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Subject: LOWER CHURCHILL: DRAFT OF INDEPENDENT ENGINEER"S REPORT
Date: Friday, July 12, 2013 3:05:42 PM
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LOWER CHURCHILL PROJECT INDEPENDENT ENGINEER"S REPORT DRAFT JUL 12, 2013.pdf
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James and Leigh Anne,

Attached please find the Draft Independent Engineer’s Report for the Lower Churchill Project.

Regards,

Chiemi B. Mitsutama (“Blaise”)

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P ***Please consider the environment before printing this e-mail.***

[IMAGE]

INDEPENDENT ENGINEER'S REPORT
LOWER CHURCHILL PROJECT

DRAFT- JULY 12, 2013

Prepared for:

Nalcor Energy

Prepared by:

MWH Americas, Inc.
2353 130th Ave SE, Suite 200
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Table of Contents

LIST OF TABLES

LIST OF FIGURES

APPENDICES

SECTION 1

MUSKRAT FALLS GENERATING STATION AND LABRADOR TRANSMISSION ASSETS

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SECTION 1

MUSKRAT FALLS GENERATING STATION AND LABRADOR TRANSMISSION ASSETS

1.1 PROJECT DATA AND COMMUNICATIONS PROTOCOLS

The Lower Churchill Project ("LCP") is a proposed large, important energy generating and transmission facility of regional and national significance to Newfoundland and Labrador ("NL"), Nova Scotia ("NS") and the federal government of Canada. The project will have a capacity to generate and transmit more than 824 MW of electricity at an initial capital cost of approximately $6.2B.

The purpose of this report is to provide independent engineer's opinions to support the financing of the LCP provided using long term bonds that will be guaranteed by Canada's best-in-the-world credit worthiness, rated AAA. To that end the 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 properly operate and maintain the Project facilities.

Nalcor Energy selected MWH CANADA, INC. ("MWH") to prepare this Engineer's Report and additional services pertaining to construction monitoring and monitoring services after the Project has been placed in commercial operation. MWH has no financial ties to Nalcor aside from the agreement to prepare this report. MWH has no fiduciary relationship with other firms involved with the LC project or interest in the sale of bonds to finance the LCP.

1.2 PROJECT DATA AND COMMUNICATIONS PROTOCOLS

1.2.1 Contacts

A kickoff meeting was held on September 13 and 14, 2012, in St. John's, Newfoundland. Nalcor Energy selected Mr. Lance Clarke, Project Commercial Manager, Lower Churchill Project to be MWH's principal contact during the duration of the Independent Engineer's review and preparation of the Independent Engineer's Report. Mr. James Meaney, CFA, General Manager Finance, was also designated as another principal contact. Additionally, Mr. Ross Beckwith, Nalcor's Commercial Coordinator, is also to be a contract for discussions. Mr. Peter Madden is to be the day-to-day contact for MWH. For all issues pertaining to the Agreement between Nalcor and MWH, Mr. Nicholas Argirov, VP, would be the principal Nalcor contact. Rey Hokenson is MWH's day-to-day contact and is the project manager ("PM") for this assignment. The Agreement between Nalcor Energy and MWH was signed on August 27, 2012.

1.2.2 Documents

On September 7, MWH transmitted a list of documents to be provided by Nalcor Energy for the Independent Engineer's review (Appendix E) 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 CD or DVD discs of the data for further copies to be made by MWH for each of our principal offices in Vancouver, BC and Bellevue, WA. 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 system. The Aconex system greatly facilitated information gathering.

1.2.3 Schedule

Appendix P contains the milestone schedule that the Independent Engineer is currently following to process the work. This same schedule was submitted to Nalcor Energy by MWH in the Execution Plan prepared by MWH and has been tailored to generally fit the Project Milestone schedule (Appendix N) for the preparation and award of the numerous contracts that will be prepared by Nalcor and the EPCM Consultant.

Contractual responsibilities pertaining to reporting, wherein MWH would be reporting directly to the Government of Canada's representatives rather than Nalcor's, 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.

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 electric demand was growing by more than ten percent per year. The plan was to construct the first project, Churchill Falls, on the Churchill River upstream of the Lower Churchill Project for supplying power to the Newfoundland Island in 1972, and then to construct the Lower Churchill Project 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% of the power available from the Churchill River, with the remaining 35% 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.

The first phase of the Lower Churchill Project (LCP) is to construct a new dam and power station in Labrador at Muskrat Falls; a new 350 kV HVdc transmission line between the Muskrat

Falls' switchyard and Soldiers Pond converter station located West of St. John's, Newfoundland, which includes a sub-sea crossing of the Strait of Belle Isle. Additionally, the Muskrat Falls switchyard will be connected to the Churchill Falls switchyard through an extension of the Churchill Falls yard. A 345 kV HVAC line will be used. The subsections following this general description more fully describe the project features.

The Phase I development also provides for the construction by Emera of a new maritime transmission link between Newfoundland and Nova Scotia employing a 180 km-long subsea cable system that allows LCP power to be used in Nova Scotia. This Emera project is not intended to be included in this review by the Independent Engineer; it is covered in a separate IE Report. The second phase of the LCP is construction of Gull Island.

1.3.1 Muskrat Falls Generating Station (MFGS)

The Muskrat Falls Generating Station consists of several primary components: a Powerhouse with an integral Intake structure; a vertical-gated auxiliary Spillway; an overflow service Spillway fitted to the North RCC dam; a South rock-fill Embankment Dam; a project Switchyard; and protective works located in the left abutment (North Spur) to control seepage. The project will be serviced by a new 21 km access road that connects the project to Highway 510, south of the Churchill River bridge crossing and by a road that connects the North abutment area to Highway 500, Trans-Labrador Highway, to Churchill Falls. The Powerhouse substructure is reinforced concrete with a structural steel superstructure. The reinforced concrete Intake structure, integral with the powerhouse, will be fitted with three service gates and three bulkhead gates, located upstream of the service gates, for each of the four intake bays. The installed capacity of the Powerhouse will be 824 MW with each unit rated at 229 MVA with a 0.9 Power Factor at 39 meters net head.

The Spillway consists of two components: (1) a reinforced concrete five-bay structure, fitted with 10.5-meter-wide by 22-meter-high vertical lift gates, and (2) a 425-meter-long, ogee-shaped overflow roller compacted concrete (RCC) spillway. The spillway sections acting in combination can pass the Probable Maximum Flood of 25,060 CMS at EL 45.1. The overflow Spillway is normally used to pass flows that exceed the Powerhouse hydraulic capacity of 2,660 CMS.

The protective works located in the left abutment include a slurry wall constructed to bedrock to control seepage from the reservoir and local groundwater and include shoreline bank protection to prevent erosion from ice heave and abrasion, and wind-induced waves.

The Muskrat Falls Powerhouse and Switchyard will be connected to the Trans Labrador Highway by an access road located on the South side of the Churchill River.

1.3.2 Labrador Transmission Assets Project (LTAP)

Near the Powerhouse, the Muskrat Falls Switchyard will be constructed to transmit power via two 345 kV HVac overland transmission lines to the 320 kV HVdc Converter Station. Four feeder lines will be used; two feeders will be connected to the converter transformers and two feeders will connect to the filters. These lines are part of the Labrador Transmission Assets project which is 1,100 km long. Each of these lines is to have a capacity of 900 MW.

The Muskrat Falls Switchyard will also connect to the Churchill Falls switchyard that will be extended to accommodate the interconnection from Muskrat Falls and to Gull Island. Two 345 kV HVac overhead transmission lines will be used for this line. Provisions will be made for Gull Island interconnection which are included for later use. One of the lines will have one OHGW (Over Head Ground Wire) and one OPGW (Optical Ground Wire), and the second line will have two OHGWs.

The Churchill Falls Switchyard will extend the existing 735 KV bus with bus coupling circuit breakers. Two 833 MVA, 735-345 kV auto-transformers will be used with tertiary windings rated at 13.8 kV to supply the substation service loads. This extension will be located approximately 500 meters East of the existing Churchill Falls switchyard and will include space for a future 735 kV and 345 kV line feeders. This complex will also include two 735 kV transmission lines, each 500 meters in length to join the existing Churchill Falls Switchyard to the Churchill Falls Switchyard extension.

Twin 350 kV HVdc lines between Muskrat Falls and the SOBI will be used. Again, each line will have the capacity of 900 MW that will allow the Muskrat Fall power station entire plant load to be transmitted on one line. The lines will be carried on lattice steel towers with self-supported angles and dead-ends and with guyed suspension towers. Each of the lines will have overhead lightning protection with one being an OPGW for the operations telecommunication system. Two electrode lines each 380 km long between Muskrat Falls and the electrode station will be employed and will also be mounted on the transmission towers. The Muskrat Falls Powerhouse step-up transformers will be connected to the switchyard using overhead lines supported on steel lattice towers.

1.3.3 Labrador-Island Transmission Link Project (LITL)

This project consists of a converter station located at Muskrat Falls, a transmission link from Muskrat Falls Switchyard to the Strait of Belle Isle (SOBI), 380 km long, a transition station at the Labrador side of the SOBI from the transmission line to a submarine cable, a submarine cable under the SOBI, a transition station on the Newfoundland side of the SOBI from the submarine cable to an overhead transmission line, and a transmission line from the SOBI to Soldiers Pond and a converter terminal station located at Soldiers Pond, West of St. John’s. The transition station (compound) at Shoal Cove will include an enclosed building and provision for the submarine cable termination system and associated switching equipment. Also included will be control, protection, and monitoring and communication equipment within the building.

The converter stations at Muskrat Falls and Soldiers Pond will be designed as an automated, remotely controlled facility. The direct current system will be a point-to-point +/- 350 kV LCC bi-pole from Muskrat Falls to Soldiers Pond. During a converter pole outage, the HVdc system will immediately and automatically reconfigure to operate as a monopole, with a metallic return without interruption to the service using sea electrodes installed at Conception Bay.

This project also includes a 350 kV HVdc, 900 MW submarine cable system that will extend from Forteau Point, Labrador, to Shoal Cove, Newfoundland across the SOBI. The offshore component will consist of three submarine HVdc MI cables; one of the cables will be used as a spare. Each of the cables will be installed on the seafloor with approximately 150 meters of separation and all within a 500 meter wide by 34 Km long corridor. Each of the cables will carry 450 MW with a rated capacity of 100 percent overload for 10 minutes and 50% overload for continuous operation. The water depth along the subsea transmission corridor varies between 60 meters to 120 meters. The cables will be protected along the length will a rock berm and the route was selected to avoid ice berg contact. The undersea cables will extend through steel pipe encasements in bored holes to protect the cables in the heavy ice and surf zones. The cables will be trenched underground about 2 meters depth to two transition compounds that will be located approximately 1 km form the land entry locations. The transition compounds contain the cable terminations, switch gear and transition to the overhead line transmission system.

A shoreline pond electrode system will be located on the Labrador side of the SOBI. An electrode system pond will be located on the East side of Conception Bay near Soldiers Pond; the electrode line is 10 km long from Soldiers Pond to Conception Bay. The electrode ponds allow the transmission system to operate as a monopole system if one of the conductors is not functioning.

The Switchyard at Soldiers Pond will inter-connect eight 230 kV HVac transmission lines (four existing transmission lines looped in), and the synchronous condensers and the Soldiers Pond Converter Station. The upgrade at Soldiers Pond will include three new 175 MVAR high-inertia synchronous condensers, 230 kV and 138 kV circuit breaker replacements, and replacement of conductors and reconstruction of eight transmission lines entering and leaving the switchyard.

Information pertaining to the Maritime Link Project to be constructed and financed by Emera will be found in a separate report prepared for the Government of Canada 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 has been postponed until July/August 2013. This postponement would also give representatives of the Government of Canada 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.

Currently there are only two major construction contracts under way, one of them is nearly completed, the contract dealing with the southerly access road. Of about 21 km of access road to be built, MWH understands that it is nearly finished. Additionally, the Bulk Excavation Contract has been initiated, but no quantitative progress is known on this project since only three Daily Site Reports recording progress in early June 2013 were furnished that do not contain quantitative information. The first scheduled blast occurred during early February 2013.

Section 2 of this IE Report will contain observations made during the site visit to be conducted in July/August 2013. Subsequent discussions between Nalcor Energy'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 the Government of Canada.

SECTION 2

SITE VISIT AND OFFICE INTERVIEWS

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SECTION 2

SITE VISIT AND OFFICE INTERVIEWS

2.1 SITE VISIT

As noted in Section 1, paragraph 3, MWH did not visit the site because of the late start due to the delay in Project sanctioning, and lack of work that would be beneficial for the Independent Engineer to view. MWH has tentatively agreed with Nalcor Energy to schedule a site visit in July or August 2013 where we believe that work will be in full progress on the bulk excavation and where the construction camp will also be available to view. Our Agreement with Nalcor requires only one site visit, but during one of our conversations it was suggested by the IE that a couple of more 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.

2.2 OFFICE INTERVIEWS

The IE has been forwarding questions to Nalcor that pertain to questions contained in the RFPs and the Contract documents that are being reviewed by MWH. MWH has not had direct contact with any of the contractors or suppliers for the project, but looks forward to holding brief discussions with them during the site visit and also during a meeting (s) in St. John’s to the extent provided in our Agreement with Nalcor.

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SECTION 3

PROJECT DESIGN AND PROJECTED PERFORMANCE

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SECTION 3

PROJECT DESIGN AND PROJECTED PERFORMANCE

3.1 PROJECTED PROJECT PERFORMANCE

In the following paragraphs of this section we have included our comments based on the review of the information furnished MWH that summarize our observations to date (March 2013). Additional information has been requested of Nalcor Energy to allow us to complete our review and to allow us to form our final opinions pertaining to each of the subjects included herein. For ease of reference we have highlighted areas still requiring information to be presented.

3.2 PROJECT HYDROLOGY

3.2.1 Spillway Design Flood

For high hazard potential critical structures where loss of life and substantial damage would occur if a dam breach occurred during a flood event or a sunny day event, international standards and those of Canada required that the Spillway be designed to pass the probable maximum flood (PMF). This flood is derived using stochastic methods that estimate the probable maximum precipitation (PMP) in the watershed and then apply this precipitation to the watershed to derive the runoff associated with the PMF. Consultants involved in this effort found that for the Muskrat Falls Project site, the PMF is 29,750 cms. This flood was used to size the capacity of the gated spillway (16,750 cms) and the RCC dam (13,300 cms). Reservoir flood routing studies using the reservoir volume curve and the hydrograph for the PMF determined the resulting maximum flood elevation of the reservoir during a PMF event to be El. 45.1 msl. From this elevation, the deck elevation of the power station was established, considering freeboard requirements.

The IE has not reviewed these studies to give an opinion up to this time (July 2013) but will after receiving the necessary support studies from Nalcor Energy.

3.2.2 Ice Effect on Tailwater Elevation

Ice effects water elevation since water is forced to flow beneath it which results in higher frictional resistance than that generated by an open water surface. A higher water surface elevation for a given flow occurs to overcome the additional resistance. Nalcor performed studies that indicate that ice can expect to form at the site during the months from November to May. The studies indicate, for example, that for a plant discharge of 2,500 cms, the tailwater is 2.0 meters higher when ice cover is present than during the ice free period. This ice-cover condition affects the rated head on the unit by about 5 percent, and, therefore, it must be taken into consideration when computing the power output of the hydroelectric plant. Two tailwater curves were derived for open water and for ice cover which were used in the energy generation model (Vista Decision Support System—Vista DSS^TM) where the model employs an adjustment factor to shift the curves to accommodate the conditions that are being modeled.

3.2.3 Power Generation

Two models have been used during the derivation studies associated with determining the power generation from the Muskrat Falls (MF) power plant. Both models used a monthly time resolution (time-step); the Vista DSS™ model employs different software and is the preferred model to use for the Lower Churchill project; it uses a more detailed time resolution and a much more detailed representation of the system. The Water Management Agreement for the Churchill River prescribes that the operation of the Churchill Falls (CF) project and the Lower Churchill project must be coordinated as prescribed by the Independent River Operator and includes provisions for banking energy in the seasonal reservoirs at Churchill Falls. The Vista DSS is reported to accommodate these requirements since it is able to route the release Churchill Falls flows that arrive at Muskrat Falls about three days later. MWH has not independently verified these results, but other commercially available software, such as the suite of programs available from the US Army Corps of Engineers would allow comparisons to be made if there is a requirement to do so.

The firm energy capability for the Project is defined as "the maximum annual energy that can be supported by Muskrat Falls during the critical (dry) hydrologic sequence, assuming coordinated operations between the MF and the CF(L) Co's facilities, as specified in the WMA and while meeting all of CF(L)Co's obligations from prior agreements." We note that for each system, the definition of firm energy is specifically defined for it. International standards sometimes require an assessment that looks at the energy that is available for 95 percent of the time or 98% of the time, for example. In the analysis the critical period was determined and for this period, detailed chronologic simulation was performed to determine the Firm Energy capability of MF. The load demand on the Churchill Falls plant was determined based on contractual obligations and by considering the full range of hydrologic variability according to the reports furnished MWH. Excess sales opportunities were also determined, as according to information furnished us, and both load and excess sales were inputted to the firm energy and Average Annual Energy (AAE) analyses.

The average annual energy for the Project is defined as:

> . . . the increase in the average annual generation that can be expected from the Churchill River with the addition of Muskrat Falls, again reflecting the benefits of coordinated operations with the CF(L)Co facilities. The average annual energy is estimated by simulating operations over long periods (of time, sic) and the range of hydrologic conditions, as defined by the available hydrology.

The average annual energy was determined by performing a series of long-term analysis, using a range of Muskrat Falls load demands which were higher and lower than the firm energy demands. The simulations used 30-years of record; the simulations were reported to be repeated '54 times with a different hydrological sequence each time'. The period of hydrologic record was from 1957 to 2010 where data was used (a period of 53 years). Normally, we advise that the period of record must be at least 30 to 35 years of record before these studies are meaningful, and normally like to use 50-years of record if it is available in determining average annual energy.

The energy runs also made use of computed headloss equations, relating the losses to the flow squared, and to the guaranteed efficiency of the turbine and generator as it relates to rated head and discharge. This information is presented in one of the documents furnished to the IE that was prepared by Nalcor's consultant, Hatch Energy. The IE has not independently confirmed the values used nor has it separately confirmed the calculated power and energy from the project, however, the procedures followed are typically used in the power generation model.

In order to determine if all losses have been included in the equations used in the model (no back up data was furnished) we requested that the hydraulic loss computations be furnished to the IE for review. We were advised that at full head and flow, 0.47 m of head loss was derived and included in power estimates. An equation was developed for headloss and a coefficient determined based on these parameters for other flows and heads. A loss that is typically omitted, or incorrectly derived, is the loss at the exit of the draft tube.

Based on the plots that relate the guaranteed efficiency of the turbine and generator, as noted above, these guaranteed values were used in the model to compute the power. We believe that the guarantee value is that value prescribed in the turbine and generator generating equipment RFP, and not the actual value that Andritz committed to furnish in the contract as their guarantee value. In order for MWH to determine which values were used in the power model and to determine if there is a difference between the model values and those guaranteed by Andritz, the IE has requested a comparison table be furnished for review. Nalcor advised the model values are a "little higher" than the guarantee values. Normally, the final energy computations are performed using the equipment manufactures guaranteed values to determine the values of power that are used in the pro forma.

The model also provides for periods when the units are shut down that require an environmental flow release that was established for the project. The release will be at the gated spillway structure and is established to be 534 cms, according to Nalcor. This release, depending on river flows, will remove water from storage and is accommodated in the model to maintain the FSL established for both the winter season and the spring-summer-fall periods. It is not known what reservoir elevation tolerance is provided by the permit to maintain the prescribed FSL for the seasons, but information has been requested of Nalcor to provide the information to the IE.

The results of the power generation runs performed by a consultant (Hatch) are given in Table 3-1, below.

[redacted]

[redacted]

3.3 EXPECTED PERFORMANCE OF MAJOR SYSTEMS

Based on our current understanding of the Project and Nalcor's contracting philosophy, which we have observed in reviewing the RFPs and the Contracts reviewed to date (March 2013), only tier-one fabricators, suppliers and installers of equipment and systems, along with tier-one contractors are being solicited to propose on the work. This philosophy in turn generates competitive responses from these firms who supply the utility-grade equipment required of the specifications. This equipment and systems meet, in our 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 (March 2013) have only two contracts available to form a preliminary opinion pertaining to the compatibility of major systems and completeness.

Contract CH0030 involving the turbine, generator, and associated controls for this equipment is being provided by Andritz Hydro, a tier-one company. Andritz has provided numerous equipment packages, and several recent ones for which MWH has direct knowledge 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 hydrogenating package will perform as designed and expected. Since the responsibility of the system compatibility and completeness is Andritz, following the technical provisions of the contract documents, we expect this package will be satisfactory.

Contract LC-SB-003 involving the EPC form of contract delivery for the submarine cable (s) which is directly managed by Nalcor Energy is being provided by one of the three leading designers, fabricators, and installers of submarine cables, Nexans Cable. Based on information know to MWH about other projects Nexans' has completed which are judged to be more difficult than the Strait of Belle Isle 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 satisfactory and will be complete, as specified.

When additional contracts become available for review, MWH will include remarks about their compatibility with other systems they tie to.

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.

