

**From:** [jamesmeaney@nalcenergy.com](mailto:jamesmeaney@nalcenergy.com)  
**To:** [Manzer, Alison](#)  
**Cc:** [Kapoor, Anoop](#); [Boudreau, Anne](#); [JUS](#); [Newman, Charles](#); [Krupski, Joseph](#); [Nikolay Argirov](#); [Reynold Hokenson](#); ["Rhonda.Lazarus@justice.gc.ca"](#); [Paul Harrington](#); [Gilbert Bennett](#); [Jason Kean](#); [Lance Clarke](#); [Martis Xeno](#)  
**Subject:** Re: FW: Instructions to MWH from Canada  
**Date:** Tuesday, November 26, 2013 12:07:59 PM  
**Attachments:** [.png](#)  
[Lex155doc\\_2013\\_11\\_26\\_12\\_18\\_30\\_966-01.PDF](#)

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Thanks Alison. With respect to your proposal on a Nalcor certificate and the various information points listed below, just want to ensure I'm clear that you are looking for this in the context of the 17 Material Contracts which were outlined in the document posted to the data room last week (and are those defined as such in the Project Finance Agreements)?



**James Meaney, CFA**  
**General Manager Finance**  
**Nalcor Energy - Lower Churchill**  
**Project**  
 t. 709 737-4860 c. 709 727-5283 f.  
 709 737-1901  
 e.  
[JamesMeaney@nalcenergy.com](mailto:JamesMeaney@nalcenergy.com)  
 w. [nalcenergy.com](http://nalcenergy.com)  
 1.888.576.5454

You owe it to yourself, and your family, to make it home safely every day. What have you done today so that nobody gets hurt?

"Manzer, Alison" ---11/26/2013 11:31:00 AM---I attach our instructions intended to simplify and stream line the IE report to me our time frames f

From: "Manzer, Alison" <[amanzer@casselsbrock.com](mailto:amanzer@casselsbrock.com)>

To: Nikolay Argirov <[Nikolay.V.Argirov@mwhglobal.com](mailto:Nikolay.V.Argirov@mwhglobal.com)>, "JamesMeaney@nalcenergy.com" <[JamesMeaney@nalcenergy.com](mailto:JamesMeaney@nalcenergy.com)>, "Reynold Hokenson" <[Reynold.A.Hokenson@mwhglobal.com](mailto:Reynold.A.Hokenson@mwhglobal.com)>

Cc: "Krupski, Joseph" <[Joseph.Krupski@NRCan-RNCan.gc.ca](mailto:Joseph.Krupski@NRCan-RNCan.gc.ca)>, "Kapoor, Anoop" <[Anoop.Kapoor@NRCan-RNCan.gc.ca](mailto:Anoop.Kapoor@NRCan-RNCan.gc.ca)>, "Rhonda.Lazarus@justice.gc.ca" <[Rhonda.Lazarus@justice.gc.ca](mailto:Rhonda.Lazarus@justice.gc.ca)>, "Boudreau, Anne: JUS" <[boudreau.anne@ic.gc.ca](mailto:boudreau.anne@ic.gc.ca)>, "Newman, Charles" <[CNewman@CasselsBrock.com](mailto:CNewman@CasselsBrock.com)>

Date: 11/26/2013 11:31 AM

Subject: FW: Instructions to MWH from Canada [IWOV-Legal.FID1640195]

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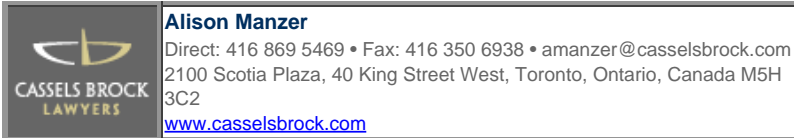
I attach our instructions intended to simplify and stream line the IE report to me our time frames for a reasonable report we can use to close. Hope we have made this possible with these directions.

We need the following dealt with and suggest that a Nalcor certificate commented on by the IE might allow the time frame to be met.

List of material contracts, value of contracts awarded versus budgeted amount, contracts that are in review and

the estimates provided by Nalcor, schedule of contract award

- percentage of projects costs awarded or locked in
- percentage of projects budget that is fixed price contracts
- Need IE opinion on reasonableness of DG3 estimates, taking into account contracts awards and any projections for unawarded contracts, if possible
- Opinion on reasons/factors for cost increase of \$300 million provided recently, and contingency



**From:** Omtooladmin [mailto:o@casselsbrock.com]

**Sent:** Tuesday, November 26, 2013 9:44 AM

**To:** Manzer, Alison

**Subject:** Email a PDF Document to Alison Manzer

To:

**E-Mailed to:**

[amanzer@casselsbrock.com](mailto:amanzer@casselsbrock.com)

**Saved to:**

**Printed to:**

**Faxed to:**

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Instructions  
from Canada

Nov. 25

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## INDEPENDENT ENGINEER'S REPORT LOWER CHURCHILL PROJECT

Canada needs chart - Perhaps Nalcor

1. List of contracts - value awarded v. budget, contracts in process with estimates, schedule of contract award
2. percentage of costs contracted by value
3. percentage on fixed price

DRAFT- NOVEMBER 15, 2013

Prepared for:

Government of Canada

Prepared by:

MWH Americas, Inc.  
Suite 1580  
One Bentall Centre  
505 Burrard Street, 15th floor, Box 17  
Vancouver, British Columbia - V7X 1M5

CONFIDENTIAL - DRAFT

SECTION 1

MUSKRAT FALLS GENERATING STATION AND LABRADOR TRANSMISSION ASSETS

1.1 INTRODUCTION

The Lower Churchill Project (LCP) is a proposed large, important energy generating and transmission facility of regional and national significance to Newfoundland and Labrador, Nova Scotia, and the federal government of Canada (Government). When completed, the LCP will have a capacity to generate and transmit more than 824 megawatts (MW) of electricity at an initial capital cost of approximately \$6.2B<sup>1</sup>.

The purpose of this report is to provide Independent Engineer's (IE) opinions to support the financing of the LCP using long-term bonds that will be guaranteed by Canada's best-in-the-world credit worthiness, rated AAA. To that end, this report presents professional opinions that the estimated construction and operations costs are reasonable, that the estimated construction schedule is reasonable, and that projected financial results of operations will generate sufficient net revenues to repay the debt, including revenues to meet debt service coverage requirements as well as to properly operate and maintain the LCP facilities.

Nalcor Energy (Nalcor) selected MWH Canada, Inc. (MWH) to prepare this Independent Engineer's Report (IER) and additional services pertaining to construction monitoring and long-term monitoring services after the LCP has been placed in commercial operation. MWH has no financial ties to Nalcor aside from the agreement to prepare this report (Nalcor/MWH Agreement). MWH has no fiduciary relationship with other firms involved with the LCP or interest in the sale of bonds to finance the LCP.

1.2 PROJECT DATA AND COMMUNICATIONS PROTOCOLS

1.2.1 Contacts

The Nalcor/MWH Agreement was signed on August 27, 2012. A kickoff meeting was held on September 13 and 14, 2012 in St. John's, Newfoundland. Nalcor selected Mr. Lance Clarke, Project Commercial Manager, LCP to be MWH's principal contact during the duration of the IE's review and preparation of the IER. Mr. James Meaney, CFA, General Manager Finance, was also designated as another principal contact. Additionally, Mr. Ross Beckwith, Nalcor's Commercial Coordinator, was also designated as a contact for discussions. Mr. Peter Madden has been the day-to-day contact for MWH. For all issues pertaining to the Nalcor/MWH Agreement, Mr. Nikolay Argirov, MWH Vice President, has been the principal Nalcor contact.

<sup>1</sup> The reader is advised that within this report, all dollars given are Year-2012 and Year-2013 Canadian Dollars, depending on the award date

*Provide a general comment re reasonable approach and work quality*

~~Comment [PH1]: It would be helpful if the Conclusion section made direct reference to this statement and provide an opinion on whether nalcor has performed the work in a reasonable manner and satisfies the stated intent of this report. Also each section would benefit from a highlighted statement that addresses this stated intent~~

~~Comment [PH2]: I suggest that the key people are simply listed here~~

SECTION 1

Rey Hokenson is MWH's day-to-day contact and is the project manager (PM) for this assignment.

1.2.2 Documents

On September 7, 2012, MWH transmitted a list of documents to be provided by Nalcor for the IE's review. The request indicated that MWH wished to receive hard copies of all of the documents that Nalcor expected MWH to review, including two copies of each document along with two compact discs or DVDs of the data for further copies to be made by MWH for each of its principal offices in Vancouver, British Columbia (BC) and Bellevue, Washington. Nalcor subsequently requested that MWH use Nalcor's data room to obtain the information. Because of difficulties encountered in downloading information and to print and save documents for future assessments using the data room, MWH requested an additional system be employed to review data. In response to MWH's request, Nalcor gave permission for MWH to use the Aconex on-line project management system. The Aconex system greatly facilitated information gathering.

Comment [PH3]: I suggest that this section be removed, it adds no real value to the report

Delete noted in interim

1.2.3 Project Schedule

The Project Milestone Schedule for the preparation and award of the numerous contracts that will be prepared by Nalcor and the Engineering, Procurement, and Construction Management (EPCM) Consultant is given in Appendix A. The IE's Execution Plan has been tailored to accommodate the Project Milestone Schedule.

Given contractual responsibilities pertaining to reporting, wherein MWH would be reporting directly to Government's representatives rather than Nalcor's for future phases of work, MWH would expect that new data-handling protocols may be required for MWH to follow. Additionally, new procedures may need to be established to gain access to contracts and other data required for the IE's review. MWH has been asked by Government to communicate through Cassels Brock & Blackwell, LLP, legal advisors to Government, and is currently following this request.

Comment [PH4]: I suggest that this whole para be removed, it is not relevant to the report

Delete

1.3 PROJECT DESCRIPTION

The history of the LCP dates to the early 20th century when it was envisioned that a series of hydroelectric projects would be developed on the Hamilton River (now the Churchill River). During the mid-1960s an earnest effort was made to plan for the development of this valuable resource when Labrador and Newfoundland were in need of power. At that time electricity demand was growing by more than 10 percent per year. The plan was to construct the first project, Churchill Falls, on the Churchill River upstream of the LCP for supplying power to Newfoundland Island in 1972, and then to construct the LCP following completion of the 5,428 MW Churchill Falls Generating Station. The Churchill Falls Project commissioned its first unit in 1971 to feed power to Newfoundland. The Churchill Falls Project provides about 65 percent of the power available from the Churchill River, with the remaining 35 percent coming from two proposed power stations, Gull Island and Muskrat Falls. Muskrat Falls has been sized to provide 824 MW, while Gull Island has been sized to provide 2250 MW.

Comment [PH5]: There are a number of technical inaccuracies- I suggest that the basis of Design is used to rewrite this section or refer to it as an attachment

Correct as needed - Nalcor to provide verify MWH

SECTION 1

Information pertaining to the Maritime Link Transmission Project to be constructed and financed by Emera will be found in a separate report prepared for the Government responsible for its financing.

1.4 REVIEW OF CONSTRUCTION PROGRESS

An initial project site visit was scheduled for September 2012, but because of the lack of construction activities pertaining to contracts that MWH would be reviewing as part of their assignment, the site visit trip was postponed until September 24-26, 2013. This postponement also gave representatives of Government an opportunity to partake in the viewing of the progress of the work to that date with the IE's principal technical representatives in attendance.

~~Comment [PH6]: Suggest removing this commentary it adds no value~~

Currently there are only two major construction contracts under way. The contract dealing with the southerly access road is completed. Of about 21 km of access road to be built, MWH understands that it is nearly finished but has not been provided with a completion date. Additionally, the Bulk Excavation Contract has been initiated, and progress has reached 90 percent. The first scheduled excavation blast occurred during early February 2013. ~~The three Daily Site Reports recording progress in early June 2013, furnished by Nalcor, did not contain quantitative information to allow the IE to access progress at that time or track the contractor's progress.~~

~~Comment [PH7]: This comment suggests nalcor is holding something back – which is not the case – so suggest removing this wording~~

~~Comment [PH8]: I do not understand the purpose of this statement – given the fact that the IE saw the actual progress and and that progress is at 90%~~

~~Section 2 of this IER contains observations made during the site visit conducted in September 2013. Subsequent discussions between Nalcor's senior representative and the IE indicate that there may be additional site visits due to the Project Schedule and the need and desire to have participation of Government after Financial Close.~~

~~Comment [PH9]: I suggest that this statement may be misplaced in this report~~

Delete

SECTION 2

SITE VISIT AND OFFICE INTERVIEWS

2.1 SITE VISIT

As noted in Section 1, MWH did not visit the site because of the late start due to the delay in Project Sanctioning, and lack of site work that would be beneficial for the IE to view. MWH had tentatively agreed with Nalcor to schedule a site visit in July or August 2013. MWH believed, at that time, that work would in full progress on the bulk excavation and the construction camp would also be available to view. This trip was again postponed and the site visit occurred on September 24-26, 2013. The Nalcor/MWH Agreement requires only one site visit, but it was suggested by the IE that a couple of additional visits be scheduled since this would provide a better opportunity to gauge progress and allow the Government of Canada's representatives to also view the work-in-progress prior to the Financial Close. MWH does not plan to conduct another site visit before Financial Close unless Government requires another visit to be conducted.

No value Deleted

2.2 GENERAL

Two members of MWH, as part of the IE's team, attended a project briefing and participated in a site visit to the Muskrat Falls project during September 24-26, 2013. The project briefing was carried out by project designers and supervisory staff in the SNC-Lavalin (SNC-L)/Nalcor project offices in St. John's on September 24, 2013. SNC-L has an EPCM Agreement with Nalcor and currently is providing the design services for Muskrat Falls. The date of the EPCM Agreement is February 2011. SNC-L works with Nalcor in an Integrated Project Team to manage this project. (Refer to Section 4.) The briefing presentations covered the main aspects of the safety programs, geotechnical and civil design, field conditions, and site facilities and construction progress of the powerhouse and spillway excavations and cofferdam construction.

Comment [PH10]: It is suggested that this paragraph has a negative tone. It would be better if there was a simple statement that a site visit was carried out and MWH were able to visit the N Spur the Main Muskrat falls excavation area and that the results were favourable

Comment [PH11]: This section does not appear to be really adding any value

Site visits to the Muskrat Falls project were made on September 25 and 26, 2013. The site visit included tours of the North Spur, cofferdams, spillway, and powerhouse/tailrace channels and the project infrastructure. Most of the project construction work viewed was being completed as part of ongoing work associated with Contract CH0006. These visits were guided by Nalcor and SNC-L. Separate discussions were held about blasting, geology, and rock slope stability with the project geology/geotechnical engineering team.

Principal observations and comments on the active geotechnical and civil construction and design works are presented in the following subsections. Photographs taken during the site visit are included in Appendix F Photographs and Artist Rendering.

SECTION 2

2.2.1 North Spur

2.2.1.1 General

The North Spur is a 1000-meter long, 500-meter wide and 45- to 60-meter high ridge that connects the Muskrat Falls rock knoll to the north bank of the river (Photograph 3, Appendix F). When the reservoir is impounded, this feature will form a natural dam and become a major part of the (river impoundment) reservoir containment system. The feature is composed of unconsolidated mixed sand and marine silt/clay sediments. The depth to bedrock underneath the spur is in the range of 200 to 250 meters. It contains a significant amount of glacio-marine silt-clay sediments, including horizons of highly sensitive clay strata, mixed with some sandy layers. The sensitive marine clays, which are similar to those found in Quebec and Norway, are susceptible to rapid strength loss, liquefaction and deep-seated progressive rotational failures when overstressed.

The upstream and downstream slopes of this feature are subject to ongoing river erosion and mass wasting. This has contributed to local slope over-steepening of the slope, which triggers rotational sliding on both the downstream and upstream sides of the spur. Past studies indicate multiple small-to-large slide events have occurred during the recent centuries. A significant landslide took place on the downstream slope of the North Spur in 1978 (Photographs 4 and 5, Appendix F). During 1980, it was determined that the natural mass wasting processes could be arrested by controlling the water table with a pumped well system. A line of pumped wells was installed in the center of the spur in 1981, and continues to operate to present times.

2.2.1.2 Site Visit Observations

A brief site visit was made on September 24 to the plateau on top (Photograph 4, Appendix F) and the scarp of the 1978 slide (Photograph 5, Appendix F). The drilled wells were viewed and found to be satisfactory; these are currently in operation. The slide is covered with vegetation indicating no significant activity for at least the past 25 years. As can be seen in photos, fine-to-medium sand is exposed in the crest of the slide scar. Large tilted and eroded blocks of cohesive soil could be seen at the toe (Photograph 6, Appendix F), adjacent to the river shoreline.

2.2.1.3 Technical Issues

After reservoir impoundment, long-term seepage and slope stability characteristics of the spur should be similar to a modern dam. Measures are needed to achieve the following: (a) control piezometric (i.e., water surface) levels; (b) control seepage across the wier; and (c) stabilize the upstream and downstream slopes. During the September 24, 2013 project briefing in St. John's, the design staff indicated that the following measures are planned.

- Construction of an upstream cut-off wall and blanket to block water seepage from the reservoir. The cut-off wall (plastic cement slurry wall) will be connected to the clay formation that extends beneath the river level. The troublesome layer is mostly above

**Comment [PH12]:** Following the discussion with John 22 Nov 2013 it is recommended that this whole section is rewritten

✓  
Correct - this should be a focused technical discussion - rewrite



**SECTION 2**

current river level (sensitive silty clay) and contains many sand layers, which could transmit water across the spur.

- Construction of an extension to the cut-off wall across the north end of the spur to cut off seepage from the high ground north of the river.
- Perform excavation to achieve local top cutting unloading by excavation of the top of the spur and the upper slope to improve sliding slope stability.
- Construct a downstream erosion protection and downstream stabilizing fill on the lower downstream slope.
- Install an impermeable geomembrane on the ground surface to minimize direct infiltration from precipitation.
- Provide toe relief drains and a major drainage trench for further lowering of the water table.
- Provide downstream erosion protection and downstream stabilizing fill in selected areas to improve local toe stability and eliminate potential for retrogressive failures due to presence of sensitive marine clays in the upper clay unit.

Current plans are to discontinue the pumping of the dewatering wells; this pumping will be discontinued when the reservoir is impounded at the end of the stabilization program. However, the pumped wells will be left operational at the end of construction. If the scheduled water table monitoring shows that the groundwater table is not sufficiently controlled by the impervious blanket and cut-off walls, pumping will be resumed. The criteria for this decision have not been made available for this review.

*update* ✓

**2.2.1.4 Comments and Queries**

Based on the IE's current understanding of the technical issues, the following clarifications given in Table 2-1 need to be addressed.

**Comment [PH13]:** Suggest rewriting this section we clarified with John that the pumps are in good working order and have been recently overhauled and will remain in place fully operational should they be required, however the expectation is that the work that will be carried out and identified above should obviate their requirement . The last sentence leaves the impression that nalcor is holding something back from MWH which is not the case .

SECTION 2

Table 2-1 (cont'd)  
NORTH SPUR QUESTIONS

Item No.	Topic	Questions	Integrated Project Team Response
8.	Planned Monitoring Program	a. Has a long-term monitoring program for recording instrument data and visual observations been produced? It would be useful to see details of this, particularly plans for continuing technical evaluation of the results.	a. The construction program includes provision for an extensive geotechnical instrumentation system that will include piezometers, inclinometers and flow measurement. The system will be set up for real time remote reading. The calibration of the system will be carried out during construction and the first stage impoundment (2016-2017). The project O&M Manual will be developed based on observations and results through that period.

NOTES:

1. The analyses look OK.
2. They cover many of my earlier concerns about seepage and conventional slope stability analyses.
3. I assume there will be a more comprehensive report. The report should include the basis for selecting shear strengths; in particular for the "stratified drift" (which includes the sensitive clay layers involved in the 1978 slide).
4. Outstanding items, still include:
  - a. Assessment of landslide generated wave in the reservoir and appropriate stability analysis;
  - b. Liquefaction assessment of the sensitive clays; and
  - c. Rationalization of the earthquake PGA (I see they used 0.11g, which is more appropriate for soft ground than the "hard rock" 0.09g value given in Atkinson's seismic hazard study).

