

2 Review Methodology

2.1 MHI's Review Process

MHI's review was approached from two perspectives, technical and financial. The technical aspects included a review of available engineering and related reports, while the financial review addressed the CPW analysis that Nalcor used to determine and justify the least cost alternative of the two options it considered. Meetings with Nalcor's staff and its consultants were held as required to clarify points raised during the reviews. As well, a formalized request for information (RFI) process was used to ask Nalcor for additional information.

Comprehensive information was gathered on the generation expansion components proposed for each of the two options. Individual experts were assigned to review the project design, specifications, standards, timelines, capacity, retirements, and capital and operating costs for the Muskrat Falls generation facility, the Labrador-Island HVdc Link, including the Strait of Belle Isle crossing, the three smaller hydroelectric projects, the wind projects, and the thermal projects, as related to each of the options. Numerous feasibility reports, engineering assessments, and risk analyses were reviewed. Technical reports were prepared to cover hydrology, load forecast, reliability, and ac system studies. The capital and operating costs of each option were examined for reasonableness, recognizing that in some cases it was necessary to escalate costs forward from previous years, as specified in the studies. The composite costs of the integral parts of the two options were carried into the CPW analysis.

The methodology used to develop the CPW model was reviewed and tested. Projected prices in the fuel price forecast were also reviewed in detail. Various related data inputs were investigated, including the applicable exchange rates, the application of Interest During Construction, the Allowance for Funds Used During Construction, the application of projected Consumers Price Indices, the escalation rates, discount rates, and costs of each of the debt and equity components. An assessment was also conducted on impacts to the CPW results if Nalcor sold energy from Muskrat Falls Generating Station to NLH on a cost-of-service basis rather than under a power purchase agreement.

Sensitivities of the CPW results were tested for changes in key input variables, such as capital costs, load forecasts, and fuel prices.

Numerous RFIs were filed with Nalcor. The responses were reviewed and further requests were made as necessary.

2.2 Review of Cost Estimates and Benchmarks

For the two options, MHI reviewed the base estimate costs, the estimates for contingency, and the escalation allowance costs. Studies and cost estimates for the construction of the Muskrat Falls Generating Station and the Labrador-Island Link date back at least 40 years, and a number of studies have been performed for the projects identified in the Isolated Island Option. Over time, more thorough studies were performed and the cost estimates were updated or refined. Nalcor has

adopted the practices used by the AACE International Recommended Practices No 17R-97, which is recognized as a leading authority in total cost management, including cost estimating standards, practices, and methods²⁰. Capital cost estimates for Muskrat Falls Generating Station and the Labrador-Island HVdc Link were prepared to the class sufficient to support the Decision Gate (DG2) screening process. The key parameters of DG2 include the key timelines, project sequencing, and execution approach. Nalcor considers the capital cost estimates coincident with DG2 to be commensurate with an AACE International Class 4 estimate which has a range of accuracy of +50% to -30%²¹. The cost estimate matures as the level of engineering and project planning advances, coincident with an improvement in forecasting accuracy. The Decision Gate 3 (DG3) or project sanction capital cost estimate is considered by Nalcor to be a Class 3 estimate with a range of accuracy of +30% to -20%.

The issue of cost estimate accuracy has a large bearing on the sensitivities of CPW analyses, as the base cost estimates of the various projects are a direct input into the financial model. Nalcor has published a number of documents on their cost estimate process in responses to RFI PUB-Nalcor-42 and 43.

In the Recommended Practices No 17R-97 guide, there are five classes of cost estimates, with different degrees of accuracy as noted below:

- Class 5: +100% to -50%, Concept Screening
- Class 4: +50% to -30%, Study or Feasibility (DG2 accuracy)
- Class 3: +30% to -20%, Budget authorization (DG3 accuracy)
- Class 2: +20% to -15%, Control or Bid/Tender
- Class 1: +15% to -10%, Check Estimate

Figure 7 shows the amount of variability in estimate accuracy versus project definition.