Table 3-2

OPERATING HISTORY OF MAJOR EQUIPMENT

ITEM NO.	CONTRACT	EQUIPMENT	REMARKS PERTAINING TO HISTORY	COMMENTS
1	CH0030	TURBINE	ANDRITZ WILL MANUFACTURE THE TURBINE; ANDRITZ HAS MANUFACTURED OVER 2000 KAPLAN TURBINES WITH OVER 34 BEING IN THE 8-9.5 METER SIZE RANGE	
2	CH0030	GENERATOR	ANDRITZ WILL MANUFACTURE THE GENERATOR USING COMPONENTS FROM THEIR WORLD-WIDE FACTORIES. ANDRITZ HAS MANUFACTURED OVER 200 GENERATORS IN THE SAME SIZE RANGE 204 MW	
3	CHOO30	GOVERNOR	HEMI CONTROALS WILL MANUFACTURE THE GOVERNOR CONTROL SYSTEM. HEMI HAS MANUFACTURED OVER 500? GOVERNORS FOR HYDRAULIC TURBINES OF	Nalcor is requested to verify with Hemi the number of turbine governors. Nalcor advised they will confirm

ITEM NO.	CONTRACT	EQUIPMENT	REMARKS PERTAINING TO HISTORY	COMMENTS
			THE KAPLAN TYPE	
4	CHOO30	STATIC EXCITATION	ABB WILL MANUFACTURE THE STATIC EXCITATION SYSTEM. ABB HAS MANUFACTURED OVER 200? EXCITATION SYSTEMS FOR GENERATORS OF THE SAME SIZE RANGE AS THE LOWER CHURCHILL UNITS	Nalcor is requested to verify with ABB the number of exication systems for generators of the size range as LC. Nalcor advised they will confirm.
5	LC-SB-OO3	SUBMARINE CABLE	NEXANS HAS MANUFACTURED OVER 10,000? KM OF MASS IMPREGNATED INSULATION FOR HVdc SUBMARINE CABLE. NEXANS HAS EXISTED AS A COMPANY FOR 35-YEARS	Nalcor is requested to verify with Nexans the length of MII cable manufactured
NO ADDITIONAL INFORMATION IS AVAILABLE				

NALCOR'S REPRESENTATIVE WAS SENT AN EMAIL ON FEBRUARY 7TH REQUESTING NALCOR'S LIST OF ADDITIONAL EQUIPMENT THAT IS ACCEPTABLE AND REMARKS PERTAINING TO HISTORY OF EXPERIENCE.

3.6 ELECTRICAL INTERCONNECTIONS BETWEEN PROJECTS

MWH has not reviewed all of the one-line diagrams for interconnection between projects because they are not currently available for review.

NALCOR'S REPRESENTATIVE WAS SENT AN EMAIL ON FEBRUARY 7TH REQUESTING ONE LINE DIAGRAMS. MWH WOULD ALSO LIKE TO REVIEW A SUMMARY DOCUMENT

PERTAINING TO THE ACCEPTABILITY OF NALCOR'S DESIGN INTERCONNECTION BETWEEN PROJECTS.

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 Energy to review provide limited opportunity to opine at this time on the technical criteria consistency. However, it 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 with in 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.

We also noted in contract CH0006 that dewatering of the excavation would be occurring after the contractor was granted substantial completion. Nalcor Energy 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 find it should allow the smooth transition between contracts to be promulgated.

3.8 EXPERIENCE AND CAPABILITY OF MAJOR PROJECT PARTICIPANTS

Nalcor Energy has advised the Independent Engineer 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 Energy’s philosophy and statements made to the Independent Engineer.

Each of the contracts that have been awarded to date by Nalcor Energy were awarded to very experienced contractors and suppliers involved in the work. 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 Project.

Nalcor Energy also selected a Canadian Engineering firm who 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 ECPM services that were awarded to SNC-Lavalin. 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 Energy has also engaged very experienced consultants who have been employed on mega projects in Canada and internationally who are assisting permanent staff but who work solely on the Lower Churchill Project, and who hold key positions of management on this project. The guidance the Nalcor team provides to its EPCM contractor and to the Contractor's they have engaged should allow early detection and resolution of any issues that may or will occur during the construction of the Lower Churchill Project.

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SECTION 4

CONSTRUCTION PLAN AND SCHEDULE

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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 revised their project delivery model that required transition from the terms of their Agreement with SNC-Lavalin Inc. (SNC-L). Section 4.1.1 discusses the Integrated Project Team Model.

4.1.1 Responsibilities of Parties Clearly Defined

The Engineering, Procurement and Construction Management Services Agreement for the Muskrat Falls Hydroelectric Development between Nalcor Energy 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 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 Energy's Project Manager. This process constricts the EPCM process of facilitating quickly, the 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 up to certain limits, usually provided with a reasonable "cap" to allow the process to proceed more quickly. Change Orders above this amount would be at the authorization of the Nalcor Project Manager. For this project, we would recommend Project Manager be given the authority to authorize $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.

Late in 2012, Nalcor made a strategic decision to adjust its organizational model as it moved through Decision Gate 3. 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 Project 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.

Leveraging the strength of Nalcor's Owner's Team, combined with the significant resources of SNC-Lavalin as EPCM Consultant, the execution model has transitioned from a pure EPCM model to an integrated Project Team Model, or Option 2 to Option 1 in Figure 4-1. The mantra, according to Nalcor, of this team is "One Team. One Vision." The organizational model shift is viewed as a key enabler of team effectiveness, which is considered imperative for delivery of this megaproject.

Project Delivery Methods

<table>
<tr><th>Activity</th><th>Option 1</th><th>Option 2</th><th>Option 3</th></tr>
<tr><td>Oversight / Project Controls / Audit</td><td rowspan="4">Integrated Project Team
Engineering Consultant</td><td>Nalcor</td><td>Nalcor</td></tr>
<tr><td>Detailed Engineering & Design</td><td rowspan="3">EPCM Consultant</td><td rowspan="4">EPC Contractor</td></tr>
<tr><td>Project Management, Engineering, Procurement, Project Services</td></tr>
<tr><td>Overall Site and Contractor Management</td></tr>
<tr><td>Construction of the Physical Works</td><td>Construction Contractors</td><td>Construction Contractors</td></tr>
</table>

Figure 4-1 Project Delivery Methods

This integrated Project Team, or Project Delivery Organization, consists of Nalcor and SNC-L resources as well as various third party consultants, including Hatch, AMEC, Stantec, and independent consultants. Broadening the potential sourcing base for resources has facilitated the ability to secure scarce PM and Construction Management resources within Labrador/Newfoundland's heated resource-based economy. Nalcor advised MWH that within this Integrated Project Delivery Organization a Nalcor person can report to a SNC-L person, and vice versa. The objective is to avoid duplication, fully-leverage available resources, right-size the project team, and ensure an organizational structure that supports empowerment, accountability, and delegation of authority, according to Nalcor.

Nalcor's contents that strong project governance and leadership is achieved within the Project by the establishment of an Integrated Management Team that is led by a Project Director. The Nalcor Project Director reports to the LCP VP and Executive Committee. Figure 4-2 gives the high-level organization and governance structure for the Project.

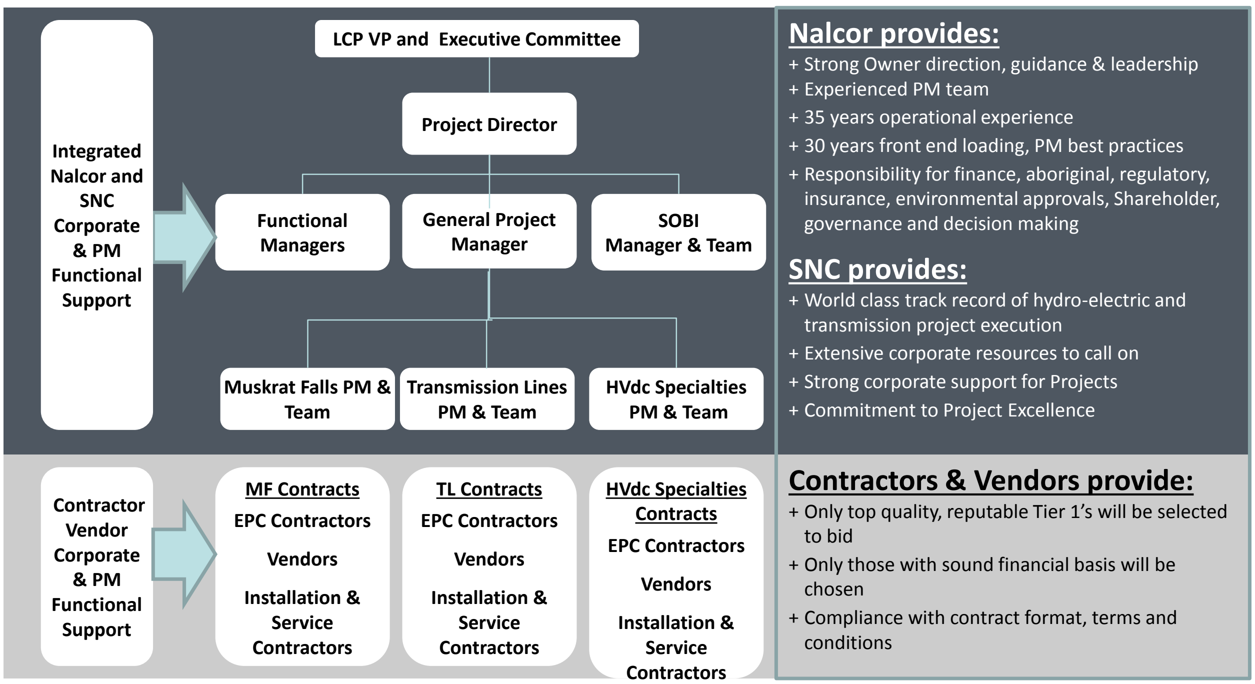

Figure 4-2 LCP Organization and Governance

Consistent with the premises stated within the Overarching Contracting Strategy, this Project Delivery Organization is the Integrator of all contractor works. The Project Delivery Organization must fulfill all obligations that were previously defined for each of Nalcor and SNC-L as EPCM Consultant.

Within the model, SNC-L remains solely responsible for the completion of all engineering and design, and for assurance of the quality of all engineering with standard engineering practice as previously stated in Section 4.1.2. The Senior SNC-L Manager has accountability to ensure SNC-L's engineering and design practices are upheld.

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 fully implemented on the Project. To that effect, SNC-L provides a substantive resource base to support the Project Delivery Organization.

As can be seen in the organization figure, the organizational design consists of three Project Managers reporting to a General Project Manager. A deputy PM supports each Project Manager, 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 Strait of Belle Isle work, is led by a designated Project Manager who reports directly to the Project Director, but maintains day-to-day working relationships with the 3 Component PMs and all functional managers.

Figure 4-3 presents the organizational chart for the Integrated Management Team reporting to the Project Director.

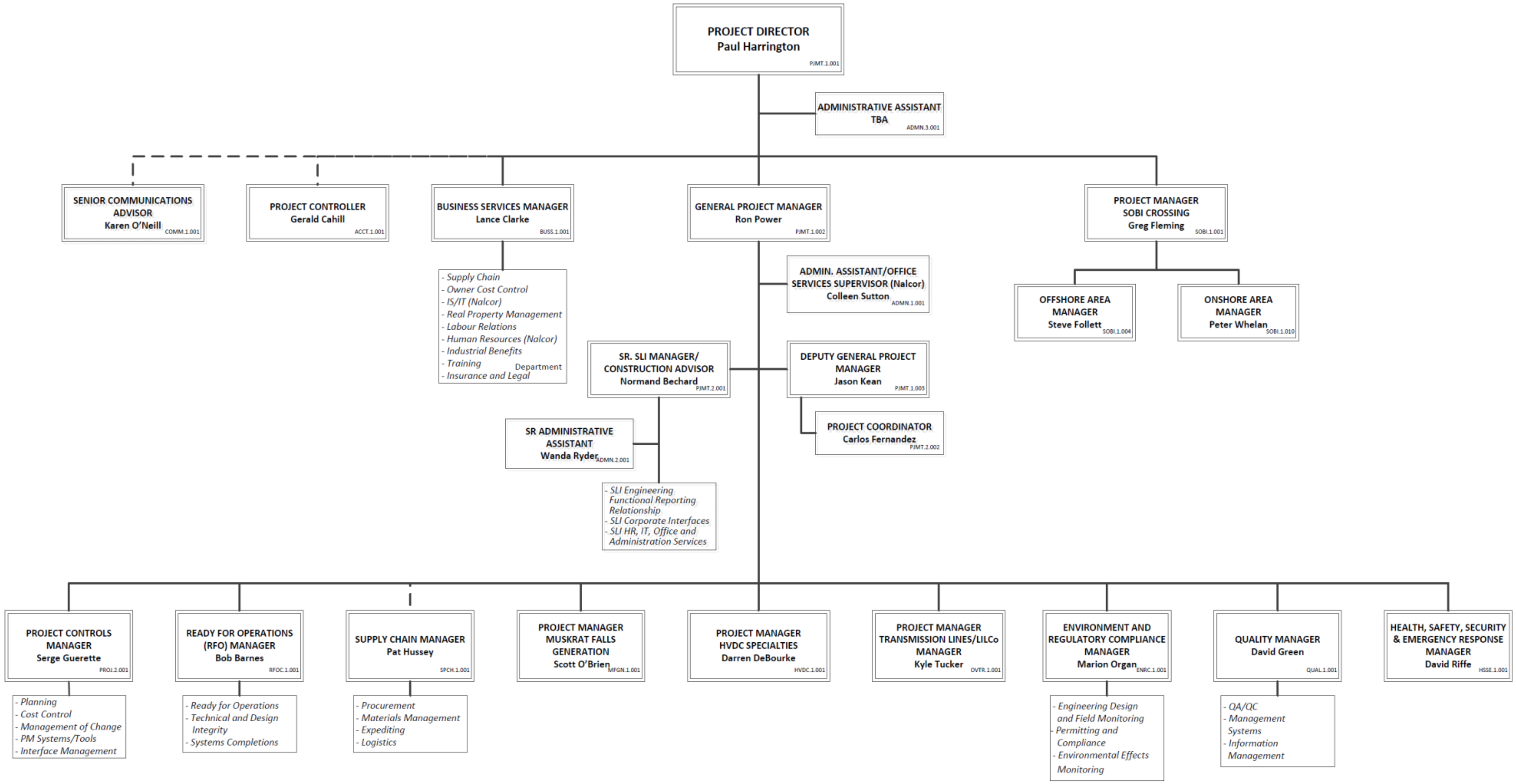

Figure 4-3 Integrated Management Team Organization Chart

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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 project and detail the studies conducted for the project that are available and set out to guide SNCL in their work. SNCL 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 the personnel and tools (software) for project control (PM+), and 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 Strait of Belle Isle crossing which Nalcor is administrating (Contract LC-SB-003).

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

CH0007 – Muskrat Falls Complex

CH0030 – Turbine and Generator

CH0006 – Bulk Excavation

CD0501 – Converters and Cable Transition Compounds

CT0327 – 350 kV HVdc Transmission Line---Section 1

CT0346 – 350 kV HVdc Transmission Line—Section 2

PH0014 – Generator Step-Up Transformer

PH0016 – Generator Circuit Breakers

PD0505 – Switchyard Equipment AC Substations CF, MF, and SP

A list of the other contracts is provided in Appendix O 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 under the Agreement,while SNC-L provides the 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.

The Agreement provides for the following protection of Nalcor Energy:

1. A parent Company Guarantee
2. A Letter of Credit equal to 5% of the Agreement Price ($15 Million)
3. Professional errors and omission liability insurance ($5 Million)
4. Commercial Liability Insurance (limit of $10 Million)
5. Project specific commercial General Liability insurance ($20 Million)
6. Automobile liability insurance ($2 Million)
7. Any Reconstruction Costs incurred by Nalcor ($2 Million)

SNC-L's limit of Liability was fixed at 16 percent of the Agreement price (Section 27.2), or $48 Million dollars.

When a change is required, as ordered by Nalcor, SNC-L has 14 days to respond to the request and is required to furnish a budget and schedule.

The Compensation for changes entitles SNC-L to obtain additional compensation for reimbursable costs and additional fixed fee incurred in relation to the Change Order or Change Request. Changed conditions are clearly detailed in Section 23 of the Agreement, in MWH's opinion.

4.1.4 Communication and Interface Requirements

The Agreement provides throughout the text in different sections pertaining to how the parties will be communicating. Several of these sections are discussed hereafter.

Section 11 allows for Nalcor to conduct performance reviews of SNC-L's work, periodically. Nalcor decides if a Performance Report is required and is delivered after the review has been completed. It would describe any actions that Nalcor directs to remedy any failure in the performance of the Services that is apparent from the review. SNC-L is required to comply and remedy the issues found.

Section 31 discusses Public Communications and the requirements placed on SNC-L regarding project information to the public without the written consent of Nalcor. SNC-L is restricted from addressing any media questions, and must revert to Nalcor for any communications that would take place.

Section 32 clearly spells out, in MWH's opinion, the requirement of the parties in how they communicate with each other as to the following when giving a notice (communication): it must be written; it must be addressed to Representative for the Party to whom the notice is addressed; when issued by Nalcor, it must be signed or authorized by a company representative, a director or company secretary , or duly authorized representative; where given by SNCL, it must be signed or authorized by an SNC-L's Representative, a director or company secretary of the Nalcor, or a duly authorized representative, and be delivered by post, by hand or facsimile to Party; it must be sent or delivered to the specified numbers and addresses in the Agreement. It also requires that electronic mail can be used for day-to-day communication, but shall not be used to give notice for Claims, Application for Payments and termination. It further notes that verbal communication will not constitute formal communications or notice under the Agreement.

Exhibit 5, Coordination Procedures, spell out numerous details on how the parties must coordinate their respective work through different management practices: Technical Interface; Health and Safety; Quality; Procurement; Contracting and Materials: Cost: Project Change: Risk: Construction: Project Completions; Invoicing and Payment; Province Benefits Obligations and Reporting; Information; Regulatory and Environment; and Schedule Management. MWH opinion is this exhibit clearly outlines he responsibilities of both parties as to how they must communicate as required by the Agreement. With the transition into an Integrated Project Delivery Organization, the formal coordination methods described in these Coordination Procedures have become practically superseded since the team is working under one management system which reflects a combined Nalcor/SNC-L management system.

Under the Integrated Project Team Model, we anticipate that the communication and interface requirements will work more effectively.

4.1.5 Dispute Resolution Provision Clearly Defined

Defects in the services are required to be rectified by SNC-L as given in Section 26 of the Agreement. When an issue arises, Section 28 of the Agreement would be implemented (Section 28 Dispute Resolution).

Disputes, claims, differences of opinion are handled by the following procedures as given in the Agreement: Party notifies other party in writing within a 30-days of the dispute; within 30-days, parties shall attempt to resolve differences through the Project Change Management Process as given in Exhibit 5, Sections 8 and 9 of the Agreement; if not resolved through the process, parties shall meet at the following levels: most senior managers within 15 days of receipt of dispute; if not resolved by senior project managers, then Project Sponsor level would be required to be involved within 15 days of the Senior Project Managers meeting to discuss; if the dispute is not resolved by the Project Sponsors level individuals, then the issue is addressed by the Chief Executive officers of Nalcor and SNCL with 30 days of the meeting of the Project Sponsors; if the dispute is still not resolved within 120 days from the delivery of the dispute to the other party, the Party filing the dispute may take whatever action is deemed appropriate pursuant to the EPCM agreement.

Based on MWH's review of the resolution process, as described above, it is our opinion that the dispute resolution procedure is satisfactory and appropriate. Furthermore, under the Integrated Project Team Model, issues will probably be identified earlier and resolved more quickly in MWH's opinion.

4.1.6 Ability to Integrate Each Project with Other Projects

Because Nalcor, through the Integrated Project Delivery Organization, has overall responsibility for all of the projects including the Strait of Belle Isle cable procurement and installation, and have the organizational structure and authority to monitor the different contracts and with the aid of their critical path schedule to be able to observe where interface issues may arise during the work, we are of the opinion that the contract provides the safeguards necessary to achieve successful integration of the meshing contracts.

The relevant Area Construction Manager, who reports to both the Construction Manager and the Area Manager, would be the individual who would identify delays or issues. The Area Construction Manager in collaboration with the Site Controls Manager would develop an appropriate specific strategy to address the issue(s) and develop the implementation plan to facilitate the corrections.

The integrated planning and scheduling team track and monitor the critical and sub-critical paths within the three projects, including the Strait of Belle Isle work. The Planning and Scheduling Team also monitor and track the critical and subcritical paths for the combination of the projects ---interfacing and completions (Ready for Operations) activities. This team also monitors, tracks, and analyzes the contractor-supplied schedules which include the critical and sub-critical paths including key interfaces between each of the contract packages. This activity, according to Nalcor helps ensure the visibility of all internal and external interfaces under the responsibility of the team.

The integration of the Strait of Belle Isle crossing work and the JVdc Specialties-work for which SNC-L are performing the design is led by Nalcor's Project Engineer (Drover) with the marine Crossings Team. Nalcor utilizes the interface management system that is guided by Nalcor's Change and Technical Interface Coordinator (Gillis) for all 3-Components of the project for which SNC-L are responsible for the design, but mostly with the Nalcor Project Manager HVdc Specialties and the Nalcor Project Manager Overland Transmission. Regular bi-weekly interface meetings between these parties occur to address open interfaces. Since there are a defined number of interfaces that are well understood and as a result, personnel from both the Onshore and Offshore functions of the Marine Crossing Team are deeply involved with the interfaces as well. MWH concurs that the system to promulgate a successful interface of the work should be able to address the rather limited number of instances where an interface issue would occur and is suitable for its intended purpose of expediting solutions to any issues that may occur during design and construction.

The procurement team is responsible for establishing contracts and facilitating the delivery of the system. The quality assurance function provides the necessary level of shop surveillance to minimize the likelihood of an unforeseen event from occurring. The Project's overall quality assurance program combined with logistics functions is expected to work to minimize losses during shipment or damage to components being shipped.

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 on the issues surrounding the conduct of SNC-Lavalin 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-Lavalin being forced to leave the company because of these activities. A pending billion dollar lawsuit by shareholders of the company is also is being promulgated that alleges the issues surrounding the bribery issues have driven the SNCL stock price lower, which caused shareholders to lose money. All of this negative publicity associated with these possible legal problems that SNC-Lavalin is facing is required to be surfaced by the Independent Engineer since the outcome of any legal action could affect the performance of the staff assigned to the Lower Churchill Project. 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 currently under way, we will not give any opinions on these matters other than what we have noted above. We have discussed the issue with Nalcor Energy representatives and they recognize the need to present this information to our readers, but have noted to MWH that they are fully supportive of the SNC-L staff they have been working with on the Lower Churchill Project 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.

