member Jason Kean
    - Even if it is accepted that these reductions targeted components of the estimate that Nalcor thought were too high, selectively second-guessing the parts of the estimate that appeared to be high while accepting parts that appeared to be low resulted in downward pressure on the estimate; selective scrutiny produces bias as effectively as direct pressure does
- Nalcor's labour productivity assumptions for construction of the powerhouse and intake were both aggressive and based on inappropriate comparators
    - The data that SNC relied on to form its cost estimates did not reflect the experience of all the comparable projects in its database and SNC generally ignored projects that were comparable but had worse productivity
- The documentation for the SNC estimate was so weak that Nalcor misunderstood the labour productivity assumption used and was not aware of whether a large allowance for labour productivity had been added

The final base estimate at DG3 for all Project components was $5.473 billion and the total escalation allowance was an additional $361 million.

Tactical Risks

At DG3, Nalcor included a contingency of $368 million to cover tactical risks. This represented only 6.7% of the base estimate and raised the base estimate to a probability value of P50. Generally, a P50 means that there is an equal probability that the actual total cost will be above or below this amount. On a component-to-component basis, the contingency percentages of future expenditures were calculated as follows: Muskrat Falls generating station 9.4%, LTA 9.2% and LIL 3.8%.

The contingency level for the Project was unreasonably low. Given the long and well-documented history of cost overruns on megaprojects and other factors particular to the Project, Nalcor was, or should have been, aware of the inadequacy of the contingency level.

Strategic Risks

At DG2, Westney and Nalcor had identified 33 key strategic risks. At DG3, Nalcor decided to quantify only four strategic risks. By the time it was preparing the DG3 estimates, Nalcor considered the 29 other previously identified strategic risks to be fully (or almost fully) mitigated or to be tactical risks. As a result, it made no attempt to quantify several long-identified strategic risks, including:

- A delay in the environmental assessment process for the LIL, or the imposition of restrictive conditions as a result of it
- The limited availability of experienced hydro contractors
- A lack of support from Indigenous Peoples that could potentially lead to protests and delays

The PMT recommended that a management reserve of $497 million be established to cover strategic risks. This would have brought the total estimate to just under $6.7 billion. Edmund Martin rejected this recommendation and did not share the results of the DG3 strategic risk analysis with GNL, Nalcor's board of directors or the public. As a result, there was nothing in the DG3 cost estimate to cover strategic risks.

An Unachievable Schedule

At Nalcor's request, Westney also performed a time-risk analysis based on Nalcor's condensed version of the construction schedule. The results of the analysis were

discouraging for Nalcor, showing a completion delay of 11 months at P25 (a 25% probability of achieving this date) and a delay of 21 months at P75. It also gave Nalcor's publicly announced dates for first power in July 2017 and full power in December 2017 a mere 1% probability of being met. Rather than change the schedule to have more realistic target dates, Nalcor de-emphasized the results of the analysis and claimed that the mitigation efforts it was making could make the schedule achievable. Nalcor tried to reduce risk at the beginning of the schedule by awarding some contracts prior to sanction, but it did not add time to the schedule.

The effect of the Project's schedule delay was not included in the DG3 cost estimates. Yet any delay in the Project would mean more money being spent on fuel at Holyrood. The cost consequences resulting from an 11-month to a 21-month delay were never calculated. Richard Westney, founder of Westney Consulting, testified that a P1 (later upgraded to P3) result means that the schedule is "completely unrealistic" and should be revised. Nalcor's decision not to adjust its target dates was unreasonable.

Conclusions on the Cost Estimate

Dr. Bent Flyvbjerg, who testified as an expert witness, has stated that statistical analysis of megaprojects shows that estimates are consistently too low. He notes there are two types of bias that explain why this happens. The first is optimism bias, which is when the hope for a successful project leads a proponent to overestimate benefits and underestimate difficulties. The second is political bias or strategic misrepresentation, which is demonstrated when project teams want their projects to be approved so they deliberately exaggerate benefits and understate costs. Both types of bias were apparent in the Project.

Dr. Flybjerg's research also indicates that megaprojects often face large capital cost overruns and schedule delays. Neither Nalcor nor GNL demonstrated any awareness of the problem of large cost overruns, but even cursory research would have revealed that overruns above 50% are not uncommon for megaprojects, including hydroelectric projects. The failure of Nalcor and GNL to do this research is indefensible.

SNC did much of the work to prepare the DG3 base estimate. It is evident that Nalcor intervened to further reduce SNC's already aggressive base estimate, that Nalcor underestimated the worst-case scenarios when assessing cost estimates and that it failed

to quantify material strategic risks. Each of these actions reduced the DG3 estimate's accuracy and increased its bias.

The decisions Nalcor made to reduce the cost estimate must be seen as part of a pattern of questionable decisions that systematically tended to overstate the Project benefits, understate its cost and disregard alternatives.

Edmund Martin, Gilbert Bennett and the PMT frequently took unprincipled steps to help secure Project sanction. They concealed information that would undermine the business case reported to the public, to GNL and to Nalcor's board of directors. The PMT did its best to narrow consultants' terms of reference to forestall independent review and it tried to influence the editing of reports to make conclusions appear more favourable to the Project. Many times, these decisions were made by the same individuals, Paul Harrington and Jason Kean, who had also determined the final inputs into the tactical and strategic risk analysis.

Given the results of the risk analysis, Nalcor knew from Westney's advice that the best estimate of the Project's most likely cost was the P75 estimate of $7.5 billion. Nalcor should have used that estimate in its CPW analysis. In addition, Nalcor failed to consider worst-case scenarios reflective of the kind of severe adverse outcomes that have happened on other projects. Nalcor also failed to consider the full cost of schedule delays, including the cost of additional thermal generation. Finally, Edmund Martin failed to communicate the full cost of the Project (including strategic risk exposure) to GNL and to Nalcor's board of directors.

THE PUBLIC UTILITIES BOARD REVIEW

In 2000, GNL exempted the development of the lower Churchill River from regulatory oversight by the PUB. In early 2011, GNL was satisfied with the progress on the Project as reported by Nalcor. By April 2011, however, growing levels of public concern led GNL to consider introducing a level of independent review. Nalcor advocated against a review by the PUB, arguing that it would lead to schedule delay, higher costs and financing uncertainty. In addition, Nalcor argued that "oversight by the Province is implicit as it is the shareholder of Nalcor."

Early in May 2011, the Department of Finance and the Department of Natural Resources prepared a Decision Note that recommended hiring an independent consultant

to conduct a full review of the Project that would be broader in scope than any performed during the Muskrat Falls decision process. It was intended to be a review of the analysis and the due diligence conducted by Nalcor and its consultants.

Minister of Finance Thomas Marshall and Minister of Natural Resources Shawn Skinner agreed that the review proposed in the Decision Note properly described the type of due diligence that GNL should undertake and gave their approval to send it to the Premier. Premier Dunderdale rejected the Decision Note's recommendation for an independent review without referring the recommendation to Cabinet.

Instead of an independent review, GNL decided to proceed with a Reference Question to the PUB. Nalcor was unhappy with this decision. The wording of the Reference Question was drafted by Nalcor and GNL. The Reference Question was to determine whether the Isolated Island Option or the Interconnected Island Option was the least-cost option. The Reference Question was issued on June 17, 2011, with a direction to the PUB to produce a final report by the end of 2011. The short time frame was of concern to the PUB from the beginning.

In July, the PUB engaged Manitoba Hydro International (MHI) to provide expert technical advice and produce a report on the two options. While the PUB had expected that the bulk of the required information would be available from Nalcor immediately, Nalcor provided very little information at the outset. The flow of information was a matter of frustration for the PUB and a topic of much correspondence throughout the process. One major issue was that the PUB wanted to see the most up-to-date work and information, while Nalcor wanted to limit the review to its work done at DG2 in November 2010.

As a result of "Nalcor's failure to provide the required information in a timely fashion" and the need to ensure a comprehensive review of the Reference Question, the PUB asked GNL for an extension of time to file its report. GNL granted an extension to the end of March 2012.

Nalcor's performance during the review process was unsatisfactory. It did not adequately prioritize its dealings with the PUB, particularly in supplying responses to requests for information and filing its submission. Nalcor did not expect to be subject to the level of scrutiny that the PUB review required. Nalcor's conduct demonstrated its opposition to the PUB review, as well as its position that it should have control over the process.

MHI provided its final report to the PUB at the end of January 2012. This report endorsed Nalcor's CPW analysis in favour of the Interconnected Island Option, while commenting on what it considered to be certain gaps in Nalcor's planning.

On March 30, 2012, the PUB submitted its report to GNL. Instead of deciding whether the Interconnected or Isolated Island Option was the least-cost option, the PUB concluded that the information provided by Nalcor was not detailed, complete or current enough to answer the Reference Question. The PUB believed that a definitive conclusion could not be made based on the DG2 estimates, which were prepared with a preliminary level (5% to 10%) of the engineering completed.

GNL expressed disappointment with the PUB's report. Premier Dunderdale said in the House of Assembly that the PUB had "walked away from their responsibility." Minister Jerome Kennedy also publicly chastised the PUB and was quoted in the media as saying that the PUB report showed a lack of respect and "a failure to comply with their statutory mandate."

It was entirely reasonable for the PUB to conclude that it lacked the necessary information and details required to appropriately respond to the Reference Question. If GNL had wanted a proper review, it should have recognized this. If GNL had been committed to discharging its oversight role in a responsible manner, as was expected by the public, it would also have recognized the importance of insisting that Nalcor have substantially more design work completed and more accurate cost and risk estimates prepared before it sent the Reference Question to the PUB. Nalcor's insistence that it would not provide any information on cost and schedule beyond DG2 estimates eliminated any real possibility that the PUB would be able to properly answer the Reference Question.

The PUB's decision on the Reference Question was reasonable and justified in the circumstances. GNL believed that the PUB should have simply rubber-stamped GNL's preference for the Interconnected Island Option.

THE MANITOBA HYDRO INTERNATIONAL DG3 REVIEW

Immediately after receiving the PUB's report, GNL decided to retain MHI to perform a review of the DG3 estimates. GNL's top priority was achieving the planned schedule for

Project sanction in 2012. MHI initially proposed a relatively broad scope of work for its review, but it was gradually narrowed by GNL on the initiative of Nalcor.

One of the most significant changes to MHI's scope of work was the removal of strategic risk from the review. Nalcor advised that its strategic risk assessment would not be completed in time for the MHI review. No one in GNL understood at the time that strategic risk was a category comprising potential costs in the order of hundreds of millions of dollars, nor did Nalcor provide GNL with an explanation of the consequences of its removal from MHI's scope of work.

Numerous drafts of the scope for MHI's proposed review were exchanged, with Paul Harrington trying to further narrow it down. Eventually a compromise was reached: it was decided that the wording that was preferred by GNL for the scope of work would be maintained, but Nalcor's concerns would be addressed by supplementing the scope of work with a side letter to MHI outlining the "understandings" that would govern MHI's work, in order to meet the timelines in the contract of service.

MHI's final report was submitted to GNL on October 26, 2012. MHI recommended that Nalcor pursue the Interconnected Island Option as the least-cost alternative to meet future power-generation requirements and found that Nalcor's work was skilled and in accordance with industry practices. The cost estimates, load forecasts and project schedule were all found to be reasonable inputs into the analysis Nalcor had performed, with some minor caveats. The Maritime Link, although explicitly outside the scope of the MHI review, was also noted to generally improve the business case for the Project. Overall, the final MHI report contained few words of caution about the Interconnected Island Option and no positive comments about the Isolated Island Option.

GNL considered the MHI report to be a cornerstone of its due diligence prior to its official sanctioning of the Project. However, there are serious concerns about the independence, quality and objectivity of the writing and editing of this report. Sequential drafts and emails reveal that Nalcor had significant input into the report, not only on questions of factual accuracy but on reaching mutually agreeable wording for contentious topics. MHI's comments about the amount of contingency in the estimate, which was low, were gradually either removed or significantly softened. When asked about specific changes in the drafts, the MHI witnesses generally said they could not recall why many of them were made. Internal MHI drafts have comments showing that at least some changes were made in order to be "politically astute."

MHI defended itself by saying that it had worked within the scope it was given. However, there were no caveats in the MHI report to indicate the review's limitations, even though MHI had originally suggested that a much broader review would be needed for DG3.

If GNL had been serious about obtaining an in-depth review of Nalcor's DG3 work, it would have given MHI full authority to request whatever information it required from Nalcor. It is evident that GNL did not believe that a comprehensive review and analysis were required. It had prioritized expedience far ahead of due diligence and had total faith and confidence that Nalcor's work was as expert and as thorough as it could possibly be.

THE EMERA SANCTION ISSUE AND THE NOVA SCOTIA UTILITY AND REVIEW BOARD

In Newfoundland and Labrador, the Project was exempted from the regulatory oversight of the provincial utility regulator, the PUB. In contrast, Nova Scotia's legislation required its utility regulator, the Nova Scotia Utility and Review Board (UARB), to review and approve the ML before its cost could be passed on to ratepayers.

In an effort to fulfill the Federal Loan Guarantee condition precedent that the Project and the ML be sanctioned by their respective proponent provinces, Nalcor and Emera signed a Sanction Agreement on December 17, 2012. In this document, Nalcor and Emera agreed to sanction the Project and the ML simultaneously and, upon that sanction, Emera committed to complete and commission the ML in accordance with the terms of the Sanction Agreement and other formal agreements.

The Sanction Agreement contemplated "Negotiations upon Certain Circumstances" that would apply if the UARB did not approve the ML, or if it approved it with conditions unacceptable to GNL or Nalcor. In such circumstances, notwithstanding anything else in the Sanction Agreement: "Nalcor and Emera will attempt to reach a mutually satisfactory resolution of such issues with the goal of ensuring that the Maritime Link is built. For greater clarity, each Party shall be free to make its own decision as to the resolution of such issues in its sole and absolute discretion."

On December 17, 2012, GNL announced Project sanction in St. John's. This occurred notwithstanding the fact that the Cabinet Submission on the sanction decision, prepared by the Department of Natural Resources, had correctly noted that the "FLG is contingent on sanction of both Muskrat Falls and the Maritime Link Project" and that "Emera is not

required to sanction the Maritime Link until after the UARB completes its review," which confirmed that there was an obvious divergence of views within GNL about what constituted Project sanction. This Cabinet submission was prepared before the completion of the Sanction Agreement, but it is clear that the issue of the UARB approval was well known within government in early December 2012.

Nalcor did not attempt to confirm with Canada that the Sanction Agreement would satisfy the condition precedent of the FLG—it merely had a "belief" that it would work. This was a remarkably reckless basis on which to proceed to sanction such a large project. Edmund Martin and Nalcor misled Premier Dunderdale and GNL into believing that the Nova Scotia sanction was a certainty, when it was actually contingent on future events in Nova Scotia, the outcome of which could not be pre-determined.

GNL could also have independently confirmed with Canada its understanding that the condition precedent had been met. However, like Nalcor, GNL did not do so. As a result, the Cabinet proceeded to announce sanction of the Project based on the false premise that the Sanction Agreement with Emera conclusively satisfied the condition precedent for the FLG. This is surprising, if not incomprehensible.

On July 22, 2013, the UARB issued its initial decision on Emera's application to approve the ML. This decision stated that the ML was not the lowest long-term cost alternative for electricity for ratepayers in Nova Scotia unless Nalcor would contractually commit to providing market-priced energy to Emera.

