

Manitoba Hydro Book of Documents #4

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BC HYDRO SITE C CLEAN ENERGY PROJECT

MAIN CIVIL WORKS CONTRACT

for the Site C Clean Energy Project

British Columbia Hydro and Power Authority

and

Peace River Hydro Partners

Dated: December 18, 2015

AGREEMENT
SITE C CLEAN ENERGY PROJECT
MAIN CIVIL WORKS CONTRACT

THIS AGREEMENT made effective as of the 18th day of December, 2015 (BC Hydro Reference # 520738)

BETWEEN:

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY, a British Columbia Crown Corporation having its head office at 333 Dunsmuir Street, Vancouver, B.C. V6B 5R3

("BC Hydro")

AND:

PEACE RIVER HYDRO PARTNERS, a British Columbia general partnership having its head office at [REDACTED], by its partners, Acciona Infrastructure Canada Inc., Samsung C&T Canada Ltd. and Petrowest Corporation

(collectively, the "Contractor")

WHEREAS:

- A. BC Hydro intends to construct the Site C Clean Energy Project (the "Project") which is a proposed third dam and hydroelectric generating station on the Peace River in northeast British Columbia;
- B. The Contractor is a knowledgeable and experienced contractor in the performance of work similar to the Work, and is the successful proponent under RFP #1824; and
- C. The parties wish to enter into a formal contract for the performance of the Work.

NOW THEREFORE in consideration of the mutual covenants and conditions contained in the Contract, BC Hydro and the Contractor agree as follows:

1 THE WORK

1.1 Scope of Work

The scope of the Work is as summarized in Appendix 6-1 [Scope of Work] and includes:

- (a) diversion works;
- (b) excavation and earth works;
- (c) relocation of surplus excavated materials;
- (d) dams and cofferdams;
- (e) roller compacted concrete buttress;

Main Civil Works

- (f) approach channel and tailrace; and
- (g) ancillary Work, including:
 - (i) permanent roads on the Work Site;
 - (ii) permanent drainage on the Work Site;
 - (iii) permanent debris-handling facilities on the Work Site;
 - (iv) boat launching facilities;
 - (v) supply and install permanent instrumentation; and
 - (vi) restoration at the Site.

1.2 Labour, Materials and Equipment

Except as expressly provided otherwise in the Contract Documents, the Contractor will provide all labour, materials and equipment necessary for the complete performance of the Work.

1.3 Title to Materials

Unless expressly stated otherwise in the Contract Documents, title to any materials provided by the Contractor for the Work will pass to BC Hydro free and clear of all encumbrances upon the incorporation of such materials into the Work.

1.4 Initial Work Program and Schedule

Attached at Appendix 4-2 [Work Program and Schedule] is the initial schedule for the Contractor's performance of the Work. The Contractor will revise and expand this initial schedule in accordance with Schedule 4 [Work Program and Schedule].

2 INTERPRETATION

2.1 Definitions

In the Contract Documents, unless the context otherwise requires, capitalized terms have the meanings set out in Schedule 1 [Definitions and Interpretation].

2.2 Contract Documents

The following is a complete list of the Contract Documents:

- (a) this Agreement;
- (b) Schedule 1 [Definitions and Interpretation];
- (c) Schedule 2 [General Conditions]:
 - (i) Appendix 2-1 [Design-Build Review Process];
 - (ii) Appendix 2-2 [Good Weather Baseline Table];

- (iii) Appendix 2-3 [Project Related Permits];
- (iv) Appendix 2-4 [Site Access, Conditions and Services];
- (v) Appendix 2-5 [Proposal Extracts];
- (vi) Appendix 2-6 [Material Sources Outside Dam Site Area];
- (vii) Appendix 2-7 [Leave to Commence]; and
- (viii) Appendix 2-8 [SharePoint Technical Requirements for Contractors];
- (d) Schedule 3 [Roles and Representatives];
- (e) Schedule 4 [Work Program and Schedule]:
 - (i) Appendix 4-1 [BC Hydro Project Schedule]; and
 - (ii) Appendix 4-2 [Work Program and Schedule];
- (f) Schedule 5 [Submittals Procedure]:
 - (i) Appendix 5-1 [Form of Submittal Schedule];
- (g) Schedule 6 [Specifications and Drawings]:
 - (i) Appendix 6-1 [Scope of Work];
 - (ii) Appendix 6-2 [Technical Specifications];
 - (iii) Appendix 6-3 [Drawings]; and
 - (iv) Appendix 6-4 [Reference Documents];
- (h) Schedule 7 [Environmental Obligations]:
 - (i) Appendix 7-1 [Contractor Environmental Incident Report Form];
- (i) Schedule 8 [Quality Management]:
 - (i) Appendix 8-1 [Design Quality Management Plan]; and
 - (ii) Appendix 8-2 [Construction Quality Management Plan];
- (j) Schedule 9 [Communications Roles];
- (k) Schedule 10 [Safety]:
 - (i) Appendix 10-1 [Safety Areas]; and
 - (ii) Appendix 10-2 [Contractor Safety Incident Report Form];

- (l) Schedule 11 [Prices and Payment]:
 - (i) Appendix 11-1 [Schedule of Prices and Estimated Quantities];
 - (ii) Appendix 11-2 [Measurement and Payment];
 - (iii) Appendix 11-3 [Form of Payment Application – Schedule of Values];
 - (iv) Appendix 11-4 [Form of Performance Bond];
 - (v) Appendix 11-5 [Form of Labour & Material Payment Bond];
 - (vi) Appendix 11-6 [Form of Letter of Credit (Use for Performance, Labour & Material Payment and Advance Payment)];
 - (vii) Appendix 11-7 [Form of Parent Company Guarantee];
 - (viii) Appendix 11-8 [Form of Environmental Compliance Statement];
 - (ix) Appendix 11-9 [Form of Statutory Declaration]; and
 - (x) Appendix 11-10 [Sample Escalation Calculations];
- (m) Schedule 12 [Changes];
- (n) Schedule 13 [Insurance]:
 - (i) Appendix 13-1 [Wrap-Up Liability Insurance Specifications]; and
 - (ii) Appendix 13-2 [Course of Construction Insurance Specifications];
- (o) Schedule 14 [Dispute Resolution Procedure]:
 - (i) Appendix 14-1 [Site C Referee Panel]; and
 - (ii) Appendix 14-2 [Referee Agreement];
- (p) Schedule 15 [Records]:
 - (i) Appendix 15-1 [Record Classification Requirements];
- (q) Schedule 16 [Aboriginal Inclusion and Reporting Requirements]:
 - (i) Appendix 16-1 [Aboriginal Inclusion Performance Report]; and
- (r) Schedule 17 [Privacy Protection].