²⁰ CE-51 Rev.1 (Public), Nalcor, "Technical Note - Muskrat Falls Generation Facility and Labrador – Island Transmission Link Overview Of Decision Gate 2 Capital Cost and Schedule Estimates", August 2011, pg 10

²¹ Response to RFI PUB-Nalcor-42

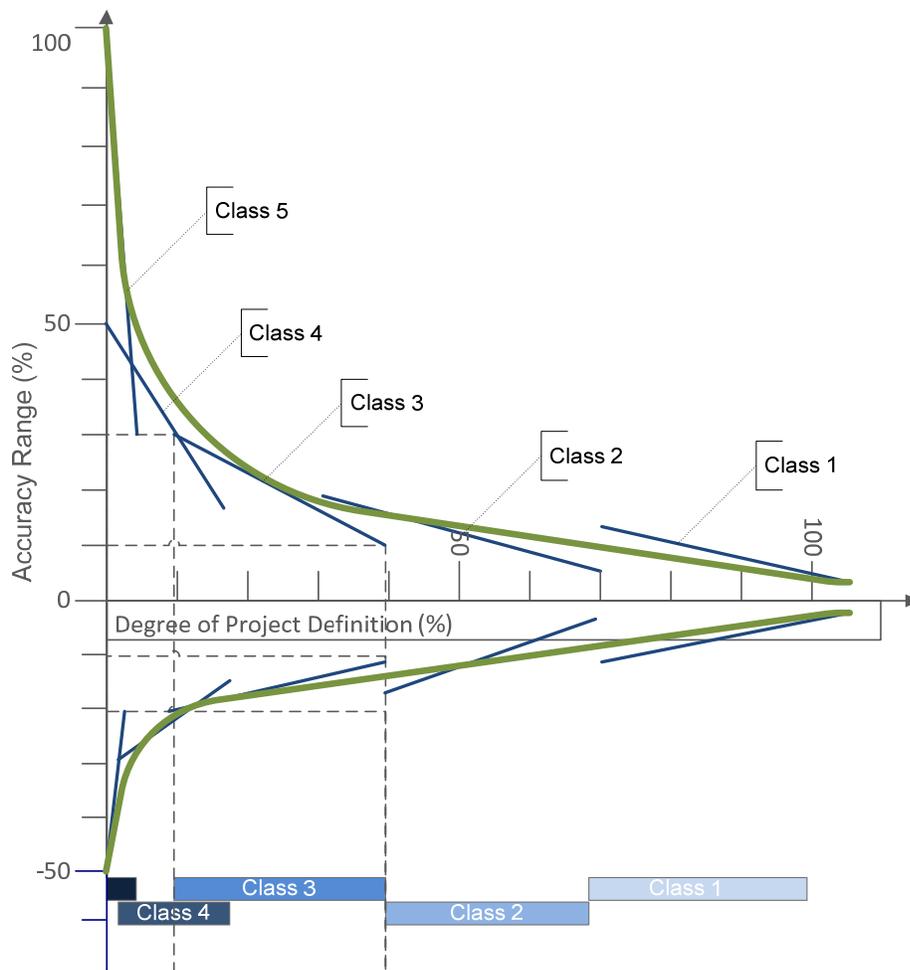


Figure 7: AACE Cost Estimating Accuracy Classes

DG2 used a Class 4 accuracy level, at the study or feasibility stage. At DG3, Nalcor proposes to use a Class 3 accuracy level, for the budget authorization or project sanction stage. Typically, in the early stages of a project’s development, a mix of cost estimate classes would be used, as evidenced by what MHI has seen in the case of Muskrat Falls Generating Station or the Strait of Belle Isle marine crossing, which were studied more extensively than other components.

For comparison purposes, Manitoba Hydro uses a staged project development process (Stage I through Stage V). The project components include input from engineering, socio-economic and environmental sources. Confidence in the cost estimate increases as the project progresses through each stage of development due to the increase in the degree of project definition. The risk analysis for contingency determination at each stage of the project uses an appropriate AACE International recommended technique to account for specific project risks, and a contingency developed.