On October 20, 2013, Nalcor and Emera signed the Energy Access Agreement in order to meet the UARB's requirement for sanctioning the ML. On November 29, 2013, the UARB issued its supplemental decision finding that the Energy Access Agreement satisfied the remaining condition of its July 22 decision and approved the Maritime Link.

THE PROJECT DELIVERY MODEL AND THE ROLE OF SNC-LAVALIN

Nalcor recognized that it required significant expertise in hydro development to bring "essential know-how and specialist resources to the Project" and hired SNC to meet this requirement. The Engineering, Procurement and Construction Management (EPCM) contract was awarded to SNC on February 1, 2011.

In the months that followed, the relationship between Nalcor and SNC grew increasingly strained. Nalcor alleged that deficiencies in SNC's performance began

appearing as early as August 2011 and continued into 2012. Nalcor's concerns included the slow rate at which managerial positions were being filled, the poor quality of personnel, the lack of proper Project control systems and missed deliverable deadlines.

When SNC had a weak start, Nalcor proceeded to manage events for the purpose of further undermining SNC's performance. In the end, Nalcor, and in particular the PMT, obtained the result that it had always wanted: management of the project by an Integrated Management Team (IMT) with the PMT in charge and SNC providing a limited support role in all areas except engineering, where SNC retained its lead role.

On March 12, 2013, Nalcor formally announced the switch from the EPCM project management model to the IMT model. It is evident, however, that Nalcor had been de-scoping SNC as early as the spring of 2012 and had made changes to SNC's scope months before the official announcement. The decision to switch from the EPCM model was made by Nalcor's PMT with limited input from the Nalcor executive.

The decision to de-scope SNC's role, and the obvious liability risk associated with this decision, was not properly assessed by the PMT, the Nalcor executive or the Nalcor board—nor was it properly communicated to GNL. The additional risks that this change introduced should have been quantified for the purposes of the DG3 estimate and the failure of Nalcor to do so was improper. The PMT's actions here are compatible with the view, expressed at the hearings, that the PMT felt that "we know best."

SNC's 2013 Risk Report

In 2013, SNC prepared a risk report for the Project that estimated that risks could increase the Project's cost by more than 30%. This report became a matter of controversy after it was revealed to the public in 2017. Premier Dwight Ball alleged that Edmund Martin had known about it in 2013 but had not disclosed it to GNL, a claim that was denied by Mr. Martin.

The *2013 Risk Report* was commissioned by SNC Project Director Normand Béchard, who stated that his motivation for preparing it was the potential of reputational damage to SNC in the event that the Project went over budget. At the time of the report's preparation, Nalcor was in the process of reducing SNC's role as the Project's EPCM contractor. An internal panel of SNC employees conducted the review and recommended that SNC work together with Nalcor to reach alignment on how to mitigate the risks.

In an interview with Grant Thornton, a consultant that prepared several reports for the Commission, Bob Card (former SNC CEO) stated that he met with Edmund Martin in April 2013 and discussed the contents of SNC's risk report.

Nalcor emails confirm that certain members of the PMT knew of the existence of this report in 2013 and that they deliberately decided not to request a copy. The most likely reason that Nalcor declined to receive the document was concern that the report might become public.

COST INCREASES PRIOR TO FINANCIAL CLOSE

Financial Close, which occurred in late 2013, was a critical point in the history of the Project. If GNL decided to cancel the Project after Financial Close, the consequences would have been dire and possibly financially devastating for the Province. It was imperative that GNL receive all relevant information about the Project before Financial Close so that, if necessary, it could re-assess, delay or even cancel it. Doing so after Financial Close was not an option—it was too late.

At the time of Project sanction (December 17, 2012), GNL publicly announced that the total cost would be $6.2 billion, exclusive of interest and financing charges. The public was not advised of any change in this cost estimate until June 2014, when it was announced that there was an increase of almost $800 million, to $6.99 billion.

In the period between Project sanction and November 29, 2013, Nalcor had obtained bids on work packages from contractors and entered into preliminary contract negotiations with many of them. The amount included for tactical risk in the DG3 cost estimate, from which these kinds of increases were to be paid, was $368 million. Nalcor must have known by April 2013, when the bids were received for contract package CH0007 (the largest contract, eventually awarded to Astaldi Canada Inc.), that the DG3 tactical risk amount (contingency) of $368 million was totally exhausted. By November 29, 2013, the bids from contractors who were subsequently hired exceeded the DG3 cost estimate by approximately $600 million, an overage of 25%. None of this information was provided to GNL or to Nalcor's board of directors prior to Financial Close.

During 2013, Nalcor's Project Controls team prepared monthly reports on the estimated costs to complete the Project. These reports were later supplemented by important information on costs and other relevant and up-to-date information, including

confidential information on the bidding process. With this supplementary information, the PMT would then prepare a "Management Outlook Report" for review by Edmund Martin and Gilbert Bennett.

Prior to Financial Close, the Management Outlook reports consistently indicated an increase in Project costs of between $600 and $800 million. Mr. Martin's explanation for not providing the information contained in the Management Outlook reports to GNL is unconvincing and implausible. The fact that the "numbers" may well have required further "stress" testing by Mr. Martin, the rationale he gave for his non-disclosure, is no excuse for not providing this information to GNL officials.

Until mid-November 2013, the only information that Nalcor had provided to GNL on the cost estimate for the Project was the $6.2 billion DG3 estimate. Further, with the approval of Mr. Martin, Nalcor had confirmed in writing to Finance Minister Thomas Marshall on November 1, 2013, that the cost estimate remained at $6.2 billion. This was misleading.

It is unreasonable to believe that the $6.2 billion DG3 cost estimate, completed in November 2012, could be considered on July 22, 2013, to be more reliable than a Management Outlook report prepared that same day. This Management Outlook report had been prepared with considerable effort by the PMT and the Project Controls team, and supplemented by more current information on costs and recent bids.

The information contained in the Management Outlook reports was critical and most certainly would have caused GNL, acting responsibly, to reassess the Project had it been informed. Nalcor did not advise GNL of these overruns prior to Financial Close, which was an egregious failure on its part.

In November 2013, after months of pressure from Canada to provide a cost update, Nalcor informed Canada and the Independent Engineer (IE) that Project costs had increased by approximately $300 million, but that this increase was offset by financing savings of $300 million due to a lower-than-expected interest rate and by a projection of $100 million more to be realized later through export sales. Nalcor provided Canada with a "final" capital cost estimate of $6.531 billion, which was the amount used in the Project's Finance Agreements signed at Financial Close. Canada agreed to use this amount as the new baseline against which cost overruns would be determined.

Nalcor did not advise GNL politicians of this revised cost estimate in any formal way. It appears that Premier Kathy Dunderdale was not advised of this increase before Financial Close. Her counsel's closing submission acknowledged that it was possible that Ms. Dunderdale was not aware of the cost increase before Financial Close. It is more probable than not that Edmund Martin did not inform the Premier or any GNL ministers of the $300 million increase until after Financial Close.

Edmund Martin also did not inform Nalcor's board of directors of the $300 million increase until after Financial Close. In fact, he directed Nalcor Chief Financial Officer (CFO) Derrick Sturge to remove slides featuring those numbers from a presentation for the board meeting of November 14, 2013.

Certain GNL civil servants were aware of the $300 million increase at the time of Financial Close, but they did not inform their ministers about it. Deputy Minister Donna Brewer and Director of Debt Management Paul Myrden of the Department of Finance were aware of it and they should have communicated this information to Finance Minister Marshall, especially since they were aware that he had recently asked to be informed of any changes to the cost estimate. Paul Morris, Assistant Deputy Minister of Energy Policy in the Department of Natural Resources, acknowledged that he was aware of the increase in November 2013 and believed it was "very, very likely" that he would have discussed it with Deputy Minister Charles Bown.

Mr. Bown was GNL's point person and conduit for information from Nalcor on the Project. It is likely that he, too, was aware of an increase in the cost estimate of the Project before Financial Close but he failed to take any steps to advise the Minister of Natural Resources and the Premier. His failure to report this information to his minister is inexcusable.

FINANCING THE PROJECT

After the signing of the Term Sheet with Emera in November 2010, GNL and Nova Scotia had initiated discussions with the Government of Canada for a federal loan guarantee that would reduce the financing costs for the Project and the Maritime Link. In August 2011, Newfoundland and Labrador, Nova Scotia and Canada signed a Memorandum of Agreement for the FLG, which Canada would provide under three conditions: that the projects collectively would have national and regional significance,

that they would have economic and financial merit and that they would significantly reduce greenhouse gas emissions.

On October 18, 2011, GNL provided Nalcor with a "Commitment Letter." It listed the commitments that GNL would make in order to ensure that the Project would be constructed. Although this Commitment Letter created no immediate financial obligations for the Province, it included an undertaking to provide an unlimited amount of money to complete the Project. The Commitment Letter allowed Nalcor to obtain a favourable indicative credit rating for the Project from three credit rating agencies.

Formal negotiations for the FLG began among Canada, Nova Scotia and the Province in June 2012 and continued until November 30, when the Term Sheet for the FLG was signed. But before the FLG was finalized, the financial arrangements had to be put in place with the lenders and a number of conditions precedent needed to be satisfied.

THE INDEPENDENT ENGINEER

One condition of the FLG was the engagement of an Independent Engineer to provide a due-diligence report to Canada and the financiers prior to the release of funds. The IE would then provide oversight during construction and would oversee the requests to draw down the funds. Although the IE's work was for the benefit of Canada and the lenders, Nalcor engaged MWH Canada to be the IE in August 2012. These contractual arrangements with the IE were in accordance with industry practice.

Leading up to Financial Close (referred to by many witnesses as the "point of no return"), the IE performed a high-level technical overview of the Project to ensure that good practice was being followed. Although the IE endorsed much of Nalcor's work on the Project, it raised particular concerns about the low level of contingency and the schedule, which it considered to be aggressive. The IE produced several drafts of its interim report before Financial Close, but except for one in July 2013, GNL was not given access to any of these drafts. Yet various GNL officials, including Premier Dunderdale and Finance Minister Thomas Marshall, stated that the work of the IE added to their confidence that due diligence was being carried out on the Project.

Nalcor was heavily involved in editing and finalizing the content of the IE reports. Because the financial structure of the Project ensured that it would be completed with contingent equity from GNL and the debt would be repaid by electricity rates, it appears

that the ultimate cost of the Project was not of particular concern to the lenders. The IE report, which was used in support of the granting of the FLG and had gone through several drafts, was called an "interim" report in its November 29, 2013, form. MWH produced a final version dated December 30, 2013.

The November 15 and November 27 draft IE reports both contained the following statement about contingency:

> While Nalcor adopted a theoretical P50 contingency based on analytical modeling (i.e., range uncertainty) of the project's sub-element summary budgets, the IE expresses the opinion that the calculated overall 6.7% scope contingency is aggressive relative to our legacy experience with similar remote heavy-civil construction endeavors that typically have a contingency reserve for known, but not specifically quantified risks approaching **double to quadruple** what is currently provided for LCP. The IE is not aware of a separate management reserve allowance to fund or accommodate unknown risks or changed field conditions as is typical practice for these types of projects. As per AACEI practice, the scope contingency is assumed to be spent during project execution while the management reserve is considered not to be spent in entirety during project execution. (emphasis added)

The information about contingency contained in the IE's November 15 and November 27 draft reports was important enough that it could have caused the Province, acting responsibly, to re-evaluate the Project before Financial Close. Yet GNL never saw these reports. Further, this information was removed from the November 29 interim report.

The reliance GNL placed on the work of the IE, without fully understanding the limited scope of that work and without seeing several of the IE draft reports, was clearly mistaken, misguided and unreasonable.

It is incomprehensible that GNL did not request access to the draft and interim reports of the IE before Financial Close. These reports contained important information on Project cost and schedule, which at a minimum should have caused GNL to make further inquiries of Nalcor before the Province was locked into such a major commitment.

It is important to note that the MWH report was meant to be the product of an *Independent* Engineer. It appears that Nalcor's influence exerted on the composition of the IE's team and the comments on the work done were unwarranted and did not recognize the true independence required of an IE.

COST INCREASES AFTER FINANCIAL CLOSE

Authorizations for Expenditure (AFEs) were the official Project cost updates that were communicated to GNL and to the public. AFEs were required because the PMT could not award contracts in excess of the currently approved AFE. Edmund Martin had the sole authority to decide when to bring an AFE before the Nalcor board of directors for approval.

Throughout construction, a series of AFEs gradually moved the Project budget upwards. It became $6.99 billion in June 2014, $7.65 billion in September 2015, $9.1 billion in June 2016, $9.4 billion in December 2016, and $10.1 billion in June 2017, which remains the estimated capital cost as of the writing of this Report. These amounts do not include financing costs.

THE MAJOR CONTRACTS

To follow is a discussion of three contract packages that, combined, account for the majority of the $3.9 billion Project cost variance from the DG3 estimate.

The Powerhouse and Spillway – Astaldi

The construction of the powerhouse, spillway and transition dams for the Muskrat Falls generating station was the largest of the Project's contract packages and the source of the largest cost overruns. This contract was awarded in 2013 to Astaldi Canada Inc. (Astaldi), a subsidiary of a major Italian multinational construction company. At the time of the Grant Thornton *Construction Phase* report (December 8, 2018), the Astaldi contract accounted for approximately 31% of the then total $3.9 billion cost overrun on the Project.

Nalcor's DG3 estimate for the contract awarded to Astaldi was $752 million. Nalcor's shortlist had two bids from Italian companies, both of which were $400 million more than the DG3 estimate, and two from Canadian companies, which were $1.2 billion more than the DG3 estimate. Nalcor believed the Canadian bids were unreasonably high because the North American market was very active, making those firms less "hungry" for business and more risk averse. Astaldi was the lowest bidder and also had better technical scoring than the other Italian bid, so Nalcor selected Astaldi for this contract package.

Nalcor was confident in its estimate for this package and was certain that the work could be done for $752 million. To alleviate Nalcor's concerns that Astaldi could earn excessive profits, it used an "LMAX" model, meaning that Astaldi would be reimbursed for hours worked up to a cap, instead of being paid a lump sum to execute the contract. In theory, this meant that Astaldi would be responsible for the cost of labour if it exceeded the LMAX.

Nalcor was aware that Astaldi did not have experience in cold-weather environments, but these concerns had been alleviated by Astaldi's plan to hire people for senior roles who had Canadian hydro experience. Astaldi's proposal was also distinguished by its plan to build an integrated cover system (ICS) to enclose the powerhouse, which would enable concrete to be poured throughout the winter.

The date for awarding the Astaldi contract was originally scheduled for June 3, 2013. Nalcor issued Astaldi a Limited Notice to Proceed on September 24, 2013, and the contract was not executed until November 29, 2013. Beginning work before signing the final contract created issues for Astaldi's hiring and procurement activities. Understandably, Astaldi was unwilling to commit resources or assume liabilities in the absence of a firm commitment. This delay had a significant effect because it meant that Astaldi started work in the winter rather than the summer.