The Contract Documents include any and all additional and amending documents issued in accordance with the provisions of the Contract Documents.

2.3 Schedules, Appendices, Exhibits and Attachments

The Schedules, Appendices, Exhibits and Attachments and the terms set out in them will be deemed to be fully a part of the Contract.

3 CONTRACT PRICE

3.1 Contract Price

The price for the Work (the "Contract Price") will be the sum in Canadian dollars of the following:

- (a) the product of the actual quantities of the Price Items listed in Appendix 11-1 [Schedule of Prices and Estimated Quantities] which are incorporated into or related to the Work and the unit prices listed in Appendix 11-1 [Schedule of Prices and Estimated Quantities]; plus
- (b) all lump sums, if any, as listed in Appendix 11-1 [Schedule of Prices and Estimated Quantities], for Price Items incorporated into or related to the Work; plus
- (c) any payment adjustments, including any payments owing on account of Changes, approved in accordance with the provisions of the Contract Documents.

3.2 Entire Compensation

The Contract Price will be the entire compensation owing to the Contractor for the complete performance of the Work and this compensation will cover and include all profit and all costs of labour, supervision, material, equipment, transportation and delivery, overhead, financing and all other costs and expenses whatsoever incurred by the Contractor in performing the Work.

4 REPRESENTATIVES

For the purposes of Section 2.1 and Section 3.1 of Schedule 3 [Roles and Representatives], the following are the initial Representatives of the parties:

Hydro's Representative - [REDACTED]

Contractor's Representative - [REDACTED]

If no names or contact details are included in this Section 4 as of the Effective Date, then each party will promptly give written notice to the other party of its respective Representative in accordance with Schedule 3 [Roles and Representatives]. Either party may, at any time and from time to time, change its Representative in accordance with Schedule 3 [Roles and Representatives].

5 NOTICES

5.1 Address for Notice

Unless otherwise expressly required to be given to Hydro's Representative or the Contractor's Representative pursuant to the Contract Documents, any notice or communication required or permitted to be given under the Contract will be in writing and will be considered to have been sufficiently given when delivered by registered mail, by hand or by email to the address of the applicable party set out below:

- (a) if to BC Hydro:

British Columbia Hydro and Power Authority
 333 Dunsmuir Street
 Vancouver, BC V6B 5R3

[Redacted]

(b) if to the Contractor:

Peace River Hydro Partners

[Redacted]

[Redacted]

and

[Redacted]

[Redacted]

and

[Redacted]

[Redacted]

(c) to such other address as either party may, from time to time, designate in the manner set out above, provided that the Contractor may not change its address under Section 5.1 to an address other than one in British Columbia without BC Hydro's prior written consent.

5.2 Delivery of Email

For the purposes of Section 5.1 of this Agreement, unless otherwise agreed in writing between Hydro's Representative and the Contractor's Representative, an email is deemed to have been delivered when:

- (a) it enters an information processing system that the recipient has designated or uses for the purpose of receiving email or information of the type sent and from which the recipient is able to retrieve the email; and
- (b) it is in a form capable of being processed by that system.

An email is deemed to be delivered under this Section 5.2 even if no individual with the recipient is aware of its delivery.

6 GENERAL

6.1 Language

All documents to be delivered under the Contract will be provided in English, the Contractor's Representative will be fluent in English and the Contractor's key personnel will be able to communicate effectively with BC Hydro in English.

6.2 Amendments

No amendment to the terms of the Contract will be binding on BC Hydro or the Contractor or effective, unless made in writing and signed by an authorized representative of each party.

6.3 Entire Agreement, Waivers And Consents In Writing

The Contract Documents, and the instruments and documents to be executed and delivered pursuant to the Contract Documents, constitute the entire Contract between the parties, expressly superseding all prior agreements and communications (both oral and written) between the parties with respect to all matters contained in the Contract Documents and such instruments and documents, and contain all the representations and warranties of the respective parties. For certainty:

- (a) RFQ #1824, and the Contractor's response to RFQ #1824;
- (b) RFP #1824, and the Contractor's proposal to RFP #1824, except as expressly included in Appendix 2-5 [Proposal Extracts]; and
- (c) any representations, warranties or guarantees made during the competitive procurement process under RFP #1824,

are expressly not included in the Contract and will not be referred to in any way in the interpretation of the Contract.

In addition:

- (d) no waiver of any provision of the Contract; and
- (e) no consent required pursuant to the Contract Documents,

is binding or effective unless it is in writing and signed by an authorized representative of the party providing such waiver or consent.

6.4 Assignment

Neither party may assign the Contract, in whole or in part, without the prior written consent of an authorized representative of the other party, which consent may not be unreasonably withheld.

Notwithstanding the foregoing, BC Hydro may assign the Contract to any of its Affiliates or to any third party that amalgamates or merges with BC Hydro or which acquires all or substantially all of the assets of BC Hydro or which was, immediately prior to the assignment, a part of BC Hydro, conditional upon the assignee covenanting and agreeing with the Contractor to be bound to the Contractor by the provisions of the Contract, and provided that the assignee has the power and capacity to carry out the transactions contemplated by this Contract to be carried out by BC Hydro and to duly observe and perform all of the obligations contained in this Contract to be observed and performed by BC Hydro. Subject to the

foregoing, the Contract will enure to the benefit of and be binding upon the parties and their respective successors and permitted assigns.