*If this is correct then yes this is better discussion*

**Comment [PH14]:** Suggest simplifying this table into a series of statements against each topic and a summary statement wrt the reasonableness of Nalcors design and if that design is following good engineering practice – John stated that the nalcor design is what he would have done – this is not coming across, for example Note 1 the analyses looks Ok is quite a weak endorsement

SECTION 2

Table 2-3 (cont'd)  
GEOLOGY SUMMARY

Location	Description
East Facing Faces	The S3 joint set, which is inclined 51 degrees towards the east, undercuts and destabilizes east facing rock faces. To date no permanent east facing slopes have been cut but this joint set is prominently displayed in temporary excavations. There is concern for the upcoming excavation of the bull noses between the generator units. Sliding along J3 joints could cause significant overbreak in this area if it is not controlled. Temporary pre-support, in the form of vertical dowels will be installed before excavation is carried out to preserve the integrity of these features. Permanent support, consisting of tensioned, grouted rock bolts will be installed sub-horizontally once the rock faces have been exposed. This is a sound plan, provided it is combined with very carefully executed blasting.
Foundation Base of Concrete Structures	Foundation conditions for water retaining concrete structures in the powerhouse intake and spillway channel are good. The rock mass is strong and the shear strength of concrete/rock interface will be high. The geological mapping indicates that no systematic sets of sub-horizontal discontinuities are present. This verified by observations made during the September 25/26 site visits. This indicated that there is very little likelihood for the presence of rock mass sliding planes below the foundations of the structures. This should be verified by geological inspections of the final foundations.

The slope control program appears to be satisfactory. However details of rock support design could not be reviewed during the September 25-26 site visit because of limited time. Additionally, the exact extent of rock bolting in the excavation walls was not clear to MWH. The site staff do not have a single plan showing areas of pattern bolting and spot bolting, nor is there a single document summarizing rock bolt patterns and support loads for various areas, as is normal for a project of this scope. All of this information is available on individual blast faces maps and data sheets, but no compilation has been done. Thus it is not possible to comment on whether sufficient rock support has been installed. In MWH's opinion, this compilation should be performed.

Visual inspections of the rock faces during the September 25-26 site visit were impeded by the ubiquitous wire mesh on the rock faces. This mesh obscures the face and makes it difficult to determine where pattern rock support was installed. It appears that the entire areas of the concrete structures are supported by pattern rock bolts (yellow and red painted bolt heads as seen on Photos 18 and 19). However, MWH was unable to visually determine the extent of rock bolting in much of the tailrace channel. In particular, the extent of pattern bolting in the high north face of the tailrace could not be assessed visually. MWH believes that, because of the J1 sliding planes, the long-term slope stability of this face is critical and should be carefully evaluated and that pattern support is probably needed. This issue should be clarified.

*Please specifically address and update as needed or deleted*

**Comment [PH15]:** This has a negative connotation and suggest that John phones our expert if he has an issue – no such issue was raised during the site visit – is it a significant item or just a passing observation ?

**SECTION 2**

- Site camps and infrastructure are adequate to handle the planned construction works.
- The Camp conditions, with only 300 beds, were very tight at the time of the site visit. However new camp facilities are being constructed and there will be accommodations for almost 1,000 persons by November.
- Roads are generally good, and are up the normal standard for a hydroelectric construction site.

The following observations pertaining to the project schedule are as follows:


- Schedule achievements are satisfactory.
- Construction work will continue throughout the winter.
- The major works (CH0007) will be covered by large weatherproof shelters to enable civil works construction during winter conditions.

**2.2.7 Summary Observations**

The following observations made during the September 2013 site visit by the MWH Team members are summarized below.

- The planned North Spur remediation measures, as presented by design staff in St John's during the site visit, are appropriate to stabilize the slopes, arrest natural mass wasting and to control seepage and piezometric pressures after impoundment of the reservoir. The reviewer has insufficient data to comment on the design analyses at the present time.
- Cofferdam construction is proceeding satisfactorily. Work on the RCC and Fill cofferdams, as viewed during the site visit, show satisfactory work by the contractor and supervisory staff that appears to exceed usual practice.
- The large rock excavations for the Powerhouse/Tailrace and the Spillway channels are more than 90 percent complete. The blasting quality exceeds normal practice, in MWH's opinion. The line drilled and pre-split permanent faces have very little overbreak and blasting damage is minimal.
- The final rock slopes have been supported by rock bolts in many areas. The design intends that all permanent rock slopes have long term stability against rock falls and sliding failures. In particular, no rock loads will be carried by concrete structures. In general, pattern rock bolts have been installed in the areas of the concrete structures and in much of the open channels. Unfortunately, this pattern could not be completely verified by visual inspections since the wire mesh obscures the view of the rock faces in many areas. Because they are undercut by S1 joints, stability of the north walls is more

*If true please  
revise*



**Comment [PH16]:** This comment can now be removed – all data is with MWH

SECTION 2

susceptible to block sliding than the south walls. It is not clear to MWH if the installed rock support reflects this difference in natural stability, which requires clarification.

- Foundation conditions for water-retaining concrete structures in the Powerhouse, Intake, and Spillway channel appear to be satisfactory. The rock mass is strong and the shear strength of concrete/rock interface is expected to be high, in MWH's opinion. The geological mapping to date indicates that no systematic sets of subhorizontal discontinuities are present.
- Due to high flow velocities that are projected to occur during the operation of the spillway channel, the potential for rock erosion is high and will require mitigation. Nalcor has decided to install a concrete lining in the upstream end of the channel, but the decision for the downstream channel will be decided when the rock, which is presently covered by blasted muck, can be inspected. It is intended to classify the rock with the Annandale erodibility index. This procedure is a useful tool for assisting in the decision to line the channel.
- Site camps and infrastructure appear to be adequate to handle the planned construction works. The camp conditions, with only 300 beds, were very tight at the time of the site visit. However, additional camp facilities are being constructed and there will be accommodations for almost 1,000 persons by November 2013. Roads are generally satisfactory, and are generally up the normal standard for a hydroelectric construction site.
- Schedule achievements are satisfactory. Construction work will continue throughout the winter. The major works will be covered by large weatherproof shelters to enable civil works construction during winter conditions.

**Comment [PH17]:** Is this a significant issue, can it be solved by a telecom/ if it is not a major item can it be dealt with outside of the report

*by date if we can or delete*

SECTION 3

opinion, the intent of the contract's quality requirements and the technical conditions. We, therefore, are currently of the opinion, and with our monitoring of the work during Phase II and thereafter, expect that the performance of major systems and sub-systems will be satisfactory.

3.4 MAJOR SYSTEMS COMPATIBILITY AND COMPLETENESS

We currently (November 2013) have only three contracts available to form a preliminary opinion pertaining to the compatibility of major systems and completeness. These contracts are as follows: CH0030, LC-SB-003, and CH0007.

Contract CH0030 involving the turbines, generators, and associated controls for this equipment is being provided by Andritz Hydro, a tier-one company. Andritz has provided numerous equipment packages for major hydro projects like this, and several recent ones that MWH has direct knowledge of, being the Owner's Engineer. Based on what has been reviewed to date, without viewing the fabrication, assembly, installation, and start-up and testing, we expect that the hydro-generating package will perform as designed and expected. Since the responsibility of the system compatibility and completeness lies with Andritz, following the technical provisions of the contract documents, we expect this package will be satisfactory.

Contract LC-SB-003 involving the Engineering, Procurement, and Construction (EPC) form of contract delivery for the submarine cable(s), which is directly managed by Nalcor is being provided by one of the three leading designers, fabricators, and installers of submarine cables, Nexans Cable. Based on information known to MWH about other projects Nexans has completed, which are judged to be more difficult than the SOBI cable crossing, we are of the current opinion that their system will be compatible with the land-based transmission systems and their system, and in itself will perform satisfactorily and will be completed, as specified.

Contract CH0007, involving the construction of Intake and Powerhouse, Spillway and Transition Dams, will be performed by Astaldi Canada Inc., based in Toronto. Astaldi's parent company is based in Italy and they have offices in the United States, Latin America, and the Middle East. MWH has direct working experience with Astaldi's Latin America company as Owner's Engineer on much smaller hydroelectric projects with less severe weather conditions than prevailing conditions at Muskrat Falls. Our experience leads us to a suggestion that this contract be very carefully managed by the Integrated Project Team to avoid change orders, in MWH's opinion, and to keep the work on schedule.

When additional contracts become available for review, MWH was planning to include remarks about their compatibility with other systems they tie to. Currently, Government has not informed MWH if these reviews will be required.

*Deal with in scope Reliance*

**Comment [PH18]:** It is suggested that this comment on Astaldi be removed from the report and a more generic statement about all contractors will require Nalcor's project Management team oversight would be a more appropriate way to convey this point -  
**Comment [PH19]:** Suggest this be removed

3.5 OPERATING HISTORY OF MAJOR EQUIPMENT

The following Table 3-2 lists major equipment that the IE has reviewed or will review during the Phase I work and comments germane to its operating history.

**Comment [PH20]:** It is suggested that this would be better handled with text rather than long tables which are repetitive - perhaps only deal with exceptions to the satisfactory statement

CONFIDENTIAL - DRAFT

32

November 25, 2013

*blanks all and delete rest plus tables necessary plus reduce to I do not think*

SECTION 3

Table 3-2 (cont'd)

OPERATING HISTORY OF MAJOR EQUIPMENT

ITEM NO.	CONTRACT	EQUIPMENT	REMARKS PERTAINING TO HISTORY	COMMENTS
5	LC-SB-003	SUBMARINE CABLE	NEXANS HAS MANUFACTURED 2,500-3,000 KM OF MASS IMPREGNATED INSULATED CABLE FOR HVdc SUBMARINE CABLE. NEXANS HAS EXISTED AS A COMPANY FOR 35-YEARS	SATISFACTORY
6	PH0014	GENERATOR STEP-UP TRANSFORMER		MWH REQUIRES CONTRACT TO COMPLETE
7	CD0502	CIRCUIT BREAKERS		MWH REQUIRES CONTRACT TO COMPLETE
8	PH0016	GENERATOR CIRCUIT BREAKERS		MWH REQUIRES CONTRACT TO COMPLETE
9	CDO501	CONVERTER TRANSFORMERS		MWH REQUIRES CONTRACT TO COMPLETE
10	CD0501	THYRISTOR VALVES		MWH REQUIRES CONTRACT TO COMPLETE

*Green please change*

**Comment [PH21]:** This should read Contract not yet awarded – it leaves the impression that nalcor is holding back on providing the contracts

**Comment [PH22]:** This should read Contract not yet awarded – it leaves the impression that nalcor is holding back on providing the contracts

**Comment [PH23]:** This should read Contract not yet awarded – it leaves the impression that nalcor is holding back on providing the contracts

**Comment [PH24]:** This should read Contract not yet awarded – it leaves the impression that nalcor is holding back on providing the contracts

**Comment [PH25]:** This should read Contract not yet awarded – it leaves the impression that nalcor is holding back on providing the contracts

~~**Comment [PH26]:** This does not belong in this report~~

~~Nalcor's representative was sent an email on September 3, 2013 requesting Nalcor's list of additional equipment that is acceptable and remarks pertaining to history of experience. Please confirm that no additional items need to be added to the list since they are not available at this time.~~

**SECTION 3**

considered transmission voltages: 315 kV and 345 kV; this link would replace the existing 138 kV line from Churchill Falls that supplies Happy Valley. The study demonstrated that a cost savings of between \$10M to \$14M could be expected by using the 315 kV systems without sacrificing dependability and thus it was adopted.

**3.6.5 One-Line Diagrams**

MWH reviewed the one-line diagrams furnished by Nalcor to assess the general arrangements of the electrical systems associated with the projects and to determine if the entire network would be able to function as required by the design criteria.

The following one-line diagrams were reviewed:

- 230 kV Soldiers Pond Terminal Station (AC Substation)
- Muskrat Falls HVdc Transmission System, Overall Single Line Diagram, 315 kVac and 350 kVdc Transmission System (seven single line diagrams)
- 735-315 CF Switchyard Extension, Single-Line Diagram, 735-315 kV Substation
- 315-138 kV Muskrat Falls Switchyard, single-Line diagram, 315-138 kV Switchyard

These one-line diagrams are included in Appendix B.

Based on our general review, the single line diagrams indicate the electrical configuration and the intended protective elements in a clear fashion, and are believed to be satisfactory to meet the design requirements.

**3.7 TECHNICAL CRITERIA CONSISTENCY**

Our current review of the limited number of contract documents and the RFPs that we have been furnished by Nalcor provide limited opportunity to opine at this time on the technical criteria consistency. However, in viewing contract CH0030 for the turbines and generators and comparing certain provisions of this contract pertaining to the water conveyance passageways with the finishes required of the concrete surfaces required in CH0007 to cite an example, we find that the criteria are consistent and have been accepted by the equipment supplier as being adequate, assuming that the passageway surfaces will actually be constructed, as required.

We also note that provisions have already been made by Nalcor to ensure that the turbine and generator components will fit within the pit dimensions used in the RFP/bid documents for CH0007 since they obtained early-on, dimensional requirements from each of the three bidders for CH0030 to help them plan the layout of the power station for Muskrat Falls and included in the drawing package in the CH0007 RFP.

We further note that for contract CH0006, Bulk Excavation, the provisions for excavation have been carefully coordinated with the drawings and contract language found within RFP CH0007, in our opinion, to accommodate a smooth transition between the contract work when it is accepted by Nalcor and transferred to the contractor for CH0007.

✓

**Comment [PH28]:** This leaves the impression that nalcor is holding back providing MWH data – which is not the case – remove this or reword to be less negative in tone

Delete  
comment



**SECTION 3**

We also noted in contract CH0006 that dewatering of the excavation would be occurring after the contractor was granted substantial completion. Nalcor was questioned about this matter and they indicated that they would be responsible for this system that would be furnished to the contractor for CH0007 to allow it to construct the substructure of the power station, intakes and transition structure within its contract. The IE was pleased with Nalcor's response and finds it should allow the smooth transition between contracts to be promulgated.

**3.8 EXPERIENCE AND CAPABILITY OF MAJOR PROJECT PARTICIPANTS**

Nalcor has advised the IE that for all of the major contracts that are currently under design or that have been awarded, a careful screening process was conducted to allow only tier-one contracting groups and suppliers the opportunity to propose on the work. Of the contracts that we have reviewed wherein we have been apprised of the bidders who proposed on the work, we are of the opinion that careful consideration and due diligence to screen prospective bidders has been conducted and that supports Nalcor's philosophy and statements made to the IE.

Each of the contracts that have been awarded to date by Nalcor were awarded to experienced contractors and suppliers involved in the work. However, as noted in the preceding paragraph, careful monitoring of the Integrated Project Team is advised for CH0007. ~~We will continue to monitor the quality of the selected contractors and suppliers and the procedures that Nalcor uses to select from only the best, most experienced, and most reliable fabricators, suppliers and contractors for the LCP.~~

**Comment [PH29]:** Suggest remove this – the point is made already

*Delete*

Nalcor also selected a Canadian Engineering firm that has not only prepared numerous designs for hydroelectric projects and other projects in Canada, but worldwide. Following Nalcor's philosophy of project development and management, Nalcor shortlisted only tier-one engineering firms to propose on the EPCM services that were awarded to SNC-Lavalin (SNC-L). Work is currently ongoing with SNC-L transferring key hydroelectric specialists to St. John's but also performing work in several of their other offices in Canada.

Nalcor has also engaged very experienced consultants who have been employed on mega projects in Canada and internationally to assist permanent staff, but who work solely on the LCP and hold key positions of management on this project. The guidance the Nalcor team provides to its EPCM contractor, and to the contractors it has engaged, should allow early detection and resolution of any issues that may or will occur during the construction of the LCP.

Additionally, Nalcor has engaged an Advisory Board (Board) of senior engineers to review project aspects and independently opine on their findings directly to Nalcor. The Board meets as often as required by project needs and will be active throughout the construction period.

MWH personally knows these individuals they are qualified to provide sound opinions for the Integrated Project Team to consider. MWH's experience working with the contractor selected for CH0007 on three recently completed, smaller hydroelectric projects in Latin America has been less than satisfactory, in our opinion. MWH notes that special monitoring and dedication of

**SECTION 3**

additional staff to this contract is advisable by the Integrated Project Team, to ensure that Nalcor's stated goals and methodologies are achieved. Nalcor has stated that they intend to closely manage this contract and adhere to their established philosophy as given in their manuals and as required by contract conditions.

**Comment [PH30]:** This point has been made and does not need to be reiterated – suggest remove the sentence

**Comment [PH31]:** Replace "this" with "all"

*Delete*

SECTION 4

CONSTRUCTION PLAN AND SCHEDULE

4.1 EPCM (ENGINEERING, PROCUREMENT, AND CONSTRUCTION MANAGEMENT) CONTRACT REVIEW

We note that Nalcor advised MWH that they have revised a pure EPCM Model to an Integrated Project Team Model. ~~According to Nalcor, they have not completed the small adjustments to the terms of their agreement with SNC-L. Section 4.1.1 discusses the Integrated Project Team Model.~~

**Deleted:** revised their project delivery model that required transition from

*No legal need delete*

4.1.1 Responsibilities of Parties

The EPCM Services Agreement (EPCM Agreement) for the Muskrat Falls Hydroelectric Development between Nalcor and SNC-L is a well prepared and comprehensive contract that places the responsibility for design of a successful project on SNC-L, in MWH's opinion. The effective date of the Agreement is February 1, 2011.

The EPCM Agreement does not give SNC-L the authority to issue any change order, no matter how small it may be, but requires all changes to be submitted to, and approved by, Nalcor's Project Manager. This process constricts the EPCM process of quickly facilitating resolutions of day-to-day issues by very experienced managers in SNC-L who have many years of hydropower practice experience, and appears to be an issue that may cause unnecessary and preventable delays to the project schedule. Experience has shown that on other large EPCM projects, when the EPCM Project Manager is authorized to issue change orders, usually provided with a reasonable "cap," this allows the process to proceed more quickly. Change orders above the cap would require authorization of Nalcor's Project Manager. For the LCP, we would recommend the SNC-L Project Manager be given the authority to authorize charging for work valued up to \$200,000. This would eliminate our initial impression that SNC-L has been given responsibility to deliver the project in a timely manner, but has not been given any level of authority over cost-control. However, given that an Integrated Project Team Model is now being used, the extent of the perceived restricted facilitation of resolution of delays by the IE may not be warranted.

**Comment [NC33]:** This paragraph is redundant. We have adjusted the organizational model, which MWH endorses.

Late in 2012, Nalcor made a strategic decision to adjust its organizational model as it moved through Decision Gate 3 (DG3). At this decision point, the bulk of strategic front-end deliverables that were the focus of Nalcor (i.e., environmental approvals) had been achieved, while the LCP was transitioning from the engineering and procurement phase into the construction phase. A change in the working organizational model was also considered by Nalcor to be key to ensure clarity on roles and responsibilities, while fully leveraging the collective organization resources to achieve priority activities.

*Please  
review  
accordingly*

## SECTION 4 CONSTRUCTION PLAN AND SCHEDULE



**Comment [NC32]:** It is suggested that for all references to contracts yet to be executed throughout the Report that the wording is revised to: 'awaiting contract completion' (or similar) as oppose to 'No opinion can be furnished' 'information not available' 'information lacking', etc. This suggestion is meant to properly reflect the fact that we are in progress and send the incorrect connotation that we are withholding information.

SECTION 4

Nalcor has advised MWH that the Project Delivery Organization relies heavily on the processes and systems offered by SNC-L, in particular as it relates to project control. SNC-L's project management enterprise system, PM+, has been implemented on the LCP. To that effect, SNC-L provides a substantive resource base to support the Project Delivery Organization.

**Comment [LC34]:** Only certain modules of PM+ have been implemented

**Deleted:** fully

**Deleted:**

As can be seen in the organization figure, the organizational design consists of three PMs reporting to a General PM. A deputy PM supports each PM, while overall delivery, including scope, cost, and schedule management, of a particular project component or physical area, is the responsibility of the Area Managers. Reporting to each Area Manager are Package Leaders (i.e., sub-Area Managers), package engineers, and contract administrators. This Area-based management approach has remained consistent since the engagement of SNC-L in early 2011, and underpins the overall delivery strategy.

The Marine Crossings Team, responsible for the SOBI work, is led by a designated PM who reports directly to the Project Director, but maintains day-to-day working relationships with the three Component PMs and all functional managers.