Once work did begin, the combination of over-excavation by a previous contractor and challenging winter conditions caused delays in the design and construction of the ICS. Originally planned to be finished in March 2014, construction on the ICS did not begin until July 2014, and the subcontractor building the ICS had ongoing disputes with Astaldi. The ICS was still unfinished by the end of 2014. Astaldi abandoned it in May 2015 and began disassembling the partially completed ICS structure in October 2015. This all affected the Project schedule and had knock-on effects for the work of other contractors.

Astaldi's mobilization to the site was slow and its performance throughout 2014 was poor. In May 2014, Ron Power wrote to Nalcor colleagues that the situation was "virtually hopeless" and that "Astaldi are perceived as a joke on site." There was also a high degree of turnover in senior Astaldi management and productivity was an issue. The number of direct labour hours used for concrete placement, for example, was three times higher than what had been assumed in the DG3 estimate.

In an attempt to improve the situation, Nalcor and Astaldi engaged in regular talks at the senior management and CEO level starting in mid-2014. In July 2015 the two firms

signed a "Road Map Agreement," which outlined their mutual intention to resolve the critical issues and to improve productivity. But larger issues were also at play. After the award of the contract, Astaldi's liquidity and credit situation had deteriorated and there was some question about its capacity to complete its work on the Project in accordance with the contractual terms.

On July 27, 2016, Nalcor and Astaldi executed a Bridge Agreement. This Agreement increased the LMAX by $150 million to allow work to continue until the negotiation of a full agreement could be concluded. Effective December 1, 2016, Nalcor and Astaldi signed a Completion Contract that resolved many of the items in dispute and kept the work progressing. Under this Contract, Nalcor paid Astaldi an additional $884 million, bringing the total package cost to $1.908 billion.

Later still, Nalcor and Astaldi signed a Settlement Agreement effective December 14, 2017, to resolve claims and specific matters that arose between December 1, 2016, and December 14, 2017. Under this agreement, Nalcor paid Astaldi a further $20 million.

On October 18, 2018, Nalcor sent Astaldi a Stoppage of Work Notice, based on its failure to provide a plan for continuity of work and Astaldi's position that it had "no intention of providing any information as to how Contractor plans to maintain operations to complete the Works." The Notice stated that Astaldi was to secure all work fronts, shut down site operations and demobilize Astaldi personnel from the site.

On November 8, 2018, Nalcor delivered a Notice of Termination to Astaldi stating: "Contractor has not remedied nor taken any steps to remedy the defaults listed in the Notice of Default." At the time of termination, less than 10% of Astaldi's work remained to be completed. After Astaldi's contract was officially terminated, Nalcor hired Pennecon to complete the remaining work on this contract package.

The Transmission Lines – Valard

The contracts for the construction of the Labrador-Island Link and Labrador Transmission Assets were awarded to Valard Construction LP (Valard), a corporation owned by Quanta Services Inc., the largest linear (transmission line and pipeline) construction company in North America. Valard, an experienced utility contractor, was found by Nalcor to be the only suitable bidder for the transmission line contracts. The transmission cost overruns on these contracts (mainly on the LIL) accounts for approximately 20% of the Project's total cost overrun.

A major part of transmission line construction is right-of-way (ROW) preparation: the process of clearing trees and land to make way for the towers, and building roads to bring equipment and personnel to the work sites. During negotiations with Valard, this part of the contract was removed from Valard's scope of work because of disagreements over cost. The final arrangement was that Nalcor would hire the ROW contractors and Valard would manage and oversee them.

When work began in October 2014, Valard encountered problems with the quality of the ROW work and advised Nalcor that additional costs and delays might result. Although Nalcor's chosen approach to handling the ROW contract was intended to reduce costs, it instead led to problems and conflict and resulted in delays and cost overruns.

A major cause of cost increases under these contracts was worse-than-predicted geotechnical conditions along the transmission corridor. The cost estimate had been developed based on a limited amount of field data and had relied mainly on a "desktop study," which had little capacity to determine subsurface conditions. Nalcor's position was that a detailed geotechnical investigation could not be completed for the DG3 cost estimate because the LIL had not yet passed environmental assessment. Nalcor could have sought permission from GNL to conduct more field testing, but chose not to do so. Nalcor was aware of the limitations of its data and should have allotted significantly more contingency to compensate for this risk.

The actual makeup of the rock and soil (the geotechnical conditions) is important because poor conditions require sturdier and more expensive types of foundations for the towers. Depending on type, tower foundations can range in price from $13,500 to $215,000 each. Once Valard started work, it encountered more locations than anticipated where the more costly tower foundations were required. In addition to increasing this contract's costs, Valard's proposed changes in foundation types led to delays—because of disagreements with Nalcor staff, who had to obtain approval for each change at the head office in St. John's. This also led to procurement delays and affected Valard's workflow, as the work teams sometimes had to skip some tower locations until a resolution was reached and thus build the transmission line in a nonlinear fashion.

By early 2016, Nalcor and Valard's relationship had become "very fractured" because of increased costs and unresolved disputes. In 2017, the two firms reached a global settlement that resulted in an overall increase of $245 million over the original contract

value. In addition to change orders that were approved by Nalcor and the costs of improved ROW and access roads, this brought the total cost overrun on the LIL to $649 million. While the PMT attributed some of the cost overruns to the "DarkNL" power outages of 2014 and subsequent requirements for increased reliability, this was not the case.

HVdc Specialties – GE Grid Solutions

Alstom, a French multinational company, was awarded three major contracts (collectively referred to as "HVdc specialties") that involve the construction and installation of specialized facilities and electrical equipment at Churchill Falls, Muskrat Falls, Soldiers Pond and the Forteau Point and Shoal Cove transition stations at the ends of the Strait of Belle Isle crossing. After Alstom's electrical divisions were acquired by General Electric in 2014, its contracts were transferred to a new subsidiary of General Electric, Grid Solutions (GE).

Although they were not among the largest sources of overruns for the Project, these contracts were subject to cost overruns, which were primarily related to a low DG3 estimate, the Astaldi delays, site disruption from protests, accommodations issues and execution challenges. In addition, the execution of the protection and control (P&C) software component has suffered serious delays that are still not resolved at this writing.

GE is responsible for developing and implementing the software required for the transmission line to function. Originally, this P&C software was going to enable the LIL to function as a bipole system and it was scheduled to be completed by early 2018. Facing delays, Nalcor and GE agreed to pursue a "phased approach" to completion, in which the system would first be commissioned as a monopole, then later as a bipole. In very simplified terms, a monopole can deliver less power less reliably, but this compromise was necessary to get the transmission line working as soon as possible.

After more delays, the monopole P&C software began working in 2018 to deliver some recall power from Churchill Falls to the Island of Newfoundland, which helped to offset some Holyrood costs. However, it had functionality problems that led to further disputes with Nalcor.

During the hearings, the stated completion date for the bipole P&C software was early 2020. At this writing, the activation of the powerhouse at Muskrat Falls is imminent and there is very little time left in the schedule for the continuing problems with the

software. The potential exists for further delays. Stan Marshall was optimistic about GE's progress and mentioned various contingency plans if the P&C software is not ready in time. This ongoing issue is being monitored by the PUB and its consultants. There remain significant concerns with GE's performance and its ability to deliver the software.

The changes made by Nalcor since 2016 in the approach to managing this contract and the decision to bifurcate the Project to provide more focus on transmission were beneficial and necessary.

After the hearings concluded, there were public reports of possible problems with the synchronous condensers at Soldiers Pond, as well. The Commission did not investigate this issue and cannot provide any comment on it.

THE JOINT REVIEW PANEL AND CONSULTATION

In late 2006, Nalcor registered the generation components of the Lower Churchill Project, including both Gull Island and Muskrat Falls, for environmental assessment with the provincial and federal governments. GNL and Canada agreed to a combined review process that would fulfill the requirements of both levels of government, resulting in the formation of a Joint Review Panel (JRP). In 2010, the focus shifted to Muskrat Falls only. The environmental assessment for the transmission lines was done separately and was conducted in 2013.

Many Indigenous Peoples had serious concerns about how the land and wildlife would be changed by the development, concerns that were shared by other citizens of Labrador. Representatives from three Indigenous groups from Labrador took part in the consultation process—the Innu Nation, the Nunatsiavut Government and the NunatuKavut Community Council—as well as members of the Innu of Ekuanitshit from Québec.

The Innu Nation was given a higher level of consultation than the other Indigenous Peoples. Negotiations between the Innu Nation and GNL began in 2006, resulting in the Tshash Petapen (New Dawn) Agreement, finalized in 2011. This agreement included an Impacts and Benefits Agreement (IBA), a Redress Agreement related to damage caused by the Churchill Falls development and an agreement in principle about the Innu Nation's land claim. Upon the ratification of the Tshash Petapen Agreement, the Innu Nation indicated that the Project was acceptable to them. Nalcor, with the agreement of GNL,

determined that it was not necessary to sign an Impacts and Benefits Agreement with Nunatsiavut Government, NunatuKavut Community Council or the Innu of Ekuanitshit.

The Nunatsiavut Government was primarily concerned about the downstream impacts of the Project, specifically the accumulation of methylmercury in Lake Melville. If the development negatively affected the food sources as a result of methylmercury contamination or other adverse conditions, the Inuit would be forced to find alternatives, including having to rely on store-bought foods.

The position of the NunatuKavut Community Council was that GNL failed to provide adequate funding for its participation in the JRP process and that GNL "abdicated its responsibilities" when it came to consultation. This meant that by the end of the environmental assessment process, no progress had been made to address any of its concerns.

The Innu of Ekuanitshit were not satisfied with the consultation they were given or the funding they received. The first language of the Ekuanitshit is Innu-aimun and their second language is French. It was a major concern for the Ekuanitshit that more effort was not made to accommodate their languages.

Another issue that arose during the environmental review process was confusion about how the process worked and who held responsibility for various aspects of it. It was not clear to some Indigenous Peoples, for example, whether they should go to GNL, as the regulator, or to Nalcor, as the proponent, when they had issues or when they were trying to engage in consultation.

The JRP report was released on August 25, 2011. It concluded that "the Project would have several significant adverse environmental effects on the aquatic and terrestrial environments, culture and heritage and, should consumption advisories be required in Lake Melville, on land and resource uses." The report's findings and comments on Indigenous consultation indicated that, at least for some groups, further information was required. The JRP report did not accept Nalcor's assertion that there would be no downstream effects on Lake Melville from the flooding required to create the Muskrat Falls reservoir and directed Nalcor to fully investigate the issue of downstream methylmercury impacts.

The Joint Review Panel also concluded that Nalcor's analysis showing the Muskrat Falls Project to be the best and least-cost way to meet domestic demand requirements

was inadequate, and an independent analysis of economic, energy and broad-based environmental considerations of alternatives was required.

Methylmercury Issues

Nalcor's position on the potential for methylmercury contamination was that there was no feasible way to substantially reduce the amount that would form in the reservoir, that potential resulting health effects could be addressed with consumption advisories and that no effects would be seen as far downstream as Lake Melville. The JRP was unconvinced by these assertions and recommended that Nalcor be required to conduct a comprehensive assessment of downstream effects and identify any additional mitigation measures.

The Nunatsiavut Government continued to be concerned with the methylmercury issue and in January 2013 it requested funding from GNL to conduct its own research and engage in a water-monitoring program. GNL, believing Nalcor's work to be adequate, refused the request. The Nunatsiavut Government proceeded anyway and funded a study. This research, published in 2015, found that methylmercury levels would be 25% to 200% higher than Nalcor's estimates and would extend farther into Lake Melville than Nalcor had estimated. The Nunatsiavut Government began to pressure GNL for full clearing of the reservoir (to reduce anticipated methylmercury levels) and initiated the "Make Muskrat Right" campaign.

In November 2015, the Nunatsiavut Government wrote GNL with four requests to address its concerns: full reservoir clearing, a negotiated Impact Management Agreement, establishment of an Independent Expert Advisory Committee (IEAC) and joint authority with the Inuit over downstream decision-making. It was June 2016 before the Nunatsiavut Government received a response from GNL, a reply that effectively denied each of their requests.

The Nunatsiavut Government's independent study suggested that reservoir flooding without full clearing would push many Inuit over the regulatory recommendations for methylmercury exposure. The disconnect between GNL and the people of Labrador on methylmercury resulted in an escalating series of meetings, press releases and protests.

Partial impoundment (flooding) of the reservoir was planned for October 2016 and protests increased as this date approached. On October 18, 2016, GNL attempted to make concessions, including a draft IEAC framework and a proposal to remove "as much forest

cover as possible" from the area to be flooded. However, this did not resolve the issue and protests eventually shut down the Muskrat Falls construction site for several days. The protests ended after a long meeting between Indigenous leaders and Premier Ball, which resulted in a commitment to lower water levels after the winter so that organic material could be removed.

The meeting also resulted in the establishment of a framework for an IEAC. The final Terms of Reference for the IEAC were completed in June 2017, with a mandate to provide independent assessment and related recommendations on methylmercury mitigation and monitoring. The IEAC issued two sets of recommendations, the first (with three recommendations) in September 2017 and the second (with four) in April 2018.

At the IEAC's meetings, the majority of the committee members voted for mitigation measures that combined wetland capping with targeted removal of soils and vegetation. The Innu Nation voted for wetland capping only. GNL did not respond to these recommendations for several months despite receiving repeated reminders from the IEAC. In January 2019, GNL approved wetland capping. However, by then it was too late to implement this process before the impoundment of the reservoir began in July. The reservoir is now fully impounded and none of the promised mitigation measures have been implemented.

The North Spur

The North Spur is an enhanced natural feature on the north side of the lower Churchill River, located slightly upriver from the Muskrat Falls dams, generating station and spillway. As part of the Project works, the existing rock and soil barrier on the North Spur was reinforced and raised, in order to safely contain the reservoir's waters once impoundment increased the water level in the river. In its natural state, the North Spur included layers of naturally occurring quick clay, an unstable material that has created concerns about the potential for landslides and dam failure.

If the North Spur were to fail, not only could the Project be seriously affected, but a flood could potentially cause serious damage to people and communities downstream. SNC conducted extensive engineering and stabilization work on the North Spur to allow it to safely help contain the waters of the Muskrat Falls reservoir.

Numerous reports and reviews have been conducted to assess the adequacy of the North Spur stabilization work that Nalcor carried out. The Commission reviewed these

reports and assessments and found that Nalcor and GNL have given an appropriate level of consideration to the safety and stability of the North Spur, and that the work carried out on it is adequate and reasonable based on industry standards.

Conclusions on Environmental Issues

GNL failed to ensure that it and Nalcor acted fairly in its consultations related to Indigenous Peoples and environmental matters. While this Report does not speak to GNL's legal obligation regarding consultation with Indigenous Peoples, it does point out that Nalcor did not act fairly with the Nunatsiavut Government, the NunatuKavut Community Council and the Innu of Ekuanitshit. GNL and Nalcor created an environment of mistrust and suspicion by not allowing all of the Indigenous Peoples and other concerned citizens to engage in a meaningful and transparent consultation process. This mistrust and suspicion led to protests that caused Project delays and significant cost overruns.

Even today, GNL has failed to ensure that its commitments, and those of Nalcor, regarding environmental matters related to the Project are being properly tracked, monitored and addressed.

GOVERNMENT AND CEO CHANGE

Shortly after the Ball government was elected on November 29, 2015, it sought updates from various Crown corporations and agencies, including Nalcor. As part of its update to GNL, Nalcor shared information about problems with Astaldi's performance on the Project. By this time, Astaldi was well behind schedule and its lack of progress and financial difficulties were major concerns. In the following weeks and months, the Ball government steadily lost confidence in Nalcor and its leadership.