6.5 Further Assurances

Each party will do, execute and deliver, or will cause to be done, executed and delivered, all such further acts, documents (including certificates, declarations, affidavits, reports and opinions) and things as the other party may reasonably request for the purpose of giving effect to the Contract or for the purpose of establishing compliance with the representations, warranties and obligations of the Contract.

6.6 Governing Law

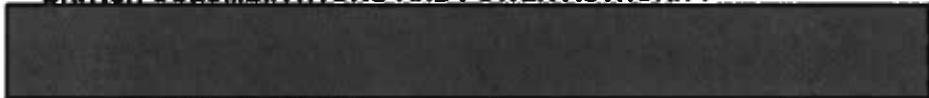
The Contract will be governed by and construed in accordance with the Laws of the Province of British Columbia and the federal Laws of Canada applicable in British Columbia.

6.7 Counterparts

This Agreement may be executed and delivered in several counterparts, including by facsimile (or other similar electronic means, including via pdf), each of which when so executed and delivered will be deemed to be an original and such counterparts together will be one and the same instrument.

IN WITNESS WHEREOF the parties hereto have executed this Agreement as of the day and year first above written.

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY



Authorized Signatory

PEACE RIVER HYDRO PARTNERS, by its partners:

ACCIONA INFRASTRUCTURE CANADA INC.



SAMSUNG C&T CANADA LTD.



PETROWEST CORPORATION





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Commission Secretary

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November 1, 2017

BCUC INQUIRY RESPECTING SITE C A-24

Sent via eFile

The Honourable Michelle Mungall, M.L.A.
Minister of Energy, Mines and Petroleum Resources
Parliament Buildings
PO Box 9060 Stn Gov't
Victoria, BC V8W 9E2
EMPR.Minister@gov.bc.ca

**Re: British Columbia Hydro and Power Authority – British Columbia Utilities Commission Inquiry
Respecting Site C – Project No. 1598922 – Final Report**

Dear Minister:

In accordance with Order in Council No. 244 dated August 2, 2017, the British Columbia Utilities Commission hereby submits its Final Report with respect to the Site C Inquiry.

Sincerely,

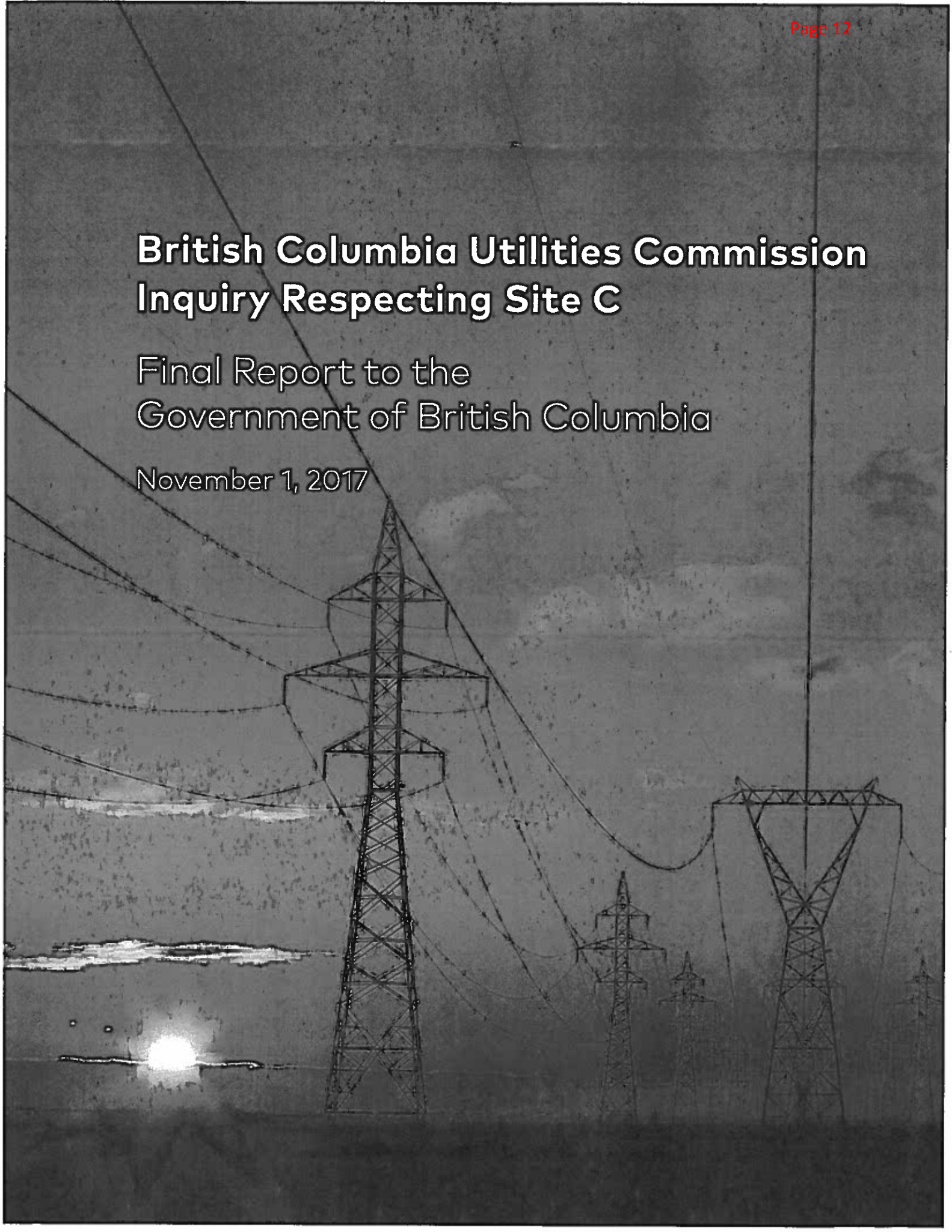
Original signed by:

Patrick Wruck
Commission Secretary

British Columbia Utilities Commission Inquiry Respecting Site C

Final Report to the
Government of British Columbia

November 1, 2017



section also explores what the total cost may be to complete the project. Additionally, the Panel explores current risks to the project budget and the experience of BC Hydro and others in managing similar projects.