Figure 4-3<sup>5</sup> presents the organizational chart for the Integrated Management Team reporting to the Project Director.

**Comment [LC35]:** Agreement is under negotiation but changes are few

**Deleted:** MWH requested Nalcor to provide a revised agreement with SNC-L for review; however, Nalcor advised that no revised agreement will be prepared

**Deleted:** ¶

*legal assessment not req used delete*

<sup>5</sup> Figure 4-3 Integrated Management Team Organization Chart was furnished to MWH by Nalcor for use in the IER.

SECTION 4

4.1.2 Scope of Work Requirements

Nalcor has included in Exhibit 6 of the Agreement with SNC-L, a listing of documents that define the previous work performed for the LCP and details the studies conducted for the LCP that are available and set out to guide SNC-L in their work. SNC-L is responsible for all of the work for the design, and for the assurance of the quality of all engineering with standard engineering practice, provides some of the personnel and tools (software) for project control (PM+), and resources for the construction management services for the power station and transmission system except the work associated with the high voltage DC cable procurement and installation for the SOBI crossing, which Nalcor is administrating (Contract LC-SB-003).

SNC-L will provide the design and specification development for the over 110 contracts that are the responsibility of the Integrated Project Delivery Organization to issue and administer for the work. Key contracts include:

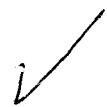
- CH0006 – Bulk Excavation
- CH0007 – Muskrat Falls Complex [Intake & Powerhouse, Spillway & Transition Dams]
- CH0030 – Turbines and Generators Design, Supply and Install Agreement
- PH0014 (RFP) – Generator Step-Up Transformers
- CD0501 (RFP) – Converters and Cable Transition Compounds
- CT0327 – 350 kV HVdc Transmission Line---Section 1
- CT0346 – 350 kV HVdc Transmission Line—Section 2
- PH0016 (RFP) – Generator Circuit Breakers
- CD0502 – Construction of AC Substations

A list of the other contracts is provided in Appendix D of this report for ease of reference by the reader.

Nalcor, through the Integrated Project Delivery Organization, is responsible for obtaining any necessary license, permit, or approval for the work, while SNC-L provides relevant technical input to obtain these permits.

4.1.3 Liability

SNC-L is responsible and assumes weather risk up to and including 20-year return period storm events.



Deleted: under the EPCM Agreement

Deleted: the

SECTION 4

4.1.7 Potential Legal Issues

Issues that the IE is aware of have surfaced in the press and in documents published by the World Bank surrounding the conduct of SNC-L representatives in Libya, Bangladesh, Montreal, and France. Allegations of bribery to win projects and aiding a banned government representative have been raised, with a senior executive of SNC-L currently imprisoned in Switzerland and the former SNC-L CEO arrested in Canada along with several senior representatives of SNC-L being forced to leave the company because of these activities. A pending billion dollar lawsuit by shareholders of the company is also being promulgated. The lawsuit alleges the bribery issues have driven the SNC-L stock price lower, which caused shareholders to lose money. All of this negative publicity associated with the possible legal problems facing SNC-L is required to be surfaced by the IE since the outcome of any legal action could affect the performance of the staff assigned to the LCP. Since the IE cannot give legal opinions, nor is required or qualified to comment on the outcome of any findings by the Royal Canadian Mounted Police or the World Bank in their preliminary findings, and the investigations are currently under way, MWH will not give any opinions on these matters other than what we have noted above. We have discussed the issue with Nalcor representatives and they recognize the need to present this information, but have noted to MWH that they are fully supportive of the SNC-L staff they have been working with on the LCP and will continue to work with them, barring any unforeseen issues that surface after investigations by legal authorities have been completed. Nalcor has recently revised the project delivery methods, as noted previously, to an Integrated Project Team working more closely with SNC-L that supports their trust in the staff working with them. In the unlikely event that SNC-L is not able to perform for any reason, there are other capable firms that could take over SNC-L's responsibilities.

**Comment [NC36]:** Commentary regarding SNC-Lavalin legal issues are out of scope. Statements about our support of the team are true

*Delete unneeded on interim*

4.2 BULK EXCAVATION CONTRACT REVIEW – CH0006

The Bulk Excavation Contract was started on November 9, 2012, shortly before Nalcor received notification that the LCP received Government Sanction on December 17, 2012, since a further delay due to waiting for the full Sanction would have severely delayed the start of the contract and the entire project. Contract CH0006 was awarded to a group of four contractors including the following firms, each of which is well known in Canada: HT O'Connell, EBJ, Nielson, and Kiewit. The current contract amount that was agreed to by the parties is \$112,942,295.00 (Rev 3). The reader is advised that within this report, all dollars given are Year-2012 and Year-2013 Canadian Dollars, depending on the award date. The Contract Substantial Completion Date is December 31, 2013.

Since the IE, by its Agreement, is only required to review certain contracts out of the 113 separate contracts currently identified (March 2013) that Nalcor and MWH believe are the main contracts that need to be reviewed as part of the IE's technical and environmental evaluations, MWH has developed a standard format that addresses the questions contained in the Agreement task descriptions to standardize its responses. Since additional information is also

**Deleted:** with Nalcor

SECTION 4

specifically requested in other sections of the IER, some information may be repeated or expanded, as required by the Agreement.

Table 4-1

CONTRACT CH0006

BULK EXCAVATION

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
1	QUALIFICATIONS OF CONTRACTOR	EACH CONTRACTOR HAS THE FULL CAPABILITIES TO PERFORM ALL OF THE WORK ITSELF	NALCOR ADVISES THAT THE CONTRACTING GROUP PLANS TO SUBMIT A BID FOR CH0007	CONTRACTING GROUP IS SATISFACTORY
2	QUALIFICATIONS OF SUBCONTRACTORS	BLASTING CONTRACTOR IS NOT KNOWN TO MWH. NALCOR ADVISED THAT EXPLOTECH ENGINEERING IS BLASTING CONTRACTOR	'MOOSE' MORIN IS BLASTING CONSULTANT. NALCOR AND SNCL HAVE ACCEPTED BLASTING SUB-CONTRACTOR	SATISFACTORY
3	COMPLETENESS	REVIEWED ENTIRE DOCUMENT; APPEARS TO BE COMPLETE	REPAIR OF OVER BLASTING AND HOW TO CORRECT- NO CORRECTIONS BY THIS CONTRACTOR PER NALCOR RESPONSE TO QUESTION; DEWATERING SYSTEM TO WORK SIX MONTHS AFTER CONTRACTOR LEAVES. NALCOR IS RESPONSIBLE IF ISSUES RESULT	SATISFACTORY
4	CONTRACTS PERFORMED INDEPENDENTLY	THIS CONTRACT IS LEAD CONTRACT AND IS INDEPENDENT OF OTHERS	SEE 3 ABOVE RE DEWATERING RESPONSIBILITIES	SATISFACTORY

Comment [PH37]: It is suggested that report be exception only when not satisfactory all other items can be simply grouped as "satisfactory"

*Can we have a sample summary in text*



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Table 4-1 (cont'd)  
 CONTRACT CH0006  
 BULK EXCAVATION

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
18	RIVERSIDE COFFERDAM ELEVATION	MWH REQUESTED REVIEW BY NALCOR TO ASCERTAIN COFFERDAM HEIGHT REQUIREMENTS AND A SKETCH THAT SHOWS RIVER GAUGES WITH PEAK ICE DAM FLOOD ELEVATION 22 METERS PLOTTED TO ASCERTAIN SUFFICIENT HEIGHT.	MWH RECEIVED REQUESTED PLOT OF WATER SURFACE ELEVATION DUE TO ICE JAM AND HEIGHT OF COFFERDAM. IE IS AWAITING DETERMINATION OF RECURRENCE INTERVAL OF ICE JAMS AT ELEVATION 22 TO 21 METERS. THIS INFORMATION WAS NEVER RECEIVED IN A NALCOR PACKAGE RESPONSE. INFORMATION FROM ANOTHER DOCUMENT IMPLIES A 1:40 YEAR RETURN PERIOD FOR THE ICE JAM WITH THE EL. OF COFFERDAM ESTABLISHED AT 21 m + 1 m FREEBOARD ALLOWANCE.	SATISFACTORY. ISSUE IS CLOSED.

*If true should be added*

The reader should note that at the present time (November 14, 2013), MWH is not able to opine on Item 7; a potential claim is pending for CH0006. However, in order for the reader to be aware of the expectations of providing such opinions, a summary table has been included with this section to provide additional information as to our expectations as to when the IE may be able to opine.

**Comment [LC38]:** There should be a general statement about the overall acceptance of this contract and the fact that the work is complete on schedule to a high quality

SECTION 4

4.3 CONSTRUCTION OF INTAKE & POWERHOUSE, SPILLWAY & TRANSITION DAMS CONTRACT REVIEW – CH0007

To date, MWH has been furnished the RFP to solicit bids for Contract CH0007 and a portion of the contract. Based on our review of these documents, we find that many of the subjects that we are required to comment on are not sufficiently addressed, requiring more information. Nalcor initially requested MWH to review the RFP in lieu of the actual contract since the contract signing was expected to be June 4, 2013, the expected award date of the contract. The actual award date of the Limited Notice to Proceed is September 24, 2013.

In accordance with the Limited Notice to Proceed dated September 24, 2013, between Nalcor Energy and Astaldi Canada Inc., the following Contract price on the finalization of the Agreement between the parties will be made up of the following components as given in Table 4-2.

Table 4-2

CONTRACT CH0007

CONSTRUCTION COST OF INTAKE & POWERHOUSE, SPILLWAY & TRANSITION DAMS

ITEM NO.	DESCRIPTION	COST (\$)
1	Target Cost of Labor	507,598,341.00
2	Labor Profit	35,531,884.00
3	Non-Labor Component	452,104,434.08
4	Travel Allowance (EST)	29,057,891.00
	<b>Total</b>	<b>1,024,292,550.08</b>

Schedule 2 of the Limited Notice to Proceed includes a table of estimated payments for the months ending September 2013 and October 2013. The respective payments are listed as \$2,105,592 and \$5,565,439. An initial amount of \$15,000,000 was advanced to the contractor to cover the two estimated payments and to provide start-up payments to the subcontractors and suppliers. All of these payments will be subject to a 10 percent holdback by Nalcor as required of the Newfoundland and Labrador Mechanics' Lien Act. The holdback will be released to the contractor on the execution of the final Agreement and upon receipt of a holdback release bond, assuming the Agreement is signed.

In further consideration of "Known Items to be Addressed" (found in the table in Schedule 3, Agreement Form, under item 7) is the following:

Finalization of Appendix A2.1: to be submitted with the text of the original A2.1 Form from the RFP document; to include for the discount of \$40 million Canadian dollars consented as part of the Minutes of Meeting of September 14th, and to include the price adjustments made for the additional \$50 million in the Letter of Credit for performance and the additional Performance Bond of \$150 million

*If true reverse*

Deleted: only

Comment [LC39]: This implies holdback of information. All that is missing are the drawings and coordination procedures that are reflected in the RFP. Contract is not yet complete.

Comment [LC40]: There is no more information, it has been provided

Comment [NC41]: This detail is unnecessary and commercially sensitive.

*Can redact - could have a supplemented with a copy of info. - in here just a sample labour / non labour*

*Do Not Break down*

SECTION 4

[minus \$40 million plus \$50 million plus \$150 million equals \$160 million of additional cost that is included in the Total amount given in Table 4-2.]

The following breakdown of the proposed Astaldi's proposed manufacturers, subcontractors, and material suppliers that are known to MWH are given in the following tables. The other proposed Astaldi firms they plan to use in the construction of the Muskrat Falls project are unknown to MWH and have not been listed.

Table 4-3

PROPOSED MANUFACTURERS

ASTALDI NO.	NAME	SERVICE/ PRODUCT	RELATIVE VALUE (X \$1 MILLION)	REMARKS	MWH REMARKS
2	JV CEMENT MUSKRAT FALLS (HOLCIM-LAFARGE)	BULK CEMENT	72		SATISFACTORY
4	ARCELOR MITTAL	REINFORCING STEEL	17	AGF STEEL INC. WILL BEND STEEL	NL DIVISION RECENTLY AWARDED 40,000 TON CONTRACT SATISFACTORY
6	VICWEST	INSULATED METAL WALL PANES	1.2	SUPPLIED BY TEQ INC.	SATISFACTORY
7	VICWEST	SIDING	0.6	SUPPLIED BY TEQ INC.	SATISFACTORY

Comment [PH42]: Can this table be replaced with some simpler text setting all manufactures are satisfactory?

*Redacted charts  
 issue in a  
 supplemental  
 without a  
 cross reference  
 in the Uman*

SECTION 4

Table 4-4

PROPOSED SUBCONTRACTORS

ASTALDI NO.	NAME	SERVICE/ PRODUCT	RELATIVE VALUE (X \$1 MILLION)	REMARKS	MWH REMARKS
6	PENNECON ENERGY LTD.	ELECTRICAL WORKS	3.1		SATISFACTORY
7	GJ CAHILL & COMPANY LTD.	ELECTRICAL WORKS	3.4		SATISFACTORY
9	LIANNU-PENNECON	MECHANICAL WORKS	12.4		SATISFACTORY
10	BLACK & MCDONALD LTD.	MECHANICAL WORKS	19.0		SATISFACTORY

Comment [PH43]: Commercially sensitive data and does it serve any purpose if all are satisfactory – suggest replace table with a simple statement of “all satisfactory”

Table 4-5

PROPOSED MATERIAL SUPPLIERS

ASTALDI NO.	NAME	SERVICE/ PRODUCT	RELATIVE VALUE (X \$1 MILLION)	REMARKS	MWH REMARKS
1	AGF STEEL	REINFORCEMENT	40		SATISFACTORY
3	PENNECON CONCRETE LTD.	PRECAST-PREFABRICATE LONGITUDINAL CONCRETE FIRE WALLS	3.2		SATISFACTORY

Comment [PH44]: Commercially sensitive data and does it serve any purpose if all are satisfactory – suggest replace table with a simple statement of “all satisfactory”

*Sence*

Based on the review of Contract CH0007, we have prepared the following table to aid the reader in its assessment of what the IE has been able to conclude, to date (November 2013).

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Table 4-6

CONTRACT CH0007

CONSTRUCTION OF INTAKE & POWERHOUSE, SPILLWAY & TRANSITION DAMS

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
1	QUALIFICATIONS OF CONTRACTOR		NALCOR REQUIRED TO FURNISH THE COMPLETE CONTRACT FOR CH0007; ALSO CONTRACTOR EVALUATION FOR MWH REVIEW	
2	QUALIFICATIONS OF SUBCONTRACTORS	SUBCONTRACTORS ARE COVERED UNDER ARTICLE 6	SUBCONTRACTOR S' NAMES HAVE BEEN SUBMITTED OR FURNISHED TO MWH. NALCOR REQUIRED TO FURNISH SUBCONTRACTOR EVALUATIONS FOR REVIEW.	NOT ALL SUB-CONTRACTORS ARE KNOWN TO MWH. REFER TO TEXT OF THE 11 OUT OF 28 FIRMS (SOLUTION 1) KNOWN TO MWH, THESE FIRMS ARE SATISFACTORY.
3	COMPLETENESS	CONTRACT APPEARS TO BE COMPLETE		SATISFACTORY
4	CONTRACTS PERFORMED INDEPENDENTLY	WE REQUIRED A CRITICAL PATH METHOD (CPM) SCHEDULE TO OPINE	P6 CPM REQUIRED	NO OPINION CAN BE GIVEN AT THIS TIME.

**Comment [LC45]:** Contract process reviewed in detail during last meeting, must note that MWH has worked and are working with Astaldi on several Hydro jobs. Astaldi's qualification through Nalcors process is clear

**Comment [LC46]:** Remove comment

**Comment [LC47]:** Please reference achievability of Astaldi scope over 5 years

*Handwritten notes:*  
 4-6 - 4-8  
 please do a sample text summary  
 Y6 needed

SECTION 4

Table 4-6 (cont'd)

CONTRACT CH0007

CONSTRUCTION OF INTAKE & POWERHOUSE, SPILLWAY & TRANSITION DAMS

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
5	CONTRACTOR'S AND OWNER'S RESPONSIBILITIES	ARTICLE 2 LISTS THE GENERAL REQUIREMENTS OF THE CONTRACTOR; ARTICLE 3 LISTS THE CONTRACTOR'S WORK OBLIGATIONS; OWNER'S RESPONSIBILITIES COVERED UNDER ARTICLE 10; ENGINEER'S RESPONSIBILITIES UNDER ARTICLE 11	EXHIBIT 9 MILESTONE SCHEDULE IS MISSING FROM THE CONTRACT. NALCOR REQUIRED TO FURNISH EXHIBITS TO MWH.	ROLES OF CONTRACTOR AND OWNER ARE CLEARLY DEFINED. SATISFACTORY
6	GUARANTEES, WARRANTIES  ON HOLD	ARTICLE 7 COVERS PERFORMANCE SECURITY; UNDER PART 1, APPENDIX A2, 7. PERFORMANCE SECURITY, PERFORMANCE BONDS AND LABOR AND MATERIAL PAYMENT BONDS ARE NOT REQUIRED. A PARENTAL GUARANTEE IS REQUIRED BY 7.4 AND AN LC OF 10% OF CONTRACT PRICE IS REQUIRED AS GIVEN IN ARTICLE 7 AT 7.6. UNDER ARTICLE 17, CONTRACTOR WARRANTIES WORK FOR 3 YEARS	LC OR PAYMENT BOND AMOUNT IS JUDGED TO BE TOO SMALL FOR THIS CONTRACT. NOTED OUR OPINION TO NALCOR FOR FURTHER CONSIDERATION. A MINIMUM AMOUNT OF ABOUT 20 TO 30% WOULD BE REASONABLE WE BELIEVE AFTER HOLDING DISCUSSIONS WITH GOVERNMENT TO SOLICIT THEIR OPINIONS. PAYMENT FOR THE LETTER OF CREDIT AND PARENT GUARANTEE (WHY WOULD NALCOR PAY FOR THIS?) IS ON A PRO-RATED MONTHLY.	NO OPINION WILL BE OFFERED AT THIS TIME.

**Comment [PH48]:** Is there a better way to present this rather than in a table- simple text would be easier and only cover the exceptions to satisfactory

*Please review*  
*J. True*

**Comment [NC49]:** Nalcor has followed a detailed risk assessment that involved financial advisors, insurance brokers, legal counsel, etc. to arrive at best value for Project security requirements. Please include substantiation regarding the statement on this item.

*Some of true*

**Comment [NC50]:** Remarks based on performance security package included in CH0007 RFP. Does not reflect final package of ~ \$250m in letters of credit / bond which would represent ~ 25% of contract value. Supporting information was sent by Nalcor to MWH/CBB on Nov 7.

SECTION 4

Table 4-6 (cont'd)

CONTRACT CH0007

CONSTRUCTION OF INTAKE & POWERHOUSE, SPILLWAY & TRANSITION DAMS

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
		STORAGE REQUIRED WHICH MAY BE SHOWN ON THE DRAWINGS WHICH WE DO NOT HAVE.	FOR ITEMS IN WAREHOUSES.	
10	CONFORMS TO INDUSTRY STANDARDS	WE REQUIRED THE CONTRACT DOCUMENTS BEFORE AN OPINION CAN BE GIVEN.	NALCOR TO SUPPLY THE CONTRACT COMPLETE CONTRACT EXPECTED OCTOBER 31, 2013.	
11	COMPENSATION TERMS	PART 2, EXHIBIT 2— ATTACHMENT 1 CONTAINS MEASUREMENT AND PAYMENT PROVISIONS. IT ALSO INCLUDED PROVISIONS FOR FIXED LUMP SUMS AND UNIT PRICES WORK AND INCLUDES PROVISIONS FOR INFLATION. A MONTHLY FORECAST SCHEDULE IS REQUIRED.		SATISFACTORY
12	GUARANTEES & LIQUIDATED DAMAGES	LDS ARE GIVEN IN PART 2, EXHIBIT 2, OPTION 2, SECTION 13, LIQUIDATED DAMAGES FOR DELAY AND PERFORMANCE INCENTIVES. ALSO GIVEN IN ARTICLE 26 WHICH LIMITS THE TOTAL AMOUNT OF	WE HAVE INCLUDED SAMPLE COMPUTATIONS IN APPENDIX H.  MWH REQUIRES COMPLETE CONTRACT.	