At Manitoba Hydro, escalation indices are then applied to the base estimate using the Global Insight data for the various project drivers (labour, equipment, commodities, fuel etc.) which are specific for the hydro power projects built in Manitoba. The escalation indices are modified to take into account regional economic activity. Nalcor's process is very similar to that used by Manitoba Hydro and is a utility best practice.

MHI reviewed the cost estimation process developed by Nalcor for the Infeed Option. Capital cost estimates were developed by Nalcor from base estimates to which contingency estimates and escalation allowances were added. The base estimates were developed in accordance with the principles found in the AACE International recommendations. Various price and productivity factors were applied by Nalcor to the key inputs to develop the revised base estimates. Nalcor's contingency percentage was evaluated and applied to the base estimate to reflect the impact of definition and performance risks, after which an escalation factor was determined to recognize cost changes associated with changes in productivity, technology, and market conditions. The indices used by Nalcor to develop the escalation provision were based on Global Insight's first quarter 2010 report. Each of the applicable contingency estimates and escalation allowances were applied to each of the base costs of the two options, to develop the costs used to ultimately form the basis of the CPW analyses. Given the timelines for the extended construction schedule, an Allowance for Funds Used During Construction was also capitalized as part of the construction costs.

The costs associated with the projects forming part of the Isolated Island Option were diverse, as they were spread across an extended number of projects, including an upgrade to the Holyrood complex and the addition of three hydroelectric plants, combustion turbines (CT), combined cycle combustion turbines (CCCT), and wind farm projects. The cost estimates for the increments of generating capacity included environmental improvements at Holyrood Thermal Generating Station in compliance with the government mandate that such improvements must proceed if the Isolated Island Option was selected. As the Infeed Option has passed DG2, the associated reports for the Infeed Option are more rigorous than they are for the Isolated Island Option where some of estimates were less detailed.

2.3 Risk Review

MHI reviewed the risk analysis components of all reports and studies for both the Infeed and Isolated Island Options including the "Technical Note – Strategic Risk Analysis and Mitigation"²². Nalcor defined risks into two categories: tactical and strategic for the Infeed Option. Tactical risks were separated into definition risks which evaluated the design and planning aspects of the project, and performance risks associated with contractor performance, weather delays, material pricing etc. Strategic risks include background risks such as changes in scope, market conditions, location factors etc. and organization risks which are associated with the size and complexity of the project.

As a part of the technical reviews, MHI noted that the segments of reports that focused on risk were tied for the most part to the determination of costs, the timing of projects, and ongoing operational

²² CE-52 Rev .1 (Public), Nalcor, "Technical Note: Strategic Risk Analysis and Mitigation", July 2010.

issues. MHI has documented the risks where appropriate throughout this report. Significant items are noted in the Key Findings sections.

2.4 Investigative Reviews

Figure 8 outlines the process steps followed by MHI and project documents required to review the two options leading to two parallel investigations that culminated in the CPW analysis, and development of the key findings.

The review process followed a power resource planning assessment, in that:

- a base load forecast was used to define energy needs;
- several scenarios were formulated to meet the energy needs;
- these scenarios were ranked by corporate approved criteria which may be the least cost (amongst others); and
- the selected option(s) were examined further to refine estimates.

The cumulative present worth analysis with results in 2010 dollars was used to measure the relative costs of the Options, which are based on a number of key inputs, e.g. fuel price, capital cost, and load forecast. These inputs were adjusted to test their sensitivities to the base assumptions.