5.2.2.1 Key submissions and issues raised in the Preliminary Report

BC Hydro submission

BC Hydro stated that the project is on budget.⁴⁰² It further stated the expected total cost of the Project is \$8.335 billion, and it does not expect to use the additional \$440 million project reserve established and held by the BC Government.⁴⁰³

BC Hydro stated it has spent \$1.8 billion to June 30, 2017,⁴⁰⁴ representing 22 percent of the budget of \$8.335 billion.⁴⁰⁵ BC Hydro compared the \$1.8 billion spent to date with the FID planned spending to June 30, 2017 of \$1.321 billion, and showed that it is \$479 million higher than planned.⁴⁰⁶ BC Hydro claimed that this variance between planned and actual spending to date relates to timing differences of expenditures, specifically that expenditures related to worker accommodation, main civil works and early works were incurred earlier than planned.

BC Hydro noted there are claims associated with the main civil works activities in 2016 which are being managed “within existing contingency funds”⁴⁰⁷, although BC Hydro does not quantify these claims.

BC Hydro stated it “expects to complete Site C...on budget”⁴⁰⁸ and did “not expect to use the additional \$440 million project reserve.” BC Hydro supported this by adding that it has an “appropriate level of...cost contingency,”⁴⁰⁹ and it has “more unused contingency now than at the time of the Final Investment Decision.”⁴¹⁰

BC Hydro stated the Site C budget prepared in 2014 (the FID budget) was “a product of a robust process and appropriate approximations.”⁴¹¹ It described how the work was broken down into work areas corresponding to the “major contract packages” for procurement; two teams independently created the estimates for the two largest packages of work (major civil works, MCW and generating station and spillway, GSS), and the results were compared. A Monte Carlo model was used to understand the variability of possible estimates based on the risk areas of design uncertainty, labour, estimate accuracy, contractor markups, and economic conditions.

Further, BC Hydro described three independent assessments that were performed on the estimates. According to BC Hydro, “KPMG verified that both the methodology for developing the assumptions and the construction of the financial model were appropriate”⁴¹²; a panel of experienced independent contractors “completed an additional review of the estimate of direct construction costs,”⁴¹³ and Marsh Canada reviewed the risk management approach, and “concluded that BC Hydro had developed a strong foundation for risk management for the Site C project.”

⁴⁰² Ibid., p. 24.

⁴⁰³ Ibid., p. 2.

⁴⁰⁴ Ibid., Appendix D, p. 3.

⁴⁰⁵ $1,800 / 8,335 * 100\%$

⁴⁰⁶ Ibid., Appendix D, p. 3.

⁴⁰⁷ Ibid., p. 37.

⁴⁰⁸ Submission F1-1, BC Hydro, p. 2.

⁴⁰⁹ Submission F1-1, BC Hydro, p. 2.

⁴¹⁰ Submission F1-1, BC Hydro, p. 24.

⁴¹¹ Submission F1-1, BC Hydro, p. 25.

⁴¹² Submission F1-1, BC Hydro, p. 25.

⁴¹³ Submission F1-1, BC Hydro, p. 26.

BC Hydro also noted that its hydro-electric generation facilities are “a mature technology with well-established estimating practices and techniques.”⁴¹⁴ It added that the main technical risks are geotechnical in nature and “A number of site investigations over the past several decades have helped BC Hydro and its contractors better understand and mitigate these risks, and take them into account in cost estimates.”

BC Hydro presented the following analysis of its current cost contingency, showing that it has grown from the original FID budget of \$794 million to the present figure of \$1.195 billion:⁴¹⁵

Table 20: Changes in Contingency Since Final Investment Decision

Description	\$ million (Nominal)
Original Contingency Budget, at Final Investment Decision	794
Identified Savings on Forecast Interest-During-Construction:	
2015	89
2016	76
2017	150
Total identified Savings on Forecast Interest-During-Construction	315
Other Cost Savings identified, to June 30, 2017	86
Total identified Cost Savings	401
Total Contingency, June 30, 2017²⁴	1,195

The primary reason for the increase in total contingency since the start of the project is that estimates of interest during construction have fallen by \$315 million, due to lower forecast interest rates. BC Hydro added that it has locked in “historically low interest rates by hedging 50 percent (\$4.4 billion) of its forecast future debt issuances from fiscal 2017 to fiscal 2024.”⁴¹⁶

BC Hydro went on to state that it has committed \$356 million of contingency to date, and its unused cost contingency was \$839 million, over and above the \$440 million project reserve:⁴¹⁷

Table 21: Contingency Remaining

	As at June 30, 2017 (\$ million)
Total Contingency Budget	1,195
Less Contingency Committed to June 30, 2017	(356)
Contingency Remaining	839
Project Reserve Held by Treasury Board	440
Total Remaining Contingency, Including Project Reserve Held by Treasury Board	1,279

⁴¹⁴ Submission F1-1, BC Hydro, Appendix T, p. 3.

⁴¹⁵ Submission F1-1, BC Hydro, p. 31.

⁴¹⁶ Submission F1-1, BC Hydro, p. 31.

⁴¹⁷ Submission F1-1, BC Hydro, p. 32.