**Comment [LC54]:** Comment should be Full agreement to be reviewed upon completion

**Comment [LC55]:** All securities are outlined in Ts and Cs provided to MWH

SECTION 4

Table 4-6 (cont'd)

CONTRACT CH0007

CONSTRUCTION OF INTAKE & POWERHOUSE, SPILLWAY & TRANSITION DAMS

*Please Use Comment*

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
16	CONSTRUCTION SCHEDULE	CRITICAL PATH SCHEDULE AND EXECUTION PLAN ARE REQUIRED TO BE FURNISHED		DATA ARE NOT AVAILABLE FOR IE TO FORM AN OPINION
17	SCHEDULE REVIEW; ADEQUATE PROVISIONS	CRITICAL PATH SCHEDULE IS REQUIRED FOR REVIEW		
18	CRITICAL PATHS	MILESTONE DATES REQUIRED; CPM SCHEDULE REQUIRED; SUBSTANTIAL COMPLETION DATE REQUIRED	MORE INFORMATION IS REQUIRED TO ALLOW AN ASSESSMENT TO BE PERFORMED BY THE IE	DATA ARE NOT AVAILABLE FOR THE IE TO FORM AN OPINION
19	LIKELIHOOD OF ACHIEVING MILESTONES		DATA MISSING	DATA NOT AVAILABLE; IE CAN NOT FURNISH AN OPINION AT THIS TIME.
20	SUBSURFACE CONDITIONS	ARTICLE 23 PROVIDES PROTECTION TO THE CONTRACTOR IF IT ENCOUNTERS UNFORESEEN GEOLOGICAL OR GEOTECHNICAL CONDITIONS, INCLUDING GROUND WATER WHICH IT BELIEVES WILL IMPACT THE PROJECT SCHEDULE. ARTICLE 14, IF ACCEPTABLE TO THE OWNER WILL ALLOW A CHANGE TO BE MADE TO THE CONTRACT		SATISFACTORY

**Comment [LC58]:** Is the overall timeline reasonable given the scope of work. Astaldi, and 3 other bidders have committed that it is

**Comment [LC59]:** See comment above

**Comment [LC60]:** See comment above



SECTION 4

CONTRACT CH0030

TURBINES & GENERATORS DESIGN, SUPPLY AND INSTALL AGREEMENT

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
				<p>NALCOR ADVISED THAT AH OWNS OR IS A PRINCIPAL SHAREHOLDER IN MANY OF THE COMPANIES AND INTENDS TO MONITOR THEM CLOSELY.</p> <p>NO OPINION ON THE SUBCONTRACTORS WILL BE FURNISHED BY MWH.</p>
3	COMPLETENESS	<p>WE STILL REQUIRE ADDITIONAL DATA IN THE RESPONSE TO THE RFP THAT SHOULD BE IN THE CONTRACT. WE HAVE NOT BEEN PROVIDED WITH EXAMPLES TO CLEARLY ILLUSTRATE THAT THE LDS ARE REALISTIC AND CAN BE SUPPORTED IF AN ISSUE GOES TO COURT. WE HAVE FURNISHED A LIST OF QUESTIONS AND ARE AWAITING A RESPONSE.</p>	<p>NALCOR ADVISED THAT CANADIAN COURTS DO NOT SUBSCRIBE TO THE "REALISTIC" AND "SUPPORTABLE" LOGIC. MWH REQUIRES A P6-TYPE SCHEDULE.</p>	<p><i>Legal details</i></p>

**Comment [N63]:** The schedule is a deliverable of Project contractors and will be input into the existing schedule framework at an appropriate level.

Table 4-7 (cont'd)

SECTION 4

CONTRACT CH0030

TURBINES & GENERATORS DESIGN, SUPPLY AND INSTALL AGREEMENT

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
19	LIKELIHOOD OF ACHIEVING MILESTONES	MILESTONES ARE GIVEN IN EXHIBIT 2, APPENDIX B.	<p>WE REQUIRE THE P6 CPM TO FURNISH AN OPINION</p> <p>WE DO NOT HAVE THE EXPERIENCE WITH THESE SUPPLIERS' USING PRINCIPALLY CHINESE MADE EQUIPMENT TO EXPRESS THIS OPINION ON THESE LARGE SIZE MACHINES; WE REQUIRE ADDITIONAL SUPPORT INFORMATION TO DEMONSTRATE THAT THE FABRICATION AND CASTING COMPANIES HAVE SIMILAR EXPERIENCE ON LARGE KAPLAN MACHINES AND THAT THIS IS NOT THEIR FIRST TIME IN MANUFACTURING 9M KAPLAN EQUIPMENT. NALCOR ADVISED THAT ANDRITZ HAS WORKED WITH ALL BEFORE AND</p>	NO OPINION WILL BE GIVEN BY MWH.

**Comment [NC68]:** The schedule is a deliverable of Project contractors and will be input into the existing schedule framework at an appropriate level.

**Comment [PH69]:** It should be within MWH's experience to evaluate the overall contract period and determine if the duration is adequate to meet the installation window

*delete  
no value*

Table 4-7 (cont'd)

SECTION 4

CONTRACT CH0030

TURBINES & GENERATORS DESIGN, SUPPLY AND INSTALL AGREEMENT

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
			HAS FINANCIAL INTEREST IN SOME OF THESE COMPANIES.	

As noted previously in the discussion following Table 4-2, we have included a discussion of how we believe we can accommodate any items that remain "blank" or are as yet undesignated, that leave gaps in the table because we either do not have a contract to review, or that have not been addressed by Nalcor to allow the IE to inform the reader as to our current position regarding the review of CH0030 documents.

**Comment [LC70]:** IE has all available information on this contract. can they not say based on the information provided they see no concerns and will continue to monitor?

4.5 STRAIT OF BELLE ISLE SUBMARINE CABLE DESIGN, SUPPLY, AND INSTALL CONTRACT – LC-SB-003

Contract LC-SB-003 was awarded with a start date of December 12, 2012, and with a given substantial completion date of November 28, 2016. The early start of this contract was necessitated by the advantage Nalcor realized in favorable market conditions for the subsea cable as well as being able to schedule the manufacture of the cable early by reserving the manufacturing facilities in Japan to fabricate the cable and appurtenances associated with it. The contract amount is \$125,245,370.00. Nexans Cable is one of the three cable companies in the world that has the required experience in manufacturing and installing subsea cables, and coupled with Nippon High Voltage Cable Corp.'s experience in manufacturing subsea cables, has been critical to assuring a successful project in the opinion of Nalcor.

**Comment [LC71]:** Sensitive  
**Comment [PH72]:** Suggest all contract values are removed  
**Deleted:**

Listed below in Table 4-4 are the current findings and opinions of MWH pertaining to contract LC-SB-003

*OK can we have supplemental detail backing the cost comments*

Table 4-8

CONTRACT LC-SB-003

STRAIT OF BELLE ISLE SUBMARINE CABLE DESIGN, SUPPLY AND INSTALL

**Comment [PH73]:** Is there a better way to present this rather than in a table- simple text would be easier and only cover the exceptions to satisfactory

SECTION 4

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
5	CONTRACTOR'S AND OWNER'S RESPONSIBILITIES	CONTRACTOR'S RESPONSIBILITIES ARE GIVEN IN ARTICLES 2, 3, AND 4 OF THE CONTRACT; NALCOR'S ARE COVERED UNDER ARTICLE 10		SATISFACTORY
6	GUARANTEES, WARRANTIES	ARTICLE 17, WARRANTIES, PROVIDES FOR 36 MONTHS; CAN BE EXTENDED 36 MONTHS IF FAILURE OR REPAIR REQUIRED OF PART OR SYSTEM.	GUARANTEES ARE NOT MENTIONED. NALCOR ADVISED THAT ONLY THE WARRANTY OF 36 MONTHS APPLIES WHICH EXCEEDS INDUSTRY STANDARDS BY AT LEAST 12 MONTHS	SATISFACTORY
7	CHANGE ORDERS	ARTICLE 26 PROVIDES FOR CHANGES ORDERED BY NALCOR; ARTICLE 39 COVERS DISPUTE RESOLUTION	EXHIBIT 4, SECTION 11 DISCUSSES CHANGE ORDERS	SATISFACTORY
8	TRANSPORTATION PLAN	NONE WAS EXPLICITLY REQUESTED OR FURNISHED BUT WOULD BE INCLUDED IN 0.5.2 EXECUTION PLAN AND METHOD STATEMENT, ITEMS (bb), (cc), (dd).	UNABLE TO OPINE UNTIL THE PLAN IS PREPARED AND REVIEWED BY MWH. NALCOR ADVISED Q2 2015 AVAILABLE.	GOVERNMENT ADVISED MWH THAT NO OPINION IS REQUIRED.

Comment [LC74]: Is this statement necessary

*delete*

Table 4-8 (cont'd)

CONTRACT LC-SB-003

STRAIT OF BELLE ISLE SUBMARINE CABLE DESIGN, SUPPLY AND INSTALL

SECTION 4

Table 4-9

CONTRACT PH0014 (RFP)

GENERATOR STEP-UP TRANSFORMERS

**Comment [NC80]:** Comments on contract status, award dates, etc. throughout this section (Table 4-9 to 4-14) can be updated based on material contracts update document provided to Canada/CBB/MWH/BF via data room on Nov 19.

**Comment [NC81]:** As indicated by Nalcor to MWH/CBB in Oct 9 email, contract PH0014 and PH0016 are still in bid evaluation

**Comment [LCB2]:** Please see comment at the start of section 4, empty tables are unnecessary to include, just say "the following contracts will be reviewed when complete"

**Deleted:** ITEM NO. ... [1]

4.7 CONVERTERS & CABLE TRANSITION COMPOUNDS – CD0501 (RFP)

The work under this RFP consists of the study, design, factory testing, supply, construction, installation, site testing, and commissioning of the HVdc link stations at Muskrat Falls and Soldiers Pond Converter Stations, and Forteau Point and Shoal Cove Cable Transition compounds. This work further includes the following components:

- Completely operational ±350 kV, 900 MW bipolar HVdc system, including the necessary communications interface equipment and the associated HVac equipment;
- Overall project management; studies; design; engineering; training; manufacture; factory testing; supply; delivery to site, loading and unloading; storing; preserving; handling and moving into final position; installation; testing; commissioning; and placing into successful commercial operation and warranty;
- Civil works, including buildings and foundations;
- Two HVdc converter stations based on Line Commutated Conversion technology; one at Muskrat Falls next to the power station and the other at Soldiers Pond interconnecting with the Newfoundland power network; and
- Two Cable transition compounds; one at Forteau Point and the other at Shoal Cove.

*Delete empty tables*

Table 4-10

CONTRACT CD0501

CONVERTERS & CABLE TRANSITION COMPOUNDS

**Comment [LCB3]:** Again, contract will be reviewed upon completion. Maybe you can make references to the standard RFP and the fact that we have used tier one suppliers, this can also be stated about the materials PO's above

SECTION 4

*Bank delete all tables*

**4.8 GENERATOR CIRCUIT BREAKERS – PH0016 (RFP)**

The work under this RFP consists of the design, fabrication, shop testing, packaging, and supply of four 24 kV, 12,000 A, 80 KA interrupting capacity generator circuit breakers complete with the control panels for each of the LC turbine/generator units. At this time, MWH has only had the opportunity to review the RFP that was issued for this work. Table 4-9 summarizes the information contained in the RFP.

Comment [LC84]: Same comment as above

**4.9 Table 4-11**

Deleted: 13

Deleted: CONTRACT PH0016 (RFP) SUPPLY OF GENERATOR CIRCUIT BREAKERS [ITEM NO. ... [2]

Comment [NC85]: The schedule is a deliverable of Project contractors and will be input into the existing schedule framework at an appropriate level.

**4.9 CONSTRUCTION OF AC SUBSTATIONS – CD0502**

The RFP for Contract CD0502 was issued on July 16, 2013, and is scheduled to be closed on October 10, 2013. Contract award is expected on December 15, 2013, and the contract forecasted completion date is November 30, 2016. The value of the contract has not been furnished to MWH, since it combines contracts and it is now an EPC contract. Table 4-11 summarizes the information known to date and was taken from the RFP.

Comment [LC86]: Same comment as above

Table 4-12

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Deleted: CONTRACT (RFP) CD0502 CONSTRUCTION OF AC SUBSTATIONS [ITEM NO. ... [3]

PRINCIPAL CONTRACTOR: UNKNOWN

CONTRACT AMOUNT: NALCOR HAS NOT PROVIDED AN UPDATED ESTIMATED AMOUNT; HOWEVER, TABLE 5-16, HEREIN, GIVES THE TOTAL AMOUNT OF COMBINED CONTRACTS AS: \$141,056,231.

CONTRACT START DATE: FORECASTED-DECEMBER 15, 2013 [IN RFP, EXHIBIT 9, SCHEDULE, IT GIVES SEPTEMBER 1, 2014]

CONTRACT COMPLETION DATE: NOV 30, 2016—FIGURE 5-1 OF THIS IE REPORT

RFP CLOSING DATE: OCTOBER 10, 2013

RFP ISSUE DATE: JULY 16, 2013

NOTE: EXHIBIT 9, SCHEDULE, OF RFP FOR CD0502 HAS THE FOLLOWING SCHEDULE—CONFLICTS WITH OTHER DATA IN IE REPORT

**SECTION 4**

1. FORECASTED CONTRACT AWARD: APRIL 1, 2014
2. CONSTRUCTION START—ALL SITES: SEPTEMBER 1, 2014
3. DELIVERY OF COMPANY SUPPLIED TRANSFORMERS: Q4 2015
4. COMMISSIONING STATIC CHECKS COMPLETE—ALL SITES SEPTEMBER 20, 2016.

**4.10 GUARANTEES AND LIQUIDATED DAMAGES (LDs)**

Included with the contract summaries as provided in Section 4 of the report are provisions established by our Agreement with Nalcor Energy for the respective contracts. For the contracts that we are expected to review, we have tabulated the results found during our reviews into Table 4-8, below, for easy reference (see also Appendix H, Liquidated Damages Calculations).

**Table 4-13**

Deleted: 15

**SUMMARY OF GUARANTEES AND LIQUIDATED DAMAGES (LDs)**

ITEM NO.	CONTRACT OR RFP NO.	ITEM NOs. IN TABLES	OBSERVATIONS	REMARKS; QUESTIONS	OPINION OF INDEPENDENT ENGINEER
1	CH0006 (MF) CONTRACT	6	NO GUARANTEES 3 YEAR WARRANTY	IE REQUIRES TIME TO OBSERVE PERFORMANCE	SATISFACTORY
		12	NO GUARANTEES NO LDS	IE REQUIRES TIME TO OBSERVE PERFORMANCE	NO IE OPINION UNTIL CONTRACT CLOSED.

**Comment [NC87]:** This contract CH0006 is ready for close-out. This detail is no longer material.

**Table 4-15 (cont'd)**

**SUMMARY OF GUARANTEES AND LIQUIDATED DAMAGES (LDs)**

ITEM NO.	CONTRACT OR RFP NO.	ITEM NOs. IN TABLES	OBSERVATIONS	REMARKS; QUESTIONS	OPINION OF INDEPENDENT ENGINEER
		13	NO PERFORMANCE BOND OR PAYMENT BOND REQUIRED	IE REQUIRES CLARIFICATION FROM NALCOR AS TO WHAT PERFORMANCE SECURITY EXISTS OTHER THAN HOLDBACK PERCENTAGE OF PAYMENTS.  NO IE OPINION UNTIL	NO OPINION WILL BE FURNISHED AT THIS TIME.

SECTION 4

ITEM NO.	CONTRACT OR RFP NO.	ITEM NOs. IN TABLES	OBSERVATIONS	REMARKS; QUESTIONS	OPINION OF INDEPENDENT ENGINEER
			EXHIBIT 1, APPENDIX B DISCUSSES PERFORMANCE GUARANTEES. SECTION 2.3 OF THE TECHNICAL SPECIFICATIONS DISCUSSES GUARANTEES	DERIVED HAVE BEEN REQUESTED; NALCOR FURNISHED TO MWH. ALSO, HOW THE LIMIT ON PENALTIES WILL BE USED. FURNISHED.	SAMPLE COMPUTATIONS NOW INCLUDED IN APPENDIX H.
		13	ARTICLE 35 DISCUSSES PERFORMANCE GUARANTEES; ARTICLE 36 DISCUSSES LDS; ARTICLE 37 DISCUSSES PERFORMANCE TESTING. BUYOUT PROVISIONS ARE ALSO GIVEN. NO BONUS PROVISIONS HAVE BEEN PROVIDED	THE IE NOTES REVISIONS TO FORMULAS SHOULD BE CONSIDERED.	THE IE REQUIRES FURTHER CONSULTATION WITH NALCOR TO ENSURE WE UNDERSTAND THESE PROVISIONS. NO OPINION CAN BE GIVEN AT THIS TIME. REQUIRES FURTHER REVIEW.
		15	APPENDIX B, EXHIBIT 1 DISCUSSES PERFORMANCE GUARANTEES	WE WOULD LIKE TO VIEW SAMPLE COMPUTATIONS TO ILLUSTRATE HOW THESE PROVISIONS WOULD BE APPLIED. PROVIDED IN APPENDIX H.	NO OPINION CAN BE GIVEN AT THIS TIME. REQUIRES FURTHER REVIEW.
4	PH0014 (MF) NO INFORMATION				

Comment [LC89]: Clarity required as to the gap

Table 4-15 (cont'd)

SUMMARY OF GUARANTEES AND LIQUIDATED DAMAGES (LDs)

ITEM NO.	CONTRACT OR RFP NO.	ITEM NOs. IN TABLES	OBSERVATIONS	REMARKS; QUESTIONS	OPINION OF INDEPENDENT ENGINEER
5	PH0016 (MF) NO				

*delete blanks inputs*



SECTION 4

ITEM NO.	CONTRACT OR RFP NO.	ITEM NOS. IN TABLES	OBSERVATIONS	REMARKS; QUESTIONS	OPINION OF INDEPENDENT ENGINEER
	INFORMATION				
6	PD0505 (MF) NO INFORMATION				
7	CT0327 (LTA) NO INFORMATION				
8	CT0346 (LTA) NO INFORMATION				
1	LC-SB-003 (LIL)	6	NO GUARANTEES 36 MONTH WARRANTY		SATISFACTORY
		12	LD OF \$200K/DAY		SATISFACTORY
		13	50% CONTRACT PRICE PERFORMANCE BOND; LC OF 15% CONTRACT PRICE	NO COMPANY GUARANTEE WAS REQUIRED	SATISFACTORY
		15	NO GUARANTEES 36 MONTH WARRANTY		SATISFACTORY
2	CD0501 (LIL) NO INFORMATION				

*Please do*

**4.11 CONSTRUCTION SCHEDULE**

The IE is currently disadvantaged to provide an accurate assessment of the LCP IPS in regards to the likelihood of achieving key milestone dates or the accuracy of the indicated critical path as it leads to a conclusion regarding the likelihood of achieving the targeted in-service date for the Project. Our fundamental concerns surrounding the robustness and adequacy of the underlying scheduling methodology to accurately model workflow and predict critical project dates prevent us from opining further on the current IPS. We will reassess our position after additional information that we require to finalize our review becomes available.

**Comment [PH90]:** It should be within MWH's experience to evaluate the overall construction periods and determine if the duration is adequate to meet the 2017 startup date of Unit 1

**Comment [LC91]:** Please adjust based on schedule review discussions in light of the actual requirement which is, "Is the schedule overall reasonable for a project of this size considering that many key bids are in hand and contracts confirm the dates as achievable"

SECTION 4

**4.12 SUPPLY CONTRACTS SCHEDULES**

Nalcor's Representative was sent an earlier email requesting these schedules on February 6, 2013, and MWH received a schedule included in Appendix I. MWH would like an updated similar schedule for the IE Report. MWH requires contractor schedules as noted in the tables in Section 4.0 giving a CPM schedule they will use.

Comment [NC92]: Should be removed.