4.2 BULK EXCAVATION CONTRACT REVIEW – CH0006

The Bulk Excavation Contract was started on November 9, 2012, shortly before Nalcor Energy received notification that the Project received the Government Sanction on December 17, 2012, since a further delay in 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 Kewit. 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 Independent Engineer, by its Agreement with Nalcor Energy 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 Independent Engineers Technical and Environmental evaluations, we have developed a standard format that addresses the questions contained in our Agreement task descriptions to standardize our responses. Since additional information is also specifically requested in other Sections of the IE Report, some information may be repeated or expanded, as required by our 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 SUB-CONTRACTORS	BLASTING CONTRACTOR IS NOT KNOWN TO MWH. NALCOR ADVISED THAT EXPLOTECH ENGINEERING IS BLASTING CONTRACTOR	'MOOSE' MORIN IS BLASTING CONSULTANT. NALCOR AND SNC-L 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 RE RESPONSIBILITY 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

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
5	CONTRACTOR'S AND OWNER'S RESPONSIBILITIES	ARTICLE 7; ARTICLE 9-CONTRACTOR; ARTICLE 10-NALCOR; EXHIBIT 3, PART 2, 5.2 ARE CONTRACTOR'S RESPONSIBILITIES & PART 1, EXHIBIT 12 SCOPE OF WORK	WORK IS SATISFACTORILY DEFINED	SATISFACTORY
6	GUARANTEES, WARRANTIES	ARTICLE 14; ARTICLE 17—NALCOR ADVISED THAT NO GUARANTEES ARE REQUIRED OTHER THAN FAULTY WORK / DEFICIENCIES ARTICLE 17-THREE YEARS FROM ACCEPTANCE OF WORK. WARRANTEE FOR RIVERSIDE RCC COFFERDAM, ROCKBOLTING AND EMBANKMENT COFFERDAMS; ONE YEAR FOLLOWING DATE OF SUBSTANTIAL COMPLETION FOR OTHER WORK.	NALCOR INFORMED MWH THAT BECAUSE OF THE LATE START OF OVER 2 MONTHS THAT OCCURRED BECAUSE OF THE DELAY IN OBTAINING THE PROJECT SANCTION, THEY DECIDED TO ELIMINATE SOME GUARANTEES TO ALLOW WORK TO START MORE QUICKLY AND FOR THE 'CONTRACTOR TO ACCOMPLISH THE WORK' WITHOUT THESE RESTRAINTS'. HOLDBACK PROVISIONS ARE IN PLACE THAT ALLOW THE OWNER TO MAINTAIN SOME MONETARY CONTROL OVER THE CONTRACTOR. MWH REQUIRES PROOF THAT THE CONTRACTOR IS PERFORMING SATISFACTORILY	MWH WILL OPINE ONCE WE CAN DETERMINE IF CONTRACTOR PERFOMANCE IS SATISFACTORY AND THE CONTRACTOR IS KEEPING TO SCHEDULE.

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
			TO ALLOW AN OPINION TO BE EXPRESSED.	
7	CHANGE ORDERS	ARTICLE 14; ARTICLE 30 DISPUTE RESOLUTION; EXHIBIT 2, PART 2, SECTION 5 CHANGES; PART 2, EXHIBIT 3-APPENDIX A CHANGE REQUEST; APPENDIX B CHANGE ORDER		SATISFACTORY
8	TRANSPORTATION PLAN	5.13 REQUIRES CONTRACTOR'S PLAN; ARTICLE 22 LISTS SITE AND TRANSPORTATION CONDITIONS; 22.3 PLACES SOLE RESPONSIBILITY WITH CONTRACTOR	NO CONTRACTOR'S PLAN WAS AVAILABLE TO REVIEW. SINCE THIS IS THE FIRST MAJOR CONTRACT AFTER ROADWAY CONTRACT, THERE MAY STILL BE AREAS TO IMPROVE FOR HEAVY EQUIPMENT PASSABILITY. SITE ACCESS IS NALCOR'S RESPONSIBILITY UP TO THE CONTRACTOR'S LAYDOWN AREA.	NO OPINION PERTAINING TO TRANSPORTATION PLAN; CONTRACT APPEARS TO DEFINE THE CONTRACTOR'S RESPONSIBILITY SATISFACTORILY
9	LOGISTICS/STORAGE OF MATERIALS	ITEM 45, PERMITS REQUIRES EXPLOSIVE LICENSE AND MAGAZINE; ITEM 50 REQUIRES PERMIT TO TRANSPORT DANGEROUS GOODS	THE SITE VISIT SCHEDULED FOR APRIL 2013 WILL ALLOW VIEWING OF CONTRACTOR'S STORAGE FACILITIES AND ASSESSMENT OF THE SUCCESS OF THE LOGISTICS ISSUES, IF THERE WERE ANY RESULTING IN	APPEARS TO BE SATISFACTORY; FINAL ASSESSMENT AFTER THE FIELD VISIT BY THE IE

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
			ISSUES	
10	CONFORMS TO INDUSTRY STANDARDS	CONTRACT SEEMS TO BE COMPLETE, HOWEVER, DOES NOT CONFORM TO CURRENT PRACTICE BEING ADOPTED USING ASCE GBRC GUIDELINES FOR GEOTECHNICAL REPORTS	FOLLOWING A CURRENT GUIDELINE ALLOWS FOR A MORE EARLY ASSESSMENT OF POSSIBLE ISSUES AND DEFINES RESPONSIBLE FOR CHANGED CONDITIONS CLEARLY; RECOMMEND THAT NALCOR AND SNCL FAMILIARIZE THEMSELVES WITH CONDITIONS IN ASCE GUIDELINE TO DETERMINE IF ANY AMENDMENTS ARE NECESSARY TO INCLUDE WITH THE CONTRACT	CURRENT USA PRACTICE WAS NOT ADOPTED WHICH MANY PROJECTS NOW FOLLOW SINCE IT CLEARLY PROVIDES AVENUES FOR RESOLUTION OF ISSUES; HOWEVER, WITH CLOSE MONITORING AND FAIR INTERPETATION OF CONTRACT, WE JUDGED THIS ITEM TO BE SATISFACTORY.
11	COMPENSATION TERMS	EXHIBIT 2 INCLUDES MATERIAL PERTAINING TO COMPENSATION AND THE REQUIREMENTS TO OBTAIN		SATISFACTORY
12	GUARANTEEES & LIQUIDATED DAMAGES	ARTICLE 17 PROVIDES FOR WARRANTIES; NO ARTICLE FOR LIQUIDATED DAMAGES IS PROVIDED IN THE CONTRACT		IE CAN NOT GIVE OPINION AT THIS TIME. RESULTS WILL BE KNOWN BEFORE FINANCIAL CLOSE AND THE LIKELY IMPACTS ON THE PROJECT SCHEDULE TO ALLOW IE TO OPINE LATER.
13	PERFORMANCE BOND, LDS, BONUS,	IN THE CONTRACT, PERFORMANCE	DATA IS MISSING AND REQUIRES TO	NO OPINION CAN BE GIVEN AT THIS

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
	BUYDOWN/OUT	BOND: 100% OF CONTRACT PRICE IS PROVIDED (CORRECTED VALUE FROM 50% RFP VALUE); IN RFP PARENT GUARANTEE REQUIRED TO BE FURNISHED; LETTER OF CREDIT-15% OF CONTRACT PRICE TO FINAL COMPLETION; 5% TO END OF WARRANTEE PERIOD; EXHIBIT 2, PART 2, SECTION 9; LDS FOR MISSSED MILESTONES. THE FINAL CONTRACT DOES NOT HAVE ANY OF THESE PROVISIONS WITHIN THE DOCUMENT. IN FINAL CONTRACT A 100% LABOR AND MATERIAL PAYMENT BOND IS FURNISHED FOR 100% OF CONTRACT PRICE.	BE ENTERED IN THE CONTRACT WHICH WOULD BE SHOWN IN EXHIBIT 14---PERFORMANCE SECURITY. NALCOR ADVISED THAT NO LDS WILL BE ASSESSED BECAUSE OF THE LATE START INCURRED BECAUSE OF THE PROJECT SANCTION BEING DELAYED.	TIME
14	COMPLIANCE CONTRACTS, PERMITS, PERFORMANCE	PART 2, EXHIBIT 6 PERMIT APPLICATIONS: 14 ARE THE RESPONSIBILITYOF THE CONTRACTOR; OTHERS—THE ENGINEER		THIS ITEM APPEARS TO BE SATISFACTORY
15	GUARANTEE OF EQUIPMENT	NOT APPLICABLE		NO OPINION NEEDED, NOT APPLICABLE
16	CONSTRUCTION SCHEDULE	LOCATED AT PART 2, FOLLOWING EXHIBIT 14; CRITICAL PATH		SATISFACTORY

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
		SCHEDULE FURNISHED		
17	SCHEDULE REVIEW; ADEQUATE PROVISIONS	SUFFICIENT BREAKDOWN INTO SUBTASKS NOTED; BENCH DESIGNATION USED FOR EXCAVATION		SATISFACTORY
18	CRITICAL PATHS	MILESTONE DATES: EXHIBIT 9, PART 2: SUBSTANTIAL COMPLETION DEC 31, 2013; EXHIBIT 3, PART 2, 5.4 CONTROL SCHEDULE BASELINE DOCUMENT; SEE 16. ABOVE, FOR LOCATION OF SCHEDULE IN DOCUMENTS	FROM SCHEDULE, THERE APPEARS TO BE ADEQUATE FLOAT TO ACCOMMODATE ISSUES THAT MAY BE ENCOUNTERED—NEARLY 1.5 MONTHS TIME; THE IE REQUIRES VIEWING THE WORK PROGRESS BEFORE OFFERING ITS OPINION SINCE ACTUAL PRODUCTION RATES MUST EQUAL OR EXCEED THOSE ASSUMED AND USED IN THE CONTRACT DOCUMENTS	NO OPINION OFFERED AT THIS TIME
19	LIKELIHOOD OF ACHIEVING MILESTONES	PROGRESS NEEDS TO BE ASSESSED BY IE DURING FIELD VISIT TO GAGE LIKELIHOOD OF ACHIEVING MILESTONES; SUFFICIENT FLOAT IN SCHEDULE PROVIDED APPEARS TO ALLOW FOR COMPLETING CONTRACT	IE WILL OBSERVE PROGRESS DURING ITS FIELD VISIT TO ASSESS PERFORMANCE AND LEARN OF ANY ISSUES THAT ARE THEN APPARENT TO FORM OPINION.	IE CAN NOT OFFER OPINION AT THIS TIME. THE IE WILL BE ABLE TO GIVE AN OPINION BEFORE FINANCIAL CLOSE BASED ON CURRENT SCHEDULE.

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
		SUBSTANTIAL COMPLETION		
20	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 SUFFICENT 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.

The reader should note that at the present time (June 2013), MWH is not able to opine on some of the items they are required to express an opinion on. However, in order for the reader to be aware of the expectations of providing such opinion, 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.

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

To date, MWH has only been furnished the RFP to solicit bids for Contract CH0007, and based on our review of the RFP, find that many of the subjects that we are required to comment on are not sufficiently addressed in the RFP. Nalcor requested MWH to review the RFP in lieu of the actual contract since the contract signing is expected to be June 4, 2013, the expected award date of the contract.

Based on the review of the RFP for 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 (March 2013).

Table 4-2

CONTRACT (RFP) 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	WE ONLY WERE FURNISHED AN RFP THAT WAS INCOMPLETE	NALCOR REQUIRED TO FURNISH THE CONTRACT FOR CH0007	
2	QUALIFICATIONS OF SUB-CONTRACTORS	SUBCONTRACTORS ARE COVERED UNDER ARTICLE 6		
3	COMPLETENESS	RFP APPEARS TO BE COMPLETE		
4	CONTRACTS PERFORMED INDEPENDENTLY	WE REQUIRED A CPM SCHEDULE TO OPINE		
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	ARTICLE 9 MILESTONE SCHEDULE IS MISSING FROM THE RFP	ROLES OF CONTRACTOR AND OWNER ARE CLEARLY DEFINED. SATISFACTORY
6	GUARANTEES, WARRANTIES	ARTICLE 7 COVERS PERFORMANCE SECURITY; UNDER PART 1, APPENDIX A2, 7. PERFORMANCE SECURITY, PERFORMANCE BONDS AND LABOUR AND MATERIAL PAYMENT BONDS ARE NOT REQUIRED. A PARENTAL GUARANTEE IS REQUIRED BY 7.4 AND AN LC OF 10% OF CONTRACT PRICE	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	NALCOR HAS EXPLAINED THE REASONING BEHIND THEIR DECISION – ENSURE THEY HAVE SEVERAL BIDDERS IN FOLLOW-UP RESPONSES FROM TIER ONE CONTRACTORS BY REMOVING PROVISION OF PERFORMANCE BONDS AND

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
		IS REQUIRED AS GIVEN IN ARTICLE 7 AT 7.6. UNDER ARTICLE 17, CONTRACTOR WARRANTIES WORK FOR 3 YEARS	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 INSTALLMENT OVER THE PERIOD OF THE AGREEMENT, NORMAL FOR SUCH LARGE CONTRACTS	LIMIT LC TO 10%. WE BELIEVE THAT THIS EVALUATION REQUIRES CONSIDERABLY MORE STUDY BEFORE OFFERING AN OPINION.
7	CHANGE ORDERS	ARTICLE 14 PROVIDES FOR CHANGES IN WORK; ONLY OWNER CAN MAKE A CHANGE. NO OVERHEAD AND PROFIT PERCENTAGES ARE GIVEN IN THE RFP. ARTICLE 30 COVERS DISPUTE RESOULUTION	REQUIRE A COMPLETE, FILLED-IN CONTRACT	SATISFACTORY
8	TRANSPORTATION PLAN	ARTICLE 22 LISTS SITE AND TRANSPORTATION CONDITIONS; AT 22.7, CONTRACTOR ASSUMES ALL RISK ASSOCIATED WITH RIVER AND WEATHER CONDITIONS AT THE SITE; IT NEGLECTS TO NOTE THAT THE OWNER PROVIDES THE REQUIREMENT FOR A 1:20 YEAR RETURN PERIOD FLOOD FOR DESIGN OF COFFERDAMS AND A MINIMUM HEIGHT FOR THE ICE	WE RECOMMEND THAT NALCOR FURTHER ELABORATE ON THESE SECTIONS SINCE THEY ARE AGREEING TO PAY FOR A HIGHER COFFERDAM FOR THE ICE DAM BREACH AND UP TO A 1:2O RETURN PERIOD FLOOD/ ICE EVENT. WE REQUIRE THE TRANSPORTATION PLAN TO BE FURNISHED BEFORE WE CAN OPINE.	

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
		DAM DISCHARGE EFFECTS ELEVATION OF COFFERDAM IS A CONCERN TO IE		
9	LOGISTICS/STORAGE OF MATERIALS	TRANSPORTATION IS COVERED UNDER ARTICE 22; STORAGE IS ACTUALLY COVERED UNDER PAY ITEM FOR SITE INSTALLATION; THE CONTRACT IS SILENT ON THE AMOUNT OF STORAGE REQUIRED WHICH MAY BE SHOWN ON THE DRAWINGS WHICH WE DO NOT HAVE.	CURRENTLY, INFORMATION IS LACKING TO FORM AN OPINION; WE NEED THE TRANSPOSRTATION PLAN; THE WAREHOUSING AND STORAGE PLAN; THE TRACKING PLAN 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	
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 SCHDULE IS REQUIRED.		SATISFACTORY
12	GUARANTEEES & LIQUIDATED DAMAGES	LDS ARE GIVEN IN PART 2, EXHIBIT 2, SECTION 12, LIQUIDATED DAMAGES FOR DELAY AND PERFORMANCE INCENTIVES. ALSO GIVEN IN ARTICLE 26	EXAMPLES OF HOW LDS ARE COMPUTED SHOULD BE FURNISHED TO THE IE FOR REVIEW. WE PLAN TO INCLUDE IN	

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
		WHICH LIMITS THE TOTAL AMOUNT OF LDS TO 5% OF THE CONTRACT PRICE	APPENDIX I.	
13	PERFORMANCE BOND, LDS, BONUS, BUYDOWN/OUT	BONUS PROVISIONS ARE GIVEN IN PART 2, EXHIBIT 2, SECTION 12.2 FOR ACHIEVING MILESTONES, OR EARLY ACHIEVEMENT THEREOF. PERFORMANCE SECURITY EXHIBIT 14, IS $50,000,000 UNTIL FINAL COMPLETION CERTIFICATE HAS BEEN ISSUED; AND $10,000,000 DURING THE WARRANY PERIOD DISCUSSED IN ARTICLE 17	WE REQUIRE BACKUP INFORMATION TO SUPPORT THE AMOUNTS USED FOR LDS AND BONUSES.	
14	COMPLIANCE CONTRACTS, PERMITS, PERFORMANCE	A SITE SPECIFIC ENVIRONMENTAL PLAN IS REQUIRED; NALCOR WILL FURNISH ALL PERMITS REQUIRED BY OWNER TO BE OBTAINED; CONTRACTOR RESPONSIBLE FOR OTHERS. CONTRACTOR MUST FOLLOW THE OWNER-FURNISHED PERMITS.	A LISTING OF CONTRACTOR FURNISHED PERMITS NEEDS TO BE REVIEWED BEFORE AN OPINION CAN BE GIVEN	
15	GUARANTEE OF EQUIPMENT	NOT APPLICABLE		NO OPINION REQUIRED
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		

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
18	CRITICAL PATHS	MILESTONE DATES REQUIRES; CPM SCHEDULE REQUIRED; SUBSTANTIAL COMPLETION DATE REQUIRED	MORE INFORMATION IS REQUIRED TO ALLLOW AN ASSESSMENT TO BE PERFORMED BY THE IE	DATA ARE NOT AVAIALBE 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

The reader should be aware of the fact that the Independent Engineer can only give opinions once it has sufficient information to review to be reasonable certain that there will be no changed conditions that would negate its opinion or observation. Opinions can be expressed in a manner that will qualify the IE's knowledge at the time of making an opinion that is a 'forecast' of what the IE believed to be reasonable expected. Because many of the contracts that the IE will be reviewing will be released later during 2013 and one contract released after financial close, there are "gaps" in this draft document that will be required to be completed prior to financial close. For the contract that will be available after financial close, CT0346, it is similar to CT0327 and provides a means for MWH to forecast on opinion, if required by the Government of Canada before financial close.

4.4 TURBINES & GENERATORS DESIGN, SUPPLY AND INSTALL AGREEMENT – CH0030

Contract CH0030 was awarded on December 31, 2012, and is scheduled to be substantial complete by March 23, 2017, when commissioning the Muskrat Falls Powerhouse is planned to occur. The amount of the contract is $166,969,064.98. The contract was awarded to Andritz Hydro Canada Inc. whose parent-company, Andritz Hydro is a world-wide-known, tier-one company that supplies hydrogenating equipment. Most of the components for the turbine will be fabricated and assembled in China at companies that Andritz Hydro has an interest in and is able to use the technologies developed by Andritz in their design, manufacturing and assemble processes.