BC Hydro in summary stated “the remaining \$839 million of contingency is sufficient to manage such risks.” However, BC Hydro did note that if the river diversion is delayed from the current schedule of 2019 to 2020, “it would likely trigger a draw on the Treasury Board reserve.”⁴¹⁸ That is, the one-year delay in the project would cause the project to exceed its budget of \$8.335 billion before Treasury Board reserve. BC Hydro added that “delaying River Diversion for one year would cost approximately \$630 million.”⁴¹⁹ BC Hydro also presented a table of “material project risks.”⁴²⁰ This table contained no quantification of the effect should any of the risk events listed come to pass.

BC Hydro claimed “a history of delivering projects on budget,”⁴²¹ with projects coming in at “0.94 per cent less than budget on a total of \$6.36 billion of spending,” based on data reported in 2016/17.⁴²²

Deloitte report

Deloitte summarized its position by stating: “As the project continues to operate within...the existing budget (and unallocated contingency), today the Project remains...on budget.”⁴²³ Deloitte reported that the project had expended \$1.8 billion to June 30, 2017.⁴²⁴ However, it noted this “is based on spent cost only and does not represent actual progress on the site to date.” Deloitte went on to say it had “not observed a clear method the Project utilizes to measure percent complete,” and the “use of earned value reporting on other mega-projects is a common practice.”⁴²⁵

Deloitte then compared the \$1.8 billion costs incurred to date with the figure of \$2.104 billion that the PMB schedule expected to have been spent to date,⁴²⁶ yielding a discrepancy of “\$305 million or 14% behind its planned spend as of June 30, 2017.”⁴²⁷ In Deloitte’s view, this underspend could be explained by lower-than-planned spending on main civil works due to schedule delays and problems encountered; shifting of expenditures on property purchases, royalties, and mitigation and compensation into future periods; and lowering of the expenditures on turbines and generators due to timing differences.

Deloitte further noted the total contingency of \$356 million committed to date represents 45 percent of the budgeted cost contingency of \$794 million, a percentage “significantly higher than the 22% of total budget spent to date.”⁴²⁸

Deloitte noted that “PRHP plans to submit a claim to BC Hydro”⁴²⁹ for the delay caused by the first tension crack on the left bank in February 2017. Also, Deloitte reported that discussions were underway between BC Hydro and PRHP regarding how the delays caused by the second left bank tension crack, in May 2017, could be mitigated, and that PRHP had “suggested that more claims are to come.”⁴³⁰

Deloitte confirmed many of the details of BC Hydro’s submission. It also noted that the budget of \$7.96 billion, developed in 2010, was a Class 3 estimate which became the basis for the FID budget of \$8.335 billion, increased “to account for HST and PST changes in addition to an adjusted project completion date of

⁴¹⁸ Submission F1-1, BC Hydro, p. 35.

⁴¹⁹ Submission F1-1, BC Hydro, p. 39.

⁴²⁰ Submission F1-1, BC Hydro, Appendix D, p. 9.

⁴²¹ Submission F1-1, BC Hydro, Appendix D, p. 24.

⁴²² Submission F1-1, BC Hydro, Appendix T, p. 2.

⁴²³ Submission A-8, p. 3.

⁴²⁴ Submission A-8, p. 28.

⁴²⁵ Submission A-8, p. 23.

⁴²⁶ Submission A-8, p. 27.

⁴²⁷ Submission A-8, p. 28.

⁴²⁸ Submission A-8, p. 32.

⁴²⁹ Submission A-8, p. 25.

⁴³⁰ Submission A-8, p. 34.

2024.”⁴³¹ Deloitte added that the budget was subsequently “identified as having a P50 value, meaning that the Project had a 50% chance of being over and 50% chance of being under the budgeted value.”

Deloitte noted the contingency of \$794 million “represented 11.5% of the total construction and development costs of \$6.928 billion and 9.5% of the total project costs of \$8.335 billion,” whereas when the project reserve of \$440 million “combined with the contingency of \$794 million, resulted in an overall contingency of \$1.234 billion, which represented 14% of the overall total project costs.” Deloitte stated that, in its experience reviewing large complex capital projects, it would expect the contingency (including project reserve) would be “in the range of 15% - 20% of total project costs,”⁴³² and noted the Site C project contingency was “just below the low end of that range.”

Deloitte went on to describe three scenarios for the outcome of the Site C project with respect to cost: low, moderate, and high impact, as described in the following table:⁴³³

Table 22: Site C Project Scenarios – Cost and Schedule Performance

	Meet Start of River Diversion milestone	Miss Start of River Diversion milestone
Existing cost contingency sufficient to cover further consumption of MCW contingency, uncertainties in other major contracts, increases in interest rates, and geotechnical issues	<ul style="list-style-type: none"> • One-year schedule contingency maintained, sufficient to cover other potential schedule risks, Final Investment Decision(FID) schedule maintained • Cost pressures of additional 0-10% to FID budget • Overall impact: Low 	<ul style="list-style-type: none"> • Loss of one-year schedule contingency due to continued issues with MCW, loss of ability to absorb other schedule slippage, potential for up to one-year delay • Cost pressures of additional 10-20% to FID to reduce schedule impact, including one year of additional Interest During Construction (IDC) and indirect costs • Overall impact: Moderate
Existing cost contingency insufficient to cover further consumption of MCW contingency, uncertainties in other major contracts yet to be awarded, increases in interest rates, and geotechnical issues	<ul style="list-style-type: none"> • One- year schedule contingency maintained, sufficient to cover other potential schedule risks • Cost pressures of additional 10-20% to FID to cover shortfall in contingency • Overall impact: Moderate 	<ul style="list-style-type: none"> • Loss of one-year schedule contingency due to continued issues with MCW, other schedule issues result in >1 year delay • Cost pressures of additional 20-50% to FID to reduce schedule impact, including one to two years of additional IDC and indirect costs • Overall impact: High

Deloitte’s view was that the best case, or low impact scenario, would have the project come in somewhere between the original budget of \$8.335 billion and \$9.169 billion, a ten percent overrun. The worst case identified by Deloitte was a 50 percent overrun, leading to a project cost of \$12.503 billion. These outcomes are presented in the table below:

⁴³¹ Submission A-8, footnote 19.