*delete*

**4.13 PERFORMANCE TEST CRITERIA**

**4.13.1 Turbines and Generators**

The performance test criteria for the turbines and generators (Contract: CH0030) are the only ones that are currently available for review (March 2013). As noted in the Summary Table 4-3, Items 13 and 15, we find that they are Satisfactory and would meet Good Utility Practice. We have noted that two of the test criteria and the penalties for not meeting the criteria are usually not found in specifications and contracts for other projects that we have reviewed; we find these extra provisions that are given in the Contract Documents very appropriate for the large size equipment. For our readers' benefit, we repeat what the LCP has accepted as its definition of Good Utility Practice as given in Schedule A of the WMA and quote this definition as follows since it is succinctly stated:

Good Utility Practice means those practices, methods or acts, including but not limited to the practices, methods or acts engaged in or approved by a significant portion of the electric utility industry in Canada, that at a particular time, in the exercise of reasonable judgment, and in light of the facts known at the time a decision is made, would be expected to accomplish the desired result in a manner which is consistent with laws and regulations and with due consideration for safety, reliability, environmental protection, and economic and efficient operations.

**4.13.1.1 Other Equipment**

Currently there is no other equipment where performance test criteria are available for comment by the IE. Nalcor is asked to verify this statement is correct.

Comment [PH93]: Suggest remove this - it gives the impression nalcor is holding daat from MWH - not the case

SECTION 5

CAPITAL BUDGET

5.1 TOTAL PROJECT COST ESTIMATE

5.1.1 Cost Estimate Methodology

A deterministic and risk-adjusted approach encompassing both the project's direct and indirect costs was followed by Nalcor to arrive at the project's Decision Gate 3 (DG3) Class 3 capital budget. The capital cost estimate is comprised of three primary components that follow the Association for the Advancement of Cost Engineering International (AACEI) Recommended Practice No. 17R-97.

First, a base cost estimate is established for each of the project's sub-elements (i.e., LTA, MFG, LITL) scope elements that reflect the most likely current cost known to be associated with the project's specifications, basis of design, drawings, and execution plan. The base cost estimate includes allowances for known but unquantified items.

To the base cost estimate, a risk-adjusted contingency is derived using analytical methods to account for uncertainties or variations associated with estimating accuracy. The estimated contingency allowance does not cover scope changes outside the parameters established for the project charter or control points for management of change (i.e., project execution plan and basis of design) nor does it cover force majeure issues associated with natural disasters, strikes or hyper-escalation.

Finally, an escalation allowance is developed that provides for changes in price levels that are driven by future economic conditions, including inflation. The escalation allowance is added to the base cost estimate inclusive of the estimated scope/risk contingency, and is derived using economic indices associated with similar construction endeavors.

The IE was not furnished with the actual cost estimate details as part of oversight effort. However, based on a review of the Basis-of-Estimate document that accompanies the cost estimate, generally Nalcor's cost estimate methodology is considered consistent with industry best practices for organizing, calculating, and reporting the project's current capital budget relative to a defined scope, indicated risks, and opportunities. Rather than comment directly on the cost estimate details, the IE will assess the accuracy of the project's capital cost estimate by comparing the DG3 estimated costs to the actual tendered amounts by contract. A current summary of this comparison analysis appears as Table 5-16 in this section.

Generally, the cost estimate methodology can be described as a "bottom-up" approach relative to the level-of-detail, supporting documentation, and the implied level-of-effort. A "bottom-up" approach is considered to be a more robust means of quantifying costs at the underlying

*Created by this*

**Comment [PH94]:** Nalcor follows the general Recommended Practice but also applies more specifically RP#69R-12 which is specific to Hydro Power projects and RF#18R-97 which is specific to Process industries

*Review co per update materials*

**Comment [PH95]:** The IE has been provided with full access to the cost estimate – this leaves a false impression that nalcor has been holding data back which is not the case- suggest removing this wording

**Comment [PH96]:** Remove

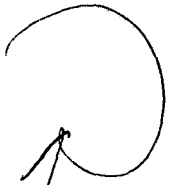
**Comment [PH97]:** The use of the word generally suggests some shortfalls in best practice – nalcor does not agree

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**Comment [PH98]:** sic

~~Deleted: s~~

SECTION 5


  
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 and additional  
 per recent decisions  
 H.P.

resource level (e.g., labor, equipment, materials, etc.) versus reliance on high level parametrics or unadjusted historical costs. Typically, at-risk contractors will price work of this nature by doing similar "bottom-up" or detailed cost estimates to gain precision and reduce estimating errors. As well, the methodology applied to the risk analysis is considered to meet industry expectations for quantifying pricing uncertainties by modeling ranges around group subtotals for the major project elements using statistical analysis techniques.

Nalcor qualifies the DG3 cost estimate as an AACEI Class 3 effort. The IE agrees with this classification and confirms the implied accuracy range (-20% to +40%). However, as noted in the *Decision Gate 3 Capital Cost and Schedule Estimates Summary Report*, a Class 2 AACEI-compatible cost estimate is required at the time of Financial Close. The IE is not aware of any ongoing efforts by Nalcor to upgrade the capital cost estimate to support Financial Close with a higher degree of accuracy. As well, Nalcor has committed to completing a Class 1 cost estimate upgrade of the cost estimate at the mid-checkpoint of the project. The IE urges stakeholders to request these cost estimate updates from the project developer to ensure the most accurate project budget is available for inspection and proactive budget control.

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.

As the project moves into full scale field execution with the award of CH0007 (Muskrat Falls Powerhouse), the IE would advocate for re-thinking and reauthorization of the project contingency fund. Due to significant overruns recently recognized with the award of CH0007, the project contingency fund is considered to be spent at this time and unavailable for future unknowns and risks associated with the field construction phase for all sub-project elements of the multi-year project. The IE believes the drivers on contingency will be varied and not entirely predictable as the project unfolds over the next several years. Issues associated with budget estimate accuracy, baseline schedule accuracy, uncompetitive market conditions, directed scope changes, changed field conditions, claims, weather impacts, resource shortages, directed schedule acceleration, potential contractor defaults, incremental owner project support costs, and other unknown risks are some of the typical factors that our experience indicates will consume contingency on a remote large-scale heavy-civil endeavor.

**Comment [PH99]:** this is not a full and accurate representation of a Class 3 Estimate according to AACEI 69R-12 which is specific to the hydropower industry which states that for an engineering completion of between 10 % to 40% which corresponds to an expected accuracy range of a low range and a high range – the low ranges is +10% to -10% and the high range is +30% to -20% - therefore the IE statement is incorrect and because of the 50% engineering progress at DG3 the accuracy range is within +10% to -10% - which is holding true based on two thirds of the total project cost being secured with fixed and firm contract/PO pricing and a 5% increase over DG3

**Comment [PH100]:** Nalcor is well advanced passed the clas 3 estimating phase and is at Control Budget level of control , furthermore Nalcor have provided an final forecast Cost to the IE and will update this every month in a Construction Report- Suggest removing this highlighted section

**Comment [PH101]:** Suggest removing this wording – the Final Forecast Cost is showing a much more modest increase over the Dg3 estimate of 5% with two thirds of the project at a Class I estimate stage

**Comment [PH102]:** IE has been made aware of the NL Government Contingent Equity and completion guarantee – therefore suggest removing this highlighted section

**Comment [PH103]:** See comment in PH101 above and reword this to reflect the actual situation on LCP

SECTION 5

5.1.2 Evaluate Cost Estimate and Fixed Price Estimates

Currently under review. No comments are yet available. MWH and Nalcor agreed to update this section once more large contract bids are received.

5.1.3 PM, Construction Contractors Experience

At the present time, we only have knowledge of the EPCM contractor and three other contracting groups of the contracts the IE is required to review and report on. These entities are included in the following Table 5-1 with our remarks.

**Comment [PH104]:** It is suggested that this be a more simpler form rather than use a table just point out the exceptions to the "satisfactory" opinion. This will make the report much more concise

Table 5-1

CONTRACTOR'S EXPERIENCE

CONTRACT NO.	CONTRACT DESCRIPTION AND CONTRACTOR	REMARKS	OPINION OF INDEPENDENT ENGINEER
CH0006	BULK EXCAVATION HT O'CONNELL, EBJ, NIELSON, AND KIEWIT	EACH OF THE CONTRACTORS IS WELL-KNOWN IN CANADA AND HAS THE FULL CAPABILITIES TO PERFORM THE ENTIRE CONTRACT BY THEMSELVES. THE CONTRACTORS HAVE WORKED TOGETHER ON OTHER HEAVY CIVIL PROJECTS AND ALL HAVE WORKED ON HYDROELECTRIC PROJECTS	SATISFACTORY
CH0030	TURBINES & GENERATORS DESIGN, SUPPLY AND INSTALL AGREEMENT ANDRITZ HYDRO CANADA INC.	ANDRITZ IS A TIER ONE SUPPLIER OF HYDRAULIC TURBINES AND ASSOCIATED EQUIPMENT. ANDRITZ HAS EXPERIENCE IN LARGE-DIAMETER KAPLAN TURBINES OF SIMILAR SIZE (9 METER SIZE)	SATISFACTORY

*If a simple text summary can be done please do*

SECTION 5

Table 5-1 (cont'd)

CONTRACTOR'S EXPERIENCE

CONTRACT NO.	CONTRACT DESCRIPTION AND CONTRACTOR	REMARKS	OPINION OF INDEPENDENT ENGINEER
LC-SB-003	STRAIT OF BELLE ISLE SUBMARINE CABLE DESIGN, SUPPLY AND INSTALL NEXANS CABLE	NEXANS CABLE IS A TIER ONE DESIGNER, SUPPLIER, AND INSTALLER OF SUBMARINE CABLES WORLDWIDE.	SATISFACTORY
EPCM	ENGINEERING, PROCUREMENT, AND CONSTRUCTION MANAGEMENT SNC-L.	SNC-L IS A TIER ONE ENGINEERING AND CONSULTING COMPANY WHICH HAS DESIGNED AND MANAGED MANY LARGE HYDROELECTRIC PROJECTS, THERMAL GENERATING STATIONS, AND NUCLEAR POWER PLANTS	SATISFACTORY
CH0007	CONSTRUCTION COST OF INTAKE & POWERHOUSE, SPILLWAY & TRANSITION DAMS	ASTALDI HAS BEEN SELECTED AND GIVEN LIMITED NOTICE TO PROCEED.	CLOSE MONITORING DURING CONSTRUCTION BY THE INTEGRATED PROJECT TEAM IS ADVISED TO ACHIEVE PROJECT GOALS AND CONTRACT REQUIREMENTS.

*Remove the cost table to a supplemental comment*

Note: No additional contracts were available for review prior to Financial Close.

5.1.4 Major Equipment Procurement Costs

We have summarized in the tables below, for each of the three projects, the major equipment costs associated with each of the projects found in the Decision Gate 3 (DG3) estimate. At the present time, only equipment costs associated with the Muskrat Falls Plant under CH0030 and with the submarine cable, LC-SB-003, are known (November 2013). The costs shown in Table

**Comment [PH105]:** It is suggested that this commercially sensitive data is removed in all tables below— there is no opinion drawn by the IE it simply lists the contracts and costs with no real purpose other than to record them. So it adds no value

*Remove all unneeded PH 105 - PH 121 PH 123*

SECTION 5

5-2 are in three currencies, and are additive. We expect that we will be able to have a more complete summary for each of the projects as we near Financial Close and the submittal of the final IER.

Table 5-2

MUSKRAT FALLS AND LABRADOR TRANSMISSION ASSETS

MAJOR EQUIPMENT PROCUREMENT COSTS

ITEM NO.	CONTRACT NO.	EQUIPMENT	COST			REMARKS
			CAD\$	USD\$	Euro €	
1	CH0030	Turbines (4)	15,522,428.00	26,301,204.71	257,805.64	
2	CH0030	Governors (4)	6,109,661.86			
3	CH0030	Generators (4)	24,023,018.20	10,147,521.30	3,946,981.40	
4	CH0030	Excitation System (4)	6,242,187.21			
5	CH0007	Not applicable				
6	PH0014					
7	CD0501					
8	PH0016					
9	CD0502					

Comment [PH106]: It is suggested that this commercially sensitive data is removed in all tables below— there is no opinion drawn by the IE it simply lists the contracts and costs with no real purpose other than to record them. So it adds no value

Note: No additional contracts were available for review prior to Financial Close.

Table 5-3

LABRADOR-ISLAND TRANSMISSION LINK

MAJOR EQUIPMENT PROCUREMENT COSTS

ITEM NO.	CONTRACT NO.	EQUIPMENT	COST	REMARKS
			CAD\$	
1	LC-SB-003	Cable Supply	64,616,770.00	Contract amount
2	LC-SB-003	Mobilization	33,510,000.00	Contract amount
3	LC-SB-003	Installation	19,913,000.00	Contract amount

Comment [PH107]: It is suggested that this commercially sensitive data is removed in all tables below— there is no opinion drawn by the IE it simply lists the contracts and costs with no real purpose other than to record them. So it adds no value

Note: No additional contracts were available for review prior to Financial Close.

*Same*

*be delete all uncompleted or which does not contribute to opinion*

SECTION 5

5.1.5 Interconnection Costs

The interconnection costs will not be available prior to Financial Close. These costs will be included in Contract CD0502 which is scheduled to be awarded in December 2013.

5.1.6 Spare Parts

Table 5-4

MUSKRAT FALLS BASE ESTIMATE

SPARE PARTS

ITEM NO.	ITEM	BASE ESTIMATE COST	REMARKS	CONTRACT COST
A.7	SPARES	\$1,500,000		
	Generator Step-up (GSU) Transformer	\$3,800,000	Spare transformer	

**Comment [PH108]:** It is suggested that this commercially sensitive data is removed in all tables below- there is no opinion drawn by the IE it simply lists the contracts and costs with no real purpose other than to record them. So it adds no value

*agree*

Table 5-5

LABRADOR TRANSMISSION ASSETS BASE ESTIMATE

SPARE PARTS

ITEM NO.	ITEM	BASE ESTIMATE COST	REMARKS	CONTRACT COST
C.4	SPARES	\$2,960,613		

Table 5-6

LABRADOR-ISLAND TRANSMISSION LINK BASE ESTIMATE

SPARE PARTS

ITEM NO.	ITEM	BASE ESTIMATE COST	REMARKS	CONTRACT COST
B.6	SPARES	\$6,724,135		
	Spare cable	\$3,000,000	3,000 m on carousel	

**Comment [PH109]:** It is suggested that this commercially sensitive data is removed in all tables below- there is no opinion drawn by the IE it simply lists the contracts and costs with no real purpose other than to record them. So it adds no value



We need - comment on reasonableness of DG3 estimates  
 Discuss factors for recent \$300 million increase

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Note: Tables 5-4, 5-5, and 5-6 contain Nalcor's partial listing of spare parts and costs. More information will be available after contract award.

5.1.7 Start-Up and Commissioning Costs

Table 5-7

MUSKRAT FALLS BASE ESTIMATE  
 START-UP AND COMMISSIONING COSTS

ITEM NO.	ITEM	BASE ESTIMATE COST	REMARKS
D.2	INTEGRATED COMMISSIONING SERVICES	\$1,950,000	No details were provided.
D.6	QUALITY SURVEILLANCE & INSPECTION/FREIGHT FORWARDING SERVICES	\$4,700,000	No details were provided.

Comment [PH110]: It is suggested that this commercially sensitive data is removed in all tables below - there is no opinion drawn by the IE it simply lists the contracts and costs with no real purpose other than to record them. So it adds no value

*Free*

Table 5-8

LABRADOR TRANSMISSION ASSETS BASE ESTIMATE  
 START-UP AND COMMISSIONING COSTS

ITEM NO.	ITEM	BASE ESTIMATE COST	REMARKS
D.2	INTEGRATED COMMISSIONING SERVICES	\$9,372,938	No details were provided.
D.6	QUALITY SURVEILLANCE & INSPECTION/FREIGHT FORWARDING SERVICES	\$1,600,000	No details were provided.

Comment [PH111]: It is suggested that this commercially sensitive data is removed in all tables below - there is no opinion drawn by the IE it simply lists the contracts and costs with no real purpose other than to record them. So it adds no value

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Table 5-9

LABRADOR-ISLAND TRANSMISSION LINK BASE ESTIMATE  
START-UP AND COMMISSIONING COSTS

ITEM NO.	ITEM	BASE ESTIMATE COST	REMARKS
D.2	INTEGRATED COMMISSIONING SERVICES	\$3,053,752	No details were provided.
D.6	QUALITY SURVEILLANCE & INSPECTION/FREIGHT FORWARDING SERVICES	\$8,100,000	No details were provided.

**Comment [PH112]:** It is suggested that this commercially sensitive data is removed in all tables below– there is no opinion drawn by the IE it simply lists the contracts and costs with no real purpose other than to record them. So it adds no value

*use a chart supplemented for cost comment and assessment*

5.1.8 Camp Costs

Table 5-10

MUSKRAT FALLS BASE ESTIMATE  
CAMP AND RELATED COSTS

ITEM NO. OR CONTRACT	ITEM	BASE ESTIMATE COST	REMARKS
A.1	ACCOMMODATIONS COMPLEX/ADMIN/UTILITIES ACCESS ROADS/CONSTRUCTION POWER	\$166,608,338	
A.6	SITE SERVICES	\$248,312,374	
D.3	PROJECT VEHICLES / HELICOPTER SUPPORT	\$5,691,750	
PD0533	TELECOM DEVICES	\$317,425	For early works
SD0560	TELECOM SERVICES	\$307,993	For early works
CD0509	CONSTRUCTION DEVICES	\$13,733,898	Post early works
CD0535	TL AND SWITCHYARD TELECOM DEVICES AND SERVICES	\$1,030,238	Construction Phase

**Comment [PH113]:** It is suggested that this commercially sensitive data is removed in all tables below– there is no opinion drawn by the IE it simply lists the contracts and costs with no real purpose other than to record them. So it adds no value

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Table 5-11

LABRADOR TRANSMISSION ASSETS BASE ESTIMATE

CAMP AND RELATED COSTS

ITEM NO. OR CONTRACT	ITEM	BASE ESTIMATE COST	REMARKS
D.3	PROJECT VEHICLES / HELICOPTER SUPPORT	\$842,250	
C.3	TELECOMMUNICATIONS	\$15,467,507	WHERE SHOULD THIS BE INCLUDED IN A TABLE?
CD0509	CONSTRUCTION TELECON DEVICES AND SERVICES	\$69,024	Post early works
CD0535	TL AND SWITCHYARD	\$3,676,493	Construction phase

**Comment [PH114]:** It is suggested that this commercially sensitive data is removed in all tables below– there is no opinion drawn by the IE it simply lists the contracts and costs with no real purpose other than to record them. So it adds no value

*Same*

Table 5-12

LABRADOR-ISLAND TRANSMISSION LINK BASE ESTIMATE

CAMP AND RELATED COSTS

ITEM NO. OR CONTRACT	ITEM	BASE ESTIMATE COST	REMARKS
D.3	PROJECT VEHICLES / HELICOPTER SUPPORT	\$10,311,000	
CD0509	CONSTRUCTION TELECON DEVICES AND SERVICES	\$69,024	Post early works
CD0535	TL AND SWITCHYARD	\$3,676,493	Construction phase

**Comment [PH115]:** It is suggested that this commercially sensitive data is removed in all tables below– there is no opinion drawn by the IE it simply lists the contracts and costs with no real purpose other than to record them. So it adds no value

Section 14.3.5 Housing Costs and Leave of Absence (LOA) of the Decision Gate 3 Basis of Estimate states:

The labor and housing strategy for the Project assumes the following:

- 1,500 person accommodations complex at Muskrat Falls which will be home to all temporary construction workers at the Muskrat Falls Site, including AC Switchyard and HVdc converter.

**SECTION 5**

- Estimate 95% of workers will be on rotational travel, with the balance of 5% from the local catchment area living out of the MF accommodations.
- Accommodations provided free-of-charge to MF contractors and EPCM staff.
- 150-person accommodations facility at Churchill Falls for construction of CF Switchyard Extension.
- Transmission and reservoir clearing contractors provide mobile camps.
- No accommodations constructed for Soldier's Pond works, Dowden's Point Electrode, and Shoal Coal Transition Compound in lieu of constructing and operating camps given to proximity to local housing. Workers paid LOA, which is considered conservative considering proximity to St. John's and normal 70 km travel free zone.

The costs for camps provided by the transmission and reservoir clearing contracts are contained within the detailed estimate for each of these work scopes. Further details on the sizing of these camps are contained within the Basis of Estimate.