Table 4-3

CONTRACT CH0030

TURBINES & GENERATORS DESIGN, SUPPLY AND INSTALL AGREEMENT

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
1	QUALIFICATIONS OF CONTRACTOR	ANDRITZ HYDRO CANADA INC., REGISTERED IN NEW BRUNSWICK, AND ITS PARENT COMPANY, ANDRITZ IS A TIER ONE SUPPLIER OF TURBINES AND ASSOCIATED EQUIPMENT		THE CONTRACTOR IS SATISFACTORY
2	QUALIFICATIONS OF SUB-CONTRACTORS	ALMOST ALL OF THE SUB-CONTRACTORS, SUB-SUPPLIERS ARE UNKNOWN TO MWH AND FOR THE TURBINE WHICH WILL BE MANUFACTURED IN TIANBAO, CHINA. ABB WILL SUPPLY THE STATIC EXCITATION SYSTEM; THE DIGITAL GOVERNOR WILL	IT IS NOT CLEAR WHERE THE GENERATOR WILL BE ASSEMBLED FIRST AND TESTED TO INSURE THAT ALL COMPONENTS WILL BE READY FOR ASSEMBLY IN THE FIELD; WE MUST SURMISE THAT THIS WILL NOT BE DONE AND	ANDRITZ IS A SATISFACTORY CONTRACTOR. HOWEVER, MWH IS UNABLE TO OPINE ON THE SUB-CONTRACTORS BEING USED TO SUPPLY THE MAJOR COMPONENTS OF THE TURBINE AND OF CERTAIN COMPONENTS OF THE GENERATOR SINCE WE HAVE

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
		BE SUPPLIED BY AH HEMI CONTROLS; THE ROTOR POLES WILL BE FROM AH BHOPAL, INDIA; THE STATOR BARS & CONNECTIONS WILL BE FURNISHED BY AH LACHINE, CANADA; THE STATOR PUNCHINGS FROM AH WEIZ, AUSTRIA (AH=ANDRITZ HYDRO)	THAT ANY MODIFICATIONS WILL REQUIRE FIELD MACHINING TO ALLOW PARTS TO FIT PROPERLY IF THERE ARE ANY ISSUES ENCOUNTERED. SINCE THE TURBINE IS AT A SIZE LIMIT FOR THE LARGEST DIAMETER BEING SUPPLIED, AND IN THE 9 METER CLASS, VERY CAREFUL MONITORING OF ALL WORK SHOULD BE REQUIRED.	NO EXPERIENCE IN DEALING WITH THEM. WE REQUIRE THE FOLLOWING: EXPERIENCE RECORD OF SIMILAR PROJECTS; COMPANY BROCHURES; LIST OF MAJOR EQUIPMENT USED IN THE MANUFACTURING PROCESS; COMPANY ORGANIZATION CHART; ISO CERTIFICATION PROOF; ANDRITZ PAST EXPERIENCE WITH THE SUPPLIER. NALCOR ADVISED THAT AH OWNS OR IS A PRINCIPAL SHAREHOLDER IN MANY OF THE COMPANIES AND INTENDS TO MONITOR THEM CLOSELY.
3	COMPLETENESS	WE STILL REQUIRE ADDITIONAL DATA IN THE RESPONSE TO THE RFP WE HAVE NOT BEEN PROVIDED WITH EXAMPLES TO CLEARLY ILLUSTRATE THAT THE LDS ARE REALISTIC AND CAN BE SUPPORTED IF AN		CURRENTLY, WE ARE AWAITING A RESPONSE TO ADDITIONAL QUESTIONS. NO OPINION CAN YET BE GIVEN

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
		ISSUE GOES TO COURT. WE HAVE FURNISHED A LIST OF QUESTIONS AND ARE AWAITING A RESPONSE		
4	CONTRACTS PERFORMED INDEPENDENTLY	WE DO NOT HAVE A CPM SCHEDULE TO FULLY UNDERSTAND THE IMPACT OF DELAYS ON OTHER CONTRACTORS, BUT BELIEVE THAT FOR THE EMBEDDED ITEMS FOR THE TURBINE, A SUBSTANTIAL IMPACT TO THE POWERHOUSE CONTRACTOR COULD OCCUR. SINCE MOST OF THE MANUFACTURING WILL OCCUR IN CHINA, NECESSITATING OCEAN SHIPMENTS AS WELL AS LAND TRANSPORT, MONITORING VERY CLOSELY WILL BE VERY IMPORTANT. FIT-UP IN THE FIELD WILL DEPEND ON THE WORK PLAN THAT WE CURRENTLY DO NOT HAVE FOR REVIEW		MWH WILL NOT BE ABLE TO OFFER AN OPINION UNTIL WE BETTER UNDERSTAND HOW THE EQUIPMENT WILL BE HANDLED AND REQUIRED SUPPORT DATA INCLUDING THE CPM NALCOR ADVISES THE INTEGRATED PROJECT SCHEDULE WILL BE AVAILABLE END OF 2013. THUS, IT WILL PROBABLY NOT BE AVAILABLE BEFORE FINANCIAL CLOSE.
5	CONTRACTOR'S AND OWNER'S RESPONSIBILITIES	IN SCOPE OF WORK, 2.7 DEALS WITH OWNER'S RESPONSIBILITY		SATISFACTORY

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
		OF SUPPLY; EXHIBIT 11 ALSO IS A NALCOR SUPPLY REQUIREMENTS; EXHIBIT 9 IS ANDRITZ WORK AND MILESTONE SCHEDULE		
6	GUARANTEES, WARRANTIES	EXHIBIT 1, APPENDIX B DISCUSSES GUARANTEES; IN THE TECHNICAL SPECIFICATIONS, SECTION 2.3 GUARANTEES ARE DISCUSSED; ALSO IN THE TS UNDER 2.4 DISCUSS THE WARRANTIES	THE GUARANTEES AND WARRANTIES ARE TYPICAL FOR UNITS EXCEPT FOR THE DIMENSIONABLE STABILITY AND CRACKING ONES; IN OUR OPINION THESE ARE AN APPROPIRATE ADDITION TO THOSE WE NORMALL REVIEW	SATISFACTORY
7	CHANGE ORDERS	CHANGE ORDERS ARE DISCUSSED IN SEVERAL LOCATIONS OF THE CONTRACT DOCUMENTS. IN EXHIBIT 2, SECTION 4 CHANGE IS DISCUSSED; IN SCOPE OF WORK, ARTICLE 3, AT 3.19 CHANGE ORDER IS DISCUSSED; AND IN EXHIBIT 3, SECTION 7, CHAGE ORDERS ARE DISCUSSED	WE BELIEVE THAT IN THE DEFINITIONS, THE AREAS IN THE CONTRACT DOCUMENTS WHERE CHANGE ORDER IS DISCUSSED SHOULD BE LISTED FOR THE PARTIES QUICK REFERENCE.	SATISFACTORY
8	TRANSPORTATION PLAN	ARTICLE 2.2.6 DISCUSSES LOGISTICS,	WE REQUESTED CLARIFICATION ON ANY LOAD	NO FORMAL PLAN WAS GIVEN, BUT APPENDIX A15

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
		ARTICLE 7.7.3 AND 7.7.4 DISCUSS THE TRANSPORTATION REQUIREMENTS; AND APPENDIX A15, LOGISTICS AND TRASNPORTATION STRATEGY	RESTRICTIONS TO THE BRIDGE DOWNSTREAM OF THE PROJECT AND RECEIVED IT. APPENDIX A15 INDICATES THAT THIS BRIDGE IS ADEQUATE. WHAT IS ITS LOAD RESTRICTION AND WHAT IS THE WEIGHT AND HEAVIEST PIECE OF EQUIPMENT THAT WILL BE TRANSPORTED OVER IT? NALCOR FURNISH ANSWER ON EQUIPMENT WEIGHTS.	SUFFICES FROM OUR PERSPECTIVE AT THIS TIME TO ALLOW US TO OPINE. SATISFACTORY
9	LOGISTICS/STORAGE OF MATERIALS	THE TS IN 1.6.3 DISCUSSES SHIPPING; IN EXHIBIT 1, SECTION 7, COVERS STORAGE, PRESERVATION AND PREPARATION OF MATERIALS; ARTICLE 22, SITE & TRANSPORTATION ROUTE CONDITIONS	IT WOULD BE DESIRABLE TO HAVE REQUIRED A SYSTEM TO INVENTORY VIA ELECTRONIC MEANS ALL EQUIPMENT AND NOTE LOCATION WITHIN STORAGE BUILDING FOR EASE IN LOCATING DURING THE WORK.	SATISFACTORY
10	CONFORMS TO INDUSTRY STANDARDS	CONTRACT APPEARS TO CONFORM TO INDUSTRY STANDARDS AND IN SOME AREAS, IN OUR OPINION,		SATISFACTORY

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
		EXCEEDS INDUSTRY STANDARDS		
11	COMPENSATION TERMS	EXHIBIT 2, SECTION 2 LISTS MILESTONE PAYMENTS; APPENDIX B TO EXHIBIT 2 IS THE MILESTONE PAYMENT SCHEDULE; EXHIBIT 2, SECTION 8 IS THE CONTRACT PRICE	TERMS APPEAR TO BE WELL EXPLAINED AS GIVEN IN APPENDIX B. PRICE IS COMPETITIVE BUT IS EXPECTED FROM PRODUCTS CURRENTLY BEING PRODUCED IN CHINA	SATISFACTORY
12	GUARANTEEES & LIQUIDATED DAMAGES	EXHIBIT 2, SECTION 7 DISCUSSES LDS; EXHIBIT 1, APPENDIX B, DISCUSSES PERFORMANCE GUARANTEES; TD, SECTION 2.3 GUARANTEES	A SAMPLE COMPUTATION WOULD BE HELPFUL IN EXPLAINING HOW THE GUARANTEE PENALITIES AND LDS WILL BE APPLIED AND SHOWING HOW THE LIMITATIONS ON PENALITIES WILL BE USED TOO. WE PLAN TO INCLUDE SAMPLE COMPUTATIONS IN APPENDIX I.	WE REQUIRE A SAMPLE COMPUTATION TO ALLOW US TO JUSTIFY THAT THE AMOUNT OF DAMAGES BEING REQUESTED IS REASONABLE. NALCOR ADVISED THAT SAMPLE COMPUTATIONS WILL BE FURNISHED; THE COMPUTATIONS ARE INCLUDED IN APPENDIX I. REQUIRES FURTHER REVIEW.
13	PERFORMANCE BOND, LDS, BONUS, BUYDOWN/OUT	ARTICLE 35 DISCUSSES THE PERFORMANCE GUARANTEES; ARTICLE 36 DISCUSSES LIQUIDATED DAMAGES; ARTICLE 37 DISCUSSES PERFORMANCE	PERFORNMANCE BOND REQUIRED FOR 50% OF CONTRACT PRICE; A BUYOUT PROVISION IS PROVIDED FOR A SITUATION WHERE PITTING	WE FIND THAT THESE CONDITIONS WOULD NOT NORMALLY ALIGN WITH NORMAL INDUSTRY STANDARDS. HOWEVER, SINCE ANDRITZ

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
		TESTING. NOTE THAT SOME OF THE FORMULAS RELATE TO KILLOWATT AND THAT THE FORMULAS FOR THE LDS ARE IN MWH—THEY SHOULD BE CONSISTENT	OCCURS AGAIN AFTER THE FIRST 40,000 HOUR PERIOD- TERMS ARE NOT DESCRIBED THAT REQUIRES ATTENTION. NO BONUS PROVISIONS ARE PROVIDED WITHIN THE CONTRACT WHICH IN SOME COURT SYSTEMS LEADS TO DIFFICULTITES WHEN LDS ARE BEING ASSSESSED. NALCOR ADVISED THAT THIS WOULD APPLY TO CANADA EXPERIENCE. LC OF 15% OF CONTRACT PRICE IS REQUIRED.	ACCEPTED THEM, THEY WILL APPLY TO THIS CONTRACT SINCE THEY WERE CONSIDERED WHEN THE CONTRACT TERMS WERE NEGOTIATED.
14	COMPLIANCE CONTRACTS, PERMITS, PERFORMANCE	EXHIBIT 1, ITEM 13; EXHIBIT 6, ENVIRONMENTAL AND REGULATORY COMPLIANCE REQUIREMENTS; ARTICLE 15, HEALTH, SAFETY AND ENVIRONMENTAL PROTECTION	IT WOULD BE BEST TO PROVIDE A COMPLETE LIST TO THE CONTRACTOR FOR EASE OF REFERENCE, IN OUR OPINION; ON THE LIST THOSE PERMITS AND ITEMS REQUIRED FOR THE CONTRACTORS ATTENTION SHOULD BE HIGHLIGHTED	SATISFACTORY
15	GUARANTEE OF EQUIPMENT	AS DISCUSSED IN 12 ABOVE,	DURING OUR DISCUSSIONS IN	WE WOULD LIKE TO REVIEW

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
		GUARANTEES ARE GIVEN	ST. JOHN'S, THE LDS WERE NOT DESCRIBED TO SUFFICIENTLY ADDRESS MWH'S REMARKS HEREIN	SAMPLE COMPUTATIONS FOR EACH OF THE GUARANTEES AS TO THE AMOUNTS BEING REASONABLE NO OPINION CAN BE GIVEN AT THIS TIME. REQUIRES FURTHER REVIEW.
16	CONSTRUCTION SCHEDULE	MILESTONES ARE GIVEN IN EXHIBIT; WE REQUIRE A CPM	WE REQUIRE A CPM BEFORE WE CAN OPINE	NO OPINION CAN BE GIVEN AT THIS TIME. NALCOR ADVISES AN IPS WILL BE AVAILABLE END 2013.
17	SCHEDULE REVIEW; ADEQUATE PROVISIONS		WE REQUIRE A CPM BEFORE WE CAN OPINE	NO OPINION CAN BE GIVEN AT THIS TIME
18	CRITICAL PATHS	WE REQUIRE A CPM SCHEDULE		
19	LIKELIHOOD OF ACHIEVING MILESTONES	MILESTONES ARE GIVEN IN EXHIBIT 2, APPENDIX B.	WE REQUIRE THE CPM TO FURNISH AN OPINION	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

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
				EXPERIENCE ON LARGE KAPLAN MACHINES AND THAT THIS IS NOT THEIR FIRST TIME IN MANUFACTURING 9M KAPLAN EQUIPMENT. NALCOR ADVISED THAT ANDRITE HAS WORKED WITH ALL BEFORE AND HAS FINANCIAL INTEREST IN SOME OF THESE COMPANIES.
20				

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 remains "blank" or 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.

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 Energy 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. experience in manufacturing subsea cables, has been critical to assuring a successful project in the opinion of Nalcor Energy.

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

Table 4-4

CONTRACT LC-SB-003

STRAIT OF BELLE ISLE SUBMARINE CABLE DESIGN, SUPPLY AND INSTALL

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
1	QUALIFICATIONS OF CONTRACTOR	NEXANS CABLE IS A TIER ONE SUPPLIER AND INSTALLER OF SUB-SEA CABLES		SATISFACTORY
2	QUALIFICATIONS OF SUB-CONTRACTORS	ARTICLE 6 DISCUSSES SUB-CONTRACTORS; EXHIBIT 3 LISTS NIPPON HIGH VOLTAGE CABLE CORP AS THE MANUFACTURE OF THE CABLE	DISCUSSION ON JAN.4, 2013, NOTED NIPPON AND NEXANS IN JV TO MANUFACTURE CABLE. AUDIT CONDUCTED APRIL-MAY, 2012 AND WAS SATISFACTORY	SATISFACTORY
3	COMPLETENESS	NO CONSTRUCTION DRAWINGS WERE INCLUDED WITH CONTRACT; EXHIBIT 5 REFERS TO LOCATION PLAN DRAWINGS INCLUDED IN EXHIBIT 6—COMPANY SUPPLIED DATA	THE DOCUMENT AS IT STANDS APPEARS TO STILL BE INCOMPLETE. NALCOR REPORTED THEY ISSUED PERFORMANCE SPECIFICATIONS. MWH REQUIRES DRAWING REVIEW TO VERIFY DESIGN; CORRIDOR SLECTED BY MAY 2013	WAITING TO RECEIVE CONSTRUCTION DRAWINGS SHOWING COORIDOR AND DESIGN DETAILS FOR FORMING AN OPINION
4	CONTRACTS PERFORMED INDEPENDENTLY	NEXANS IS EXPECTED TO WORK CLOSELY WITH NALCOR ON THIS PROJECT THAT IS MANAGED BY NALCOR. THEY ALSO INDICATE THEY WILL BE	INTERFACE AT SHORE NEEDS TO BE DISCUSSED AND SHOWN ON CPM SCHEDULE	TENATIVE: SATISFACTORY MWH WAITING TO RECEIVE CPM TO ALLOW OPINION TO BE EXPRESSED.

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
		WORKING CLOSELY WITH NIPPON.		
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.	GURANATEES 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 RESOULTION	EXHIBIT 4, SECTION 11 DISCUSSES CO	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	WATING TO RECEIVE PLAN
9	LOGISTICS/STORAGE OF MATERIALS	EXHIBIT 1A SCOPE OF WORK, SECTION 7 CONTAINS REQUIREMENTS FOR STORAGE,	MWH REQUIRES ADDITIONAL INFORMATION SINCE NO PARTICULAR INFORMATION IS	TENATIVE: SATISFACTORY AWAITING TO RECEIVE THE EXECUTION PLAN

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
		PRESERVATION AND PREPARATION. IT WOULD ALSO BE EXPECTED TO BE FURNISHED UNDER 0.5.2 EXECUTION PLAN AND EXHIBIT 4, SECTION 14	FURNISHED. NALCOR ADVISED MWH THAT STORAGE WILL BE LOCATED AT THE PORTS.	
10	CONFORMS TO INDUSTRY STANDARDS	CONTRACT APPEARS TO BE GENERALLY COMPLETE		SATISFACTORY
11	COMPENSATION TERMS	PART 2, EXHIBIT 2 COVERS COMPENSATION	THE BREADOWN OF ITEMS AND THE UNIT OF MEASURE APPEAR TO BE ADEQUATE FOR THIS CONTRACT	SATISFACTORY
12	GUARANTEEES & LIQUIDATED DAMAGES	LDS ARE GIVEN IN EXHIBIT 2, SECTION 7; REQUIRE $200,000/DAY FOR MISSING MILESTONE GIVEN IN SECTION 4 AND EXHIBIT 11-MILESTONE SCHEDULE	NALCOR ADVISED THE BARGE STANDBY RATE OF $200 K/DAY WAS USED FOR DELAYS. THE RATE WILL BE ASSESSED AS A PORTION OF A DAY TO THE NEAREST HOUR.	SATISFACTORY
13	PERFORMANCE BOND, LDS, BONUS, BUYDOWN/OUT	PERFORMANCE BOND COVERED IN ARTICLE 7 AMOUNTING TO 50% OF THE CONTRACT PRICE; LC OF 15% OF CONTRACT PRICE	NO COMPANY GUARANTEE WAS REQUIRED	SATISFACTORY
14	COMPLIANCE CONTRACTS, PERMITS, PERFORMANCE	IN PART 1, SECTION 0.7, 10. ENVIRONMENTAL, THERE ARE REQUIREMENTS FOR A PROGRAM.	SINCE NEXANS IS A FOREIGN CONTRACTOR, SOME OF THE RESPONSIBILITIES PLACED ON	TENATIVE: SATISFACTORY

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
		IT IS NOT SPECIFIC WITH RESPECT TO PERMITS; PERMITS ARE TO BE OBTAINED BY NALCOR; OTHER PERMITS FOR THE WORK VESSEL WOULD NORMALLY BE THE RESPONSIBIITY OF NEXANS. EXHIBIT 1A, SCOPE OF WORK, SECTION 2.2, TABLE 2.2 LISTS THE CONSENTS, AUTHORIZATION AND PERMITS. THE TEXT FURTHER STATES THAT THE CONTRACTOR SHALL OBTAIN AND MAINTAIN ALL OTHER AUTHORIZATIONS, PERMITS, DISPENSATIONS, CONSENTS AND LICENSES, REQUIRED BY APPLICABLE LAWS TO ENABLE IT TO PERFORM THE WORK THAT CAN BE OBTAINED IN THE CONTRACTOR'S NAME.	THEM MAY BE UNFAMILIAR TO THEM, LEAVING ROOM FOR AN INCOMPLETE RESPONSE AND DELAY OR OMISSION CAUSING A DELAY.	
15	GUARANTEE OF EQUIPMENT	GUARANTEES ARE NOT FURNISHED; WARRANTY OF WORK AND MATERIAL FOR 36 MONTHS, AND AFTER REPAIR, ANOTHER 36 MONTHS OF SERVICE	WARRANTY PERIOD REVISED DOWN TO 36 MO. FROM ORIGINAL PROPOSED 60 MONTHS. NO GUARANTEES ARE PROVIDED. TYPICALLY, INDUSTRY	SATISFACTORY

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
			REQUIRES ONLY ONE OR TWO YEARS. TESTING WILL OCCUR BEFORE AND AFTER PLACING THE ROCK FILL PROTECTION.	
16	CONSTRUCTION SCHEDULE	MILESTONES FURNISHED IN PART 2, EXHIBIT 11, MILESTONE SCHEDULE;CPM SCHEDULE IS REQUIRED TO BE FURNISHED	MWH REQUIRES A CPM SCHEDULE	MWH AWAITING TO REVIEW THE CPM
17	SCHEDULE REVIEW; ADEQUATE PROVISIONS	MWH REQUIRES CPM SCHEDULE TO REVIEW		MWH AWATING TO REVIEW THE CPM
18	CRITICAL PATHS	MWH REQUIRES CPM SCHEDULE		MWH AWAITING TO REVIEW THE CPM
19	LIKELIHOOD OF ACHIEVING MILESTONES	NO OPINION CAN BE OFFERED AT THIS TIME		NO OPINION CAN BE GIVEN AT THIS TIME
20				

4.6 GENERATOR STEP-UP TRANSFORMER – PH0014

No information is currently available; expected: August 2013

Table 4-5

CONTRACT PH0014

GENERATOR STEP-UP TRANSFORMER

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
PERFORMANCE TEST CRITERIA				
1	REASONABLENESS OF CRITERIA			

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
2	ADEQUACY OF TEST DURATION			
3	ABILITY TO EXTRAPOLATE RESULTS			
4	CONFORMANCE TO CODE			
5	ABILITY TO ACHIEVE CONTRACT CONDITIONS			

4.7 CONVERTERS & CABLE TRANSITION COMPOUNDS – CD0501

Table 4-6

CONTRACT CD0501

CONVERTERS & CABLE TRANSITION COMPOUNDS

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
1	QUALIFICATIONS OF CONTRACTOR			
2	QUALIFICATIONS OF SUB-CONTRACTORS			
3	COMPLETENESS			
4	CONTRACTS PERFORMED INDEPENDENTLY			
5	CONTRACTOR'S AND OWNER'S RESPONSIBILITIES			
6	GUARANTEES, WARRANTIES			
7	CHANGE ORDERS			
8	TRANSPORTATION PLAN			
9	LOGISTICS/STORAGE			

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
	OF MATERIALS			
10	CONFORMS TO INDUSTRY STANDARDS			
11	COMPENSATION TERMS			
12	GUARANTEEES & LIQUIDATED DAMAGES			
13	PERFORMANCE BOND, LDS, BONUS, BUYDOWN/OUT			
14	COMPLIANCE CONTRACTS, PERMITS, PERFORMANCE			
15	GUARANTEE OF EQUIPMENT			
16	CONSTRUCTION SCHEDULE			
17	SCHEDULE REVIEW; ADEQUATE PROVISIONS			
18	CRITICAL PATHS			
19	LIKELIHOOD OF ACHIEVING MILESTONES			
20				

CONTRACT NUMBER: CD0501 **CONTRACT NAME: CONVERTERS AND CABLE TRANSITION COMPOUNDS**

PRINCIPAL CONTRACTOR:

CONTRACT AMOUNT:

CONTRACT START DATE: **CONTRACT COMPLETION DATE:**

No information is currently available; expected: October 2013

4.8 350 KV HVdc TRANSMISSION LINE – SECTION 1 – CT0327

Table 4-7

CONTRACT CT0327

350 kV HVdc TRANSMISSION LINE – SECTION 1

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
1	QUALIFICATIONS OF CONTRACTOR			
2	QUALIFICATIONS OF SUB-CONTRACTORS			
3	COMPLETENESS			
4	CONTRACTS PERFORMED INDEPENDENTLY			
5	CONTRACTOR'S AND OWNER'S RESPONSIBILITIES			
6	GUARANTEES, WARRANTIES			
7	CHANGE ORDERS			
8	TRANSPORTATION PLAN			
9	LOGISTICS/STORAGE OF MATERIALS			
10	CONFORMS TO INDUSTRY STANDARDS			
11	COMPENSATION TERMS			
12	GUARANTEEES & LIQUIDATED DAMAGES			
13	PERFORMANCE BOND, LDS, BONUS, BUYDOWN/OUT			
14	COMPLIANCE CONTRACTS, PERMITS, PERFORMANCE			
15	GUARANTEE OF			