⁴³² Submission A-8, pp. 19, 20.

⁴³³ Submission A-8, p. 2.

adding \$200 million for PST, but adding nothing for interest or inflation since the original figure was for an in-service date of 2023.

Flintoff⁴⁷⁰ observes that a Class 3 estimate for Site C could have an accuracy range of -20 percent to +30 percent, and using the upper end of that range would predict a final cost of \$11.408 billion. He adds that there may be merit in using the P90 figure for contingency calculated in BC Hydro's Monte Carlo analysis of the project costs. In response to a Panel question, BC Hydro submitted that its P90 value for the Site C construction cost contingency is \$1.7 billion.⁴⁷¹

In CEC's oral submission to the Panel, it described analyzing BC Hydro's cost performance building dams, and quotes a range of 25 percent to 75 percent overruns when compared to pre-construction budgets.⁴⁷²

5.2.2.4 Panel analysis and findings

The Panel finds that the project is not within the proposed budget of \$8.335 billion. Further, the Panel finds that the total cost at completion may be in excess of \$10 billion as there are significant risks remaining that could lead to further budget overruns.

BC Hydro states in its October 4, 2017 submission that it presently expects to spend \$8.945 billion on Site C. This differs from BC Hydro's August 30, 2017 filing in which it stated that the project was on budget. The Panel understands that BC Hydro has not completed its work with the Province on a revised budget and that the disposition of the \$440 million Treasury Board reserve is not known at this time.

Since BC Hydro has not yet completed an updated budget estimate, which the Panel expects will be a more refined estimate, it is necessary for the Panel to consider if there are other probable budget impacts that it should take into account in making its other findings required under the OIC.

Site C is currently at an early stage in its construction period. To date, significant risk events have occurred, including tension cracks and contractor issues that have caused BC Hydro to delay the timing of the diversion of the Peace River. At this point in time, none of these issues have been resolved and the estimated costs for the project have already grown by \$610 million. There is no certainty that the river diversion will be completed in 2020. Given that the project is still at a relatively early stage in construction and the lack of certainty around the resolution of issues that led to the delay, the additional \$610 million may just be the first in what could be a continuing series of additional risk events occurring, resulting in further cost overruns.

BC Hydro's latest estimate of expenditures for Site C is \$8.945 billion, which is \$610 million more than the \$8.335 billion budget and the project is still only two years into a nine-year construction schedule. The Panel notes BC Hydro's response that it believes there is a "reasonable probability" that the budget overruns will be in the low or moderate categories (i.e. that the budget overruns will be between zero and 20 per cent) and the likelihood of the high impact scenario to be "very low" in its estimation.

A number of participants have suggested alternative approaches to estimating the cost at completion including adjusting the amount of contingency. The Panel considers BC Hydro's pre-FID P90 contingency estimate is a reasonable starting point for estimating a cost at completion until BC Hydro completes its new budget estimate. This P90 contingency assessment as prepared prior to the FID budget update was \$1.7 billion, compared to the original approved contingency of \$679 million plus \$440 million in project reserve. It was developed by BC Hydro using a Monte Carlo contingency analysis and provides an estimate of the contingency which would have been required to have confidence that the budget estimate would be

⁴⁷⁰ Submission F212-1, Flintoff, D. (Flintoff), p. 7.

⁴⁷¹ Submission F1-15, BC Hydro, IR 3.15, Attachment 1.

⁴⁷² TTP-2, October 14, 2017, Vancouver, p. 1546, lines 4–11.

exceeded only 10 percent of the time. The Panel considers that, when estimating a budget for a project of this nature, a Monte Carlo-based P90 contingency assessment would have been appropriate. The Panel also understands BC Hydro frequently uses a Monte Carlo-based P90 estimate for budget authorization from its Board of Directors, including contingency and project reserves.

In addition to adjusting the contingency to a P90 estimate, in the Panel's view it is necessary to adjust IDC and inflation to account for the higher estimated budget. BC Hydro acknowledges that the estimate of IDC changes with the timing of project costs and interest rates. Further, the Panel notes that BC Hydro has estimated that a 1.0 percentage point increase in the interest rate would increase its project costs by \$65 million.⁴⁷³

BC Hydro has also provided a table of risks, indicating that all but one of the risks has a probability of occurrence of 10 percent and that all of them have a budget impact of \$10 million - \$100 million if they were to occur. Given the similarity of the estimates despite the diversity of the possible risks (from geotechnical to regulatory risks by way of reservoir filling), the Panel concludes that these assessments are not refined and further overruns could materialize.

Finally, BC Hydro has provided confidentially to the Panel amounts of contractor claims that have been received but not accepted. The Panel accepts that these amounts should remain confidential.

There is a high degree of uncertainty at this time. As such the Panel is persuaded by the analysis performed by Deloitte, which indicated that in a "high impact" scenario the budget may be exceeded by between 20 and 50 percent. The first of the possible events described by Deloitte in the high impact scenario, the delay in the river diversion, has already become a reality. While this has only so far caused BC Hydro to increase its expected costs for the project to \$8.945 billion, the project is only two years into a nine-year construction schedule. Other challenges, and a further one-year delay in the river diversion are still possible, and other increases in budget are likely.

The Panel notes that Eliesen concludes that the final Site C capital costs will be about \$12 billion. Others have submitted that large hydro projects are subject to large cost overruns and provided some examples to support this. The Panel is not persuaded there is sufficient evidence to support the finding of an estimated cost overrun of this magnitude. However, given the nature of this type of project and what has occurred to date, total costs for the project may be in excess of \$10 billion and there are significant risks that could lead to further budget overruns. The Panel considers this amount is a reasonable point estimate to use in making its other findings required under the OIC.