*Same*

**5.1.9 Ancillary Infrastructure and Services Costs**

**Table 5-13**

**MUSKRAT FALLS BASE ESTIMATE**

**ANCILLARY INFRASTRUCTURE AND SERVICES COSTS**

ITEM NO.	ITEM	BASE ESTIMATE COST	REMARKS
D.4	INSURANCE/COMMERCIAL	14,531,242	No remarks will be provided by MWH.
D.5	LAND ACQUISITIONS AND PERMITS	\$1,115,004	
D.7	ENVIRONMENTAL & ABORIGINAL AFFAIRS	\$16,243,349	

**Comment [PHS 16]:** It is suggested that this commercially sensitive data is removed in all tables below— there is no opinion drawn by the IE it simply lists the contracts and costs with no real purpose other than to record them. So it adds no value

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Table 5-14

LABRADOR TRANSMISSION ASSETS BASE ESTIMATE  
ANCILLARY INFRASTRUCTURE AND SERVICES COSTS

ITEM NO.	ITEM	BASE ESTIMATE COST	REMARKS
D.4	INSURANCE/COMMERICAL	\$2,519,988	No remarks will be provided by MWH.
D.5	LAND ACQUISITIONS AND PERMITS	\$1,119,630	

**Comment [PH117]:** It is suggested that this commercially sensitive data is removed in all tables below– there is no opinion drawn by the IE it simply lists the contracts and costs with no real purpose other than to record them. So it adds no value

Table 5-15

LABRADOR-ISLAND TRANSMISSION LINK BASE ESTIMATE  
ANCILLARY INFRASTRUCTURE AND SERVICES COSTS

ITEM NO.	ITEM	BASE ESTIMATE COST	REMARKS
D.4	INSURANCE/COMMERICAL	\$15,674,421	No remarks will be provided by MWH.
D.5	LAND ACQUISITIONS AND PERMITS	\$18,472,787	
D.7	ENVIRONMENTAL & ABORIGINAL AFFAIRS	\$11,735,229	

**Comment [PH118]:** It is suggested that this commercially sensitive data is removed in all tables below– there is no opinion drawn by the IE it simply lists the contracts and costs with no real purpose other than to record them. So it adds no value

5.1.10 Schedule and Equipment Delivery

The IE, in responding to this requirement has assembled tables using the information furnished by Nalcor that is presented herein: Commitment Package Estimate(s) for each of the separate subprojects – see Table 5-16 (see also the Schedule of Delivery Dates for each of the subprojects).

*Same – best to use supplemental separate chart report to the extent it gives supporting or useful information*

*Canada has cost charts*

*Wants season address comment*

*discussion per Review ASD*

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The IE has included columns in Table 5-16 to reflect the actual contract price for each of these items to allow a direct comparison to be made with the estimated price. Currently, (November 2013) MWH has insufficient information to express any opinions pertaining to underruns or overruns of the estimate, or to fill in the table for the contract price except as shown.

**Comment [PH120]:** It is suggested that the IE considers the Final Forecast cost rather than individual contract prices – i.e focus on the aggregate of Project costs rather than at this lower level

Table 5-17

DELIVERY DATES

MAJOR EQUIPMENT AND SYSTEMS

**Comment [PH121]:** The purpose of this table is unclear – does it add any value to the report?/ it does not seem to support an opinion

**Muskrat Falls Generation**

**Spillway**

CH0032	Gate Anchors	2014 Jan
CH0032	Gate Guides 1	2015 Mar
CH0032	Gate 1	2015 Jun
CH0032	Stoplog Anchors	2014 Jan
CH0032	Stoplog Guides	2015 Mar
CH0032	Stoplog 1	2015 Oct

**Powerhouse Crane**

**Powerhouse Unit 1**

CH0032	Draft Tube Gate anchors	2014 Mar
CH0032	Draft Tube Gate guide	2015 Sep
CH0032	Draft Tube Gate	2016 May
CH0032	Intake Gate anchors	2014 Apr
CH0032	Intake Gate guide	2016 Mar
CH0032	Intake Gate	2016 Jun
CH0030	T/G anchors (embedded)	2014 Mar
CH0030	Stay Ring (embedded)	2016 May
	non-embedded parts not included in this list	

PH0014	Power Transformer	2015 Jul
PH0015	Isophase System	2017 Jul

**Labrador Transmission Asset**

PD0537	<b>Transformers 735kV – Churchill Falls Switch Yard</b>	2015 Jun
PD0537	<b>Transformers 315kV – Muskrat Falls Switch Yard</b>	2015 Jun

**Labrador Marshalling Yard for Transmission Line**

PD0335	Anchors – 50% to Marshalling yard	2013 Aug
PD0307	Steel Tower Foundations – 40% to Marshalling yard	2013 Sep

*Explain or delete the in to the Schedule discussion*

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5.1.12 Allowance for Contractor Bonus

Bonuses or performance incentives are only provided under the following contract: CH0007.

For Contract CH0007, the following incentives are offered:

Table 5-18

SUMMARY OF CONTRACTOR BONUS PROVISIONS

ITEM NO	PERFORMANCE GOAL	BONUS	REMARKS
1	<b>DIVERSION</b>		
1.1	IF CONTRACTOR ACHIEVES ALL OF THE MILESTONES M4, M5, M6, M7, M8, M9, AND M10 BY THE ASSOCIATED MILESTONE DATES LISTED IN THE MILESTONE SCHEDULE, NALCOR WILL PAY A BONUS OF:	\$6,000,000	
1.2	FOR EACH OF THE MILESTONES, M4, M5, M6, M7, M8, AND M9, IF CONTRACTOR ACHIEVES THE MILESTONE EARLIER THAN THE MILESTONE DATE AS LISTED IN THE MILESTONE SCHEDULE, NALCOR WILL PAY A BONUS FOR EACH DAY THAT ACHIEVEMENT IS EARLY, UP TO A MAXIMUM OF 21 DAYS. FOR EACH MILESTONE, THE BONUS SHALL BE \$50,000 PER DAY EARLY, TO A MAXIMUM OF \$1,050,000.	MAXIMUM BONUS PAYABLE, 6 MILESTONES \$6,300,000	
2	<b>POWERHOUSE INTAKE STRUCTURE</b>		

**Comment [PH123]:** This is commercially sensitive data – it is suggested that the IE comments on the suitability of the bonus provisions rather than go into details – however the value of the Table is debatable

*Agree fine detail only if leads to conclusions - perhaps separate addendum*

SECTION 5

Table 5-18 (cont'd)

SUMMARY OF CONTRACTOR BONUS PROVISIONS

ITEM NO	PERFORMANCE GOAL	BONUS	REMARKS
2.1	FOR EACH OF THE MILESTONES, M28, M36, M44, AND M52, IF CONTRACTOR ACHIEVES THE MILESTONE EARLIER THAN THE MILESTONE DATE AS LISTED IN THE MILESTONE SCHEDULE, NALCOR WILL PAY A BONUS FOR EACH DAY THAT ACHIEVEMENT IS EARLY, UP TO A MAXIMUM OF 21 DAYS. FOR EACH MILESTONE, THE BONUS SHALL BE \$50,000 PER DAY EARLY, TO A MAXIMUM OF \$1,050,000	MAXIMUM BONUS PAYABLE, 4 MILESTONES:  \$4,200,000	
	<b>TOTAL POSSIBLE BONUS FOR PERFORMANCE</b>	<b>\$16,500,000</b>	

Nalcor advised MWH that no other contracts provide for a bonus provision.

5.1.13 Highlight Sensitive and Critical Areas

Nalcor has identified several areas that they believe are the critical risk areas for the projects, namely the following: Performance Risk; Competition for Resources; and Schedule Risk. A brief discussion of each, from Nalcor's perspective, follows.

Performance risk is assumed to exist since Nalcor has used historical norms from legacy hydroelectric projects that were predicated on achieving an envisioned labor strategy and were even assumed to be more efficient in realizing productivity compared to a contemporary project where restrictive work practices exist. Nalcor is concerned that "...contractor mark-ups for unit price agreements could be excessive if there is a perception risk that the labor strategy will not materialize." The experienced front-line supervision, which is key to performance execution for the LCP has been correctly identified by Nalcor in MWH's opinion, now competes with other projects, world-wide, and could likely place a high demand on Churchill Falls.

*Please comment on this issue*

**Comment [PH124]:** This was a risk at DG3 – nalcor is actively and successfully mitigating this risk – as has been shown by the 5% increase in DG3 estimate with two thirds of the Project at a Class 1 estimate level according to AACEI RP69R-12



*informal discussion  
further  
up date for*

**SECTION 5**

Competition for resources is another concern and because the cost estimate for Muskrat Falls is based upon the labor rates given in the Hebron Agreement, and given that approximately 18 million person-hours of labor required, which includes Nalcor, Project Management Team (PMT) and services, the project demand will compete with other Western Canada projects for skilled and professional labor. Nalcor advises that in addition, the wages used in the estimates are slightly lower than used for Western Canada, but because Newfoundland has larger union premiums, it will result in lower take-home compensation for those employed in LCP assignments. In addition, the other large projects in Western Canada have completion bonuses that are planned and could have an impact on attracting qualified labor resources for LCP; Nalcor's LCP does not have the bonus.

**Comment [PH125]:** Need to add DG3 Cost estimate here – we have since negotiated the labour agreements and they are in fact highly comparable to the Western Canada rates i

Nalcor considers that there is a potential for a time or schedule risk exposure for the MF powerhouse beyond the plan they developed due to weather and the sheer magnitude of the volume of work for the powerhouse. The main concern is that the placement and curing of the 460,000 CM of powerhouse reinforced concrete over several winters will be a significant challenge for the contractor for CH0007. Additionally, the Bulk Excavation contractor (CH0006) must keep to schedule to complete its work this fall (2013) to enable the contractor for CH0007 to start its work on time.

*Review  
PH126*

**Comment [PH126]:** Suggest removing this section it is not accurate – we have negotiated and executed three labour agreements and the terms and conditions provide for enhanced productivity, good turnarounds and highly competitive wage compensation packages – this statement perhaps refers to a DG3 sentiment – which has since been superceded by actual events and mitigations

MWH agrees with Nalcor's assessment that these are certainly risks that must be considered and accounted for in the schedule and cost estimate. MWH notes that the perceived schedule risk exposure pertaining to the Bulk Excavation contractor completing on time appears to be a non-issue, as viewed during the field trip in late September 2013, assuming that the contractor's performance continues to be satisfactory. Additionally, MWH believes that with Nalcor's acceptance of the contractor's proposal to use an all-weather enclosure for powerhouse construction as proposed by the contractor for CH0007 can work to mitigate the risk of extensive delays in the powerhouse concrete construction during the winter seasons.

**Comment [PH127]:** This needs to be in the past tense – this is what nalcor was concerned about at DG3 which has since been superceded by actual events and mitigations

*Review*

With the concern that Nalcor has expressed in the uncertainties surrounding the potential cost increase due to the competition for labor and key personnel, MWH believes that this concern could have been addressed in the cost estimate and reflected in the Project Schedule by including higher more customary contingencies and a lengthened project schedule. A larger Owner's contingency could have been assumed as compared to what Nalcor used to offset the risk of overrunning the project budget and communicated timeline. In the DG2 and DG3 estimates, MWH generally follows AACEI's guidelines for projects with respect to contingencies since AACEI has a broad data base to support the contingency values and accuracy statement used for each level of the cost estimate. In addition, the schedule opinion will gain accuracy if the project's risk register is mapped to the individual line item activities and supported with an analytical uncertainty analysis using Monte Carlo simulation to discern finish date accuracy relative to desired confidence intervals.

*Keep up for*

**Comment [PH128]:** This needs to be in the past tense – this is what nalcor was concerned about at DG3 which has since been superceded by actual events and mitigations

**Comment [PH129]:** It is suggested that Nalcor has followed AACEI RP69R-12 and that the estimate accuracy is within the +10% TO -10% range and adjust the wording of this section accordingly

**SECTION 6**

The total number of personnel that Nalcor proposes to use to operate and maintain the LCP facilities under their domain is 105.5 people.

In addition to those technical personnel and specialists who will be assigned to the LCP, Nalcor plans to engage the following services from others as given in Table 6-8, immediately below.

**Table 6-8**

**CONTRACTORS AND CONSULTANTS**

SERVICE	REMARKS
SNOW CLEARING	
ROAD MAINTENANCE	
SUPPLY OF CONSUMABLES	
PEST CONTROL	
VEGETATION MANAGEMENT	
VEHICLE MAINTENANCE	
HELICOPTER SERVICES	
TRUCKING AND OTHER TRANSPORTATION	
DIVING	
ELEVATOR MAINTENANCE	
FIRE ALARM AND SUPPRESSION SYSTEMS MAINTENANCE	
CRANE AND HOIST MAINTENANCE	
PRESSURE VESSEL INSPECTIONS	
HVAC MAINTENANCE	
DAM SAFETY INSPECTIONS	IE SUGGESTS THIS CONSULTANT BE INCLUDED

*Complete or delete*

In addition to the outside services to be provided by others to Nalcor for the LCP, Nalcor has identified specialized technical support for the following equipment and systems as given in Table 6-9.

SECTION 6

Table 6-9

TECHNICAL SUPPORT

SERVICE, EQUIPMENT OR SYSTEM	REMARKS
TURBINES	
GOVERNORS	
GENERATORS	
EXCITERS	
CONVERTER STATION EQUIPMENT	
CONTROL SYSTEMS	
SWITCHGEAR	
TRANSFORMERS	
SUBMARINE CABLE	
DYKE BOARD OF CONSULTANTS	IE RECOMMENDS THAT THE BOARD OF CONSULTANTS BE MOVED TO TABLE 6-8.
ENVIRONMENTAL CONSULTANTS	THE IE RECOMMENDS THAT IT BE CONSIDERED THAT ENVIRONMENTAL CONSULTANTS BE ADDED TO THIS LIST.

*Complete  
delete or*

**6.2.5 Maintenance Provisions**

No information is currently available to review; descriptive material will not be available until 2014.

**6.2.6 Administrative Costs**

Corporate costs (general and overhead) are allocated among the three projects based on the direct O&M cost estimates. They are:

- MF 23.95 percent;
- LTA 19.28 percent; and
- LIL 56.77 percent.

ECC costs are allocated among two projects based on expected use. They are:

- LTA 25 percent; and
- LIL 75 percent.

**SECTION 7**

**PROJECT AGREEMENTS**

**Comment [PH130]:** Please refer to Gilbert Bennetts comments provided earlier to the IE

*Review if suitable*

As required by the Professional Services Agreement among Nalcor, MWH, and Government, requirements were set forth for MWH to review the following Project Agreements: Power Purchase Agreement; Interconnection Facilities Agreement; Water Management Agreement; Water Lease Agreement; and O&M Agreements. Subsequent to completion of MWH's review following the terms of this agreement, Government directed MWH to only review the technical portions of the Water Management Agreement; the Water Lease Agreement; and the O&M Agreements. The other agreements to be reviewed by MWH that were initially included in MWH's Scope of Work, at Government's request, are currently being reviewed by CBB under their agreement with Government.

**7.1 WATER MANAGEMENT AGREEMENT (WMA)**

The WMA, between Nalcor and the Churchill Falls Labrador Corporation Limited was ordered by the Board of Commissioners of Public Utilities, Newfoundland and Labrador, No. P.U. 8(2010) on March 9, 2010. The intent of the WMA is to manage and operate facilities within the Province in the most efficient way for the production, transmission, and distribution of power and energy, and be assessed and allocated and re-allocated in the manner necessary to effect such a policy. As such, the objective of the WMA

shall be the coordination of the Power generation and Energy production in the aggregate for all Production Facilities on the Churchill River to satisfy the Delivery Requirements for all Suppliers, in a manner that provides for the maximization of the long term Energy-generating potential of the Churchill River, while ensuring that the provisions of any Prior Power Contracts are not adversely affected.

The WMA requires the establishment of a Water Management Committee consisting of four members selected by the parties, and the Committee is required to appoint an Independent Coordinator which may be one or more persons.

The duties of the Independent Coordinator shall

establish short and long term Production Schedules for all Production Facilities on the Churchill River, through the coordination of production scheduling of the Suppliers based upon the use of the aggregate generating Capability, storage and transmission facilities of any supplier on the Churchill River.

The Independent Coordinator is required to determine the total power to be produced and is required to determine and prepare the production schedules, which shall specify the amount of

**SECTION 8**

Legislation that is relevant to the design and construction of the LCP includes numerous regulatory requirements that are under the jurisdiction of federal, provincial and municipal entities. The LCP adopted Nalcor's Corporate Environmental Policy and Guiding Principles and its Environmental Management System which meets the requirements of ISO 14001:2009. Listed in Table 8-1 are the acts and regulations that apply to the LCP as identified by Nalcor.

**Table 8-1  
FEDERAL, PROVINCIAL AND MUNICIPAL  
ACTS AND REGULATIONS**

AUTHORITY	ACTS AND REGULATIONS	COMMENTS
<b>FEDERAL</b>	CANADIAN ENVIRONMENTAL ASSESSMENT ACT (CEAA)	
	CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA)	
	SPECIES AT RISK ACT (SARA)	
	NAVIGABLE WATER PROTECTION ACT (NWPA)	
	TRANSPORTATION OF DANGEROUS GOODS ACT, 1992	
	OCEANS ACT	
	CANADA SHIPPING ACT	
	MIGRATORY BIRD CONVENTION ACT	
	FISHERIES ACT	
<b>PROVINCIAL</b>	DANGEROUS GOODS TRANSPORTATION ACT	
	ENDANGERED SPECIES ACT	
	FORESTRY ACT	
	HISTORIC RESOURCES ACT	
	NEWFOUNDLAND AND LABRADOR LANDS ACT	
	ENVIRONMENTAL PROTECTION ACT (EPA)	
	<ul style="list-style-type: none"> <li>• AIR POLLUTION CONTROL REGULATIONS, 2004</li> <li>• GASOLINE VOLATILITY CONTROL REGULATIONS, 2003</li> </ul>	

*delete*

SECTION 8

Table 8-1 (cont'd)

FEDERAL, PROVINCIAL AND MUNICIPAL  
ACTS AND REGULATIONS

AUTHORITY	ACTS AND REGULATIONS	COMMENTS
	<ul style="list-style-type: none"> <li>• PESTICIDES CONTROL REGULATIONS, 2003</li> </ul>	
	<ul style="list-style-type: none"> <li>• STORAGE AND HANDLING OF GASOLINE AND ASSOCIATED PRODUCTS REGULATIONS, 2003</li> </ul>	
	<ul style="list-style-type: none"> <li>• USED OIL CONTROL REGULATIONS, 2002</li> </ul>	
	<ul style="list-style-type: none"> <li>• WASTE DIVERSIONS REGULATIONS, 2005</li> </ul>	
	<ul style="list-style-type: none"> <li>• WASTE MANAGEMENT REGULATIONS, 2003</li> </ul>	
	<ul style="list-style-type: none"> <li>• WASTE MATERIAL DISPOSAL AREAS, 1996</li> </ul>	
	NALCOR ENERGY/LOWER CHURCHILL GENERATION PROJECT UNDERTAKING ORDER, ENVIRONMENTAL PROTECTION ACT	
	WILDLIFE ACT	
	WATER RESOURCES ACT	THE BULK OF THE COSTS ACCRUED FOR PERMITS PERTAINING TO SECTION 48 OF THIS ACT.
	<ul style="list-style-type: none"> <li>• WELL DRILLING REGULATIONS, 2003</li> </ul>	
	<ul style="list-style-type: none"> <li>• WATER POWER RENTAL REGULATIONS, 2003</li> </ul>	
	<ul style="list-style-type: none"> <li>• ENVIRONMENTAL CONTROL WATER AND SEWAGE REGULATIONS, 2003</li> </ul>	
	MOTORIZED SNOW VEHICLES AND ALL-TERRAIN VEHICLES REGULATIONS, 1996	

*delete*

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Table 8-1 (cont'd)

FEDERAL, PROVINCIAL AND MUNICIPAL  
ACTS AND REGULATIONS

AUTHORITY	ACTS AND REGULATIONS	COMMENTS
<p><b>MUNICIPAL</b></p>	<p>WHERE CONSTRUCTION TAKES PLACE WITHIN MUNICIPAL BOUNDARIES, LOCAL BYLAWS ARE REQUIRED TO BE COMPLIED WITH AND PERMITS OBTAINED</p>	<p>APPENDIX L CONTAINS A MAP THAT DELINEATES AREAS WHERE THE PROJECT ABUTS OR PASSES THROUGH, OR IS LOCATED WITHIN, A MUNICIPAL BOUNDARY.</p> <p>IN RESPONSE TO A QUESTION FROM THE IE ABOUT MUNICIPAL APPROVAL, NALCOR ADVISED THAT THERE ARE NO ACTIVITIES CURRENTLY PLANNED THAT REQUIRE MUNICIPAL APPROVAL. THE PROVINCIAL LEGISLATION ALLOWS THE USE OF LAND FOR PROJECT ACTIVITIES WITHIN MUNICIPALITIES. WASTE MANAGEMENT CONSULTATION IS ONGOING AND THE GOVERNMENT OF NEWFOUNDLAND AND LABRADOR IS CURRENTLY IMPLEMENTING A REGIONAL WASTE MANAGEMENT STRATEGY IN MOST JURISDICTIONS.</p>
		<p>THE IE AT THIS TIME CANNOT OPINE ON ANY PERMITS AND LICENSES THAT ARE INVOLVED WITH THE LIL SINCE THEY HAVE NOT BEEN PROVIDED TO MWH. NALCOR ADVISES THAT NO NEW PERMITS HAVE BEEN ISSUED.</p> <p>THE IE HAS BEEN ADVISED BY GOVERNMENT THAT NO OPINION NEEDS TO BE EXPRESSED BY THE IE ON ADDITIONAL PERMITS AND LICENSES.</p>

*delete*

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Nalcor reports that the total cost of obtaining permits, as reported in DG3 estimate as given in Document #: LCP-PT-ED-0000-EP-ES-0001-01, Rev. B1 is \$115,723.24. Table 23-6 of this document lists the cost of the permits and associated fees that were known at that time.