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
	EQUIPMENT			
16	CONSTRUCTION SCHEDULE			
17	SCHEDULE REVIEW; ADEQUATE PROVISIONS			
18	CRITICAL PATHS			
19	LIKELIHOOD OF ACHIEVING MILESTONES			
20				

CONTRACT NUMBER: CT0327 **CONTRACT NAME: 350 Kv HVdc Transmission Line – Section 1**

PRINCIPAL CONTRACTOR:

CONTRACT AMOUNT:

CONTRACT START DATE: **CONTRACT COMPLETION DATE:**

No information is currently available; expected: October 2013

4.9 350 kV HVdc TRANSMISSION LINE – SECTION 2 – CT0346

Table 4-8

CONTRACT CT0346

350 KV HVdc TRANSMISSION LINE – SECTION 2

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
1	QUALIFICATIONS OF CONTRACTOR			
2	QUALIFICATIONS OF SUB-CONTRACTORS			

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
3	COMPLETENESS			
4	CONTRACTS PERFORMED INDEPENDENTLY			
5	CONTRACTOR'S AND OWNER'S RESPONSIBILITIES			
6	GUARANTEES, WARRANTIES			
7	CHANGE ORDERS			
8	TRANSPORTATION PLAN			
9	LOGISTICS/STORAGE OF MATERIALS			
10	CONFORMS TO INDUSTRY STANDARDS			
11	COMPENSATION TERMS			
12	GUARANTEEES & LIQUIDATED DAMAGES			
13	PERFORMANCE BOND, LDS, BONUS, BUYDOWN/OUT			
14	COMPLIANCE CONTRACTS, PERMITS, PERFORMANCE			
15	GUARANTEE OF EQUIPMENT			
16	CONSTRUCTION SCHEDULE			
17	SCHEDULE REVIEW; ADEQUATE PROVISIONS			
18	CRITICAL PATHS			
19	LIKELIHOOD OF ACHIEVING MILESTONES			
20				

CONTRACT NUMBER: **CT0346** **CONTRACT NAME: 350 kV HVdc Transmission Line – Section 2**

PRINCIPAL CONTRACTOR:

CONTRACT AMOUNT:

CONTRACT START DATE: **CONTRACT COMPLETION DATE:**

No information is currently available; expected: September 2014—AFTER FINANCIAL CLOSE

4.10 GENERATOR CIRCUIT BREAKERS – PH0016

No information is currently available; expected: August 2013

Table 4-9

CONTRACT PH0016

GENERATOR CIRCUIT BREAKERS

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
PERFORMANCE TEST CRITERIA				
1	REASONABLENESS OF CRITERIA			
2	ADEQUACY OF TEST DURATION			
3	ABILITY TO EXTRAPOLATE RESULTS			
4	CONFORMANCE TO CODE			
5	ABILITY TO ACHIEVE CONTRACT CONDITIONS			

4.11 SWITCHYARD EQUIPMENT AC SUBSTATIONS CF, MF & SP – PD0505

Table 4-10

CONTRACT PD0505

SWITCHYARD EQUIPMENT AC SUBSTATIONS CF, MF & SP

ITEM NO.	DESCRIPTION	OBSERVATIONS; SOURCE IN CONTRACT	REMARKS; QUESTIONS?	OPINION OF INDEPENDENT ENGINEER
PERFORMANCE TEST CRITERIA				
1	REASONABLENESS OF CRITERIA			
2	ADEQUACY OF TEST DURATION			
3	ABILITY TO EXTRAPOLATE RESULTS			
4	CONFORMANCE TO CODE			
5	ABILITY TO ACHIEVE CONTRACT CONDITIONS			

No information is currently available; expected: December 2013---Near FINANCIAL CLOSE TIME

4.12 GUARANTEES AND LIQUIDATED DAMAGES

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.

Table 4-11

SUMMARY OF GUARANTEES AND LIQUIDATED DAMAGES

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	IE REQUIRES TIME TO OBSERVE	NO IE OPINION UNTIL OBSERVE PERFORMANCE

ITEM NO.	CONTRACT OR RFP NO.	ITEM NOs. IN TABLES	OBSERVATIONS	REMARKS; QUESTIONS	OPINION OF INDEPENDENT ENGINEER
			WARANTEE	PERFORMANCE	
		12	NO GUARANTEES NO LDS	IE REQUIRES TIME TO OBSERVE PERFORMANCE	NO IE OPINION UNTIL OBSERVE PERFORMANCE
		13	NO PERFROMANCE 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 MWH RECEIVES ADDITIONAL CLARIFICATION AND INFORMATION
		15	NOT APPLICABLE		NOT APPLICABLE
2	CH0007 (MF) RFP	6	LC AND PAYMENT BOND JUDGED TO BE TOO SMALL; WARANTEE OF WORK FOR THREE YEARS PARENTAL GUARANTEE IS REQUIRED	NALCOR IS REVIEWING ALL PROVISIONS FOR LCS, GUARANTEES, WARANTEES, PAYMENT AND PERFORMANCE BONDS	NO IE OPINION CAN BE FURNISHED AT THIS TIME; AWAITING DECISIONS BY NALCOR AS TO WHAT THEY WILL REQUIRE CONTRACTOR TO PROVIDE IN ITS BID
		12	LDS RANGING FROM $15K TO $20K FOR MISSED MILESTONES ARE GIVEN IN PART 2, EXHIBIT 2, SECTION 12. PERFORMANCE INCENTIVES ARE ALSO GIVEN IN SECTION 12.2 WITH A POSSIBLE TOTAL BONUS OF $16.5M	EXAMPLES OF HOW LDS ARE COMPUTED ARE REQUIRED BY THE IE	NO OPINION CAN BE GIVEN AT THIS TIME BY THE IE SINCE WE HAVE ONLY REVIEWED RFP AND REVISIONS ARE EXPECTED
		13	SEE 12 DIRECTLY ABOVE FOR BONUS PROVISIONS DECISIONS ON PERFORMANCE	NALCOR REQUIRED TO MAKE DECISIONS REGARDING THESE ISSUES	NO OPINION BY IE CAN BE GIVEN AT THIS TIME PENDING NALCOR'S DECISIONS AND OUR REVIEW OF

ITEM NO.	CONTRACT OR RFP NO.	ITEM NOs. IN TABLES	OBSERVATIONS	REMARKS; QUESTIONS	OPINION OF INDEPENDENT ENGINEER
			BONDS AND LDS DISCUSSED IN 6 ABOVE		THE CONTRACT
		15	NOT APPLICABLE		NO OPINION REQUIRED
3	CH0030 (MF) CONTRACT	6	GUARANTEES ARE DISCUSSED IN EXHIBIT 1, APPENDIX B AND IN THE TECHNICAL SPECIFICATIONS IN SECTION 2.3 WARANTEES ARE DISCUSSED IN THE TS UNDER 2.4	TYPICAL GUARANTEES AND WARRANTEES ARE PROVIDED. DIMENSIONABLE STABIITY AND CRACKING ARE ALSO COVERED	SATISFACTORY
		12	LDS DISCUSSED IN EXHIBIT 2, SECTION 7. EXHIBIT 1, APPENDIX B DISCUSSES PERFORMANCE GUARANTEES SECTION 2.3 OF THE TS DISCUSSES GUARANTEES	SAMPLE COMPUTATIONS TO SHOW HOW LDS ARE DERIVED HAVE BEEN REQUESTED. ALSO, HOW THE LIMIT ON PENALITIES WILL BE USED.	REQUIRES FURTHER REVIEW. SAMPLE COMPUTATIONS INCLUDED IN APPENDIX I.
		13	ARTICLE 35 DISCUSSES PERFORMANCE GUARANTEES; ARTICLE 36 DISCUSSES LDS; ARTICLE 37 DISCUSSES PERFORMANCE TESTING. BUYOUT PROVISIONS ARE ASLO GIVEN NO BONUS PROVISIONS HAVE BEEN PROVIDED	THE IE NOTES REVISIONS TO FORUMALS 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	NO OPINION CAN BE GIVEN AT THIS TIME. REQUIRES FURTHER REVIEW.

ITEM NO.	CONTRACT OR RFP NO.	ITEM NOs. IN TABLES	OBSERVATIONS	REMARKS; QUESTIONS	OPINION OF INDEPENDENT ENGINEER
				WOULD BE APPLIED. PROVIDED IN APPENDIX J.	
4	PH0014 (MF) NO INFORMATION				
5	PH0016 (MF) NO INFORMATION				
6	PD0505 (MF) NO INFORMATION				
7	CT0327 (LTA) NO INFORMATION				
8	CT0346 (LTA) NO INFORMATION				
1	LC-SB-003 (LITL)	6	NO GUARANTEES 36 MONTH WARANTEE		SATISFACTORY
		12	LD OF \$200K/DAY		SATISFACTORY
		13	50% CONTRACT PRICE PERFORMANCE	NO COMPANY GUARANTEE WAS REQUIRED	SATISFACTORY

ITEM NO.	CONTRACT OR RFP NO.	ITEM NOs. IN TABLES	OBSERVATIONS	REMARKS; QUESTIONS	OPINION OF INDEPENDENT ENGINEER
			BOND; LC OF 15% CONTRACT PRICE		
		15	NO GUARANTEES 36 MONTH WARANTEE		SATISFACTORY
2	CD0501 (LITL) NO INFORMATION				

4.13 CONSTRUCTION SCHEDULE

To allow the Independent Engineer to address the questions contained in our Agreement and to provide information to the reader, we have assumed that the Decision Gate No.3 Critical Path Construction Schedule for the Project would form the basis for our comments. We also have presently, CPM schedules for the following contracts: CH006; CH0030; and LC-SB-003 that were provided in the contract documents for these awarded work packages. A copy of the DG No.3 CPM Schedule is included in Appendix K.

4.13.1 Schedule Review and Adequate Provisions

Awaiting staff input

4.13.2 Principal Critical Paths

Awaiting staff input

4.14 LIKELIHOOD OF ACHIEVING MILESTONES

Figure 4-1 presents the Target Milestone Schedule established by Nalcor Energy for key components of the Work which is and will be monitored very closely by the EPCM consultant as well as Nalcor Energy personnel assigned to the particular components of the project. The milestone schedule represents the planning at the DG3 level of project planning and was Sanctioned by Government. The Target Milestone Schedule is also supported by the Project's Critical Path Schedule which was prepared by Nalcor Energy and its consultants and forms the basis for the Milestone Schedule.

In general, Nalcor Energy has presented a well-planned project which included the preparation of risk assessments and constructability reviews to support their planning. This methodology should result in a higher level of certainty to achieving the milestones than most projects the IE has reviewed. The Independent Engineer has examined several of the key project components to allow it to offer preliminary opinions at this time.

Opinion 1: ON HOLD; to be furnished when MWH has more information. This information will include consideration of the following items: progress on major contracts to gauge progress by reviewing actual progress; review of history of issued change orders and request for change; award of major contracts has been accomplished; receipt of all contracts required to be reviewed by IE; or quality control reports; and review of current CPM Project Schedule and contract CPM schedules.

Opinion 2: ON HOLD; to be furnished when MWH has more information.

Additionally, the Independent Engineer believes that it will be a more knowledgeable position to opine on achieving milestones after it views the progress on the first contracts that have been awarded by Nalcor Energy that allow it to view actual progress and achievements of the suppliers and contractors working in the conditions that prevail for the Project.

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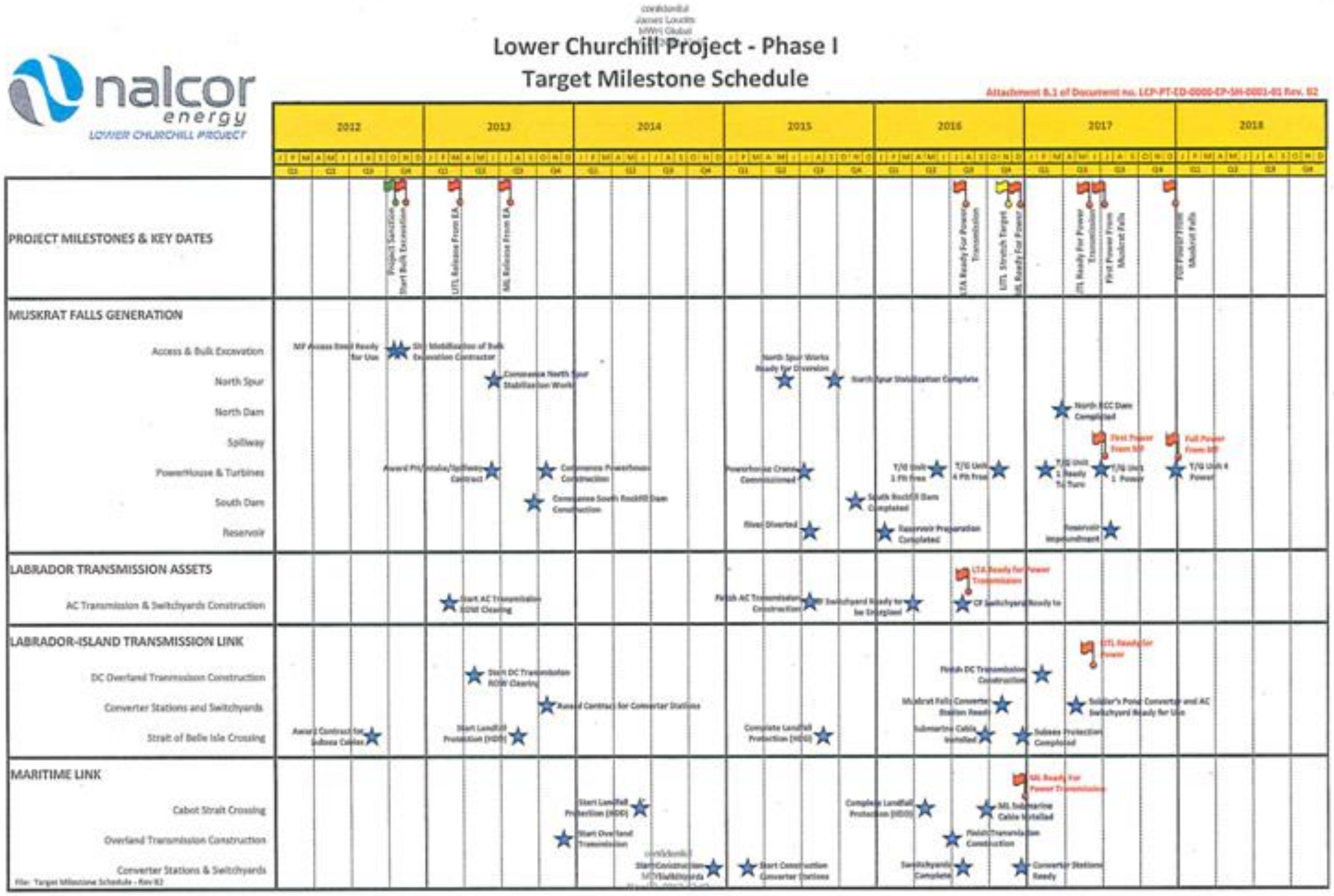

Figure 4-4 Phase I Target Milestone Schedule

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4.15 SUPPLY CONTRACTS SCHEDULES

NALCOR'S REPRESENTATIVE WAS SENT EMAIL REQUESTING THESE SCHEDULES ON February 6, 2013

4.16 PERFORMANCE TEST CRITERIA

4.16.1 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 4-8, 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 project that we have review; 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 Project has accepted as its definition of Good Utility Practice as given in Schedule A of the Water Management Agreement 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;"

4.16.1.1 Other Equipment

Currently there is no other equipment where performance test criteria are available for comment by the IE.

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SECTION 5

CAPITAL BUDGET

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SECTION 5

CAPITAL BUDGET

5.1 TOTAL PROJECT COST ESTIMATE

5.1.1 Cost Estimate Methodology

A deterministic approach based on both direct and indirect costs was followed by Nalcor Energy to arrive at the cost estimate. The cost estimate is comprised of three primary components that follow the Recommended Practice No. 10S-90 of the AACE. A base estimate for each of the cost items is developed that reflects the most likely current cost known associated with the project's specifications, basis of design, drawings and execution plan. The base estimate includes allowances for the identified, but un-quantified items.

To the base estimate, an estimated contingency is derived and added to it that includes variations associated with time or cost that are likely to occur but cannot be specifically identified at the time the estimate is prepared, but based on experience, will likely occur. The estimated contingency does not cover scope changes outside the parameters established for the project or control points for management of change (project execution plan and basis of design, for example) nor does it include natural disasters, strikes or escalation.

Finally, an escalation allowance is developed that provides for changes in price levels that is driven by economic conditions, including inflation. The escalation allowance is added to the base estimate including the estimated contingency, and is derived using economic indices associated with similar construction or type of product and system.

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 Other Facilities

[Not Applicable per correspondence with Nalcor (7/9/2013)]

5.1.4 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 Independent Engineer is required to review and report on. These entities are included in the following Table 5-1 with our remarks.

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 KEWIT	EACH OF THE CONTRACTORS IS WELL-KNOWN IN CANADA AND HAS THE FULL CAPABILITIES TO PERFORM THE ENTIER CONTRACT BY THEMSELVES. THE CONTRACTORS HAVE WORKED TOGETHER ON OTHER HEAVY CIVIL PROJECTS AND ALL HAVE WORKED ON HYDROELECTRIC PROJECT	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
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 WORLD-WIDE.	SATISFACTORY
EPCM	ENGINERING, PROCUREMENT, AND CONSTRUCION MANAGEMENT SNC-LAVALIN INC.	SNCL IS A TIER ONE ENGINEERING AND CONSULTING COMPANY WHO HAS DESIGNED AND MANAGED MANY	SATISFACTORY

CONTRACT NO.	CONTRACT DESCRIPTION AND CONTRACTOR	REMARKS	OPINION OF INDEPENDENT ENGINEER
		LARGE HYDROELECTRIC PROJECTS, THERMAL GENERATING STATIONS, AND NUCLEAR POWER PLANTS	

5.1.5 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 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 (March 2013). 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 Independent Engineer's Report.

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			

ITEM NO.	CONTRACT NO.	EQUIPMENT	COST			REMARKS
			CAD$	USD$	Euro €	

Table 5-3

LABRADOR-ISLAND TRANSMISSION LINK

MAJOR EQUIPMENT PROCUREMENT COSTS

NALCOR'S REPRESENTATIVE SENT EMAIL ON February 6, 2013 REQUESTING INPUT

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

5.1.6 Interconnection Costs

NALCOR'S REPRESENTATIVE SENT EMAIL ON February 6, 2013 REQUESTING THESE COSTS

5.1.7 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		

Table 5-5

LABRADOR TRANSMISSION ASSETS BASE ESTIMATE

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		

5.1.8 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		
D.6	QUALITY SURVEILLANCE & INSPECTION/FREIGHT FORWARDING SERVICES	$4,700,000		

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		
D.6	QUALITY SURVEILLANCE & INSPECTION/FREIGHT FORWARDING SERVICES	$1,600,000		

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		
D.6	QUALITY SURVEILLANCE & INSPECTION/FREIGHT FORWARDING SERVICES	$8,100,000		

5.1.9 Camp Costs

Table 5-10

MUSKRAT FALLS BASE ESTIMATE

CAMP AND RELATED COSTS

ITEM NO.	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		
A.5	TELECOMUNICATIONS	$17,298,550		

Table 5-11

LABRADOR TRANSMISSION ASSETS BASE ESTIMATE

CAMP AND RELATED COSTS

ITEM NO.	ITEM	BASE ESTIMATE COST	REMARKS	
D.3	PROJECT VEHICLES / HELICOPTER SUPPORT	$842,250		
C.3	TELECOMUNICATIONS	$15,467,507	**SHOULD THIS BE INCLUDED IN THIS TABLE?**	

Table 5-12

LABRADOR-ISLAND TRANSMISSION LINK BASE ESTIMATE

CAMP AND RELATED COSTS

ITEM NO	ITEM	BASE ESTIMATE COST	REMARKS	
D.3	PROJECT VEHICLES / HELICOPTER SUPPORT	$10,311000		
B.5	TELECOMUNICATIONS	$21,433,995	**SHOULD THIS BE INCLUDED IN THIS TABLE?**	

5.1.10 Ancillary Infrastructure and Services Costs

Table 5-13

MUSKRAT FALLS BASE ESTIMATE

ANCILLARY INFRASTRUCTURE AND SERVICE COSTS

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

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		
D.5	LAND ACQUISITIONS AND PERMITS	$1,119,630		

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		
D.5	LAND ACQUISITIONS AND PERMITS	$18,472,787		
D.7	ENVIRONMENTAL & ABORIGINAL AFFAIRS	$11,735,229		

5.1.11 Schedule and Equipment Delivery

The Independent Engineer, in responding to this requirement has assembled tables using the information furnished by Nalcor Energy that is presented herein: a Commitment Package Estimate (s) for each of the separate sub-projects – see Table 5-17; and the Schedule of Delivery Dates for each of the sub-projects – see Table 5-16.