5.3 Other implications of continuing Site C

In addition to the direct costs for continuing with Site C, there are a number of potential and actual indirect costs which are difficult to determine whether they will actually occur and, if so, how to quantify them. Many of the implications were identified by the Joint Review Panel in its report, including the following findings by the Joint Review Panel:

The Panel concludes that the Project would likely cause a significant adverse effect on other traditional uses of the land for the First Nations represented by Treaty 8 Tribal Association, Sauteau First Nations, and Blueberry River First Nations, and that some of these effects cannot be mitigated⁴⁷⁴

⁴⁷³ Submission F1-5, BC Hydro, IR 2.12.0.

⁴⁷⁴ Submission F28-2, Prophet River and West Moberly First Nations, Tab 2, JRP Report, May 1, 2014, p. 113.

Canada June 23, 2017 10:51 am

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Muskrat Falls hydro project price tag rises by another billion: CEO

By Sue Bailey The Canadian Press



The construction site of the hydroelectric facility at Muskrat Falls, Newfoundland and Labrador is seen on Tuesday, July 14, 2015.

Andrew Vaughan/The Canadian Press

Costs for the Muskrat Falls hydro project in Labrador are up another \$1 billion, a “boondoggle” the man in charge says is worse than the lopsided Upper Churchill debacle.

Nalcor Energy CEO Stan Marshall said Friday the new price tag is \$12.7 billion with financing. That’s up from an estimate last year of \$11.7 billion and is about \$5 billion higher than when the former Progressive Conservative government approved Muskrat Falls five years ago.

Marshall took over as head of the Crown corporation last year after the governing Liberals criticized oversight. He said at the time the megaproject was a colossal mistake that he'd try to fix.

"I knew this was a boondoggle," that should never have gone ahead, Marshall reiterated Friday.

READ MORE: Subsea electric cable linking Newfoundland and Nova Scotia now connected

"As long as I'm here I'll do my best," he added, vowing it can still "finish strong."

"The only way to have solved this was not to have built it in the first place ... It was too late to stop. We couldn't get a refund."

Initial cost projections were drastically low-balled, he said: Either intentionally or unintentionally, "the costs were significantly underestimated."

Marshall blamed the latest budget bloat on contractor disputes, higher operating costs, a leaky cofferdam and delays, including a worksite occupation last fall by demonstrators concerned about methylmercury.

READ MORE: Nova Scotia to pay next to nothing for Muskrat Falls energy: Nalcor CEO

Marshall said 75 per cent of construction is now done, up from 48 per cent last May.

First power is expected in 2019 at an estimated cost of 23.3 cents per kilowatt hour before tax.

That's up 8.2 cents from when Muskrat Falls was approved and would double recent rates paid by consumers.

Marshall and Premier Dwight Ball have said they'll look at ways to reduce that hit and cut average monthly bills that could otherwise go up more than \$150 per month.

The previous Tory government sanctioned Muskrat Falls in 2012, a joint venture with Nova Scotia utility Emera championed by former premier Danny Williams. It will bring power from Labrador to the island of Newfoundland then on to Nova Scotia using subsea cables and a vast overland transmission network.

READ MORE: Aboriginal leaders tell Muskrat Falls protesters to 'go home' after meeting with Premier

Williams hailed Muskrat Falls as the answer to his province's long-running feud with Hydro-Quebec over transmission access and the Upper Churchill deal. Terms of the 65-year contract did not reflect rising energy rates.

As a result, the Upper Churchill dam and powerhouse in Labrador have so far delivered about \$27.5 billion for Hydro-Quebec versus \$2 billion for Newfoundland and Labrador. The dispute is once again before the Supreme Court of Canada for a hearing on whether the contract should be reopened.

Marshall said Friday that Muskrat Falls is especially painful because it made the opposite gaffe as supporters gambled that energy values would stay high. They lost, and this time ratepayers on the hook, he said.

Costs could rise again, Marshall added.

“Muskrat Falls has had its surprises. I’m not going to say that there won’t be any more.”

WATCH: Protesters explain why they’re bringing the issue of the Muskrat Falls dam to Ottawa

He said Nalcor is working with Labrador aboriginal leaders on methylmercury concerns downstream as land is flooded.

“I’m not looking to do anything that will endanger people.”

Ball said Friday that Muskrat Falls was “ill-conceived and reckless,” but stopped short of calling for a forensic audit.

Such a review now would eat up more cash and could add to delays, he said. Ball said he’s committed to a more in-depth look later on.

He blamed the staggering increases on “neglect” and questioned why Nalcor and the previous Tory government did not act years ago to rein in costs.

On Friday, Ball released a 2013 risk management report by SNC-Lavalin that warned of the fiscal fallout.

READ MORE: N.L. premier to meet with aboriginal leaders over Muskrat Falls protests

Stamped “confidential” and “for internal use only,” it forecast cost overruns of 39 per cent with a potential extra price tag of \$2.4 billion when Muskrat Falls was just 20 per cent complete.

Ball said he only received the report Thursday from Nalcor.

Still, Ball continued this week to talk up future Labrador hydro projects. But he stressed that consultation with aboriginal leaders would have to improve and any new developments can’t be “on the backs of ratepayers.”

Former premier Paul Davis, who became official Opposition leader when the Liberals won in 2015, said Friday the Tory government pushed for Muskrat Falls based on information it had at the time. He said he wasn't aware of the risk management report while in power.

READ MORE: Protesters break into Muskrat Falls hydro site in Labrador, form blockade outside

He also challenged Ball to order a forensic audit now if the premier questions those initial estimates.

“We have nothing to hide from the decisions that we made.”

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It's official: Muskrat Falls a boondoggle, says Stan Marshall

Marshall says top priority to find ways to lower projected electricity rates over next four years

Terry Roberts · CBC News ·

Posted: June 24th 2016, 2:18:48 PM | Last Updated: June 24, 2016

Nalcor Energy CEO Stan Marshall acknowledged Friday that the Muskrat Falls Project is a boondoggle and was not the right choice for Newfoundland and Labrador's energy needs. 23:30

Nalcor Energy CEO Stan Marshall acknowledged Friday that the Muskrat Falls Project is a boondoggle and was not the right choice for Newfoundland and Labrador's energy needs.