*deleted*

**8.2 REVIEW OF PERMITS AND LICENSES AND APPROVALS**

Based on our initial review of the documents furnished and those that are available on the Nalcor website for the LCP, we have summarized our findings of representative permits that currently are available for review. This summary is contained in Table 8-2, below. We realize that additional documents will be made available as they are prepared and issued for the LIL that will require further sampling to ascertain the information to form the IE's opinions.

**Table 8-2**

**PRELIMINARY FINDINGS OF REPRESENTATIVE PERMITS  
REVIEWED BY THE INDEPENDENT ENGINEER**

Document Reviewed			Reviewer's Assessment and Nalcor Comments	
Document No.	Title	Status	Complete / Incomplete	Questions / Comments
SLI-00006	DFO Project Review C7 (5+800) Caroline's Brook	Approved	Complete	Permit should reference Project- Wide Environmental Protection Plan relative to potential equipment oil leaks, operation of equipment in and near water, fueling and overnight storage of equipment, and working within 15 m of a water body.  Nalcor comments: 1. The P-WEPP has been referenced in all applications; 2. The requirements P-WEPP requirements are applicable for all construction activities regardless of the approval documentation. 3. Requirements are made aware to all contractors during the procurement process and during construction by the LCP Environment Team



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Table 8-3 (cont'd)

**CURRENT ENVIRONMENTAL STUDIES FUNDING MUSKRAT FALLS  
AND LABRADOR-ISLAND TRANSMISSION LINK**

Control Account Description	Control Account	Budget Items	2013 Budget
		Socioeconomic Effects Monitoring Program	\$25,000
	5.4.360.0000.0000.00.00	Total	\$325,000
	<b>GRAND TOTAL</b>		<b>\$12,972,224</b>

MWH had begun to review representative studies and the year-2013 budget amounts with Nalcor representatives and will review with Agency personnel to allow us to better understand the scope of the study and required budget to allow us to give an opinion on the adequacy of the budget. MWH was advised by Government that ~~no further work will need to be performed; CBB will review work pertaining to permits and licenses for Government.~~

*no further report is required*

**8.3.2 Studies to be Performed During Construction**

Nalcor has prepared a budget for the period 2012 through 2018 to cover the required environmental activities that will be occurring during the construction period and leading up to it. As a basis for the studies, Nalcor considered the following items and commitments:

- Requirements of the Environmental Assessment (EA) for MF and the LTA;
- Commitments and anticipated requirements of the LIL EA;
- Environmental requirements of the Impacts and Benefits Agreement (IBA) with the Innu Nation;
- Mitigation measures designed to maintain compliance with applicable legislation, EA commitments and requirements, and minimize effects; and
- Baseline data needed to inform the environmental effects monitoring programs required post-construction.

Nalcor has advised MWH that they have completed extensive field programs in support of the EA process. The estimates provided herein have been derived with consideration of these costs. Nalcor advised MWH that many of the projected costs should be considered conservative with sampling frequencies at the upper limit of those expected for all programs.

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**Table 8-7 (cont'd)**

**CONSTRAINTS AND PROVIDED MITIGATION**

<b>Constraint</b>	<b>Mitigation</b>
Reservoir Clearing	Reservoir clearing methodology selected to optimize technical and economic constraints as well as ensure wildlife access, navigation and aesthetics during operations.

The IE has reviewed the EA requirements and Fisheries Act Authorization and is of the opinion that the prescribed conditions will not restrict the LCP given the design will accommodate the prescribed conditions to mitigate the issues. Nalcor has advised MWH that during the LCP's execution, if issues that are being mitigated are not as effective as proposed, they will modify the mitigation methods and means to achieve the intended results.

**8.6 ESTABLISH CONTACT WITH GOVERNMENT**

The IE is currently working with Government and its representatives to address outstanding issues. Modifications to the MWH scope of work and report are ongoing to satisfy Government's needs and requirements. As noted in Section 8.3.1, MWH no longer will be required to be involved with environmental reviews.

*deleted*

**8.7 TECHNICAL AND COMMERCIAL ISSUES**

Nalcor advised MWH that only a very limited number of issues were identified during the study and design phase of the project that were of technical and commercial importance. Table 8-8 lists the two potential commercial issues related to constraints to the LCP and includes the adopted mitigation for resolution of the issue.

**Table 8-8**

**TECHNICAL AND COMMERCIAL ISSUES AND PROVIDED MITIGATION**

<b>Issue</b>	<b>Mitigation</b>
Requirement for a letter of credit for the fisheries authorization.	This requirement was waived by the Department of Fisheries and Oceans based on the public ownership of the LCP.
Requirement for the provision of minimum downstream flow during impoundment and operations.	Flow values required align with available inflows and the WMA with the Upper Churchill plant.

Based on information made available to MWH and correspondence with Nalcor, there are no known issues with respect to technical or commercial aspects of the project or with permits or licenses. Because the majority of the LCP is on Crown Land, with the exception of small lengths of HVdc transmission line, land acquisition or expropriation will mitigate any perceived issues.

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Canadian Hydrographic Service nautical chart data, and temperature and salinity measurements taken during the 1998-1999 oceanography field program.

The salinity program concluded that there is a stable and slightly brackish surface layer of 2-4 practical salinity units (PSU) in Goose Bay and Lake Melville. There is also a stable saline bottom layer (15-25 PSU) that extends throughout Goose Bay and Lake Melville. Lower Churchill River salinity was between 2-3 PSU with no variation in depth or location between Muskrat Falls and the river mouth.

With the Muskrat Falls plant in operation and the compensation flow being followed, the salt water penetrations would be pushed back to almost their original location at the river mouth as was modeled when Gull Island was modeled (Muskrat Falls was not solely modeled at this time and we believe that it was not modeled alone). The report concludes that saline intrusion is limited to the "last few kilometers of the river nearest the mouth" and "that the progress of the intrusion would be halted at this maximum extent even without the release of any compensation flow." Based on this early study, in the IE's opinion, there should be no issues with saline penetrations with the LCH in operation.

### 8.11 RESERVOIR FILLING AND MANAGEMENT STRATEGIES

The IE reviewed the Information Request, IR#JPR.28 (Information Request-Joint Review Panel) associated with the proposed reservoir filling and management strategies under which both Gull Island and the Muskrat Falls projects were reviewed. The criteria that was adopted for flow release was 30 percent of the Mean Annual Flow (MAF) which equates to about 500 cms for the minimum fixed flow during reservoir impounding. The actual minimum flow release is 534 cms. The current normal minimum flow release is 350 cms. The 500 cms has been found to be a flow that "both the fish populations within the river and the habitat would have experienced previously." Nalcor has advised the IE that once the spillway is constructed, the compensation flow (minimum flow of 350 cms) will be modified, if necessary based on monitoring results. This will allow flexibility to allow proper adjustments in the flow based on what the monitoring results reveal. It is uncertain whether the permits provide for this adjustment and it must be verified that they do allow for revisions to the prescribed and agreed to value by the regulatory agencies and concerned parties. The report determines the filling time for Muskrat Falls and the environmental effects for fish and fish habitat. The report does not lead directly to a recommendation, but lists the findings of the study, both pro and con. Based on the data presented, Alternative 4: Fall appears to be the desirable choice with a filling time of 15-19 days. Elsewhere in the documents that MWH reviewed, we found a citing of filling time of 9-11 days which equates to the spring alternative, Alternative 2, which lists 9-11 days; this alternative was apparently selected. This alternative notes that it has the least amount of adult mortality, but the young-of-year would be lost in de-watered habitat perimeters. Table 8, page 11, where this information is found does not mention the adults issues under the fish issues. We note there was apparently a trade-off made in which more data was presented to support this decision. We requested support backup data but it was never furnished. ~~Since MWH was apprised by CBB~~

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~~that Government no longer needs the IE's opinion pertaining to environmental issues, no further comments are necessary by MWH.~~

*delete  
unnecessary*

**8.12 DOCUMENTATION AND SUPPORT CONCLUSIONS**

As noted in Section 8.2, the IE has reviewed a sample of the permits that have been prepared to date and requested additional information as well as providing comments on what has been performed. This information was received from Nalcor and noted in Table 8-2.

Based on the exchange of comments to date, in the opinion of the IE, the documentation presented supports the conclusions. No further information has yet been presented on permits and studies performed for the LIL project; no opinion by the IE is necessary since Government has advised MWH that it is no longer a part of their scope of work.

For other studies (e.g., the saline study as discussed in Section 8.10), the documentation presented by Nalcor supports the conclusion that there will be no adverse effect from LCP operations.

**8.13 UNUSUAL CIRCUMSTANCES**

Unusual circumstances identified by Nalcor that are related to the Muskrat Falls/LTA and LIL include the following items summarized in Table 8-10:

Table 8-10

**UNUSUAL CIRCUMSTANCES AND PROVIDED MITIGATION**

<b>Circumstance</b>	<b>Mitigation</b>
Cultural significance of the rock knoll at Muskrat Falls.	This effect was mitigated through consultation with the Innu Nation and project design which avoided diversion tunnels through the rock knoll and minimized the disturbance in this area.
Presence of culturally significant sites such as the last shaking tent ceremony.	This effect was mitigated through consultation with the Innu Nation and funding of an Innu Elder Site visit and documentation of this event.
Presence of cultural significant plant in the river valley (Canada Yew).	This was mitigated by commitment to relocate the plants prior to impoundment.

The IE is not aware of any other significant unusual circumstances that should be identified and discussed herein.

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**NALCOR ENERGY'S PROJECT FINANCIAL PRO FORMA**

The purpose of this section is to review Nalcor's<sup>6</sup> financial planning for the LCP as represented in Nalcor financial models/pro forma and other resources, and to review projected results of operations as represented in Nalcor financial models.

**9.1 INTRODUCTION**

This section includes the following topics:

- Capital costs
- Financial planning
- Annual costs
- Revenue requirements and projections
- Implementation issues

Reviews of Nalcor's financial planning and projected results of operations are preliminary, conditioned by development of the LCP. The LCP is progressing rapidly, but at this juncture the financial information includes a number of unknown features, including the accuracy and degree of precision of estimated costs and cost contingencies.

The review of overall LCP economics has been narrowed by this constraint, and focus is placed on technical content and analysis of the Nalcor financial models.

The scope of the review covers three projects being developed by Nalcor, namely the Muskrat Falls Generation Facility (MF), Labrador Transmission Assets (LTA), and Labrador Island Link (LIL), collectively comprising the LCP. The review does not include the Maritime Link (ML) project being developed by Emera.

**9.2 CAPITAL COSTS**

A principal feature of the development of the LCP is preparation of estimates of construction and ancillary costs, collectively known as Capital Costs. Section 5 of this IER addresses in detail the LCP construction cost estimate; Section 4 addresses the construction schedule.

<sup>6</sup> Nalcor is a body corporate existing pursuant to the Energy Corporation Act being Chapter E-11.01 of the Statutes of Newfoundland and Labrador, 2007.

*Review as per extensive discussions and updated information*

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9.2.1 Cost Estimating Methodology

Construction cost estimates were prepared by Nalcor and its cost estimating consultants. The IE provided a cursory review of the cost estimating process and results. The review included communications with Nalcor representatives about the methods used to estimate allowances for contingencies at the various stages of design and cost estimate development. Industry-standard methods published by AACEI, the Project Management Institute (PMI) and proprietary methodologies were referenced.

The estimate basis was previously published in Nalcor's *Technical Report for Rating Agency Review* dated October 12, 2012, (Rec No. 200-160341-00009).

The methodology adopted by Nalcor to estimate costs is similar to methods the IE is familiar with in other projects of similar nature and size. Costs of major equipment secured through requests for proposals from manufacturers, all-inclusive lists of materials, adoption of best available technologies and market data, labor costs and productivity factors are factored into the construction cost estimates. The estimates are as reliable as can be expected at this development stage.

By taking into account multiple aspects influencing the costs, from schedule to labor, from construction plans and equipment to logistics, Nalcor developed a solid base for its estimates. The estimates are, in our opinion, comprehensive to the extent that they include escalation, prior costs, financing fees, allowance for funds used during construction (AFUDC, also called interest during construction, or IDC) and debt service reserve accounts.

Significant emphasis was placed in securing competitive proposals from manufacturers for major equipment. However, the IE has not reviewed all of the major contracts required to be reviewed by the Agreement between Nalcor and the IE. Thus, the IE is not in a position to offer an opinion as to whether all appropriate costs have been included in the capital costs assumed in the financial models. Further, without the benefit of reviewing all of the contracts, and confirming certain commercial obligations, such as performance guarantees and liquidated damage provisions, an unqualified opinion cannot yet be formed on the reasonableness and magnitude of increases in the total capital cost under certain commercial scenarios. Regarding the contracts (and one RFP) that have been reviewed by the IE, comments pertaining to warranties, guarantees and liquidated damages are noted in the tables in Section 4 of this report. Another potential impact that cannot be verified without the contract review is how potential change orders will be managed.

*We need assessment and opinion of how com.*

**Comment [PH132]:** It is suggested that this statement is revisited by the IE in light of the cost information provided and the ability to pass an opinion on the reasonableness of the cap costs included in the financial models – if the cap costs have been arrived at by best industry practice to form and estimate in accordance with AACEI Recommended Practices than the application of these in the financial model should be possible

**Comment [PH133]:** See 132

9.2.2 Capital Cost Estimates

The principal component of LCP is the funding of capital costs.

A deterministic and risk-adjusted approach, based both on direct and indirect costs, is stated to be the methodology followed to derive the cost estimate. The capital cost estimates used as

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input into the Nalcor financial models, already in AACEI Class 3 category, differ (see Table 9-1) from those shown in DG3 ("Project Sanction" granted, milestone preceding Project Execution and EPC phase) Capital Cost and Schedule Estimate Summary Report (DG3). The differences are shown in Table 9-1.

Table 9-1

DG3 COST ESTIMATES AND FINANCIAL MODEL DATA

Line	Description		MF	LTA	LIL	Total
1	DG3 Base Estimate	(1)	\$2,511,923,504	\$601,311,778	\$2,359,610,970	\$5,472,846,252
2	DG3 Growth Allowance	(1)(2)	389,234,769	90,270,587	250,137,947	729,643,303
3	Total DG3 Capital Cost Estimate	(1)	\$2,901,158,273	\$691,582,365	\$2,609,748,917	\$6,202,489,555
4	Additional Capitalized Costs	(3)	351,231,727	\$ 80,237,635	\$587,118,083	\$1,018,587,445
5	Total Costs to be Funded		\$3,252,390,000	\$771,820,000	\$3,196,867,000	\$7,221,077,000
6	Nalcor financial models total capex		\$2,901,158,288	\$691,582,485	\$2,609,748,917	\$6,202,489,690
7	Variance Nalcor model data vs. DG3	(4)	\$ (15)	\$ (120)	\$ 0	\$ (135)
8	Growth allowance components					
9	P50 contingency		\$ 226,700,000	\$ 54,800,000	\$ 86,500,000	\$ 368,000,000
10	Escalation		162,545,000	35,441,000	163,658,000	361,643,000
11	Total		\$ 389,245,000	\$ 90,241,000	\$ 250,158,000	\$ 729,643,000
12	Variance of growth allowances	(5)	\$ 10,231	\$ (29,587)	\$ 20,053	\$ (303)

Notes:

- (1) Source: "DG3 Capital Cost and Schedule Estimate Summary Report" Table 3, p. 15
- (2) DG3 Growth Allowance = Estimate Contingency + Escalation Allowance
- (3) Includes financing fees, IDC, DSRA and LRA (terms are explained in narrative)
- (4) Total DG3 Capital Cost Estimate (line 3) – Nalcor financial models capex (line 6)
- (5) DG3 Growth Allowance (line 2) – Total (line 11)

As of the date of the DG3 Report, the DG3 estimate is based on a fixed and firm design and on a level of engineering of over 50 percent (P50), making it an AACEI Class 3 estimate, with a level of accuracy within a -20 to +30 percent range.

Table 9-1 shows that the total DG3 estimates for the three projects consist of DG3 Base Estimates plus DG3 Growth Allowances. Growth allowances include P50 Estimate Contingencies plus an Escalation Allowance, as indicated in Note (2).

The table also includes the total capital cost data included in the Nalcor financial models. The overall "Difference between Nalcor (financial model) data and DG3" row (base plus allowances)

*If true reverse*

**Comment [PH134]:** AACEI RP 69R-12 which is specific to Hydropower industry states a high and low range corresponding to the level of engineering with low being 10% and high being 40% at DG3 – nalcor was at 50% engineering and therefore is at the low end of estimate accuracy which is +10% to -10%

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indicates minimal variation between the DG3 estimate and Nalcor data for the MF and LTA projects and no variation for the LIL project estimates.

It is important to note the context for the DG3 estimate, which was prepared to verify Decision Gate 2, but also to support the Project Budget determination and provide the input to the financial pro forma models. The opinion of the IE is that the estimates for MF, LTA, and LIL are generally comprehensive to the extent that they include contractors' indirect costs, particularly important in the MF case, where the value of accommodations and site support services represent a substantial percentage of the total estimate.

As indicated in Note (3), additional costs are added to the capex figures to determine the total amounts to be financed. The additional capitalized costs include financing fees, interest during construction, debt service reserve account and a liquidity reserve account.

Differences between the DG3 Growth Allowances and the Nalcor financial models total growth allowances are all less than \$30,000 (bottom line of table), which is *de minimis*.

The DG3 total cost of the three projects as shown in Table 9-1 is about \$6.202B. Given the indication earlier that the estimate figure is representative of a range of actual outcomes ranging from -20 to +30 percent of the cost estimate, expected outcomes may be in the range of \$5.0B to \$8.0B.

*Same  
Corrected  
True*

**9.2.3 Cost Escalation**

Estimated capital costs included in the DG3 estimate are costs based on 2012 values. These values were escalated in the Nalcor financial models to reflect expected cost bases in the years of construction.

**Comment [PH135]:** AACEI RP 69R-12 which is specific to Hydropower industry states a high and low range corresponding to the level of engineering with low being 10% and high being 40% at DG3 – nalcor was at 50% engineering and therefore is at the low end of estimate accuracy which is +10% to -10%- Therefore using the IE rationale the expected outcomes should be amended to read a "range of \$5.58B to \$6.82B"

The long duration of the development, construction, and operation phases of the LCP subject project costs to escalation caused by inflation and various other factors, including changes in market conditions, labor rates, productivity, etc.