Edmund Martin left Nalcor on April 20, 2016. On the same day, Nalcor's board of directors resigned. Stan Marshall was appointed the Nalcor CEO on April 21, 2016. One of his first major acts was to split the organization of the Project into two parts: generation and transmission (sometimes referred to as the "bifurcation" of the Project).

Some Nalcor staff found this to be a controversial decision and certain members of the PMT did not like losing part of the control that they had previously held.

But the bifurcation of the Project was a good decision. Bifurcation had no adverse impact on the Project's cost and schedule, as has been suggested by some members of the PMT.

Prior to the appointment of Stan Marshall, there was insufficient focus on the transmission component of the Project. The management approach Mr. Marshall introduced also resulted in a more accountable chain of command and ensured greater participation in the Project by the Nalcor CFO as well as by its Finance personnel.

THE TRANSMISSION SYSTEM'S RELIABILITY

The reliability of an overhead transmission line is generally measured by its "return period." A return period of 50 years (1:50-year return period) means the transmission line is designed to withstand weather conditions that will occur on average once in a 50-year period. Longer return periods mean that transmission lines are more robust and reliable.

According to the Canadian Standards Association, all transmission lines should be built with a return period of at least 50 years. A 1:150-year return period is suggested for high-voltage lines as well as for lower-voltage lines that "constitute the principal or perhaps the only supply to a particular load." A 1:500-year return period is suggested for high-voltage lines that "constitute the principal or perhaps the only source of supply to a particular electric load." The reliability of the LIL (or, conversely, its vulnerability to adverse weather) is critical to maintaining power on the Avalon Peninsula once the Project comes on-line. But there is some question about what level of reliability the line has been built to, and about how Nalcor has communicated that reliability.

There is no evidence that a decision to increase the return period of the line was ever made—either in 2012 or later. If Nalcor had intended to move to a higher reliability return period in 2012 to ensure greater reliability of the Project's transmission component, that cost should have been included in its DG3 estimate. If Nalcor was planning to keep the same return period, then it should have accounted for this in its estimate because that choice introduced the possibility that the Public Utilities Board would eventually require Nalcor to build back-up generation for the Labrador-Island Link. Both scenarios are consistent with Nalcor's pattern of underestimating the likely costs prior to Project sanction.

Nalcor and the PMT demonstrated a tendency to categorize cost increases for the LIL component of the Project as "reliability-driven changes." This implies that these

increases resulted from a conscious decision on the part of Nalcor to improve the lines' reliability. The PMT suggested that poor geotechnical conditions, the building of all-season access roads and the proud stranding and restringing of the conductor wire all qualified as reliability-enhancing costs. Most of these changes were clearly made for other reasons.

Although the reliability of the LIL may have been improved as a secondary effect of those activities, they are hardly "reliability-driven changes." It is misleading and self-serving that Nalcor and its PMT presented them as such. The suggestion that major reliability-driven upgrades were made that resulted in significant cost increases is untrue.

There is a reasonable likelihood that additional costs will be incurred to ensure that there is adequate reliability for Island ratepayers and, in particular, those who live on the Avalon Peninsula. It is clear that Nalcor did not communicate this reality to GNL and the public when it was seeking sanction for the Project. This is regrettable.

ON-SITE AUTHORITY AND CONSTRUCTION OVERSIGHT

The degree of decision-making authority at the various Project construction sites and the concept that delays were caused by on-site managers' insufficient ability to make major decisions was an issue raised at the hearings. Requests for changes that were above a certain cost needed to be relayed back to the PMT at Nalcor's home office in St. John's, where staff would decide whether to approve the change. The PMT held that the financial authority limits were sufficient to empower the managers on site to make necessary decisions, but this was disputed by several witnesses. A recurring theme in testimony was the idea that the PMT micromanaged from a distance while not spending enough time on site.

One Astaldi project manager described it as "critical" to have a representative of the owner on a construction site, noting that this person should have construction experience and decision-making power. He said that because nobody from Nalcor with authority was present, issues on site would become dragged out and compounded over time while contractors waited to hear back from St. John's. Concerns relating to this issue were echoed by managers from other contractors as well as by former Nalcor managers. Nalcor lost experienced site managers who felt ill-used and were frustrated by their lack of authority to make decisions.

While it is normal for the most senior managers on a project to work out of a home office some distance from the work site, the PMT did not achieve an appropriate and balanced allocation of decision-making authority but instead tightly controlled and attempted to micromanage construction decisions from afar. The particular challenges of the Project, when combined with the PMT's lack of hydroelectric experience and unwillingness to delegate authority, caused cost overruns and schedule delays. Although the PMT was aware by early 2014 that this was causing problems, it had no interest in taking a different approach. The PMT's refusal to concede that management could have been improved in any way speaks volumes about how this Project was governed.

NALCOR'S BOARD OF DIRECTORS

GNL expected Nalcor's board of directors to provide oversight, good judgment and to exercise its fiduciary duty, even though GNL was fully aware that the board lacked the breadth of expertise to adequately do so. The board members, although sincere and dedicated in their efforts, had no specialized knowledge or experience in megaproject construction and therefore lacked the ability to effectively challenge management about the Project's costs, schedule and risks, and generally to provide oversight on behalf of the shareholder, GNL.

As a result of the board members' limitations, they required full and accurate information from Nalcor's executive in order to properly execute their duties on behalf of GNL. It is clear that Edmund Martin had a duty to fully, frankly and accurately disclose to the board all relevant information on cost estimates, schedule, risk and contingencies before the board of directors considered the Project's sanction, and also thereafter. Edmund Martin failed to discharge this duty. The high level of trust and reliance that the Nalcor board placed on Nalcor's executive, and particularly Edmund Martin, was a mistake.

GOVERNMENT OVERSIGHT

The flow of information between Nalcor and GNL was loose, unstructured and informal. There was neither a reporting protocol nor policy directive to guide it. GNL did not have the necessary capability or resources to meaningfully challenge, test or evaluate the information that it was receiving from Nalcor. The solution to this lack of capability

and resources would have been to retain truly independent experts to conduct a thorough analysis, which was not done until 2016.

No one in GNL appears to have bothered to conduct any research on megaprojects, even though well before 2012 there were textbooks, articles, reports and other online information available on this subject. It has been common knowledge for decades that megaprojects have a history of substantial cost overruns.

GNL's oversight of Nalcor was weak, at best. GNL was the owner of Nalcor but nevertheless allowed Nalcor to be the dominant player in the relationship. Nalcor officials knew that the GNL officials and politicians who worked on the Project were considerably over their heads and unqualified to evaluate cost, schedule and risk. Nalcor officials took full advantage of this serious and glaring weakness when they should have recognized that this imposed on them an even greater duty to ensure that GNL was fully informed and understood the cost, schedule and risk.

There is no doubt that Nalcor, and in particular Edmund Martin, must be faulted for intentionally failing to disclose to GNL relevant information on costs, schedule and risk before Project sanction, before Financial Close and thereafter. If GNL had received full disclosure from Nalcor before sanction, it would have been in a position to properly evaluate the Project and provide the public with truthful and accurate information on Project costs, schedule and risk. There is also no doubt that GNL politicians and officials must be faulted for failing to provide a reasonable level of oversight of Nalcor, for placing an unjustified amount of trust and blind faith in that corporation and for the naivety that they demonstrated in accepting, without a comprehensive independent review, Nalcor's DG3 cost estimate and schedule.

In January 2014, Cabinet brought forward an initiative to provide oversight for the Project. As a result, the Oversight Committee was established in March 2014. The first Oversight Committee was composed entirely of civil servants and reported directly to Cabinet. Nalcor's initial approach to the work of the Oversight Committee was a further example of its reluctance to share information with GNL.

On November 29, 2015, a Liberal Government was elected under the leadership of Dwight Ball. On January 14, 2016, consultant Ernst & Young LLP (EY) and GNL signed a contract under which EY would conduct a full review of the Project's cost and schedule. EY brought in an international team to complete the work under this contract. EY prepared a report entitled *Muskrat Falls Project: Review of project cost, schedule and related risks,*

dated April 8, 2016. The work done to produce this EY report was the first time that Nalcor had been subjected to a comprehensive, independent review of the Project's cost, schedule and risk. Nalcor did not fare well in that 2016 review, but EY found significant performance improvement in a further report that was prepared in 2017.

Before 2015, the reports of the Oversight Committee simply restated Nalcor's untested assertions. Until 2016, the effectiveness of the Oversight Committee's work was largely thwarted by Nalcor's ongoing attempts to limit review and withhold information. This resistance continued almost unabated until Stan Marshall was appointed Nalcor CEO in April 2016. There is now a strong indication that Nalcor has changed its attitude and is providing a reasonable level of co-operation to the Oversight Committee.

Serious and significant challenges remain, in particular, with transmission and reliability issues prior to the commissioning of the Project. GNL oversight will continue to be necessary and the lessons of the past about inadequate oversight must be kept in mind.

It is hoped that this Report will serve both as an accurate account of what has transpired related to the Muskrat Falls Project and as a resource that can be used to identify areas for improvement in the consideration, initiation, evaluation, development, construction and oversight of any and all future large-scale projects or megaprojects in this province.

This Executive Summary was prepared for the purpose of providing readers with a brief overview of the Report. It should be read in conjunction with the key findings and recommendations that follow.

KEY FINDINGS

This Report, *Muskrat Falls: A Misguided Project*, outlines the history of the Muskrat Falls Project from its inception to almost completed construction. In setting out the details of the Project, I have made certain findings and conclusions. This chapter summarizes what I consider to be the key findings. It does not repeat every observation, finding and conclusion made in the Report. Rather, it highlights and groups the ones I wish to particularly emphasize.

THE GOVERNMENT OF NEWFOUNDLAND AND LABRADOR

1. A Progressive Conservative Government was elected with Danny Williams as Premier in October 2003. That government was determined to proceed with the development of the hydroelectric potential of the lower Churchill River and it initiated several activities to advance this development. Its policy after the election favoured development of the lower Churchill River that was led and managed in this province. The Government of Newfoundland and Labrador ordered that an energy plan be prepared for the Province's petroleum (oil and gas) and electricity resources. A Crown corporation, Nalcor, was established to manage the Province's energy resources. Nalcor, with the full support of GNL, took as its mandate the planning, development and execution of a hydroelectric project on the lower Churchill River, which ultimately became the Muskrat Falls Project.

2. In proceeding with the Project, the actions of GNL, in effect, showed that it had predetermined that the Project would proceed, notwithstanding it had publicly professed that a business case for the Project would have to be established. In acting as it did, GNL failed in its duty to ensure that the best interests of the province's residents were safeguarded.

3. GNL failed in its responsibility to objectively assess and oversee the decisions and actions of Nalcor. For example, GNL failed to ensure that all viable options for the production of electricity for residents on the Island of Newfoundland were appropriately considered and assessed prior to its decision to proceed with the Interconnected Island Option (the Project). The frustrations felt by politicians and others in Newfoundland and Labrador relating to Hydro-Québec, particularly as a

result of the 1969 Upper Churchill Contract, were leveraged for the purpose of promoting the Project. They clearly contributed to the decision to proceed with it.

4. Before Project sanction, it would have been very easy for Nalcor and GNL to have educated themselves on the history of cost overruns and schedule delays for megaprojects and their failure to do this is indefensible.

5. Surprisingly, GNL failed to conduct a thorough assessment or review of the potential impact of undertaking a megaproject such as the Muskrat Falls Project, and of its potential cost overruns, on the future financial position of the Province.

6. GNL failed in its obligations to the citizens of the province to provide appropriate oversight of Nalcor at all stages of the Project up to the change in government in 2016. There was inappropriate alignment and integration between GNL and Nalcor.

7. Water management, an issue with the potential to present significant risk to the viability of the Project, should have commanded far more careful review, consideration and understanding by GNL than it received. GNL decided to invest billions of dollars developing the lower Churchill River even though issues regarding water management had not been adequately addressed.

8. Government officials could have independently confirmed with officials from Canada their understanding, obtained from Nalcor, that the condition precedent related to Project sanction for the Federal Loan Guarantee had been met before GNL sanctioned the Project in December 2012. It failed to do so. As a result, Cabinet proceeded to announce GNL's sanction of the Project based on the false premise that the Sanction Agreement signed with Emera conclusively satisfied a condition precedent for the FLG. This was surprising, if not incomprehensible.

9. It is unlikely that any GNL politicians were informed of the approximate $300 million increase in the capital cost of the Project between the time of the Project's sanction and Financial Close. However, certain government officials were aware that the Project estimate had increased.

    - Donna Brewer, Paul Myrden, both of the Department of Finance, and Paul Morris of the Department of Natural Resources knew of the $300 million increase.

- Donna Brewer and Paul Myrden were unable to provide any plausible or convincing explanation for why they did not ensure that Finance Minister Thomas Marshall was informed of the $300 million increase in the Project's capital cost before Financial Close. Ms. Brewer was the Deputy Minister of Finance and she failed in her duty to keep the Minister up to date on this important information. Mr. Myrden was well aware of the Minister's interest in determining what the Project cost was at that time.
- Assistant Deputy Minister Paul Morris could not recall with any certainty whether he advised his superiors, including his Minister, of the significant increase in cost.
- Deputy Minister Charles Bown was, or should reasonably have been, aware that there was an increase in the capital cost of the Project, but he failed to take any steps to advise the Minister of Natural Resources and the Premier of it. This is inexcusable because he was the Government's primary liaison with Nalcor for the Project.

10. Considering the extent of construction completed and the contractual and other obligations in place at the time, the Project had clearly reached the point of no return when the Ball government was elected (late 2015). The real point of no return was at Financial Close of the FLG in November 2013.

11. During the hearings, Todd Stanley, a senior lawyer with the Department of Justice and Public Safety, stated that at certain times, some GNL officials believed that Nalcor was "a fiefdom" and "a runaway train." The evidence at the hearings confirmed that these descriptions of Nalcor had merit.

12. The environmental review process for the two Project components (the generating station and the transmission line) took more than five years. Yet it has not fully satisfied all of the related environmental, human health and safety concerns.

13. GNL failed to ensure that it and Nalcor acted fairly in its consultations related to Indigenous Peoples and environmental matters. While not speaking to GNL's legal obligation regarding consultation with the Indigenous groups in Labrador, GNL did not act appropriately from a fairness perspective with the Nunatsiavut Government, the NunatuKavut Community Council and the Innu of Ekuanitshit. GNL and Nalcor created an environment of mistrust and suspicion by not allowing all of the

Indigenous Peoples and other concerned citizens to engage in a meaningful and transparent consultation process. This mistrust and suspicion led to protests that caused Project delays and significant cost overruns.

14. Even today, GNL has failed to ensure that its commitments, and those of Nalcor, regarding environmental matters related to the Project are being properly tracked, monitored and acted upon.