Table 5-16

COMMITMENT PACKAGE COST ESTIMATES AND CONTRACT AWARD COST

#	CONTRACT PACKAGE ID AND DESCRIPTION	MUSKRAT FALLS GENERATION FACILITY (MF)		LABRADOR-ISLAND TRANSMISSION LINK (LITL)		LABRADOR TRANSMISSION ASSET (LTA)		TOTAL		REMARKS
		ESTIMATED COST	CONTRACT AWARD COST	ESTIMATED COST	CONTRACT AWARD COST	ESTIMATED COST	CONTRACT AWARD COST	ESTIMATED COST	CONTRACT AWARD COST	
1	CD0501 - Supply and Install Converters and Cable Transition Compounds			$401,654,399				$401,654,399		
2	CD0502 - Construction of AC Substations and Synchronous Condensers Facilities			$80,571,584		$60,484,647		$141,056,231		
3	CD0503 - Construction of Earthworks at Various Power Distribution Sites			$47,820,858		$17,447,657		$65,268,515		
4	CD0508 - Supply and Install of Electrode Sites			$27,317,881				$27,317,881		
5	CD0509 - Construction Telecommunication Services - Phase 2	$13,733,898		$69,024		$69,024		$13,871,946		
6	CD0510 - Supply and Install Permanent Communication Systems	$1,908,996		$15,688,478		$5,352,178		$22,949,652		
7	CD0512 - Construction of Construction Power Facilities	$8,973,000						$8,973,000		
8	CD0534 - Supply and Install Soldiers Pond Synchronous Condensers			$74,995,326				$74,995,326		
9	CD0535 - Construction Telecommunication Services - Phase 2 Remote Camps	$1,030,238		$3,676,493		$2,046,305		$6,753,036		
10	CD0538 - Supply and Install Accommodations Camp (CF)					$17,343,523		$17,343,523		
11	CH0002 - Supply and Install Accommodations Complex Buildings	$65,267,191						$65,267,191		
12	CH0003 - Supply and Install Administrative Buildings	$8,369,000						$8,369,000		
13	CH0004 - Construction of Southside Access Road	$34,585,885						$34,585,885		
14	CH0005 - Supply and Install Accommodations Complex Site Utilities	$18,017,564						$18,017,564		
15	CH0006 - Construction of Bulk Excavation Works and Associated Civil Works	$132,970,112	$112,942,295	$1,269,129		$1,232,708		$135,471,949		
16	CH0007 - Construction of Intake and Powerhouse, Spillway and Transition Dams	$687,994,112						$687,994,112		
17	CH0008 - Construction of North Spur Stabilization Works	$62,709,810						$62,709,810		
18	CH0009 - Construction of North and South Dams	$117,166,506						$117,166,506		
19	CH0023 - Construction of Reservoir Clearing South Bank	$85,033,860						$85,033,860		
20	CH0024 - Construction of Reservoir Clearing North Bank	$54,045,313						$54,045,313		
21	CH0030 - Supply and Install Turbines and Generators	$200,000,000	$166,969,064.98					$200,000,000	$166,969,064.98	
22	CH0031 - Supply and Install Mechanical and Electrical Auxiliaries (MF)	$91,913,298						$91,913,298		
23	CH0032 - Supply and Install Powerhouse Hydro-Mechanical Equipment	$101,525,168						$101,525,168		
24	CH0033 - Supply and Install Powerhouse Cranes	$8,872,175						$8,872,175		
25	CH0034 - Supply and Install Powerhouse Elevator	$755,300						$755,300		
26	CH0039 - Supply and Install McKenzies River Permanent Bridge	$2,635,900						$2,635,900		
27	CH0046 - Supply and Install Spillway Hydro-Mechanical Equipment	$50,794,781						$50,794,781		
28	CH0048 - Construction of Site Clearing Access Road & Ancillary Areas	$3,589,830						$3,589,830		
29	CH0049 - Supply and Install Log Booms	$7,500,000						$7,500,000		
30	CH0052 - Construction of Habitat Compensation Works	$10,100,000						$10,100,000		
31	CT0319 - Construction of 315 kV HVac Transmission Line (MF to CF)	$3,770,591				$184,345,852		$188,116,443		
32	CT0327 - Construction of 350 kV HVdc Transmission Line - Section 1			$358,988,474				$358,988,474		

	CONTRACT PACKAGE ID AND DESCRIPTION	MUSKRAT FALLS GENERATION FACILITY (MF)		LABRADOR-ISLAND TRANSMISSION LINK (LITL)		LABRADOR TRANSMISSION ASSET (LTA)		TOTAL		REMARKS
		ESTIMATED COST	CONTRACT AWARD COST	ESTIMATED COST	CONTRACT AWARD COST	ESTIMATED COST	CONTRACT AWARD COST	ESTIMATED COST	CONTRACT AWARD COST	
33	CT0341 - Clearing of Right of Way for 315 kV HVac Transmission Line (MF to CF)					$29,701,301		$29,701,301		
34	CT0342 - Construction of AC Transmission Lines - Island			$13,010,122				$13,010,122		
35	CT0343 - Clearing of Right of Way for HVdc Transmission Line - Section 1			$91,825,753				$91,825,753		
36	CT0345 - Clearing of Right of Way for HVdc Transmission Line - Section 2			$53,762,352				$53,762,352		
37	CT0346 - Construction of 350 kV HVdc Transmission Line - Section 2			$167,647,168				$167,647,168		
38	PD0505 - Supply of Switchyard Equipment, AC Substations at CF, MF and SP			$23,200,921		$71,964,505		$95,165,426		
39	PD0513 - Supply of 138/25 kV Transformers	$2,098,005						$2,098,005		
40	PD0514 - Supply of 138 kV & 25 kV Circuit Breakers	$205,100						$205,100		
41	PD0515 - Supply of 230 kV, 138 kV & 25 kV Disconnect Switches	$212,480						$212,480		
42	PD0518 - Supply of 138 kV Capacitor Voltage Transformers	$25,540						$25,540		
43	PD0519 - Supply of 25 kV Vacuum Interrupters	$142,600						$142,600		
44	PD0520 - Supply of 25 kV 6 x 3.6 MVAR Capacitor Banks	$207,252						$207,252		
45	PD0522 - Supply of Pre-fabricated Control Room Building	$806,701						$806,701		
46	PD0523 - Supply of Substation Service Transformer	$18,236						$18,236		
47	PD0529 - Supply of 25 kV Reclosers	$62,859						$62,859		
48	PD0530 - Supply of 138 kV & 25 kV Surge Arrestors	$41,325						$41,325		
49	PD0531 - Supply of MV Instrument Transformer	$55,512						$55,512		
50	PD0533 - Supply and Install Early Works Telecom Devices	$317,425						$317,425		
51	PD0537 - Supply of Power Transformers, AC Substations at CF, MF and SP			$6,689,740		$22,814,174		$29,503,914		
52	PD0561 - Supply of D20 RTU and Cabinet (CF) - Construction Power	$50,000						$50,000		
53	PD0562 - Supply of Specific Relays and Test Switches (CF) - Construction Power	$100,000						$100,000		
54	PD0563 - Supply of 138 kV Circuit Switcher (CF), MV Switches/Fuse Cut-outs	$117,000						$117,000		
55	PH0014 - Supply of Generator Step-up Transformer	$19,464,468						$19,464,468		
56	PH0015 - Supply of Isolated Phase Bus	$1,860,952						$1,860,952		
57	PH0016 - Supply of Generator Circuit Breakers	$5,056,000						$5,056,000		
58	PH0036 - Supply of Auxiliary Transformers	$469,281						$469,281		
59	PH0037 - Supply of 25 kV Switchgear	$1,366,952						$1,366,952		
60	PH0038 - Supply of Emergency Diesel Generators	$1,706,125						$1,706,125		
61	PT0300 - Supply of Transmission Line Conductors - 315 kV HVac					$19,896,000		$19,896,000		
62	PT0301 - Supply of HVac Insulators - 315 kV HVac					$4,792,470		$4,792,470		
63	PT0302 - Supply of Steel Towers - 315 kV HVac					$23,879,000		$23,879,000		
64	PT0303 - Supply of Tower Hardware - 315 kV HVac					$12,133,405		$12,133,405		
65	PT0304 - Supply of Optical Ground Wire (OPGW) - 315 kV HVac					$2,322,860		$2,322,860		
66	PT0307 - Supply of Steel Tower Foundations - 315 kV HVac					$5,514,614		$5,514,614		
67	PT0308 - Supply of Steel Tower Foundations - 315 kV HVdc			$23,779,087				$23,779,087		

	CONTRACT PACKAGE ID AND DESCRIPTION	MUSKRAT FALLS GENERATION FACILITY (MF)		LABRADOR-ISLAND TRANSMISSION LINK (LITL)		LABRADOR TRANSMISSION ASSET (LTA)		TOTAL		REMARKS
		ESTIMATED COST	CONTRACT AWARD COST	ESTIMATED COST	CONTRACT AWARD COST	ESTIMATED COST	CONTRACT AWARD COST	ESTIMATED COST	CONTRACT AWARD COST	
68	PT0326 - Supply of Steel Wires - 315 kV HVac					$2,797,761		$2,797,761		
69	PT0328 - Supply of Transmission Line Conductors - 315 kV HVdc			$82,574,783				$82,574,783		
70	PT0329 - Supply of HVdc Insulators - 350 kV HVdc			$49,928,860				$49,928,860		
71	PT0330 - Supply of Steel Towers - 350 kV HVdc			$61,189,733				$61,189,733		
72	PT0331 - Supply of Tower Hardware - 350 kV HVdc			$6,431,818				$6,431,818		
73	PT0334 - Supply of Steel Wires - 350 kV HVdc			$1,815,840				$1,815,840		
74	PT0335 - Supply of Anchor Materials - 315 kV HVac					$1,920,943		$1,920,943		
75	PT0336 - Supply of 25 kV Distribution Line Hardware	$490,000						$490,000		
76	PT0337 - Supply of 25 kV Distribution Line ADSS Fibre Optic Cable	$460,000						$460,000		
77	PT0338 - Supply of 25 kV Distribution Line Conductors	$345,000						$345,000		
78	PT0339 - Supply of 25 kV Distribution Line Insulators	$65,000						$65,000		
79	PT0340 - Supply of Wood Poles for 138/25 kV Distribution Line	$375,000						$375,000		
80	PT0351 - Supply of Wood Poles			$430,060				$430,060		
81	PT0352 - Supply of Anchor Materials - 350 kV HVdc			$21,216,830				$21,216,830		
82	PT0353 - Supply of Optical Ground Wire (OPGW) - 350 kV HVdc			$3,889,923				$3,889,923		
83	SD0536 - Provision of Integrated Commissioning Support Services	$1,950,000		$3,053,762		$9,372,938		$14,376,700		
84	SD0560 - Provision of Early Works Construction Telecommunication Services (MF)	$307,993						$307,993		
85	SH0018 - Provision of Catering, Housekeeping and Janitorial Services (MF)	$114,800,000						$114,800,000		
86	SH0019 - Provision of Security Services	$21,907,250						$21,907,250		
87	SH0020 - Provision of Medical Services	$19,029,000						$19,029,000		
88	SH0021 - Provision of Road Maintenance and Snow Clearing Services (MF)	$8,150,000						$8,150,000		
89	SH0022 - Provision of Fuel Supply and Dispensing Services (MF)	$750,000						$750,000		
90	SH0040 - Provision of Garbage Removal and Disposal Services (MF)	$2,500,000						$2,500,000		
91	SH0041 - Provision of Ground Transportation Services (HVGB to MF)	$12,685,680						$12,685,680		
92	SH0051 - Provision of Building Maintenance Services (MF)	$24,000,000						$240,000,000		
93	SM0700 - Provision of General Freight Forwarding Services	$2,500,000		$7,000,000		$500,000		$10,000,000		
94	SM0701 - Provision of Third Party Quality Surveillance & Inspection Services	$2,200,000		$1,100,000		$1,100,000		$4,400,000		
95	SM0703 - Provision of Happy Valley-Goose Bay Project Office Space	$480,000						$480,000		
96	SM0704 - Provision of Surveying Services	$13,261,600						$13,261,600		
97	SM0705 - Provision of Laboratory Services	$31,078,844						$31,078,844		
98	SM0706 - Supply and Maintenance of Project Vehicles	$2,303,000		$822,500		$164,500		$3,290,000		
99	SM0707 - Provision of Helicopter Services	$3,388,750		$9,488,500		$677,750		$13,555,000		
100	SM0710 - Supply and Maintenance of various IT Equipment	$2,000,000						$2,000,000		
101	SM0713 - Provision of Geotechnical Investigation Services	$2,000,000						$2,000,000		
102	ST0309 - Provision of Geotechnical Investigation Services - 315 kV HVac					$950,000		$950,000		

	CONTRACT PACKAGE ID AND DESCRIPTION	MUSKRAT FALLS GENERATION FACILITY (MF)		LABRADOR-ISLAND TRANSMISSION LINK (LITL)		LABRADOR TRANSMISSION ASSET (LTA)		TOTAL		REMARKS
		ESTIMATED COST	CONTRACT AWARD COST	ESTIMATED COST	CONTRACT AWARD COST	ESTIMATED COST	CONTRACT AWARD COST	ESTIMATED COST	CONTRACT AWARD COST	
103	ST0310 - Provision of Geotechnical Investigation Services - 350 kV HVdc			$3,800,000				$3,800,000		
104	ZZ0999 - Unallocated SOW	$10,000,000		$4,827,959		$1,460,613		$16,278,572		
105	**GRAND TOTAL**	**$2,084,673,458**		**$1,649,537,357**		**$500,284,728**		**$4,450,485,543**		
106	**LC-SB-003 – Strait of Belle Isle Submarine Cable Design, Supply and Install**				**$125,245,370**					

The Independent Engineer has included columns in Table 5-16 to reflect what the actual contract price is for each of these items to allow a direct comparison to be made with the estimated price. Currently (March 2013) MWH has insufficient information to express any opinions pertaining to any underruns or overruns of the estimate, nor has information to fill in the table for the contract price except as shown.

Table 5-17

DELIVERY DATES

MAJOR EQUIPMENT AND SYSTEMS

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
CH0033	**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) non-embedded parts not included in this list	2016 May
PH0014	Power Transformer	2015 Jul
PH0015	Isophase System	2017 Jul
Labrador Transmission Asset		
PD0537	**Transformers 735kV – Churchill Falls Switch Yard**	2015 Jun
PD0537	**Transformers 315kV – Muskrat Falls Switch Yard**	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

PD0302	Steel Towers – 1000 Tons to Marshalling yard	2013 Oct
PD0300	Conductor – 50% to Marshalling yard	2013 Nov
Labrador Island Transmission Link		
	Synchronous Condensers – Soldiers Pond	
CD0534	1st unit at site	2014 Dec
	Converter Station Equipment – Muskrat Falls	
CD501	DC Equipment	2015 Jan
CD501	AC Equipment	2015 Mar
	Converter Station Equipment – Soldiers Pond	
CD501	DC Equipment	2015 Apr
CD501	AC Equipment	2016 Feb
	Labrador Marshalling Yard for Transmission Line	
PT0352	Anchors – 50% to Marshalling yard in Lab	2014 Apr
PT0308	Steel Tower Foundations – 50% to Marshalling yard in Lab	2014 Jun
PT0330	Steel Towers – 50% Tons to Marshalling yard in Lab	2014 Aug
PT0328	Conductor – 50% to Marshalling yard in Lab	2014 May
	Newfoundland Marshalling Yard for Transmission Line	
PT0352	Anchors – 50% to Marshalling yard in Nfld	2014 Apr
PT0308	Steel Tower Foundations – 50% to Marshalling yard in Nfld	2014 Jun
PT0330	Steel Towers – 50% Tons to Marshalling yard in Nfld	2014 Aug
PT0328	Conductor – 50% to Marshalling yard in Nfld	2014 May
SOBI Crossing		
	Subsea Cable fabricated and available for pick-up	2015 Nov

Schedule of Values

The schedule showing by component the estimated base cost (DG3 Cost) for Muskrat Falls, Labrador Transmissions link Assets and Labrador-Island Link projects cash expenditure schedule and the accumulated cash flow is given in Figure 5-1 at the bottom of the table, which has been enlarged following the figure. This exhibit was copied directly from Decision Gate 3 Capital Cost Estimate, LCP-PT-ED-00000-EP-ES-0002-01, and clearly illustrates what Nalcor Energy predicts is the cash flow for the three different projects comprising their portion of the Lower Churchill Project. In the opinion of the Independent Engineer, we find this schedule to be reasonable and supported by Nalcor Energy's evaluation and analysis. We have not yet independently reviewed the schedule within the limitations of our Agreement.

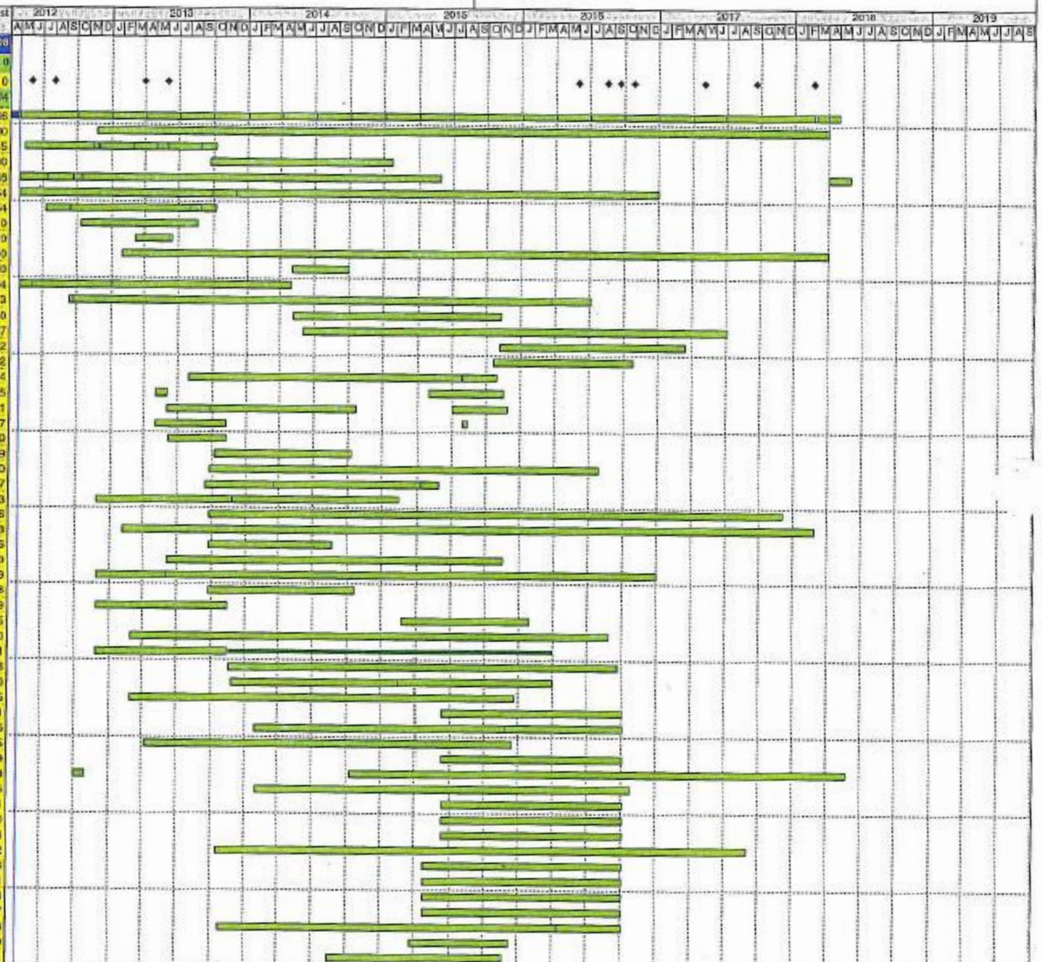
Project: LCP Ph1 DG3 Financial Model (MF+LITL+LTA+GENERAL)