As shown in Table 9-1, above, the DG3 capital cost estimates have been adjusted to reflect cost escalation and contingency allowances. The Nalcor financial models also incorporate cost escalation and contingencies as separate line items, as indicated in Table 9-1. The capital costs projected and input into the financial models also incorporate escalation in addition to contingency, which addresses separately risks of a different nature. With the assistance of external experts, Nalcor has projected cost escalation that takes into account how each sector of the economy, e.g. commodity, labor market or global economic factors, is impacted differently. In our opinion, the strategy adopted by Nalcor permits a realistic estimate of escalation. Escalation assumptions input into the MF, LTA, and LIL spreadsheets in the financial models reflect the detailed estimates prepared, and appear consistent with the trends projected for the region. Table 9-2 summarizes the annual escalation through 2018.



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Table 9-2

ANNUAL COST ESCALATION

ESCALATION	2012	2013	2014	2015	2016	2017	2018
<b>MUSKRAT FALLS</b>							
CUMMULATIVE	1.1%	2.8%	5.8%	8.3%	10.1%	10.6%	10.2%
ANNUAL	1.1%	1.7%	2.9%	2.3%	1.7%	0.5%	-0.3%
<b>LABRADOR TRANSMISSION ASSETS</b>							
CUMMULATIVE	0.6%	2.5%	5.4%	10.3%	13.0%	14.8%	
ANNUAL	0.6%	1.9%	2.8%	4.7%	2.5%	1.5%	
<b>LABRADOR ISLAND TRANSMISSION LINK</b>							
CUMMULATIVE	0.2%	2.5%	5.0%	7.8%	9.5%	14.2%	21%
ANNUAL	0.2%	2.3%	2.4%	2.7%	1.6%	4.4%	5.9%
<b>TOTAL PROJECT ESCALATION</b>							
CUMMULATIVE	0.9%	2.7%	5.3%	8.2%	9.8%	12.0%	11.9%
ANNUAL	0.9%	1.8%	2.6%	2.7%	1.5%	1.9%	

9.2.4 Contingency

Capital costs used in the Nalcor financial models include contingency as well as escalation, as shown in Table 9-1.

The level of accuracy supported by the amount of engineering performed at this stage of project development should provide an adequate margin to mitigate the risk of uncertainty still present in the absence of the larger contracts being awarded. At this point in our review, the IE is of the opinion that allowances for contingencies should be greater than the figures provided by the Nalcor cost estimating consultants and summarized in Table 9-1.

By arriving at the contingency levels used as input to the pro forma following a multi-faceted Project Risk Management Plan, and using ACEI's recommended practice, Nalcor has adopted a reasonable approach in the interim period. However, they have arrived at some figures that do not compare well to those used in other similar projects we have reviewed. The IE typically sees contingency allowances in the range of 12 percent to 18 percent at this state of project development.

The contingency allowance figures for the three projects are identified in Table 9-1, above. Table 9-3 shows the same capex and P50 contingency as Table 9-1 and includes the ratio of

*Only review if true*

**Comment [PH136]:** Perhaps the IE would revisit this statement in light of the recent data provided and that two thirds of the project costs are at a Class 1 estimate level of definition with a 5% increase over DG3

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- freight forwarding services; and
- environmental and aboriginal affairs.

In our opinion, the approach and the comprehensiveness of the technical estimates is consistent, and even better than those normally seen in projects of this type.

Financing fees, namely those for arrangement and commitment (LIL at 1.8 percent of amount financed, for example), are in the range typically seen in other similar projects.

The input to the financial models will be revised as the projects move closer to funding.

**9.2.6 Historical Capital Outlay**

Capital costs that have occurred or shall have occurred prior to project financing are included in the DG3 estimate. Some utilities capitalize such costs in their main financing packages where some form of short-term "bridge financing" may have been used to pay for the initial construction activities. Such bridge financing securities are refinanced into the main financing structures. Other utilities fund the initial construction outlay using equity funds on-hand and do not re-capitalize those expenditures into the main financing vehicles.

Nalcor's DG3 cost estimate and financial planning models include more than \$186M in pre-operating construction costs. Pre-operating construction costs are associated with the following items:

[TO BE ADDED LATER.]

*Can this be done now*

Table 9-4 summarizes these costs by project.

**Comment [PH138]:** What data is required – Nalcor believes all necessary data has been provided

**Table 9-4**

**HISTORICAL COSTS**

<b>PROJECT</b>	<b>HISTORICAL COST</b> (note 1; note 2)
Muskrat Falls	\$97,303,164
Labrador Transmission Assets	4,196,093
Labrador Island Transmission Link	85,307,165
<b>Total</b>	<b>\$186,806,422</b>

**Notes:**

Note 1: Cost data in Table 9-4 are reported at original cost.

Note 2: Historical costs are those costs associated with the projects that have occurred before Project Sanction, December 17, 2012.

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**9.2.7 Interest During Construction**

The DG3 construction cost estimate does not include costs of IDC, also called AFUDC. However, IDC is an important feature to capitalize in the financings and it is included in the Nalcor financial models. Table 9-5 summarizes the IDC values included for the three projects.

**Comment [JM139]:** Suggest MWH work with Blair Franklin to update this section based on updated financial models that have been named available through the data room.

**Table 9-5**

**FINANCING COST AND INTEREST DURING CONSTRUCTION COST**

PROJECT	IDC
MF	\$403,270,000
LTA	\$95,700,000
LIL	\$462,976,000
<b>TOTALS</b>	<b>\$961,946,000</b>

*Please do*

**9.2.8 Renewals and Replacements**

Nalcor advised the IE that the financial planning for the projects does not specifically include costs for renewals and replacements in the capital or annual cost estimates. Their opinion is that with proper design and installation and with regular and prudent maintenance following manufacturers' recommended scheduled maintenance there should be no need to replace the equipment since its useful life will exceed the bond repayment period.

The IE is of the opinion, based on experience that funds should be provided for major replacements in the 25-30 year period with minor replacement after 10-15 years of service.

If major repairs/replacements become necessary, Nalcor will have access to Provincial equity funding to be repaid subsequently. This program is consistent with the manner of utilities that use the "Cash Needs" method of revenue requirements. The three step solution: (1) problem happens or will happen; (2) problem solution is funded; and (3) the funding is repaid, is optimized if the utility has a capital reserve or other liquidity feature to minimize the time taken in the funding step.

Although Renewals and Replacements are not included in either DG3 or the Nalcor financial models, Nalcor has included in its Asset Management Philosophy report the R/R data included here in Table 9-6.

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Table 9-7  
**CAPITAL COST ESTIMATE SUMMARY**  
**DECISION GATE 3 (DG3)**  
 (not including Growth Allowances)

<b>MUSKRAT FALLS</b>	
Accommodation Complex / Admin / Utilities / Access Roads/ Construction Power	\$166,608,338
Bulk Excavation & Main Civil Works for Intake & Powerhouse, Spillway & Transition dams	\$823,064,224
North Spur/North and South Dams/Reservoir Clearing/Habitat Compensation works	\$336,605,489
T&G's/Powerhouse Mechanical and Electrical Auxiliaries/Hydro Mechanical Equipment/GSUs/Collector Lines	\$484,012,733
Telecommunications	\$17,298,550
Site Services	\$248,312,374
Spares	\$1,500,000
<b>Sub-Total</b>	<b>\$2,077,401,708</b>
Project Management	\$292,987,287
Integrated Commissioning Services	\$1,950,000
Project Vehicles / Helicopter Support	\$5,691,750
Insurance / Commercial	\$14,531,242
Land Acquisition and Permits	\$1,115,004
Quality Surveillance & Inspection / Freight Forwarding Services	\$4,700,000
Environmental & Aboriginal Affairs	\$16,243,349
<b>Sub-Total</b>	<b>\$337,218,632</b>
Historical Cost	\$97,303,164
<b>TOTAL, MF</b>	<b>\$2,511,923,504</b>
<b>LABRADOR TRANSMISSION ASSETS</b>	
OL Transmission CF-MF	\$288,254,205
Switchyards	\$192,087,214
Telecommunications	\$15,467,507
Spares	\$2,960,613
<b>Sub-Total</b>	<b>\$498,769,539</b>
Project Management	\$82,891,340
Integrated Commissioning Services	\$9,372,938
Project Vehicles / Helicopter Support	\$842,250
Insurance / Commercial	\$2,519,988
Land Acquisition and Permits	\$1,119,630

**Comment [PH141]:** This is commercially sensitive and could be rolled up into an aggregate level to avoid this problem- is any value added by breaking the costs out into this level of detail.?

*Use a separate chart of detail would assist Canada but want some where*

**SECTION 9**

"...determine the total power to be produced and is required to determine and prepare the production schedules which shall specify the amount of power to be produced by each supplier's production facilities in accordance with the provisions of the Agreement. Nalcor and Churchill Falls (Labrador) Corporation Limited are the "Suppliers of power."

MWH has been advised that the Province of Quebec has introduced a legal challenge to the LCP. MWH are not lawyers, and therefore, are not qualified to opine on the merits or legal issues to be raised in the Quebec challenge or to estimate the probabilities of potential outcomes. MWH recognizes the Quebec challenge as a project risk, but without further information MWH cannot form professional opinions pertaining to technical issues associated with loss of power that would be associated with the Quebec lawsuit should Quebec prevail. Such information is currently being developed by Nalcor at the request of Government and may be available before Financial Close.

*delete legal*

MWH currently does not see where a dispatch constraint could occur, in our opinion, with the WMA in place and dutifully promulgated, and with the information the IE has been provided.

We requested further information from Nalcor pertaining to any dispatch constraints and where and why they may occur, since this issue was studied and risk assessments conducted. Nalcor reports that no constraints were identified.

**9.6.2 Project Performance and Reliability**

Based on the number of contracts and the RFP for CH0007 that we have been able to review to date, it is still too early to forecast directly from actual results of LCP testing and commissioning of systems, and how each of the turbine-generating units and the systems actually will perform over time. However, based on other projects of similar complexity and size and their performance and reliability history which we are aware of, we have no reason to question at this time that the LCP, as presently configured and provided with the proposed adequate O&M and renewals and replacement budgets, will produce satisfactory performance and will be a reliable and dependable resource.

**SECTION 10**

**CONCLUSIONS AND INDEPENDENT ENGINEER'S  
OPINIONS AND RECOMMENDATIONS**

The following section lists our principal conclusions and recommendations as of November 13, 2013, which are based on a site visit conducted during the week of September 23, 2013 and data, RFPs, and contracts furnished by Nalcor, the Borrower for the following three of the four projects of the LCP: MFGS; LTAP; and LIL.

**10.1 CONCLUSIONS AND INDEPENDENT ENGINEER OPINIONS**

10.1.1 In our opinion, and based on past experience, the Integrated Project Team consisting of SNC-L (the borrower's Engineer) and Nalcor (the borrower) are qualified to design, contract, manage, commission, operate and maintain the three projects currently under design and construction for the LCP. Furthermore, in our opinion, an amendment to the SNC-L Agreement with Nalcor should be issued to commemorate the understandings under which the Integrated Project Team is working and to clarify, where necessary, understandings with respect to responsibilities and duties.

10.1.2 The Muskrat Falls Generating site is a relatively easy site to develop from a technical and logistical point of view. The terrain is relatively flat with nearby access to a principal road in Labrador. For both the temporary structures and the permanent facilities, sufficient space is available for the project development.

10.1.3 The North Spur area has been geologically explored and studied in the past by several engineering organizations as well as during the most recent studies conducted by the Integrated Project Team to develop a satisfactory solution to reduce seepage and provide stabilization remediation procedures that should provide a useful life beyond the design life of 50-years, in our opinion. With the existing monitoring program currently being updated of seepage conditions, this update will provide a means to continue to monitor the performance of the area before, during and after pool raise. [ON HOLD PENDING ANSWERS TO QUESTIONS PREVIOUSLY SUBMITTED; ADDITIONAL QUESTIONS WILL BE FORMULATED FOR NALCOR TO RESPOND TO ONCE THE SEED AND IDRIS REPORT IS AVAILABLE FOR REVIEW.]

10.1.4 Hydrological risk in terms of generation capability is well understood as documented in the studies conducted for the project. With average annual energy of 4.93 TWH/year established by using long-term flow records, the power purchase agreement with Emera allowed Emera to claim 20 percent of the power for 35-years with the commitment to build the transmission system to Nova Scotia, and Nalcor and their special purpose companies using the rest of the power in the Labrador and Newfoundland system. Long-term generation is assured

*I do so*  
*true*

**Comment [PH144]:** This section should be rewritten to reflect the positive opinion provided by the IE's expert John 22 Nov 2013

SECTION 10

by the WMA that provides storage at Churchill Falls and a means of operating the Churchill River to near-optimize the power production.

10.1.5 Hydrological risk in terms of construction diversion flows at Muskrat Falls have been satisfactorily studied and cofferdam heights and means of diversion have been designed to account for ice jams as well as flood flows with a return period of 20-years; 40-years for the ice jam events. Mitigation of flooding event risks beyond these normally assumed return-period events will be the responsibility of Nalcor Energy.

10.1.6 Construction safety requires contractors to supply their Health, Safety and Security Plans as part of their required submittals. They must follow the generally-high standards established by Nalcor Energy which follows a 'safety first' philosophy. We understand that Nalcor intends to strictly monitor these plans to ensure these requirements are met.

10.1.7 The risk of problems associated with transportation are mitigated to some extent by Nalcor providing storage facilities at two locations as well as providing transportation to the sites of the projects. Risk associated with transportation of materials, equipment, and supplies to these facilities is the responsibility of the contractors. Risk still exists using overseas suppliers, however, these shipments will be closely monitored as required by Nalcor's overarching transportation plan by the Integrated Project Team.

10.1.8 RFPs and Contracts reviewed to date are generally satisfactorily written and similar with respect to terms and conditions imposed on the suppliers and contractors. The contracts convey to the parties the clear responsibilities of the contractor as well as Nalcor, with no ambiguities detectable by the IE in the documents we have reviewed to date. Nalcor has established a system wherein they weigh the bid amount with the security provided (performance bond amount, letters of credit, and parent-company guarantees) to arrive at a satisfactory level of risk and to keep the price as low as practical. We normally do not see this level of balancing all factors considering risk to reduce cost on other projects we are aware of, but find the methodology employed by Nalcor to be satisfactory for the projects.

For several of the contracts that involve contractor procurement of equipment, supplies, and materials as well as the necessity to engage subcontractors, we note Nalcor has not required a Labour and Material Bond; MWH believes that further consideration of this protection be included in the contracts.

10.1.9 Based on the limited number of large contracts we have reviewed, it is our opinion that the DG3 cost estimate was robustly prepared, following the general procedures outlined in the AACEI for a Class 3 estimate. We differ from Nalcor's opinion as to the level of accuracy of the estimate in that we strictly follow the recommendations of AACEI for this level of estimate wherein they allow a -20% to a + 30% allowance for estimating accuracy.

10.1.10 Construction to date pertaining to the contracts that MWH is required to review is limited to the Bulk Excavation contract, CH0006, that currently is on, or ahead of, schedule and at

Comment [PH145]: Nalcor has considered the most appropriate security measures for all contracts and will continue to do so

Comment [PH146]: AACEI RP 69R-12 which is specific to Hydropower industry states a high and low range corresponding to the level of engineering with low being 10% and high being 40% at DG3 - nalcor was at 50% engineering and therefore is at the low end of estimate accuracy which is +10% to -10%

Comment [PH147]:

*of trees removed* ↑

SECTION 10

budget levels. We are not aware of any change orders issued to this contract that Nalcor has apprised MWH of that would increase the cost above the contract amount. MWH has recently been made aware by Nalcor that an Acceleration Claim is pending and is under discussion between the parties.

We have reviewed the Integrated Project Schedule prepared by Nalcor and find that it is generally complete as far as listing contracts, but it is a simplistic Gantt chart without activity linking, critical path(s), float time, etc., and is not suitable to the level of detail we require and had expected to view to allow us to form opinions. Until we view more large contracts under construction and obtain the P6 classic CPM view of the project schedule, we cannot express an opinion as to the likelihood of the contracts being completed as scheduled.

10.2 RECOMMENDATIONS

1. Nalcor should consider including in some of the contracts the requirement for a Labour and Materials Bond (LMB), where extensive equipment will be purchased by the contractor or the use of anticipated subcontractors and suppliers is required by the contractor. A suitable analysis to support this decision to require a LMB for Nalcor's protection and overall project schedule and cost adherence should be performed to guide the decision to support the decision.
2. Within 120 days of Financial Close, Nalcor should furnish to the IE a complete P6 CPM schedule that includes the extensive task list (over 6000 tasks) to allow the IE to review the critical path schedule and float. The purpose of this review would be to independently verify schedule accuracy and determine if the currently targeted completion date is achievable.
3. Within 60 days of Financial Close, Nalcor should furnish to the IE for review the complete analysis of the North Spur including the laboratory test reports that determine the strength of the soils under the loadings that it will sustain during the life of the project and that address the questions contained in Section 2 of the IE's report that have not yet been addressed. Additionally, the IE would expect to be furnished the technical reports of Dr. Seed and Dr. Idriss as noted in Section 2 when these reports become available.
4. In accordance with the philosophy pertaining to the owner-prepared cost estimate and following AACEI, within 10 days of Financial Close, the Nalcor should furnish to the IE the AACEI Class 2 cost estimate that is required for the financing for review and comment. Within 600 days of Financial Close, an AACEI Class 1 estimate should be furnished to the IE for a mid-point check on the cost estimate.

*Page deleted*



**Comment [PH148]:** It is suggested that ongoing claims and disputes which are at a very early stage are not included in the report it could effect any eventual legal action we may pursue

*Review for discussion schedule for*

**Comment [PH149]:** MWH have extensive experience in the construction of hydropower projects and it is suggested by nalcor that the overall sequence and duration of the main activities at Muskrat falls are reasonable and that MWH should be in a position to comment if the overall period of engineering, procurement Construction, commissioning and startup from Project Sanction of Dec 2012 to April 2018 is reasonable. Nalcor has provided the execution strategy schedule and activity durations and interdependencies can be seen in this level of detail. Nalcor will explain the critical path in a telecom to alleviate any remaining concerns

**Comment [PH150]:** It is unclear to nalcor if the IE is required to provide Recommendations

**Comment [PH151]:** Nalcor has considered the most appropriate security measures for all contracts and will continue to do so

**Comment [PH152]:** If Canada deem it necessary nalcor will provide the approved Contractor schedule as and when they are made available

*update*

**Comment [PH153]:** It is suggested this is no longer required

*update all*

**Comment [PH154]:** The Forecast Cost to Complete is in fact in between a Class 2 and Class 1 estimate and will be provided and updated monthly in the Construction report so it is suggested that this statement is not required



Page 87: [1] Deleted		Lance Clarke		22/11/2013 4:25:00 PM
ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
1	QUALIFICATIONS OF CONTRACTOR	THE RFP WAS FURNISHED TO MWH. NO CONTRACT HAS BEEN SIGNED; AWARD WAS TO OCCUR JUNE 23, 2013.[NC1]	WHY HAS THE CONTRACT NOT BEEN MADE AVAILABLE TO MWH?	NO OPINION CAN[LC2] PRESENTLY BE GIVEN BY MWH.
2	QUALIFICATIONS OF SUBCONTRACTORS	NOT KNOWN	MWH REQUIRES CONTRACT FOR REVIEW.	
3	COMPLETENESS	THE RFP APPEARS TO BE GENERALLY COMPLETE.	PLEASE FURNISH CONTRACT.	SATISFACTORY FOR THE RFP
4	CONTRACTS PERFORMED INDEPENDENTLY		PLEASE FURNISH CONTRACT.	
5	CONTRACTOR'S AND OWNER'S RESPONSIBILITIES	THE RESPONSIBILITIES APPEAR TO BE ADEQUATELY DEFINED IN THE RFP	PLEASE FURNISH CONTRACT.	SATISFACTORY FOR THE RFP
6	GUARANTEES, WARRANTIES		PLEASE FURNISH CONTRACT.	
7	CHANGE ORDERS	EXHIBIT 3- APPENDIX A, CHANGE REQUEST. CONDITIONS SEEM TO BE COMPLETE AS GIVEN IN THE RFP	PLEASE FURNISH CONTRACT.	SATISFACTORY FOR THE RFP

Table 4-9 (cont'd)

*OK to delete charts*