NALCOR'S INVOLVEMENT IN THE PROJECT

Project Management

15. Nalcor's first CEO, as well as its core Project Management Team, had worked in various capacities in megaprojects, particularly in the oil and gas industry. However, none of these individuals had held positions equivalent to, or at such senior levels as, their Nalcor jobs, nor had they worked on a project of similar size. While they were hard-working and intelligent individuals, they were not highly experienced in project management to the degree that was required for their positions on the Project. With the exception of Ron Power, these individuals had no experience with hydroelectric or transmission line projects. Similarly, Nalcor's Vice-President of the Lower Churchill Project, Gilbert Bennett, had no prior experience in hydroelectric or transmission line projects and had no experience in construction management. He had not worked on any megaprojects prior to joining Nalcor.

16. Nalcor's PMT, at times, exhibited a culture of superiority when confronted on issues that arose, particularly during the construction phase of the Project. Members of the PMT often exhibited a "we know best" attitude on matters related to the Project. Consequently, individuals who did have the requisite experience in hydroelectric and transmission line construction were not adequately consulted, nor was their advice properly considered or adopted on many occasions.

17. SNC had been retained as the Engineering, Procurement and Construction Management contractor for the Project based on a recognition of its experience in hydroelectric and transmission line construction and management and because that experience was lacking in the Nalcor personnel. The transition from an EPCM model

of management to an Integrated Management Team model resulted in added risk to the Project for Nalcor, which Nalcor appears to have largely ignored.

18. The PMT never fully intended to allow SNC to perform all of the services stated in the EPCM contract, which would have reduced the PMT's management authority. As a result, when SNC had a weak start, Nalcor's PMT took full advantage of the opportunity it presented and proceeded to manage events for the purpose of further undermining SNC's performance. This eventually led to the PMT being in charge of the Project with SNC providing a limited support role in all areas except engineering, where SNC retained its lead role. Nalcor had earlier recognized that it required the specialization that SNC had for the successful construction of the Project. Given this, it is shocking that the PMT had the authority to remove SNC as the EPCM contractor without the approval of Gilbert Bennett, the Nalcor executive, its board and possibly GNL.

19. There is no definitive evidence that Nalcor received SNC's *2013 Risk Report* in 2013. However, it is clear that Nalcor knew of its existence in 2013 and deliberately decided not to obtain a copy of it. Paul Harrington's stated reasons for not accepting this report are misleading and do not provide a reasonable justification for Nalcor's decision to decline to receive the report.

20. The PMT's approach (managing from the home office in St. John's) may not have been wrong in theory. However, several circumstances particular to this Project, including an aggressive schedule, major performance issues with contractors and the PMT's absorption of SNC's construction management role, should have alerted the PMT that a different approach was required. These circumstances, along with the PMT's lack of experience in the construction of hydroelectric and transmission projects and its unwillingness to adequately delegate authority, have adversely impacted both the Project's cost and schedule.

21. Had the PMT members been on-site more often, the people with the ultimate decision-making authority could have been actively listening to contractors and making decisions based on receiving real-time feedback on problems and opportunities.

22. Problems with the PMT's management approach were identified in numerous incidents during the Commission's construction phase hearings, particularly by the individuals who had valuable experience. The PMT's lack of hands-on experience in

construction projects of this type and scale resulted in serious gaps that caused schedule delays and cost overruns. The PMT's refusal to acknowledge, even now, that management gaps existed and that its approach could have been improved speaks volumes about the way this Project was managed.

23. Edmund Martin assumed full responsibility for, and had absolute control over, the information provided to GNL. Because of GNL's failure to provide a formal protocol defining its communication expectations from Nalcor, it was left to Mr. Martin to decide which information on cost estimates, schedule, risks and other matters would be communicated to GNL. The fault for any deficiency in disclosure from Nalcor to GNL must be assigned to Mr. Martin.

24. Nalcor officials knew that the GNL officials and politicians who worked on the Project were considerably over their heads and unqualified to evaluate cost estimates, schedule and risk. Nalcor officials took full advantage of this serious and glaring weakness when they should have recognized that this imposed on them an even greater duty to ensure that GNL was fully informed and understood the cost estimates, schedule and risk.

25. Edmund Martin, Gilbert Bennett and the PMT frequently took unprincipled steps to help secure Project sanction. They concealed information that would undermine the business case reported to the public, to GNL and to Nalcor's board of directors. The PMT, with the tacit approval of Nalcor's executive, did its best to narrow consultants' terms of reference to forestall independent and comprehensive review and it tried to influence the editing of reports to make conclusions appear more favourable to the Project. Many times, these decisions were made by the same individuals, Paul Harrington and Jason Kean, who had also determined the final inputs into the tactical and strategic risk analyses.

26. Edmund Martin should have communicated the full Project cost estimate, including strategic risk exposure, to Nalcor's board of directors and to GNL politicians and officials prior to Project sanction. There is no doubt that Nalcor, and in particular Edmund Martin, must be faulted for intentionally failing to disclose to GNL relevant information on costs, schedule and risk before Project sanction. If GNL had received full disclosure from Nalcor before sanction, it would have been in a position to properly evaluate the Project and provide the public with truthful and accurate information on Project costs, schedule and risk.

27. There is also no doubt that GNL politicians and officials must be faulted for failing to provide a reasonable level of oversight of Nalcor, for placing an unjustified amount of trust and blind faith in that corporation, and for the naivety that they demonstrated in accepting, without a comprehensive independent review, Nalcor's DG3 cost estimates, schedule and risks.

28. Nalcor did not attempt to confirm with Canada that the Sanction Agreement would satisfy the condition precedent of the FLG about Emera's involvement in the Project—it merely had a "belief" that it would do so. This was a remarkably reckless basis on which to proceed to sanction such a large project. Edmund Martin and Nalcor misled Premier Dunderdale and GNL into believing that the FLG was a certainty when it was actually contingent on future events in Nova Scotia, the outcome of which could not be pre-determined.

29. Nalcor appropriately planned and executed its procurement and contracting policies and procedures. Nalcor's procurement policies and procedures met what is said to be best practice standards and bids were, in general, properly evaluated.

30. Stan Marshall had a strong background in hydro development and transmission projects and he has demonstrated excellent leadership and management skills in advancing the Project's construction. Although members of the PMT did not like losing some of the authority and control they previously held, the bifurcation of the Project was a good decision. Prior to Stan Marshall's appointment as Nalcor CEO, there was insufficient focus on the transmission component of the Project. His different management approach has resulted in a more accountable chain of command and has ensured more complete information is flowing to GNL and its consultants.

Pre-Sanction Events

31. Many of Nalcor's screening decisions about the options for the supply of electricity were incomplete or unreasonable. Most of the potential viable alternatives that Nalcor screened out would have required additional work, exploration and costing before being included in a viable generation plan.

32. Nalcor's decision to screen out negotiations with Québec on the potential import of electricity was an example of its failure to adequately investigate all potentially viable options. Nalcor's exclusion of Grand Banks natural gas and/or liquefied natural gas

as supply options was improper and unreasonable. Nalcor did not conduct an adequate assessment of wind generation and small-scale hydro generation. Significantly, Nalcor did not expend the necessary funds and effort to optimize the Isolated Island Option. All of this occurred because Nalcor was already committed to the Lower Churchill Project.

33. Nalcor's planning and evaluation processes were deficient. The System Planning staff at Newfoundland and Labrador Hydro was knowledgeable about the Island's electrical system's history and about its planning methods. Their experience was obviously a benefit in any System Planning exercise. At the same time, the System Planning team did not demonstrate a deep knowledge of other utilities' approaches or newer methods. They also demonstrated little willingness to expand their knowledge base or innovate in the process they were undertaking.

34. NLH and Nalcor effectively obstructed the establishment of an Integrated Resource Planning framework for system planning. Its absence was not an oversight. If there was ever a decision that justified the full scrutiny of a modern and accepted process such as Integrated Resource Planning, the LCP was it. The decision to pursue the Project ought to have been the conclusion of a rigorous analysis. Instead, a rigorous analysis was not performed because of Nalcor's determination to pursue the Project.

35. It is not possible to forecast accurately over a 50-year time frame. It is, of course, possible to produce estimates, but even precise ones will be inherently inaccurate. A CPW analysis that is extended half a century into the future becomes a mix of reliable estimates in the early years and nothing more than guesswork in later years. Nalcor and GNL did not appear to have appreciated this limitation.

36. Nalcor's use of the PIRA forecast for a 20-year period (2012 to 2031) was reasonable in assessing and estimating fuel price. However, Nalcor's adjustments of the forecast numbers for the later period (2032 to 2067) were unreasonable. Nalcor assumed that the uncertainty in the long-term fuel forecast was fixed, so that forecast prices in 2067 were as certain as those in 2032. This negatively impacted the viability of the Isolated Island Option as compared to the Project.

37. In its power generation planning work, Nalcor unreasonably limited Conservation and Demand Management, which negatively influenced the effectiveness and value of its load forecasting and which ultimately favoured the Project as the best option.

38. At DG2 and DG3, Nalcor failed to adequately test the business case for both the Isolated Island and Interconnected Island options, in that the sensitivity analyses and approaches used were significantly limited. A much larger number of potential scenarios should have been run, including the consideration of worst-case scenarios. Nalcor's approach to running sensitivities for both options was flawed, particularly in the treatment of the inputs of various sensitivities. As a unique project, the development of Muskrat Falls was far more likely to encounter a large capital cost overrun than were any of the Isolated Island Option's capital projects, particularly those involving off-the-shelf thermal and wind assets.

39. Nalcor's DG3 base cost estimate was not of the highest quality and accuracy, as would have been an expected requirement for Project sanction. The Project cost was knowingly understated by Nalcor at the time of sanction. Nalcor's estimates were affected by optimism bias, strategic misrepresentation and political bias, as these terms were defined by Professor Bent Flyvbjerg.

40. The contingency levels chosen by Nalcor for the DG3 estimate were unreasonably low given the documented history of cost overruns on megaprojects, a general decreasing trend in labour productivity and the impact of cold weather that could be reasonably expected. Nalcor knew, or ought to have known, that a contingency of $368 million at DG3 was inadequate. Nalcor also knew or ought to have known that the contingency amount of $183 million remaining at the time of Financial Close was grossly inadequate.

41. A reasonable reserve for strategic risk should have been included in the Project's cost estimate and made known to GNL. There was no reasonable basis to support Edmund Martin's decisions to exclude strategic risk from the CPW analysis or the Project's cost estimates.

42. Nalcor's adoption of an unrealistic and aggressive schedule, as well as its decision not to adjust its target dates for first and full power, were unreasonable. By failing to adjust the schedule, its cost estimates were knowingly understated. Nalcor should have considered the full cost of schedule delays. Such costs would have included the cost of additional Holyrood fuel and the potential need for new generation capacity. At the time of sanction, Nalcor's CEO as well as the PMT knew that the Project's schedule was extremely aggressive and unrealistic. Edmund Martin was aware that

Paul Harrington and other members of the PMT were of the view that the schedule had a probability value of between P5 and P10—a long shot at best.

43. In proceeding with the Project, Nalcor put extensive but misplaced reliance on the fact that the provincial government had provided an unlimited Project completion guarantee in order to obtain the FLG. This meant that the Province was fully committed to cover any cost overruns.

Post-Sanction Events

44. Subsequent to the sanction of the Project, Nalcor continued to fail in its duty to provide full and accurate information to those to whom it had a duty to disclose. Examples of this failure include the following:

- It is egregious that Nalcor failed to advise GNL in April 2013, just four months after sanction, that, based on bids on contracts received to that point, the Project's $368 million contingency was already exhausted. Furthermore, between April and November 2013, Nalcor received more bids that exceeded the DG3 cost estimates by an additional $226 million. The bids that had been received were approximately 25% higher than the DG3 estimate, and bids for many large work packages had not yet been received. This was critical information that most certainly would have caused GNL, acting responsibly, to reassess the Project had it been informed.

- It is unreasonable to believe that the $6.2 billion DG3 cost estimate, completed in November 2012, could be more reliable than the Management Outlook reports prepared on July 22, 2013, and later. By that time, the DG3 cost estimate had been supplemented by important information on cost, including contract bids. The DG3 cost estimate had been prepared without the benefit of this new, recent and important information.

- Edmund Martin's explanation for not providing information on the Management Outlook reports to GNL is unconvincing and implausible. Until mid-November 2013, the only information that Nalcor provided to GNL on Project cost was the $6.2 billion DG3 estimate.

- Further, with Mr. Martin's approval, Nalcor had confirmed in writing to Finance Minister Thomas Marshall on November 1, 2013, that the cost estimate remained at $6.2 billion. This was clearly misleading.
- It is unlikely that Nalcor advised any of the GNL politicians or its own board of directors of the approximate $300 million increase in the capital cost of the Project prior to Financial Close (from $6.2 to $6.5 million).
- The first revised Authorization for Expenditure (AFE Rev. 1) of $6.99 billion did not cover all estimated costs to Project completion that were known at that time ($7.5 billion) and it was deceiving to represent it as a legitimate AFE.
- Edmund Martin's decision to withhold information on cost and schedule demonstrated extremely poor judgment on his part and it deprived GNL of the opportunity to cancel and reassess the Project prior to Financial Close. The decision taken by Mr. Martin in failing to provide cost information on a timely basis was not for him to make. Mr. Martin either failed to recognize this or, out of concern that the Project might be cancelled or reassessed, he decided to keep GNL and the public in the dark.

45. The Oversight Committee established by GNL in 2014 was initially composed of only government civil servants and they lacked the expertise to properly provide the requisite oversight of the Project. The engagement of Ernst & Young as an expert consultant was an excellent choice that filled the gaps in the Oversight Committee's expertise. Unfortunately, EY was not permitted to do a comprehensive review of costs, schedule and risk for the Project until 2016. Up to that time, the effectiveness of the Oversight Committee's work was largely thwarted by Nalcor's ongoing attempts to withhold and control the information provided. The resistance continued until Stan Marshall was appointed as the CEO of Nalcor in April 2016. Fortunately, there is a strong indication that Nalcor has changed its attitude and is now providing a reasonable level of co-operation to the Oversight Committee.

46. In its reporting to the Oversight Committee (including to its consultant, EY) Nalcor was never justified in withholding information on the basis that it could be "commercially sensitive."

47. At the time that the Astaldi contract was signed (November 29, 2013), both Astaldi and Nalcor knew that the schedule for Astaldi to complete its work was totally unrealistic. Astaldi's failure to perform and Nalcor's inadequate actions in dealing with Astaldi resulted in major cost overruns, schedule delays and significant impacts on the work of other contractors.

48. Nalcor knew that more geotechnical work for the transmission component of the Project (particularly for the Labrador-Island Link) was required. Nalcor could and should have applied to GNL for permission to conduct additional geotechnical investigations prior to the Project's environmental release and before the preparation of its DG3 capital cost estimate. Nalcor should have allocated a much greater contingency to account for unknown geotechnical conditions for the Valard contracts. The underestimation of risk exposure, as well as other issues, contributed to a significant cost variance on the Project's transmission line scope.

49. Nalcor's contracting arrangement with Valard was complex, specifying that the right-of-way scope was contracted directly by Nalcor but Valard was to manage the construction for the ROW. It is clear that the purpose of this arrangement was to reduce the Valard contract price to bring it more in line with Nalcor's DG3 estimate. The result, however, was a contract arrangement that was awkward and more difficult to manage. This led to Nalcor impeding Valard in its ability to manage the ROW contract and to perform its work. This approach ultimately led to delays and cost overruns.