Filter: TASK filter: All Activities

DG3 Financial Model

12-Jun-12 12:20

Activity ID	Activity Name	Start	Finish	Budgeted Total Cost
Total		01-Apr-12 A	29-Jun-18	5,492,783,808
General		01-Jun-12	22-Feb-18	0
No 4WBS_PHYS COMP		01-Jun-12	22-Feb-18	0
Muskrat Falls		01-Apr-12 A	29-Jun-18	2,511,923,504
0000	NO SPECIFIC COMPONENT	01-Apr-12 A	29-Jun-18	650,239,166
1030	Office Facilities - Other	23-Nov-12	31-Mar-18	480,000
1110	Access Roads	15-May-12	08-Oct-13	45,811,615
1150	Construction Bridges (Inc Spillway & MF SSAR)	23-Sep-13	23-Jan-15	8,100,000
1320	Construction Power - Muskrat Falls	01-May-12	30-May-18	19,142,968
1420	Construction Telecoms - Muskrat Falls	01-May-12	31-Dec-16	15,389,554
1500	ACCOMODATIONS COMPLEX/TEMPORARY BUILDINGS	11-Jul-12	08-Oct-13	83,384,754
1530	Buildings - Dormitories	12-Oct-12	19-Aug-13	0
1540	Buildings - Administration Building and Workshops	07-Mar-13	12-Jun-13	8,209,000
1570	Site Services	12-Nov-12	29-Jun-18	34,850,000
1830	Offsite Roads & Bridges	01-May-14	30-Sep-14	10,000,000
2000	RESERVOIR, DIVERSION, DAM & SPILLWAY - GENERAL	01-May-12	30-Apr-14	1,115,004
2110	Reservoir	11-Sep-12	06-Jul-16	144,079,173
2130	Trash Management System (incl. log booms)	06-May-14	07-Nov-15	7,500,000
2300	DAMS & COFFERDAMS	30-May-14	05-Jul-17	4,008,067
2320	North Dam	05-Nov-15	15-Mar-17	1,137,512
2321	North Dam Prep/Foundation	20-Oct-15	25-Oct-16	75,941,122
2322	North Dam Abutment	29-Jul-13	28-Oct-15	2,821,664
2330	South Dam	01-May-13	14-Nov-15	4,971,005
2341	Upstream Cofferdams	01-Jun-13	27-Nov-15	67,373,841
2342	Downstream Cofferdams	01-May-13	10-Aug-15	3,104,737
2343	Riverside Cofferdam	06-Jun-13	06-Nov-13	10,918,440
2361	North Transition Structure	09-Oct-13	11-Oct-14	7,185,589
2362	Centre Transition Structure	25-Sep-13	27-Jul-16	20,072,290
2363	South Transition Structure	13-Sep-13	28-May-15	21,511,387
2400	SPILLWAY	26-Nov-12	14-Feb-15	17,006,053
2410	Spillway Structure	25-Sep-13	04-Dec-17	76,758,866
2420	Gates, Guides Stoplogs and Hoist	06-Feb-13	26-Feb-18	53,514,793
2430	Spillway Channels	25-Sep-13	20-Aug-14	597,946
2800	NORTH SPUR	05-Jun-13	18-Nov-15	57,709,810
3000	POWER FACILITIES	26-Nov-12	31-Dec-16	40,736,119
3120	Tailrace	23-Sep-13	21-Oct-14	5,138,608
3200	INTAKE AND PENSTOCKS	26-Nov-12	13-Nov-13	51,083,599
3220	Intake Structure	25-Feb-15	27-Jan-16	178,716,005
3240	Intake Gates,Trashracks & Stoplogs	28-Feb-13	26-Aug-16	13,485,490
3300	POWERHOUSE	26-Nov-12	31-Mar-16	6,067,551
3310	Substructure	19-Nov-13	20-Sep-16	289,079,738
3320	Superstructure	25-Nov-13	31-Mar-16	45,373,310
3330	Draft Tube Gates & Hoists	28-Feb-13	18-Dec-15	94,841,166
3340	Building Electrical Services	08-Jun-15	04-Oct-16	15,782,541
3350	Building Mechanical Services	28-Jan-14	04-Oct-16	13,306,025
3360	Powerhouse Crane	06-Apr-13	15-Dec-15	8,872,175
3400	POWER GENERATION	08-Jun-15	04-Oct-16	8,985,349
3410	Turbine	01-Oct-12	23-May-18	200,000,000
3420	Generator	30-Jan-14	24-Oct-18	7,394,645
3430	Electrical Ancillary/Auxillary Systems	08-Jun-15	04-Oct-16	2,999,701
3431	DC Power/UPS System	08-Jun-15	04-Oct-16	1,517,500
3435	Station Service Transformers	08-Jun-15	04-Oct-16	1,914,704
3436	Bus Ducts	17-Oct-13	31-Aug-17	1,880,952
3440	Mechanical Ancilliary/Auxillary Systems	22-Apr-15	04-Oct-16	17,554,583
3441	Service Air System	22-Apr-15	04-Oct-16	1,162,841
3448	Colling Water System	22-Apr-15	04-Oct-16	2,438,534
3449	Service Water System	22-Apr-15	04-Oct-16	1,599,297
3460	Generator Transformers	24-Oct-13	04-Oct-16	19,731,483
3470	Spare Parts & Special Tools	24-Mar-15	07-Dec-15	277,079
6160	CL to Switchyard	14-Aug-14	20-Nov-15	3,770,591



Remaining Level of Effort — Remaining Work — Actual Work — ◆ Milestone

Page 1 of 2

TASK filter: All Activities
Resource Profile Filter:ESC_AirTravel.Air Travel (ESCALATION CUSETG01NS), ESC_Marine.Cable Laying Vessels, ESC_CementProd.Cement Products (ESCALATION V1575794), ESC_Concrete.Concrete

Figure 5-1 Schedule of Expenditures for Major Components of the Projects and Accumulated Cash Flow Projection

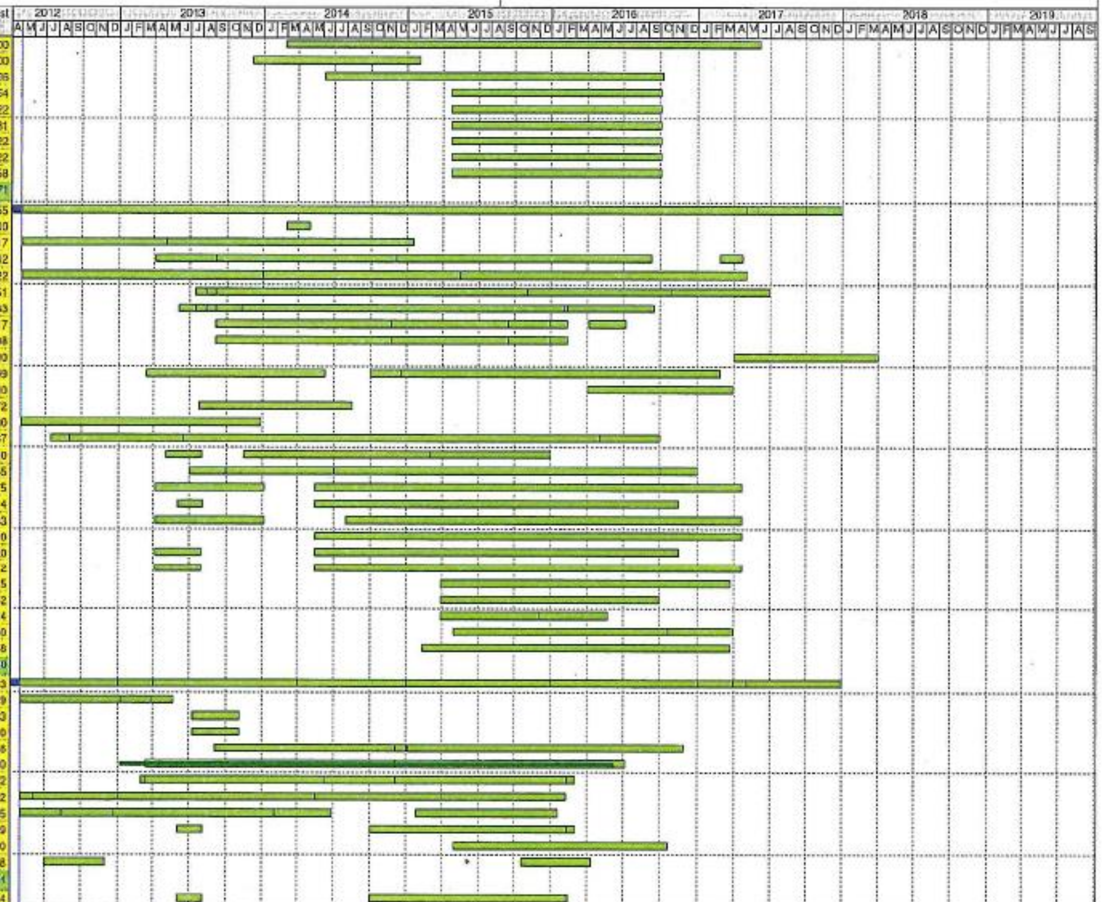
Project: LCP Ph1 DG3 Financial Model (MF+LITL+LTA+GENERAL)

Filter: TASK filter: All Activities

DG3 Financial Model

12-Jun-12 12:20

Activity ID	Activity Name	Start	Finish	Budgeted Total Cost
9112	Aquatic Habitat Compensation Muskrat Falls	27-Feb-14	07-Jun-17	10,100,000
9200	OPERATIONS TELECOMS SYSTEMS	05-Dec-13	31-Jan-15	250,000
9220	Operations Telecoms - MF	04-Jun-14	07-Oct-16	1,658,906
3442	Govonor Air System	22-Apr-15	04-Oct-16	1,172,654
3443	Fire Protection System	22-Apr-15	04-Oct-16	3,732,122
3444	Pump Drainage System	22-Apr-15	04-Oct-16	2,695,481
3445	Pump Dewatering System	22-Apr-15	04-Oct-16	2,448,322
3446	Hydraulic Oil Handling & Filtration System	22-Apr-15	04-Oct-16	862,322
3447	Oily Water Interception System	22-Apr-15	04-Oct-16	591,758
Island Link & Upgrades		01-Apr-12 A	31-Mar-18	2,359,610,971
0000	NO SPECIFIC COMPONENT	01-Apr-12 A	31-Dec-17	323,388,755
1110	Access Roads	01-Mar-14	29-Apr-14	3,500,000
1430	Construction Telecoms - Island Link	01-May-12	15-Jan-15	3,745,517
4500	SOLDIERS POND SWITCHYARD	04-Apr-13	22-Apr-17	102,144,142
6200	DC TRANSMISSION	01-May-12	02-May-17	26,995,922
6221	Island Section 1 West	13-Jul-13	29-Jun-17	534,087,951
6224	Labrador Section1 @ MF	04-Jun-13	16-Sep-16	366,800,163
6310	Electrode Line - Labrador	05-Sep-13	06-Jul-16	5,036,517
6320	Electrode Line - Newfoundland East	05-Sep-13	10-Feb-16	4,527,398
7110	Unit Conversion @ Holyrood	01-Apr-17	31-Mar-18	30,000,000
7120	New Synchronous Condensers	13-Mar-13	24-Feb-17	110,776,909
7130	Breakers	01-Apr-16	31-Mar-17	6,700,000
7140	AC Line Rebuilds	26-Jul-13	15-Aug-14	7,536,772
8110	SOBI	01-May-12	27-Dec-13	110,000
8111	Subsea Cables (SOBI) Supply	15-Jul-12	30-Sep-16	173,366,767
8113	SOBI Landfall	01-May-13	31-Dec-15	85,344,240
8114	SOBI Protection	01-Jul-13	31-Dec-16	78,619,255
00	CONVERTER STATIONS	04-Apr-13	22-Apr-17	11,788,175
0	Labrador Converter Station	01-Jun-13	17-Nov-16	179,430,514
0	Soldiers Pond Converter Station	04-Apr-13	22-Apr-17	187,199,083
00	DC SPECIALITIES - TRANSITION COMPOUNDS	13-May-14	22-Apr-17	10,498,800
8510	Transition Compound - Labrador	04-Apr-13	17-Nov-16	19,313,420
8520	Transition Compound - Northern Peninsula	04-Apr-13	22-Apr-17	18,165,312
8600	DC SPECIALITIES - ELECTRODES	27-Mar-15	24-Mar-17	420,745
8610	Electrode - Labrador	27-Mar-15	01-Oct-16	14,895,752
8620	Electrode - Newfoundland East	27-Mar-15	21-May-16	12,050,384
9200	OPERATIONS TELECOMS SYSTEMS	01-May-15	31-Mar-17	6,675,000
9230	Operations Telecoms - LITL	11-Feb-16	23-Mar-17	15,688,478
Labrador Transmission Assets		01-Apr-12 A	31-Dec-17	601,311,780
0000	NO SPECIFIC COMPONENT	01-Apr-12 A	31-Dec-17	92,799,673
1450	Construction Telecoms - Labrador Transmisison Assets	01-May-12	21-May-13	2,115,329
1500	ACCOMODATIONS COMPLEX/TEMPORARY BUILDINGS	09-Jul-13	04-Nov-13	7,520,683
1570	Site Services	09-Jul-13	04-Nov-13	9,822,840
4000	SWITCHYARDS - GENERAL	04-Sep-13	30-Nov-16	6,898,866
4100	CHURCHILL FALLS EXTENSION	08-Jan-13	07-Jul-16	117,753,190
4300	MUSKRAT FALLS SWITCHYARD	01-Mar-13	29-Feb-16	53,444,572
6140	Muskrat Falls to Churchill Falls	01-May-12	08-Feb-16	288,716,952
6180	735kV AC line at Churchill Falls	01-May-12	18-Jan-16	2,117,495
7520	315kV/138kV Switchyard @ Muskrat Falls	01-Jun-13	29-Feb-16	6,019,999
9200	OPERATIONS TELECOMS SYSTEMS	01-May-15	21-Oct-16	750,000
9250	Operations Telecoms - LTA	01-Jul-12	11-Apr-16	13,352,178
HVGB Tranmission Connection		01-Jun-13	12-Feb-16	19,937,554
7520	315kV/138kV Switchyard @ Muskrat Falls	01-Jun-13	12-Feb-16	19,937,554



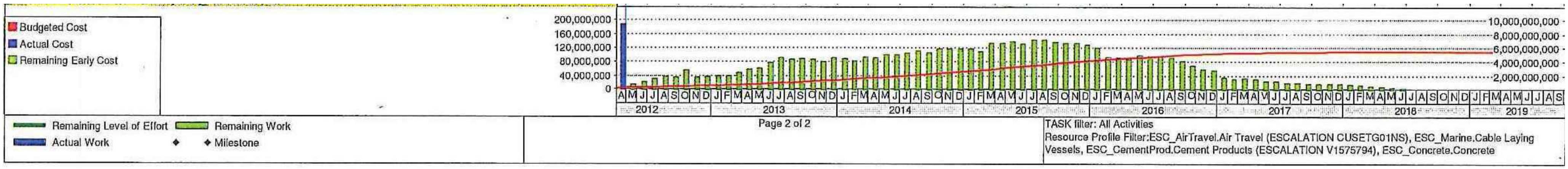
Remaining Level of Effort Remaining Work
Actual Work ◆ Milestone

Page 2 of 2

TASK filter: All Activities
Resource Profile Filter:ESC_AirTravel.Air Travel (ESCALATION CUSETG01NS), ESC_Marine.Cable Laying Vessels, ESC_CementProd.Cement Products (ESCALATION V1575794), ESC_Concrete.Concrete

Figure 5-1 Schedule of Expenditures for Major Components of the Projects and Accumulated Cash Flow Projection (continued)

Enlargement of bottom section of Figure 5-1.



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5.1.12 Allowance for Contractor Bonus

Bonuses, or performance incentives, are provided under the following contracts: CH0007

For Contract CH0007, the following incentives are offered:

ITEM NO	PERFORMANCE GOAL	BONUS	REMARKS	
1	**DIVERSION**			
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 Energy 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 ENERGY WILL PAY A BONUS FOR EACH DAY THAT ACHIEVEMENT IS EARLY, UP TO A MAXIMUS 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	**POWERHOUSE**			

ITEM NO	PERFORMANCE GOAL	BONUS	REMARKS	
	INTAKE STRUCTURE			
2.1	FOR EACH OF THE MILESTONES, M28, M36, M44, AND M52, IF CONTRACTOR ACHIEVES THE MILESTONE EARLIER THAN THE MILESTONE DATE AS LISTE4D IN THE MILESTONE SCHEDULE, NALCOR ENERGY 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		
	TOTAL POSSIBLE BONUS FOR PERFORMANCE	**$16,500,000**		

5.1.13 Highlight Sensitive and Critical Areas

LATER

5.1.14 Comparisons

LATER

5.1.15 Price Risks

Nalcor Energy has discussed in the contracting philosophy their methods to quantity and manage price risks due to changing market conditions, inflation, labor issues, weather and hydrology issues, manufacturing space and equipment availability, delays in meeting milestones, and competition with other projects in Canadian Providences. The risk assessments they conducted following a multi-faceted Project Risk Management Plan using AACEI's recommended practice for price changes for major equipment they will purchase as well as the construction and installation contracts they and SNCL will administer appears to be carefully performed and was taken into consideration in their economic analysis. The CPM schedule was also integrated into the analysis to arrive at appropriate unit cost pricing.

Where appropriate, LDs, LCs and performance protection have also been used to protect Nalcor as well as bonus provisions for at least one contract (CH0007).

The contingences for each of the projects are given below in Table 5-18 for reference as follows:

Table 5-18

CONTINGENCIES DERIVED FOR EACH PROJECT

PROJECT	CONTINGENCY AMOUNT (P50)	REMARKS
MUSKRAT FALL GENERATING STATION	$226,700,000	ON HOLD
LABRADOR TRANSMISSION ASSETS PROJECT	$54,800,000	ON HOLD
LABRADOR-ISLAND TRANSMISSION LINK PROJECT	$86,500,000	ON HOLD
TOTAL	**$368,000,000**	

5.2 DRAWDOWN SCHEDULES

In order to opine on the reasonableness of the drawdown schedules for each of the contracts that MWH is required to review and comment on, we have prepared Table 5-19 wherein we have summarized our findings for each of the contracts. We note that even where we believe we have observed some payments in favor of the contractor or vendor, since the payment schedule was considered among many items in the consideration and award of the contract, other issues may override any unbalance we may observe.

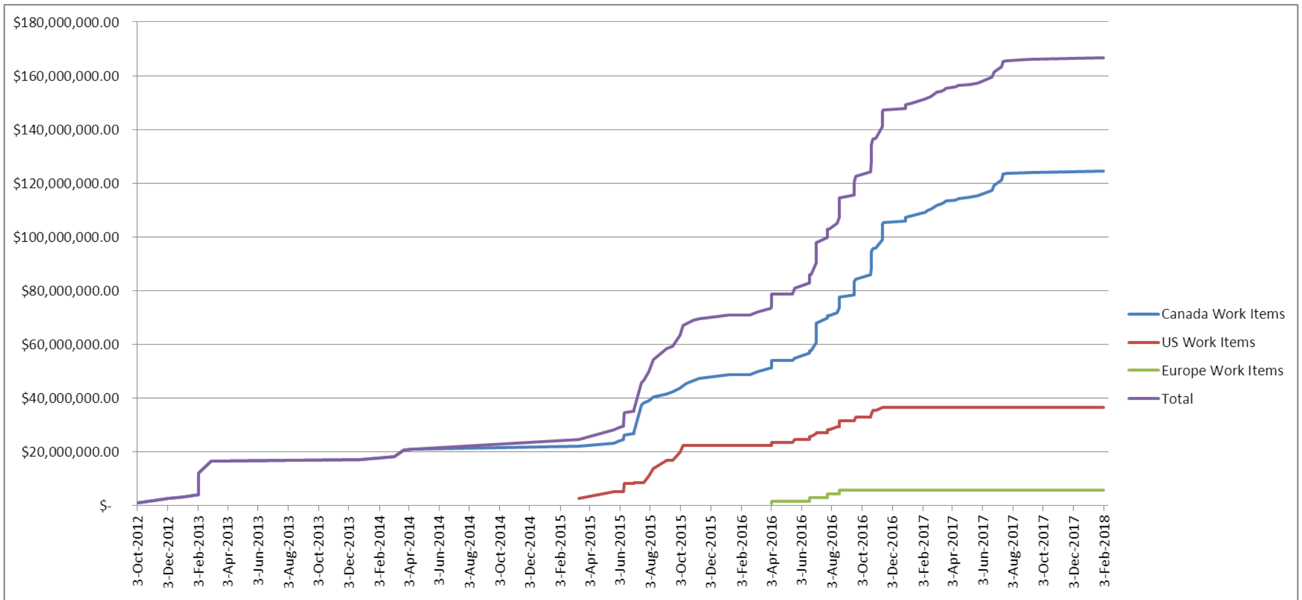
Table 5-19

PAYMENT SCHEDULES FOR CONTRACTS REVIEWED

BY THE INDEPENDENT ENGINEER

PROJECT	CONTRACT NUMBER	PAYMENT SCHEDULE		REMARKS/COMMENTS
		NORMAL EXPECTED	UNUSUAL	
MF	CH0030			

To allow a more easy comparison to determine if the drawdown payment schedule is normal or unusual, we have plotted for each of the schedules we have been asked to review. A composite plot is given in Figure 5-2 below for contract CH0030, which has three currencies to consider.



Note:
Source: Andritz Hydro Milestone Payment Schedule, Exhibit 2, Appendix B.
Payments are reported in Canadian dollars (CAD). Payments originally in US$ and Euros have been converted to CAD based on the exchange rate on December 31, 2012 as reported in OANDA Corporation, Historical Exchange Rates.

Figure 5-2 Composite Plot of Drawdown Payment Schedule – Contract CH0030

SECTION 6

COMMERCIAL OPERATION AND MAINTENANCE SERVICES

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SECTION 6

COMMERCIAL OPERATION AND MAINTENANCE SERVICES

6.1 OPERATIONS AND MAINTENANCE PLAN

6.1.1 Commercial Operation Services

Nalcor Energy plans to use outside services to assist them in operating and maintaining the terminal station extension at Churchill Falls according to Nalcor's O&M Philosophy document. The Churchill Falls Labrador Corporation will be responsible for the operation and maintenance of this facility.

Nalcor Energy plans to operate the other components of the Project they are constructing and financing by themselves or through subsidiary companies establish for taxing and legal reason.

Nalcor advises they will confirm above (RFO Manager Bob Barnes.)

6.1.2 Adequacy of Start-Up and Long-Term Procedures

6.1.3 Reasonableness of Annual Operations and Maintenance Budget

6.1.4 Reasonableness of Operation and Maintenance Fee

6.1.5 Proposed Training Budget

6.2 OPERATIONS AND MAINTENANCE COST ESTIMATE

6.2.1 Completeness

6.2.2 Assumptions

6.2.2.1 Nalcor Energy's O&M strategy is to operate Muskrat Falls, terminal and converter stations at soldiers Pond and Muskrat Falls, terminal station extension at Churchill Falls, AC transmission lines in Labrador, DC transmission lines in Labrador and Newfoundland and the

SOBI crossing and transition stations remotely from Nalcor's ECC in St. John's and by local staff as required.

6.2.2.2 Routine maintenance, condition and performance monitoring, inspection, adjustment and minor repairs will be performed by Nalcor staff working at the facilities, or located nearby in other Nalcor facilities.

6.2.2.3 Major maintenance and repair, specialized inspections, tests and adjustments will be performed by contractors through various arrangements depending on the service to be provided.

6.2.2.4 Support services including technical, environmental, accounting, budgeting, financial reporting, procurement, human resources, legal, ETC will be provided from Nalcor headquarters in St. John's.

6.2.2.5 Staffing requirements are discussed in the tables, below, and were provided by Nalcor.

6.2.2.6 Nalcor has advised MWH that as the design is refined and more specific details are finalized, the staffing requirements will be reviewed and if needed, adjusted.

6.2.3 Reasonableness Of Assumptions

6.2.4 Staffing

Contained within Nalcor Energy's Operations and Maintenance Philosophy document, LCP-PT-0000-PM-00010-01 are summary tables that designate the positions, number of personnel, and classification/expertise that are required for each of its major facilities found in the document for the Lower Churchill Project. We have included below in table form several of these tables for the principal facilities as reported by Nalcor.