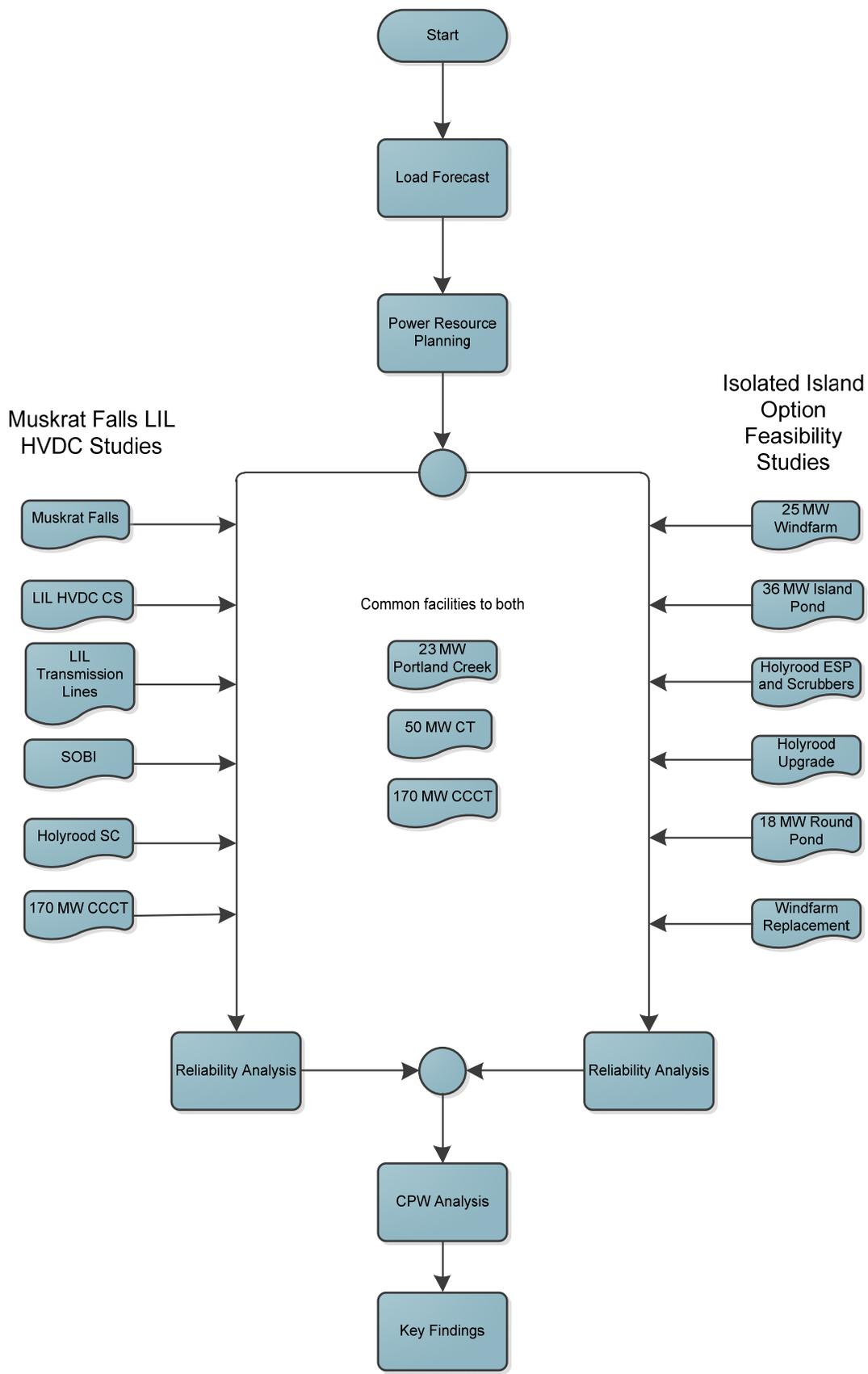


Figure 8: MHI Two Options Review Process

2.5 Technical Review

The technical review included an assessment of prior work available to ensure that Nalcor and its consultants had taken all reasonable steps and followed acceptable practices in developing the two scenarios, cost estimates, schedules, feasibility studies, and risk analyses. Topics covered in MHI's assessment included the generation resource planning process, reliability studies, load forecasts, hydrology studies, hydraulic optimization, power and energy assessments, ac system studies, and the cost estimating methodology.

2.6 Financial Review

In its financial review, MHI evaluated the CPW analysis, which is a financial model and methodology that gauges the cost of an option based on capital costs, operating costs, escalators, fuel pricing, power purchase agreements, and other relevant components staged over time. The Strategist tool that Nalcor used for its CPW analyses is sophisticated and will optimize a resource plan based on available resource options, load forecasts, fuel pricing, and capital and operating costs.