50. As was the case for most of the Project's major contracts, the bids for the HVdc specialties contracts awarded to General Electric came in significantly higher than the DG3 estimates. There are concerns about GE's performance to date and also its ability to deliver the necessary protection and control software so that full transmission from the Muskrat Falls Project can be attained.

51. There were significant cost overruns on Andritz contract package CH0032 and some cost overruns on the Andritz CH0030 contract package. These overruns were primarily caused by the low DG3 estimates and Astaldi's poor performance. In addition, Astaldi impacted and restricted Andritz's access to work sites and impeded its work progress.

52. If Nalcor had intended to move to a higher reliability return period in 2012 to ensure greater reliability of the Project's transmission component, that cost should have

been included in its DG3 estimate. If Nalcor was planning to keep the same return period, then it should have accounted for this in its estimate because that choice introduced the possibility that the Public Utilities Board would eventually require Nalcor to build back-up generation for the Labrador-Island Link. Both scenarios are consistent with Nalcor's pattern of underestimating likely costs prior to Project sanction. There is no evidence that a decision to increase the return period of the line was ever made—either in 2012 or later.

53. Nalcor and the PMT have demonstrated a tendency to categorize cost increases for the Labrador-Island Link as "reliability-driven changes." This implies that the increases resulted from a conscious decision on the part of Nalcor to improve the lines' reliability. The PMT suggested that poor geotechnical conditions, the building of all-season access roads and the proud stranding and restringing of the conductor wire were all contributors to reliability enhancement. It is misleading and self-serving that Nalcor and its PMT presented them as such. Most of these initiatives were clearly made for other reasons.

54. There is a reasonable likelihood that additional costs will be incurred to ensure that there is adequate power reliability for Island ratepayers and, in particular, those who live on the Avalon Peninsula. It is clear that Nalcor did not communicate this reality to GNL and the public when it was seeking sanction for the Project. This is regrettable.

Nalcor's Board of Directors

55. GNL expected Nalcor's board of directors to provide oversight and good judgment and to exercise its fiduciary duty, even though GNL was fully aware that the board lacked the breadth of expertise to adequately do so. The board members, although sincere and dedicated in their efforts, had no specialized knowledge or experience in megaproject construction and therefore lacked the ability to effectively challenge management regarding the Project's costs and risks, and generally provide oversight on behalf of Nalcor's shareholder, GNL.

56. Based on the limitations of the Nalcor's board members' experience and expertise, it is surprising that the board did not hire a consultant knowledgeable in hydroelectric megaproject construction to assist and advise it regarding the Project.

57. As a result of the board members' limitations, they required full and accurate information from Nalcor's executive in order to properly execute their duties on behalf of GNL. It is clear that Edmund Martin had a duty to fully, frankly and accurately disclose to the board all relevant information on the cost estimates, schedule, risk and contingencies before the board of directors considered the Project's sanction, as well as thereafter. Edmund Martin failed to discharge this duty. The high level of trust and reliance that the Nalcor board placed on Nalcor's executive, and particularly Edmund Martin, was a mistake.

58. It is both surprising and incomprehensible that Nalcor's board was not made aware of the approximate $300 million increase in the Project's cost estimate prior to Financial Close.

THE PUBLIC UTILITIES BOARD

59. Nalcor's actions, inaction and general conduct frustrated and undermined the PUB's efforts to discharge its important responsibilities in a timely and efficient manner in responding to GNL's Reference Question.

60. If GNL had been committed to discharging its oversight role in a responsible manner, as was expected by the public, it would have recognized the importance of insisting that Nalcor had substantially more design work completed and more accurate cost and risk estimates prepared before sending the Reference Question to the PUB.

61. Nalcor's insistence that it would not provide any information on cost and schedule beyond the DG2 cost estimate eliminated any real possibility that the PUB would be able to answer the Reference Question.

62. The PUB's decision on the Reference Question was reasonable and justified in the circumstances. GNL appears to have believed that the PUB should have rubber-stamped GNL's preference for the Project.

63. The PUB's review should have been high on Nalcor's list of priorities. It was not, particularly with regard to information requests and the filing of Nalcor's submission. Like the PUB, Nalcor was well aware of the short time frame the Board had been given to answer the Reference Question. Nalcor's actions clearly indicate its opposition to having any review conducted by the PUB and also reflect its view that it had complete control over the information that the PUB would receive.

64. Nalcor's position that some "commercially sensitive" documentation should not be provided to the PUB is surprising, considering the mandate given to the PUB by GNL and the Board's quasi-judicial status. Nalcor's position, however, is consistent with its resistant attitude toward any external review of its work on the Project.

65. It was important for Nalcor to file its formal submission with the PUB at or near the commencement of the PUB's review process. Nalcor knew this or ought to have known this. However, the evidence clearly establishes that Nalcor deliberately delayed filing its formal submission, thereby undermining the PUB's review process.

66. It is unacceptable that Nalcor justified its delay in providing timely disclosure to the PUB on the basis that some of its documents were not in the format that the Board and its consultant, Manitoba Hydro International Ltd., required. Nalcor's actions and general conduct frustrated and undermined the PUB's efforts to discharge its important responsibility in a timely and efficient manner.

67. The importance of this work by the PUB on behalf of the public was either not understood or intentionally frustrated by the actions of Nalcor.

MANITOBA HYDRO INTERNATIONAL

68. The MHI DG3 review was a further lost opportunity to have a fully independent and comprehensive analysis done of Nalcor's work, one that would include a full review of costs, schedule and risks. It is shocking that GNL did not comprehend the absolute necessity to have a fully independent and comprehensive analysis done, especially considering the conclusions that had been reached by the Joint Review Panel and the PUB in their reports.

69. Nalcor's efforts to restrict MHI's inquiries into and knowledge of relevant information on the Project to a "high level" and MHI's acquiescence to this approach was improper and indefensible.

70. The report MHI prepared for GNL, applying the DG3 cost information, was plainly and obviously improperly influenced and biased in favour of the Project.

71. While MHI's work for GNL can be faulted from a professional point of view, the deficiencies in its work were not solely the fault of MHI. GNL and Nalcor approached this review as a means of securing support for Project sanction. They were not

interested in obtaining an independent and comprehensive analysis of the Project, its costs and associated risks, although this is what the public was being told that they were getting.

72. GNL's involvement in restricting MHI's review scope, particularly as it related to strategic risks, coupled with Nalcor's conduct, was fatal to the preparation of any comprehensive and accurate report that could be relied upon for sanctioning of this Project.

THE INDEPENDENT ENGINEER

73. The reliance placed by GNL on the work of the Independent Engineer on behalf of Canada, without fully determining or understanding the limited scope of that work and without reviewing several of the draft and interim reports prepared by the IE, was clearly mistaken, misguided and unreasonable.

74. It is incomprehensible that GNL did not request access to draft and interim reports prepared by the IE prior to Financial Close. These reports contained important information on Project cost and schedule, which at a minimum should have caused GNL to make further inquiries of Nalcor before causing the Province to be locked into its major commitment for the Project.

75. The information about contingency that was contained in the draft IE reports of November 15 and November 27, 2013, which GNL did not request or receive, was important enough that it could have caused the Province to re-evaluate the Project before Financial Close.

76. Nalcor's position that "only fixed and firm costs" had to be included in its calculation of the annual Cost Overrun Escrow Account (COREA) payment by the Province was not based on any understanding or agreement with Canada. This position, as suggested in the hearings, was an attempt by Nalcor to justify its past practice of failing to report to Canada its reasonable estimates of cost overruns as they became apparent, in contravention of the financing agreements that were signed at Financial Close.

KEY AND ANCILLARY RECOMMENDATIONS

Pursuant to s. 6 of the Terms of Reference of this Commission of Inquiry, I make the following key and ancillary recommendations. This is not an exhaustive list of the recommendations I have made in various chapters throughout the Report.

KEY RECOMMENDATIONS

1. The Government of Newfoundland and Labrador should never undertake, on its own or through one of its Crown corporations or agencies, the planning, approval or construction of any large project (meaning a project with a budget of $50 million or more) without:

    a. Engaging independent external experts to provide robust review, assessment and analysis of the project

    b. Providing well-defined oversight after consideration of oversight processes instituted in other jurisdictions

2. The Public Utilities Board should review the proposed business case, reliability, cost and schedule of any large project that could potentially impact Newfoundland and Labrador electricity ratepayers. Following this review, the Public Utilities Board should report its findings to the government and the public.

3. The Government of Newfoundland and Labrador should amend s. 5.4 of the *Energy Corporation Act* to authorize the Information and Privacy Commissioner to determine if Nalcor is required to disclose information it wishes to withhold on the grounds of "commercial sensitivity."

4. Nalcor should not be entitled to withhold information from the Premier, the Minister of Natural Resources, the Minister of Finance or the Clerk of the Executive Council on the grounds of legal privilege or commercial sensitivity. Persons holding the aforementioned government positions should only be entitled to withhold this information from public disclosure if such action is permitted pursuant to the *Access to Information and Protection of Privacy Act* or the *Energy Corporation Act*.

5. The Government of Newfoundland and Labrador should proceed to fund large projects using a probability value of not less than P85. As well, recognizing the

likelihood of bias in any cost and schedule estimate, government should require the project proponent to provide a range of cost estimates in order to establish the project's budget, so that government can determine its own risk appetite. Amounts for tactical and strategic risks should be included in the overall budget but should not be specifically identified or quantified when disclosure is made to the public. Government should authorize the release of dollar amounts for tactical and strategic risks only on pre-determined, structured and well-defined terms.

6. The Department of Finance and Treasury Board should oversee the financing negotiations, cost control and cost review of any large project. Prior to project approval, the Department of Finance and Treasury Board should conduct a full assessment of the impact of the project on the financial position of the Province.

7. In preparation for 2041, government should appoint an expert panel with a mandate to determine the best approach to be taken by the Province in its attempt to ensure maximum long-term benefits from the Churchill Falls generating station and other potential generation sites on the Churchill River. This panel should be properly funded, non-political and include experts who are best able to assist government in preparing for the negotiations with Québec. The panel should be required to report its progress to Cabinet on a regular basis.

ANCILLARY RECOMMENDATIONS

8. Upon completion of the Muskrat Falls Project, government should direct the Public Utilities Board to conduct a full review of all costs used to determine the amount to be recovered from Island ratepayers pursuant to the Power Purchase Agreement. The present legislative framework and the formal commitments in place related to the financing of this Project are legally binding and the Public Utilities Board will be curtailed from disallowing, reducing or altering such costs. Nevertheless, this recommended review will enhance transparency and accountability. The Public Utilities Board's work should include a review of the financial arrangements between Nalcor and Emera regarding the Labrador-Island Link and the financial and equity allocations involved. Government should make any necessary amendment to the *Electrical Power Control Act, 1994* or other applicable legislation to authorize this review.

9. Unless and until government directs that all profits from export sales of electricity accrue to the benefit of ratepayers, it should direct Nalcor to identify and allocate all costs that it incurs to support the marketing and export of electricity from the Project in order that these costs are not borne by this province's ratepayers. Additionally, where transmission occurs over the Labrador Transmission Assets or the Labrador-Island Link for the purposes of exports (not including the Nova Scotia Block and energy sold to Emera under the Energy Access Agreement), some allocation of cost for the use of the Labrador Transmission Assets and the Labrador-Island Link to support such sales should be recovered for the benefit of ratepayers. The Public Utilities Board should be authorized to determine this allocation.

10. Government should direct Nalcor to work with Newfoundland Power Inc. to develop and implement a plan to enhance reliability of the electrical supply to the Island portion of the province prior to any closure of the Holyrood generating station. The Public Utilities Board should be authorized and directed to review and approve any such plan.

11. Government should amend the *Energy Corporation Act* to ensure the following in respect of Nalcor's board:

    a. The Nalcor board has a minimum of nine and a maximum of eleven members

    b. Nalcor's CEO cannot be a voting member or acting chair of the board

    c. Directors are chosen by an independent appointment process that is established by government

    d. The process of appointing Nalcor's directors is guided by its skills competency matrix, which should be reviewed and updated annually to ensure that the board is properly equipped to exercise its challenge function and to oversee the lines of business of Nalcor

    e. Nalcor directors are appointed for an initial term of three years and are allowed to serve for a maximum of nine years

    f. Vacancies on the Nalcor board are filled on a timely basis by government, with no vacancy lasting more than 45 days

g. Directors are reasonably compensated: government should obtain a report on board compensation for Nalcor from an expert consultant within six months of the date of the filing of this Report and thereafter, within three months, government should consider the resulting recommendations in setting an appropriate level of compensation for the Nalcor board members

12. Government should take immediate steps to ensure appropriate tracking, monitoring and follow-up of the recommendations accepted by government from the Joint Review Panel, as well as the commitments made by Nalcor as part of the environmental assessment process. Appropriate measures should be taken by government and Nalcor regarding environmental, mitigation and monitoring measures, including potential methylmercury contamination both in the Churchill River and Lake Melville. Such measures are not only important for health and safety reasons, they are necessary to assist in restoring the faith and trust of many people living in Labrador who are affected by the Project's construction and operation.

13. The Government of Newfoundland and Labrador should immediately commission an independent study to determine the views of current and recently employed members of the public service about the actual or perceived constraints, if any, felt by public servants in regard to communicating differing viewpoints, opinions and rationales to their superiors, including politicians. This study should also investigate record-keeping practices, and the rationale for such practices, within the public service in response to the current requirements under the *Access to Information and Protection of Privacy Act, 2015* and the *Management of Information Act*. The results of such a study should inform government about areas that require improvement and changes.

14. Government should take steps to ensure that civil servants are empowered to speak truth to politicians, so that they may provide complete and objective advice. Once government makes a decision on an issue, civil servants must then be expected to loyally implement such a decision. Politicians must understand that civil servants should be able to provide advice without fear of adverse consequences, that voicing such advice is a responsibility of their work and that it does not affect their ability to carry out policy directives.

15. Government should legislate and fully implement a "duty to document" policy within six months of the submission of this Report. The duty to document should also apply to Crown corporations and agencies.

16. To improve the ability of future Commissions of Inquiry to fufill mandates given pursuant to the *Public Inquiries Act, 2006*, the Act should be amended to provide for the following:

    a. A Commission should be exempted from the *Access to Information and Protection of Privacy Act* legislation so that its investigations can be conducted fully and without potential interference or influence. This exemption should continue at least until each Commission files its final report.

    b. Documents received from third parties on a confidential basis should be returnable to those third parties without the Commission retaining copies, if such is determined necessary by the Commissioner.

    c. Documents that have been entered at Commission proceedings as "Confidential Exhibits" or that have been sealed by the Commissioner should not be subject to further disclosure, even subsequent to the fulfilment of the Commission's mandate.

17. Cabinet minutes, as well as Cabinet Committee meeting minutes, should contain far more detail than those disclosed to this Commission of Inquiry.