The cost of the project has ballooned to \$11.4 billion, including interest.

That's an increase of \$4 billion — with interest factored in — from when the project was first sanctioned in 2012.

"It was a gamble and it's gone against us," he told reporters at a briefing in St. John's — his first since taking on the job in April.

- [Stan Marshall, Nalcor's new CEO, 'deeply troubled' by Muskrat Falls](#)
- [Muskrat Falls another 10% over budget, cost climbs to \\$7.65B](#)

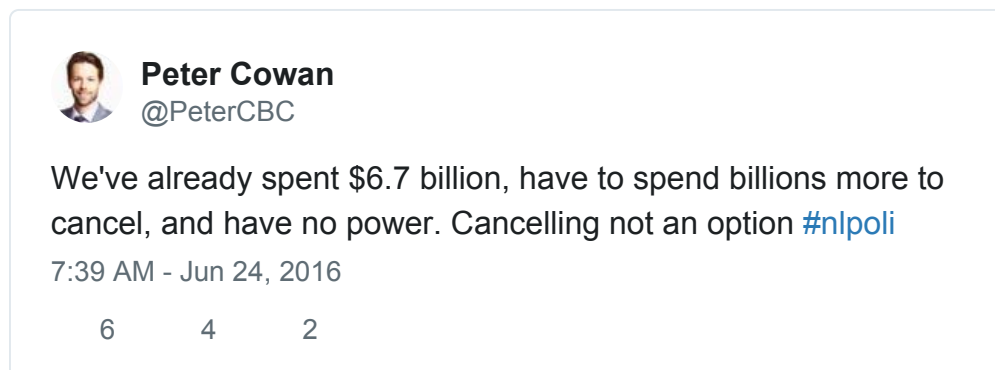
Marshall said first power from the Muskrat Falls generating station won't happen until 2019, reaching full power in the second quarter of 2020, nearly two years behind schedule.

He also pointed out power demand in the province will not grow at the rate previously estimated, which means higher power bills for consumers.

By 2022, the domestic rate for power is expected to jump to nearly 22 cents per kilowatt hour, almost double the current rate of 11.9 cents.

For the average homeowner, Nalcor estimates this could mean an extra \$150 per month in power costs, before HST, which Marshall described as "not affordable."

"Muskrat Falls was not the right choice for the power needs of this province," he said.



"I'm not at all surprised that the cost is where it is," said Marshall, adding "original estimates were low."

When asked what went wrong with the project, Marshall said its size is one factor.

"The generation and transmission project was much too large than was necessary to meet the energy requirements of the province," he said.

"The original capital cost analysis, estimates and schedule was very aggressive and overly optimistic and just didn't account for many of the

risks that were known, or should've been known, at the time. And the analysis, finally, relied on high energy prices which were projected to continue with the rise."

Lack of experience a factor, says Marshall

Another part of the problem was a lack of experience by Nalcor and its contractors working in a cold, northern climate, Marshall said, adding that Nalcor has not built a power project in a very long time.

He said his job over the next four years is to find savings or boost revenue. For example, he is asking for a larger loan guarantee from the federal government to reduce borrowing costs.



Stopping the project is not a practical option.

- Stan Marshall

"We have four years in order to address the rate. A lot of things can be done in four years that can't be done in the two months I've had so far. So I'm going to step back and think," Marshall said.

"We will focus on getting more value from the excess power and exploring new arrangements and longer term arrangements to secure as much additional revenue as we can."

He said the key to this will be talks with Emera and Hydro Quebec.

"My challenge is to ensure that come 2021, our electricity rates will be substantially less than I've just described," said Marshall.

Astaldi dispute still ongoing

Meanwhile, the single biggest uncertainty about costs going forward, according to Marshall, is a "major" dispute with Astaldi, the Italian company contracted to build the power generating station at Muskrat Falls.

A lot of things can be done
in four years that can't be
done in the two months I've
had so far.

- Stan Marshall

Both sides are at odds, with Astaldi demanding hundreds of millions in additional payments from Nalcor.

Marshall said there has been very little progress in talks with the company, though an eventual resolution has been factored into the new estimates for the project.

"I put in an estimate. They do not reflect the worst case or the best case," he said, adding there is no deadline to reach an agreement.

Too late to cancel





The Muskrat Falls project is again up in cost, and behind schedule, but Nalcor CEO Stan Marshall says cancelling it is not an option. (Andrew Vaughan/Canadian Press)

Nalcor has spent, or is contractually obligated to spend, more than \$6.7 billion on the Muskrat Falls project.

Marshall said it's simply gone too far to pull the plug.

"If we halted this project, we would have spent \$6.7 billion, and would have to spend billions more to settle claims and bring the project to some conclusion," he said.

"And we would not have a source of power, which is needed."

What's more, Nalcor is contractually obligated to provide Emera with free power for the next 35 years.

Emera is building the Martime Link, which will bring Muskrat Falls power to mainland Canada.

"Stopping the project is not a practical option," Marshall said.

Link to be completed next year

Meanwhile, the Martime Link project remains on schedule and on budget, with completion scheduled for late 2017, according to a statement Friday from Nova Scotia's Department of Energy.

The project includes constructing a transmission line from central Newfoundland to the province's southwest coast, and under the Cabot Strait to Nova Scotia.

The link will be owned and operated by Emera for 35 years, though Nalcor will have transmission rights to import and export power over the 50 megawatt capacity line.

In exchange for building the link, Emera will receive 20 per cent of the electricity generated at Muskrat Falls.

The department released a statement, saying there is a plan in place to deliver rate stability to Nova Scotia power consumers for the next three years.

"We don't see today's update changing our plan. The Maritime Link project is also important for our plan to reduce greenhouse gas emissions and reach our target of 40 per cent renewable energy by 2020.

"This announcement doesn't impact our ability to meet our target."

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