Intentionally Left Blank

THE COMMISSION'S RESPONSE TO THE TERMS OF REFERENCE

The Commission's Terms of Reference are as follows:

4. The commission of inquiry shall inquire into:

   (a) the consideration by Nalcor of options to address the electricity needs of Newfoundland and Labrador's Island interconnected system customers that informed Nalcor's decision to recommend that the government sanction the Muskrat Falls Project, including whether

      (i) the assumptions or forecasts on which the analysis of options was based were reasonable,

      (ii) Nalcor considered and reasonably dismissed options other than the Muskrat Falls Project and the Isolated Island Option, and

      (iii) Nalcor's determination that the Muskrat Falls Project was the least-cost option for the supply of power to Newfoundland and Labrador Island interconnected system over the period 2011–2067 was reasonable with the knowledge available at that time;

   (b) why there are significant differences between the estimated costs of the Muskrat Falls Project at the time of sanction and the costs by Nalcor during project execution, to the time of this inquiry together with reliable estimates of the costs to the conclusion of the project including whether

      (i) Nalcor's conduct in retaining and subsequently dealing with contractors and suppliers of every kind was in accordance with best practice, and, if not, whether Nalcor's supervisory oversight and conduct contributed to project cost increases and project delays,

      (ii) the terms of the contractual arrangements between Nalcor and the various contractors retained in relation to the Muskrat Falls Project contributed to delays and cost overruns, and whether or not these terms provided sufficient risk transfer from Nalcor to the contractors,

      (iii) the overall project management structure Nalcor developed and followed was in accordance with best practice, and whether it contributed to cost increases and project delays,

      (iv) the overall procurement strategy developed by Nalcor for the project to subdivide the Muskrat Falls Project into multiple construction packages followed industry best practices, and whether or not there was fair and competent consideration of risk transfer and retention in this strategy relative to other procurement models,

(v) any risk assessments, financial or otherwise, were conducted in respect of the Muskrat Falls Project, including any assessments prepared externally and whether

(A) the assessments were conducted in accordance with best practice,

(B) Nalcor took possession of the reports, including the method by which Nalcor took possession,

(C) Nalcor took appropriate measures to mitigate the risks identified, and

(D) Nalcor made the government aware of the reports and assessments, and

(vi) the commercial arrangements Nalcor negotiated were reasonable and competently negotiated;

(c) whether the determination that the Muskrat Falls Project should be exempt from oversight by the Board of Commissioners of Public Utilities was justified and reasonable and what was the effect of this exemption, if any, on the development, costs and operation of the Muskrat Falls Project; and

(d) whether the government was fully informed and was made aware of any risks or problems anticipated with the Muskrat Falls Project, so that the government had sufficient and accurate information upon which to appropriately decide to sanction the project and whether the government employed appropriate measures to oversee the project particularly as it relates to the matters set out in paragraphs (a) to (c), focusing on governance arrangements and decision-making processes associated with the project.

Based on the findings made in this Report, I respond to the issues raised in the Terms of Reference as follows:

4(a)(i) The commission of inquiry shall inquire into the consideration by Nalcor of options to address the electricity needs of Newfoundland and Labrador's Island interconnected system customers that informed Nalcor's decision to recommend that the government sanction the Muskrat Falls Project, including **whether the assumptions or forecasts on which the analysis of options was based were reasonable.**

Response:

No. The assumptions or forecasts on which the analysis of options was based were not reasonable.

4(a)(ii) The commission of inquiry shall inquire into the consideration by Nalcor of options to address the electricity needs of Newfoundland and Labrador's Island interconnected system customers that informed Nalcor's decision to recommend that the government sanction the Muskrat Falls Project, including **whether Nalcor considered and reasonably dismissed options other than the Muskrat Falls Project and the Isolated Island Option.**

Response:

No. Nalcor did consider but unreasonably dismissed options other than the Muskrat Falls Project and the Isolated Island Option.

4(a)(iii) The commission of inquiry shall inquire into the consideration by Nalcor of options to address the electricity needs of Newfoundland and Labrador's Island interconnected system customers that informed Nalcor's decision to recommend that the government sanction the Muskrat Falls Project, including **whether Nalcor's determination that the Muskrat Falls Project was the least-cost option for the supply of power to Newfoundland and Labrador Island interconnected system over the period 2011–2067 was reasonable with the knowledge available at that time.**

Response:

No. With Nalcor's failure to consider all viable options, Nalcor's determination that the Muskrat Falls Project was the least-cost option for the supply of power to the Newfoundland and Labrador Island interconnected system over the period 2011–2067 was unreasonable. This response is based, in part, on my findings related to s. 4(a)(i) and s. 4(a)(ii).

4(b)(i) The commission of inquiry shall inquire into why there are significant differences between the estimated costs of the Muskrat Falls Project at the time of sanction and the costs by Nalcor during project execution, to the time of this inquiry together with reliable estimates of the costs to the conclusion of the project including **whether Nalcor's conduct in retaining and subsequently dealing with contractors and suppliers of every kind was in accordance with best practice, and, if not, whether Nalcor's supervisory oversight and conduct contributed to project cost increases and project delays**.

Response:

Yes. Nalcor's conduct in retaining contractors and suppliers of every kind was generally in accordance with best practice.

However, Nalcor's dealing with contractors, its supervisory oversight and conduct contributed to Project cost increases and Project delays. This response is based, in part, on my findings related to s. 4(b)(iii) and s. 4(b)(v).

It should be noted that the significant differences between the estimated costs of the Muskrat Falls Project at the time of sanction and the costs to the conclusion of the project are largely because Nalcor's DG3 base cost estimate was not of the highest quality and accuracy, and was knowingly understated by Nalcor at the time of sanction.

4(b)(ii)The commission of inquiry shall inquire into why there are significant differences between the estimated costs of the Muskrat Falls Project at the time of sanction and the costs by Nalcor during project execution, to the time of this inquiry together with reliable estimates of the costs to the conclusion of the project including **whether the terms of the contractual arrangements between Nalcor and the various contractors retained in relation to the Muskrat Falls Project contributed to delays and cost overruns, and whether or not these terms provided sufficient risk transfer from Nalcor to the contractors.**

Response:

Yes. The contractual arrangements between Nalcor and the various contractors did contribute to delays and cost overruns. Nalcor undertook more risk as a result of its understatement of cost estimates.

With respect to risk transfer, this response is based, in part, on some of my findings related to s. 4(b)(iv).

4(b)(iii) The commission of inquiry shall inquire into why there are significant differences between the estimated costs of the Muskrat Falls Project at the time of sanction and the costs by Nalcor during project execution, to the time of this inquiry together with reliable estimates of the costs to the conclusion of the project including **whether the overall project management structure Nalcor developed and followed was in accordance with best practice, and whether it contributed to cost increases and project delays.**

Response:

No. The overall Project management structure Nalcor developed and followed was not in accordance with best practice.

Yes. The overall Project management structure Nalcor developed and followed did contribute to cost increases and Project delays.

4(b)(iv)The commission of inquiry shall inquire into why there are significant differences between the estimated costs of the Muskrat Falls Project at the time of sanction and the costs by Nalcor during project execution, to the time of this inquiry together with reliable estimates of the costs to the conclusion of the project including **whether the overall procurement strategy developed by Nalcor for the project to subdivide the Muskrat Falls Project into multiple construction packages followed industry best practices, and whether or not there was fair and competent consideration of risk transfer and retention in this strategy relative to other procurement models.**

Response:

Yes. The overall procurement strategy for the Project generally did follow industry best practice. However, I am unable to conclude that Nalcor's decision to proceed with large contract packages was inappropriate.

I agree with the following conclusion of Miller Thompson contained in the Grant Thornton *Construction Phase* report:

> In conclusion, while certain contractual terms included in the Agreements were negotiated to be more favourable to the Contractors than as originally included in the Owners' template, we did not locate any contractual terms included in the Agreements that were clearly unsuitable for an agreement of this type. Included in the Agreements were contract terms providing the Owners with the ability to approve additional costs and time extensions, and to terminate the Agreements for convenience or for poor performance on the part of the Contractors. Therefore, delays and cost overruns that occurred cannot be attributed directly to the contractual terms of the Agreements themselves. The contractual terms of the Agreements reflect a procurement/contractual strategy employed by the Owners to limit the aggregate cost of the Project, and in so doing, allocated a higher proportion of risk to the Owners.

There was fair and competent consideration of risk transfer and retention in this strategy relative to other procurement models.

4(b)(v) The commission of inquiry shall inquire into why there are significant differences between the estimated costs of the Muskrat Falls Project at the time of sanction and the costs by Nalcor during project execution, to the time of this inquiry together with reliable estimates of the costs to the conclusion of the project including **whether any risk assessments, financial or otherwise, were conducted in respect of the Muskrat Falls Project, including any assessments prepared externally and whether (A) the assessments were conducted in accordance with best practice, (B) Nalcor took possession of the reports, including the method by which Nalcor took possession, (C) Nalcor took appropriate measures to mitigate the risks identified, and (D) Nalcor made the government aware of the reports and assessments.**

Response:

No. Althought there were risk assessments conducted by Nalcor for the Project, many of those risk assessments were not conducted in accordance with best practice.

Nalcor did take possession of all risk reports, with the exception of SNC-Lavalin's *2013 Risk Report*.

Nalcor did not take the appropriate measures to mitigate the risks identified, including those identified in SNC's *2013 Risk Report*, which it unreasonably declined to receive.

Nalcor did not make the Government of Newfoundland and Labrador aware of the risk reports and assessments.

4(b)(vi) The commission of inquiry shall inquire into why there are significant differences between the estimated costs of the Muskrat Falls Project at the time of sanction and the costs by Nalcor during project execution, to the time of this inquiry together with reliable estimates of the costs to the conclusion of the project including **whether the commercial arrangements Nalcor negotiated were reasonable and competently negotiated.**

Response:

Yes. Generally speaking, the commercial arrangements were reasonable and competently negotiated by Nalcor. However, Nalcor assumed greater risks and costs in some instances, which led to cost overruns and schedule delays.

This response is based, in part, on some of my findings related to s. 4(b)(ii) and s. 4(b)(iv).

4(c) The commission of inquiry shall inquire into **whether the determination that the Muskrat Falls Project should be exempt from oversight by the Board of Commissioners of Public Utilities was justified and reasonable and what was the effect of this exemption, if any, on the development, costs and operation of the Muskrat Falls Project.**

Response:

No. The determination that the Muskrat Falls Project should be exempt from oversight by the Board of Commissioners of Public Utilities was unjustified and unreasonable. The effect of the exemption was to deprive the Government of Newfoundland and Labrador of an opportunity to make a proper assessment of the development, costs and operation of the Project. The Government of Newfoundland and Labrador should have removed the exemption and directed the Public Utilities Board to conduct a full assessment of the Project before sanction.

The Reference Question that the Government of Newfoundland and Labrador referred to the Public Utilities Board prior to Project sanction was limited and was not an adequate substitute for a comprehensive assessment of the Project by the Public Utilities Board.

Even with a limited Reference Question, the Public Utilities Board was impeded by Nalcor in carrying out its analysis.

4(d) The commission of inquiry shall inquire into **whether the government was fully informed and was made aware of any risks or problems anticipated with the Muskrat Falls Project, so that the government had sufficient and accurate information upon which to appropriately decide to sanction the project and whether the government employed appropriate measures to oversee the project particularly as it relates to the matters set out in paragraphs (a) to (c), focusing on governance arrangements and decision-making processes associated with the project.**

Response:

No. Nalcor did not fully inform the Government of Newfoundland and Labrador of the risks and problems anticipated with the Project and it also deprived it of sufficient and accurate information upon which to appropriately decide whether to sanction the Project. The Government of Newfoundland and Labrador did not employ appropriate measures to oversee the Project.

Intentionally Left Blank

GLOSSARY

This list includes terms and their meanings as used in this Report.

Term	Meaning
alternating current (AC)	An electric current that periodically reverses direction. Alternating current power is typically the form of power delivered to households and businesses.
base estimate	An estimate that reflects the most likely costs for known and defined scope associated with the Project's specifications and execution plan.
bifurcation	A separation into two parts. When used in the context of the Project, it describes the establishment of distinct management teams for the generation and transmission components, as implemented in June 2016.
bipole (operations)	A bipole HVdc system has two conductors and allows for greater reliability for transmission than a single-conductor or monopole system. If one line goes down, the system immediately reconfigures itself to monopole operation to avoid power outages.
capacity	The maximum power that a generating unit, generating station or other electrical apparatus can supply. Common units for measuring capacity include kilowatt (kW) and megawatt (MW).
cofferdam	A temporary enclosure built within (or in pairs across) a body of water to allow the enclosed area to be pumped dry. This pumping creates a dry work environment so that the main dam (or other) work can be carried out safely. Commonly used for construction or repair of permanent dams, oil platforms and bridge piers built in or over water.
Conservation and Demand Management (CDM)	A range of programs and initiatives to encourage energy consumers to conserve electricity and use it more efficiently. It also includes efforts to decrease peak demand for electricity.
contingency	In an estimate, the provision made for probable variations in estimates of time or cost that cannot be specifically identified at the time the estimate is prepared.

Term	Meaning
converter station	Equipment used to convert alternating current to direct current (or direct current to alternating current).
critical path	A project management term for the entire sequence of steps or activities between the start and completion of a target, milestone or project.
Cumulative Present Worth (CPW)	The present value of all incremental utility capital and operating costs expected to be incurred to reliably meet a specified load forecast, given a prescribed set of reliability criteria. CPW is used for comparative purposes, as a measure of the total costs of a supply option.
DarkNL	A series of widespread and significant power outages that occurred on the Island of Newfoundland in January 2014.
Decision Gate (DG)	In the development of a project, a pre-defined moment when the Gatekeeper (see below) has to make appropriate decisions about whether to move a project to the next stage, to place a temporary hold or to terminate it.
direct current (DC)	An electric current that flows in only one direction. Direct current is used to transport power over long distances. Direct current has to be converted to alternating current before it can be used by homes and businesses.
dispatchable power generation	Sources of electricity that can be used on demand at the request of power grid operators, according to market needs. Dispatchable power generators can be turned on or off, or can adjust their output according to an order.
electrostatic scrubbers and precipitators	Pollution abatement equipment that reduces particulate emissions from thermal generating plants, such as Holyrood.
energy	The total amount of electricity that a utility supplies or a customer uses over a period of time. The energy supplied to electricity consumers is usually recorded as kilowatt hours, megawatt hours, gigawatt hours or terawatt hours.
Engineering, Procurement and Construction Management (EPCM)	A contracting model in which the EPCM contractor, acting as the owner's representative, is responsible for the engineering, procurement and construction management of suppliers and contractors.

Term	Meaning
escalation	In estimating, the provision for changes in price levels driven by economic conditions. Escalation includes inflation.
Federal Loan Guarantee (FLG)	The guarantee by Canada on a portion of the debt borrowed by Nalcor and Emera, enabling them to borrow at a lower interest rate than they would otherwise have been given.
Financial Close	The execution and delivery of several financing documents, the issuance of bonds and the advance of funds for the Project, pursuant to the Federal Loan Guarantee which took place in late 2013.
firm energy	Energy intended to be available throughout a specified period of time.
first power	The point at which power is first transmitted to the grid from a generating system.
force majeure	An event, condition or circumstance beyond the reasonable control of a party, and without fault or negligence of that party. Examples of *force majeure* events are natural disasters, environmental conditions, acts of war, court orders and strikes or lockouts.
full power	The first time the full capacity of a generating station is transmitted to the electrical grid.
Gatekeeper	The individual responsible for making decisions at each Decision Gate of a project's Gateway process. On the Muskrat Falls Project at DG2 and DG3, this was Nalcor CEO and President Edmund Martin.
Gateway process	A staged or phased decision-assurance process used to guide the planning and execution of the business opportunity presented by the development of the lower Churchill River.
geotechnical engineering	The study of the behaviour of soils under the influence of loading forces and soil-water interactions.
glaze ice	A smooth, transparent and homogeneous ice coating caused by freezing rain or drizzle.
grid	The layout of an electrical transmission or distribution system.

Term	Meaning
Integrated Resource Planning (IRP)	A method of least-cost planning that aims to properly compare the economic and environmental implications of alternative solutions for providing reliable electric power.
Interconnected Option	One of two options presented by Nalcor for the supply of electricity to Island ratepayers. It consists mainly of the Muskrat Falls Project and Labrador-Island Link, with thermal combustion providing reliability support.
Isolated Island Option	One of two options presented by Nalcor for the supply of electricity to Island ratepayers. It consists of a combination of thermal, small-scale hydro and wind generation projects on the Island.
Labrador Transmission Assets (LTA)	High-voltage cables transmitting power between Muskrat Falls and the Churchill Falls generating station.
Labrador-Island Link (LIL)	High-voltage cables transmitting 900 MW of power from Muskrat Falls through Labrador, across the Strait of Belle Isle and the Island to Soldiers Pond on the Avalon Peninsula.
Limited Notice to Proceed (LNTP)	A written notice that gives a contractor the go-ahead to begin work in a limited manner prior to the signing of a final contract.
LMAX	"Labour maximum cost," or the maximum value of the reimbursable cost of labour that an owner will provide to a contractor. The intention of an LMAX is to make the contractor responsible for labour costs above the LMAX value.
load	The amount of electric power delivered at any specific point or at specific locations on a grid system.
Maritime Link (ML)	The 500 MW high voltage connection from Granite Canal, Newfoundland, to Woodbine, Nova Scotia.
Mass Hub Price	A measure of current market prices for electricity in New England.

Term	Meaning
methylmercury	A toxic organic form of mercury formed when inorganic mercury combines with a methyl group, which is composed of carbon and hydrogen. It can be absorbed by fish and marine mammals and, as mercury poisoning, affect the health of humans who the eat contaminated species.
mitigation	The adoption of special measures or techniques to minimize or neutralize the negative impacts of a particular event.
monopole	An HVdc transmission system with one conductor.
Monte Carlo simulation	A mathematical method using random sampling that can simulate the probability of various outcomes. It is used in engineering and construction as a tool for quantitative risk analysis, to help determine a range of likely cost outcomes.
non-dispatchable power generation	Sources of electricity that cannot be used on demand at the request of power grid operators, according to market needs. Examples are wind and solar generation, because their energy is not always available.
non-firm energy	A source of energy that is not guaranteed to be a continuous flow and reliably available.
North Spur	A feature of the landscape at Muskrat Falls that forms a natural dam.
optimism bias	The demonstrated tendency for people to be overly optimistic about the outcome of planned actions.
peak demand	The highest level of electricity consumption that a utility has to meet at any one time.
penetration (wind)	The amount of wind energy supplied to a power grid, often expressed as a percentage.
powerhouse	The structure that contains the turbine(s) and generator(s) of a power project.
price elasticity	An index or measure of consumers' responsiveness to a price changes. Simply put, more product will be bought when the price of a commodity is cheaper and less will be bought when the product is more expensive.

Term	Meaning
P value	The statistical confidence level of achieving specific cost and schedule forecasts. For example, a cost estimate with a P value of 75 indicates a 75% chance the predicted cost will be achieved.
Quantitative Risk Analysis (QRA)	A process that attempts to determine the probability of various cost and schedule outcomes. The cost risks can be separated into strategic and tactical risks.
Recall Block	The 300 MW block of power that can be recalled from Churchill Falls, under the existing power contract between Hydro-Québec and CF(L)Co. Also "recall power."
reliability	The extent to which equipment, systems and facilities can be counted on to perform as intended.
rime ice	Opaque ice that forms when airborne drops of water freeze on contact with an object.
sanction	The milestone event at which a project's scope, budget and schedule are authorized. Sanction for the Project occurred on December 17, 2012, marking the start of the execution phase.
S-Curve	A diagram that has an S-shaped curve, which in a cost analysis simulates the likelihood of achieving a capital cost. In a time risk analysis, the curve simulates the likelihood of achieving project completion at given times.
sensitivity analysis	Analysis of the impact on a project's overall costs caused by variations in the key input parameters.
spilling water	Allowing water to pass through or over a dam, rather than using it to generate electricity.
Strait of Belle Isle (SOBI) crossing	A 30-kilometre underwater cable between Labrador and Newfoundland.
strategic misrepresentation	The planned, systematic distortion or misstatement of fact (lying) in response to incentives in a budget process.
strategic risk	Identified background risks that are outside of the control of the project team and that typically pertain to external issues.
Strategist	A software program that calculates and minimizes the cost of meeting anticipated energy demand for every hour of every year, suggesting which new generation assets should be built and when.

Term	Meaning
substation	A component of an electrical generation, transmission and distribution system where electricity passes through switchyards that transform it from high- to low-voltage electricity or vice versa.
synchronous condenser	A specialized machine, the unattached shaft of which spins freely. Its purpose is to assist in the voltage control of the transmission system to which it is connected.
tactical risk	The risk amounts associated with the base capital cost estimate and that result from uncertainties with the four components of that estimate: (1) project definition and scope omission, (2) construction methodology and schedule, (3) performance factors, and (4) price.
thermal generation	Electricity generated through the conversion of heat to electricity. Common thermal generating station types are coal, petroleum, geothermal, solar and natural gas.
watt	The base unit of electrical power used to measure the generating capacity of an electrical system, or the maximum demand of electricity consumers. Equivalencies: 1 kilowatt (kW) = 1,000 watts 1 megawatt (MW) = 1,000,000 watts 1 gigawatt (GW) = 1,000,000,000 watts 1 terawatt (TW) = 1,000,000,000,000 watts

Intentionally Left Blank

ACRONYMS

Acronym	Expansion
AACE	Association for the Advancement of Cost Engineering International
AC	alternating current
AFE	Authorization for Expenditure
ATIPPA	*Access to Information and Protection of Privacy Act*
CDM	Conservation and Demand Management
CEAA	Canadian Environmental Assessment Agency
CEO	Chief Executive Officer
CF(L)Co	Churchill Falls (Labrador) Corporation Limited
CFO	Chief Financial Officer
COREA	Cost Overrun Escrow Account
CPW	Cumulative Present Worth
COS	Cost of Service
CSA	Canadian Standards Association
DG	Decision Gate
EA	Environmental Assessment
EAA	Energy Access Agreement
EIS	Environmental Impact Statement
EOI	Expression of Interest
EPCA	*Electrical Power Control Act*
EPC	Engineer, Procure and Construct
EPCM	Engineering, Procurement and Construction Management
EY	Ernst & Young LLP
FFC	Final Forecast Cost / Forecast Final Cost
FLG	Federal Loan Guarantee
GDP	gross domestic product

Acronym	Expansion
GHG, GHGs	greenhouse gas(es)
GIS	gas insulated switchgear
GNL	Government of Newfoundland and Labrador
GWh	gigawatt hour
HHRAP	Human Health Risk Assessment Plan
HVac	high-voltage alternating current
HVdc	high-voltage direct current
IBA	Impacts and Benefits Agreement
IBEW	International Brotherhood of Electrical Workers
ICS	integrated cover system
IE	Independent Engineer
IEAC	Independent Expert Advisory Committee
IMT	Integrated Management Team
IPR	Independent Project Review
IRP	Integrated Resource Planning
JRP	Joint Review Panel
kV	kilovolt
kWh	kilowatt hour
LCC	line commutated converter
LCMC	Lower Churchill Management Corporation
LCP	Lower Churchill Project
LiDAR	light detection and ranging
LIL	Labrador–Island Link
LMAX	labour maximum cost
LNG	liquefied natural gas
LNTP	Limited Notice to Proceed
LTA	Labrador Transmission Assets

Acronym	Expansion
MF	Muskrat Falls
MFC	Muskrat Falls Corporation
MFEA	Muskrat Falls Employers Association
MHI	Manitoba Hydro International
ML	Maritime Link
MOU	Memorandum of Understanding
MW	megawatt
MWH	MWH Canada Inc.
MWh	megawatt hour
NCC	NunatuKavut Community Council
NERC	North American Electric Reliability Council
NG	Nunatsiavut Government
NLH	Newfoundland and Labrador Hydro
NSPI	Nova Scotia Power Inc.
O&M	operating and maintenance
P&C	protection and control (software)
PAA	Project Assignment Authorization
PBR	Performance-Based Regulation
PMT	Project Management Team
PPA	Power Purchase Agreement
PPE	personal protective equipment
PUB	Public Utilities Board
QRA	Quantitative Risk Assessment
RCC	roller-compacted concrete
RDTC	Resource Development Trades Council
RFI	Request for Information
RFP	Request for Proposals
ROW	right-of-way

Acronym	Expansion
SNC, SLI	SNC-Lavalin Group Inc.
SOBI	Strait of Belle Isle
SPO	Special Project Order
TWh	terawatt hour
UARB	Utility and Review Board (Nova Scotia)

NAMES AND AFFILIATIONS

This list includes the names and affiliations (as it pertains to the content of this Report) of people frequently referenced in this Report.

Last Name	First Name	Organization
Alteen	Peter	Newfoundland Power
Argirov	Nik	Independent Engineer
Bader	Georges	Astaldi
Ball	Dwight	Government of Newfoundland and Labrador
Béchard	Normand	SNC-Lavalin
Benefiel	Roberta	Grand Riverkeeper Labrador/ Labrador Land Protectors
Bennett	Gilbert	Nalcor
Blidook	Kelly	Memorial University
Bown	Charles	Government of Newfoundland and Labrador
Brewer	Donna	Government of Newfoundland and Labrador
Brockway	Tom	Grant Thornton, Expert Witness
Browne	Dennis	Consumer Advocate
Bruneau	Stephen	Memorial University
Cappe	Mel	University of Toronto, Expert Witness
Card	Bob	SNC-Lavalin
Chebab	George	Nalcor
Chippett	Jamie	Government of Newfoundland and Labrador
Clark	David	Nalcor
Chryssolor	Ken	Astaldi
Churchill	Jason	Cleo Research, Expert Witness
Clarke	Lance	Nalcor
Clift	Tom	Nalcor board of directors
Coady	Siobhan	Government of Newfoundland and Labrador
Colaiacovo	Pelino	Morrison Park Advisors, Expert Witness
Crawley	Brian	Nalcor
Dalley	Derrick	Government of Newfoundland and Labrador
Davis	Paul	Government of Newfoundland and Labrador
DeBourke	Darren	Nalcor
Delarosbil	Don	Astaldi

Last Name	First Name	Organization
Dodson	Keith	Westney Consulting
Ducey	BJ	Valard
Dunderdale	Kathy	Government of Newfoundland and Labrador
Evans	Jack	Westney Consulting
Fagan	Kevin	Nalcor
Feehan	James	Memorial University
Fleming	Greg	Nalcor
Flowers	Marjorie	Grand Riverkeeper Labrador/ Labrador Land Protectors
Flyvbjerg	Bent	Oxford University, Expert Witness
Goebel	Martin	Government of Newfoundland and Labrador
Goulding	A.J.	London Economics International, Expert Witness
Gover	Aubrey	Government of Newfoundland and Labrador
Greene	Maureen	Public Utilities Board
Hancock	Bernice	Community Education Network
Hanrahan	Denise	Government of Newfoundland and Labrador
Harrington	Paul	Nalcor
Harrington	Tim	Cahill-Ganotec
Hokenson	Rey	Independent Engineer
Holburn	Guy	Western University, Expert Witness
Hollmann	John	Validation Estimating
Humphries	Paul	Nalcor
Huskilson	Chris	Emera
Hussey	Patrick (Pat)	Nalcor
Jergeas	George	University of Calgary, Expert Witness
Kast	Mack	Manitoba Hydro International
Kean	Jason	Nalcor
Keating	James	Nalcor
Kennedy	Jerome	Government of Newfoundland and Labrador
Kennedy	Michael	Ernst & Young
Klakegg	Ole Jonny	Norway University of Science and Technology, Expert Witness
Knox	Leonard	H.J. O'Connell
Lemay	Paul	SNC-Lavalin
Leopold	Tim	Independent Project Review Team

Last Name	First Name	Organization
Lewis	Roy	Nalcor
Loucks	James	Independent Engineer
MacIsaac	John	Nalcor
Mallam	John	Nalcor
Manzer	Alison	Cassels Brock & Blackwell (legal counsel for Canada)
Marshall	Stan	Nalcor
Marshall	Ken	Nalcor board of directors
Marshall	Thomas	Government of Newfoundland and Labrador
Martin	Craig	Government of Newfoundland and Labrador
Martin	Edmund	Nalcor
Martin	Fred	Public Utilities Board
Martin	Thierry	General Electric
Mavromatis	Bill	Andritz
McClintock	Ken	Nalcor
McCormick	Patrick	Resource Development Trades Council
McLean	Carl	Nunatsiavut Government
Meaney	James	Nalcor
Michael	Lorraine	Retired, Member of the House of Assembly
Molloy	Donovan	Government of Newfoundland and Labrador
Morris	Paul	Government of Newfoundland and Labrador
Mulcahy	John	Nalcor
Mullaley	Julia	Government of Newfoundland and Labrador
Myrden	Paul	Government of Newfoundland and Labrador
Noble	Richard	Ernst & Young
O'Brien	Scott	Nalcor
Over	Ed	SNC-Lavalin
Owen	Derek	Independent Project Review Team
Paddon	Terry	Government of Newfoundland and Labrador
Palumbo	Mauro	Astaldi
Penney	Ronald	Muskrat Falls Concerned Citizens Coalition
Piétacho	Jean-Charles	Innu of Ekuanshit
Power	Ronald (Ron)	Nalcor
Power	Tanya	Nalcor
Raphals	Philip	Helios Centre, Expert Witness

Last Name	First Name	Organization
Rietveld	Aaron	Barnard-Pennecon
Russell	Todd	NunatuKavut Community Council
Schaufele	Brandon	Western University, Expert Witness
Shaffer	Scott	Grant Thornton, Expert Witness
Shortall	Gerry	Nalcor Board
Skinner	Shawn	Government of Newfoundland and Labrador
Snyder	Allen	Manitoba Hydro International
Snyder	Greg	SNC-Lavalin
Stanley	Todd	Government of Newfoundland and Labrador
Sturge	Derrick	Nalcor
Styles	Terry	Nalcor Board
Taylor	Brian	Government of Newfoundland and Labrador
Thompson	Robert	Government of Newfoundland and Labrador
Thon	Scott	SNC-Lavalin
Tisdel	Derek	Barnard-Pennecon
Tranquilla	Desmond	Nalcor
Tremblay	Jean-Daniel (J.D.)	SNC-Lavalin
Turpin	Mark	Nalcor
Vardy	David	Muskrat Falls Concerned Citizens Coalition
von Lazar	Laszlo	General Electric
Wade	David	Resource Development Trades Council
Walsh	Tom	Resource Development Trades Council
Warren	Auburn	Nalcor
Wells	Andy	Public Utilities Board
Westney	Richard	Westney Consulting
Williams	Danny	Government of Newfoundland and Labrador
Williams	Kelly	Valard
Wilson	Paul	Manitoba Hydro International
Young	Geoffrey	Nalcor