Table 6-1

STAFFING REQUIREMENTS PROPOSED FOR MUSKRAT FALLS FACILITY

POSITION	NO. REQUIRED	CLASSIFICATION/EXPERTISE	REMARKS
PLANT MANAGER	1	ELECTRICAL/MECHANICAL ENGINEER	
PLANT ENGINEER, ASSET SEPCIALIST	1	ELECTRICAL/MECHANICAL ENGINEER	
TECHNCIAL SUPERVISOR	1	P&C/OPERATIONS/MECHANICAL/ ELECTRICAL TRADES & TECHNOLOGY	
TECHNCIAL OPERATOR	4	P&C/COMMUNICATIONS/OPERATION S/MECHANICAL/ELECTRICAL TRADES	

POSITION	NO. REQUIRED	CLASSIFICATION/EXPERTISE	REMARKS
		& TECHNOLOGY	
UTILITY WORKER	2	GENERAL MAINTENANCE	
PLANNER	1	MECHANICAL/ELECTRICAL—TRADES & TECHNOLOGY	
ENVIRON-MENTAL COORDI-NATOR	1	BIOLOGY, SCIENCE	
AREA OFFICE CLERK	1	ADMINISTRATION, ACCOUNTING	
CLERK	1	CLERICAL/DOCUMENT CONTROL/STORES/TOOL CRIB	
TOTAL STAFF MF	**13**		

Table 6-2

STAFFING REQUIREMENTS PROPOSED

FOR

MUSKRAT FALLS, ISLAND LINK AND MARITIME LINK TRANSMISSION (SIC) FACILITIES

POSITION	NO. REQUIRED	CLASSIFICATION/EXPERTISE	REMARKS
SYSTEM OPERATOR	5	ELECTRICAL TECHNOLOGY	
SYSTEM PERFORMANCE	1	ELECTRICAL ENGINEERING	
OPERATIONS PLANNING	1	ELECTRICAL ENGINEERING	
GENERATION COORDINATOR	1	ELECTRICAL OR HYDROTECHNICAL ENGINEER	
TOTAL MF; LITL; ML	**8**		

The Independent Engineer notes that the staffing includes provisions for the Maritime Link facilities that are believed to be just those that deal with the Nalcor assets **[Nalcor to verify that**

it is only Nalcor's assets and the Emera will provide staff too; also, how will this interface be managed???].

According to Nalcor's O&M Philosophy document, the Churchill Falls Labrador Corporation will be responsible for the operation and maintenance of the terminal station extension at Churchill Falls.

Table 6-3

STAFFING REQUIREMENTS PROPOSED

FOR

MAINTENANCE OF TRANSMISSION LINES, ELECTRODE LINE, SHORE LINE POND ELECTRODE, DISTRIBUTION LINES AT MUSKRAT FALLS AND ASSOCIATED FACILITIES IN LABRADOR WILL BE THE RESPONSIBILITY OF TRO LABRADOR. THIS INCLUDED THE SWITCHYARD AND CONVERTER STATION AT MUSKRAT FALLS, THE TRANSITION STATION AT FORTEAU BAY

POSITION	NO. REQUIRED	CLASSIFICATIONS/EXPERTISE	REMARKS
LINE WORKER	6	TRADES	
P&C TECHNOLOGIST	2	ELECTRICAL TECHNOLOGY	
ELECTRICIAN	4	TRADES	
TERMINAL MAINTENANCE A	2	TRADES	
SUPERVISOR	2	TRADES	
CLERICAL	1	TRADES	
PLANNER	1	TRADES	THE IE QUESTIONS THE EXPERTISE, BELIEVEING IT SHOULD BE AN ENGINEER OR TECHNOLOGIST
EQUIPMENT ENGINEER	1	PROFESSIONAL ENGINEER	
MECHANIC	1	TRADES	
TOTAL TRO LABRADOR	**20**		

Table 6-4

PROPOSES STAFFING LEVELS FOR TRO NORTHERN/CENTRAL INCLUDING MAINTENANCE OF TRANSMISSION LINES AND ASSOCIATED FACILITIES ON NEWFOUNDLAND INCLUDING SWITCHYARD AT SOLDIER'S POND, THE ELECTRODE LINE, SHORELINE POND ELECTRODE AT CONCEPTION BAY, THE SOBI CABLE CROSSING AND TRANSITION STATION NEAR SHOAL COVE

POSITION	NO. REQUIRED	CLASSIFICATION/EXPERTISE	REMARKS
LINE WORKER	8	TRADES	
P&C TECHNOLOGIST	4	ELECTRICAL TECHNOLOGY	
NETWORK SERVICES TECHNICIAN	3	COMMUNICATION TECHNOLOGY	
EQUIPMENT ENGINER	1	ELCTRICAL ENGINEERING	
ELECTRICIAN	6	TRADES	
TERMINAL MAINTENANCE A	2	TRADES	
GENERAL MAINTENANCE B	1	TRADES	
SUPERVISOR	2	TRADES	
VEGETATION INSPECTOR	1	TRADES	
PLANNER	1	TRADES	THE IE QUESTIONS THE EXPERTISE REQUIRED FOR THE PLANNER, REQUIRING MORE INFORMATION AS TO EXACTLY WHAT THE PLANNER WILL BE DOING SINCE THE DEFINITION

POSITION	NO. REQUIRED	CLASSIFICATION/EXPERTISE	REMARKS
			PROVIDED BY NALCOR AND REPEATED BELOW IN NOTES WOULD NORMALLY BE UNDER ENGINEERING
MECHANIC	2	TRADES	
TOTAL TRO NORTHERN & CENTRAL	**31**		

Notes: 1. A P&C Technologist is a person who will install, test, perform maintenance and modifications to protective relaying, metering, instrumentation and control equipment (P&C is Protection and Control).

2. A Planner is defined as people who will co-ordinate the development and implementation of a computerized maintenance program, develop schedules, and assist in the implementation of maintenance.

Table 6-5

PROPOSED STAFFING LEVELS FOR SOLDIERS POND CONVERTER STATION

POSITION	NO. REQUIRED	CLASSIFICATION/EXPERTISE	REMARKS
TECHNICAL SUPERVISOR	1	TECHNICAL SUPERVISOR P&C/ELECTRICAL TECHNOLOGY/ENGINEERING	
TECHNICAL OPERATOR	4	P&C/ELECTRICAL/MECHANICAL/OPERATIONS-TRADES AND TECHNOLOGY	
UTILITY WORKER	2	GENERAL MAINTENANCE	
ASSET SPECIALIST	1	ELECTRICAL/MECHANICAL ENGINEER TECHNOLOGIST	
TOTAL SOLDIERS POND	**8**		

Table 6-6
PROPOSED STAFFING LEVELS FOR ST. JOHN'S CORPORATE HEAD OFFICE
(ADDITIONAL STAFF REQUIRED FOR THE PROJECT)

POSITION	NO. REQUIRED	CLASSIFICATION/EXPERTISE	REMARKS
ENGINEERING	3	**MECHANICAL, PROTECTION AND CONEROL, ELECTRICAL**	
FINANCE-BUDGETS	1	ACCOUNTING GRADUATE	
FINANCE—GENERAL ACCOUNTING, FINANCIAL STATEMENT PREPARATION AND REPORTING	2	ACCOUNTING GRADUATE	
FINANCE—TRANSACTIONAL PROCESSING	3	ACCOUNTING GRADUATE	
FINANCE—CASH MANAGEMENT	1.5	ACCOUNTING GRADUATE	
ENVIRONMENTAL SPECIALIST, ECOLOGIST	3	BIOLOGY, SCIENCE	IN THE IE'S OPINION, THERE DOES NOT SEEM TO BE SUFFICIENT BIOLOGISTS AND ENVIRONMENTAL ENGINEERS TO MONITORING THE PROJECT AND ITS GREAT GEOGRAPHIC SPREAD, ESPECIALLY IN THE EARLY YEARS WHEN THERE WILL BE NUMEROUS REPORTS TO DEVELOP AND FACILITIES TO MONITOR AND REPORT ON. THERE IS NO MENTION OF ANY CONTRACTORS AND CONSULTANTS

POSITION	NO. REQUIRED	CLASSIFICATION/EXPERTISE	REMARKS
			PLANNED TO AID THE PROPOSED STAFF AS PRESENTLY PLANNED.[1]
INFRASTRUCTURE SUPPORT & CLIENT SUPPORT SPECIALIST (IS)	3	DEGREE OR DIPLOMA WITH APPROPIRATE TRAINING	
TOTAL CORPORATE HEAD OFFICE	**16.5**		

[1]Nalcor advised there are other staff to assist.

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

In addition to those technical personnel and specialists who will be assigned to the Project, Nalcor Energy plans to engage the following services from others as given in Table 6-7, immediately below.

Table 6-7

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	

SERVICE	REMARKS
FIRE ALARM AND SUPPRESSION SYSTEMS MAINTENANCE	
CRANE AND HOIST MAINTENANCE	
PRESSURE VESSEL INSPECTIONS	
HVAC MAINTENANC	
DAM SAFETY INSPECTIONS	IE SUGGESTS THIS CONSULTANT BE INCLUDED

In addition to the outside services to be provided by others to Nalcor Energy for the Project, Nalcor has identified specialized technical support for the following equipment and systems as given in Table 6-8.

Table 6-8

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 6-7.

6.2.5 Maintenance Provisions

6.2.6 Administrative Costs

6.2.7 Management Fees

6.2.8 Consumables

6.3 NALCOR ENERGY'S RELIABILITY STATISTICS

In the review of information furnished MWH by Nalcor Energy, we found information that is germane to consider for this review in document: LCP-PT-MD-0000-AM-PH-0001-01, REV.B1, Appendix XIV: Reliability Statistics. Nalcor's regulate utility, Newfoundland and Labrador Hydro has been a member of the Canadian Electricity Association (CEA) for many years and for the period year-2006 to year 2010 report period which is tabulated below for reference, is a good source of data pertaining to the reliability of their projects compared to the other utilities in the grouping they are a member of.

Table 6-9

RELIABILITY STATISTICS

YEARS 2006-2010

PARAMETER	CEA AVERAGE	NLH AVERAGE	NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION *Generating Availability Data System* (2007-2011) AVERAGE VALUE IS:[8]
FOR (FORCED OUTAGE RATE)1	2.60%	0.79%	5.79%
DAFOR (DERATE ADJUSTED FORCED OUTAGE RATE)[2]	2.74	0.96	ON HOLD
DAUFOP (DERATE ADJUSTED UTILIZATION FORCED OUTAGE PROBABILITY)[3]	2.40	0.84	ON HOLD
ICBF (INCAPABILITY FACTOR)[4]	8.4	8.04	ON HOLD
FAIL RATE[5]	2.15	2.79	3.10
MOF (MAINTENANCE OUTAGE FACTOR)[6]	0.85	0.70	1.92
POF(PLANNED OUTAGE FACTOR)[7]	5.41	6.59	8.46

NOTES: 1. A measure of the time a unit is unable to operate because of a problem.

2. A measure of the time a unit is unable to operate, or is able to operate but not at rated capacity, because of a problem.

3. The probability that a unit will not be available, or is available but not at rated capacity, when required.

4. A measure of the total outage time for a unit.

5. The rate at which a unit encounters a forced outage.

6. A measure of the total maintenance outage hours for a unit.

7. A measure of the planned maintenance outage hours for a unit.

8. Values in table were computed by MWH using the GADS data.

Nalcor draws the following conclusion: "The table indicates that the generating equipment operated by Newfoundland and Labrador Hydro performs very well compared to the other Canadian utilities." Based on the numbers presented in the Table 6-9, the Independent Engineer concurs with this observation.

The IE has also added values taken the North American Electric Reliability Corporation, Generating Availability Data System (GADS) for the about the same period of time for comparison purposed. Based on these values which have a much broader base but include plants in the Southern and Western portion of the USA, we find ___ LATER) ___.

Based on the above data, the Independent Engineer is of the opinion that the expected performance of Nalcor Energy and the companies it has established to operate and maintain the Lower Churchill Project assets are expected to be at least as reliable as the CEA average and is satisfactory.

SECTION 7

PROJECT AGREEMENTS

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SECTION 7

PROJECT AGREEMENTS

7.1 POWER PURCHASE AGREEMENT

7.1.1 Full Energy and Capacity Payments

THIS AGREEMENT IS NOT AVAILABLE FOR REVIEW (July 12, 2013)

7.1.2 Dispatch Power

THIS AGREEMENT IS NOT AVAILABLE FOR REVIEW (July 12, 2013)

7.2 INTERCONNECTION FACILITIES AGREEMENT

This agreement is not available for review (July 12, 2013)

7.3 WATER MANAGEMENT AGREEMENT

The Water Management Agreement, between Nalcor Energy and Churchill Falls (Labrador) Corporation Limited was ordered by the Board of Newfoundland and Labrador Board of Commissioners of Public Utilities, No. P.U. 8(2010) on March 9, 2010. The intent of this Agreement is to manage and operate facilities within the Province 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 that is necessary to affect such a policy. As such, the Agreement objective "….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 Agreement requires the establishment of a Water Management Committee 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 Power to be produced by each Supplier's Production Facilities in accordance with the provisions of the Agreement. The Independent Coordinator is required to determine the energy storage and energy losses assignments for each of the suppliers in accordance with the terms of the Agreement. The procedure under which this is accomplished and the calculations necessary to do so are described in Annex “A” to the Agreement to appropriately assign energy storage amounts and energy losses to each Supplier. Energy benefits for each of the suppliers are also described therein.

The term of the Agreement is discussed in Article 12 of the Agreement and will continue in full force until the earliest of the “....(i) the permanent cessation of all operations at either of the CF(L)Co Production Facilities or the Nalcor Production Facilities, and (ii) any earlier date agreed to by the Suppliers, subject to the execution of a new water management agreement agreed to by the Suppliers and approved by the Board pursuant to Subsection 5.4(3)(a) of the Act.

In the opinion of the IE, the Agreement is similar to other agreements where compensations must be allocated to generation facilities that share the resources of a river basin and is found to be satisfactory.

7.4 WATER LEASE AGREEMENT

The Water Lease Agreement, between Nalcor Energy and Newfoundland and Labrador was made March 17, 2009. It gives Nalcor Energy the exclusive use of all that part of the Churchill River below the 425-foot-contour line and that part of the Churchill River below Elevation 425, downstream to the intersection of the Churchill River with the meridian of 60 degrees-45 minutes West of Greenwich and includes all waters that originate within the Churchill River catchment area and all rivers that naturally flow within the catchment area. It also gives Nalcor the right to flood those areas held by the Lease. The period of the lease is for 50 years.

The Government has reserved rights of the public to use the Lower Churchill River for the purpose of fishing, shooting, hunting, trapping, logging and travelling. It places restrictions on the public that would constitute a hazard to Nalcor Energy where it would create an operation concern.

The lease gives Nalcor Energy the exclusive right to store and regulate so much of the Lower Churchill River that is economic or beneficial for the purpose of developing the Lower Churchill River.

Nalcor Energy may be required to install, operate and maintain stream flow, water level monitoring stations and other measuring measures including level of quality at designated locations. Copies of records can be provided, as requested, at least once per year.

Nalcor Energy is required to pay to the Government $2.50 per megawatt hour of power generated each year from their facilities. This rate can be adjusted every year based on the Consumer Price Index (CPI, Canada, All-items) as established under the Statistics Act of Canada.

The records must show the rates and amounts of water used on a daily basis for the generation of hydroelectric power, rates and amounts of water spilled or released downstream, operating water levels, extent of the flooded area, and additional related information requested by Government. Submittals are to be made at the end of March each year to the Water Rights Section of the Department of Environment and Conservation.

7.5 FUEL SUPPLY AND TRANSPORTATION AGREEMENT

In the opinion of the IE, this is a carryover clause from a thermal power project requirement for an IE Report and is not applicable for this report

7.6 O&M AGREEMENTS

How many agreements is Nalcor planning on? One for each of the projects: MF; LTA; AND LITL?

The agreements are not available for review (July 12, 2013)

7.6.1 Term and Termination Provisions

7.6.2 Budget Review and Control

7.6.3 Owner and Operator Responsibilities

7.6.4 Operations and Maintenance Plans

7.6.5 Environmental Compliance Plans

7.6.6 Reporting Procedures

7.6.7 Compensation and Incentive Bonus

7.6.8 Consistency

7.7 LOAN DOCUMENTS

The term sheet prepared by Nalcor is available but the loan documents are not available for review until financial close

Since the Government of Canada will receive the IE report prior to financial close, how will the IE's review be possible? MWH believes this subsection, 7.7 should not be included in the IE's Report. This work should really be assigned to the financial advisors of the Government of Canada, in our opinion.

7.7.1 Terms of a Budget Review and Approval Process

We require an explanation as to what this means

7.7.2 Review Owner/Operator Reporting Requirements

We require an explanation as to what this means

SECTION 8

REVIEW PERMITS AND LICENSES

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SECTION 8

REVIEW PERMITS AND LICENSES

8.1 PROJECT-WIDE ENVIRONMENTAL PROTECTION PLAN

As part of MWH's review of permits and licenses, we reviewed the Project-Wide Environmental Protection Plan-Component 1 and 4b (P-WEEP) provided to us by Nalcor Energy. Our copy notes a date of January 24, 2013, which is believed to be the most current edition of the Plan. The Plan succinctly provides the basis for which all work practices must follow to mitigate negative environmental effects associated with construction and commissioning of the Lower Churchill Project. The plan lays out those requirements that can be found in the following sections of the P-WEEP:

- INTRODUCTION
- PROJECT DESCRIPTION
- ROLES AND RESPONSIBILITIES
- RELEVANT LEGISLATION
- GENERAL ENVIRONMENTAL PROTECTION PROCEDURES
- ENVIRONMENTAL MONITORING AND FOLLOW UP
- CONTINGENCY PLANS
- FORMS
- REFERENCE DOCUMENTS
- REGULATORY CONTACT LIST.

The Plan includes an extensive number of figures and several tables that illustrate examples of what is typically acceptable or unacceptable practice and presents examples of recommended mitigation methods. The Plan lists in considerable detail the General Environmental Protection Procedures recommendations that are to be followed for the Project which forms the essence of the Plan. The Plan provides to those monitoring the progress of the Work the necessary guidelines and information to successfully inform others as to the acceptability of the Work being performed in a satisfactory manner in compliance with the Plan. Sample forms are provided in Section 8 of the Plan, as noted above, to track the activities where environmental monitoring is prescribed. The forms provide a historic record for regulatory review, as may be required in the permits issued to Nalcor, as well as its contractors. In the opinion of the Independent Engineer, the Plan, itself, is comprehensive and suitable, and is judged to be satisfactory for the Project.

Legislation that is relevant to the design and construction of the Project includes numerous regulatory requirements that are under the jurisdiction of federal, provincial and municipal entities. The Project adopted Nalcor Energy'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 Project as identified by Nalcor Energy as being applicable.

Table 8-1

FEDERAL, PROVINCIAL AND MUNICIPAL

ACTS AND REGULATIONS

AUTHORITY	ACTS AND REGULATIONS	COMMENTS
FEDERAL	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	
PROVINCIAL	DANGEROUS GOODS TRANSPORTATION ACT	
	ENDANGERED SPECIES ACT	
	FORESTRY ACT	
	HISTORIC RESOURCES ACT	
	NEWFOUNDLAND AND LABRADOR LANDS ACT	
	ENVIRONMENTAL PROTECTION ACT (EPA)	
	• AIR POLLUTION CONTROL REGULATIONS, 2004	
	• GASOLINE VOLATILITY	

AUTHORITY	ACTS AND REGULATIONS	COMMENTS
	CONTROL REGULATIONS, 2003	
	• PESTICIDES CONTROL REGULATIONS, 2003	
	• STORAGE AND HANDLING OF GASOLINE AND ASSOCIATED PRODUCTS REGULATIONS, 2003	
	• USED OIL CONTROL REGULATIONS, 2002	
	• WASTE DIVERSIONS REGULATIONS, 2005	
	• WASTE MANAGEMENT REGULATIONS, 2003	
	• WASTE MATERIAL DISPOSAL AREAS, 1996	
	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.
	• WELL DRILLING REGULATIONS, 2003	
	• WATER POWER RENTAL REGULATIONS, 2003	
	• ENVIRONMENTAL CONTROL WATER AND SEWAGE REGULATIONS, 2003	
	MOTORIZED SNOW VEHICLES	

AUTHORITY	ACTS AND REGULATIONS	COMMENTS
	AND ALL-TERRAIN VEHICLES REGULATIONS, 1996	
MUNICIPAL	WHERE CONSTRUCTION TAKES PLACE WITHIN MUNICIPAL BOUNDARIES, LOCAL BYLAWS ARE REQUIRED TO BE COMPLIED WITH AND PERMITS OBTAINED	APPENDIX Q CONTAINS A MAP THAT DELINEATES AREAS WHERE THE PROJECT ABUTS OR PASSES THROUGH, OR IS LOCATED WITHIN, A MUNICIPAL BOUNDAY. 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 CURENLY IMPLEMENING A REGIONAL WASTE MANAGEMENT STRATEGY IN MOST JURISDICITONS.
		THE INDEPENDENT ENGINEER AT THIS TIME CAN NOT OPINE ON ANY PERMITS AND LICENSES THAT ARE INVOLVED WITH THE LITL SINCE THEY HAVE

AUTHORITY	ACTS AND REGULATIONS	COMMENTS
		NOT BEEN PROVIDED TO MWH. THESE PERMITS AND LICENSES WILL BE REQUIRED BEFORE FINANCIAL CLOSE. NALCOR HAS BEEN REQUESTED TO PROVIDE THESE ITEMS

Nalcor reports that the total cost of obtaining permits, as reported in DG#3 estimate as given in Doc. #: 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 associate Fees that were known at that time.

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 Energy website for the Project, 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 LITL that will require further sampling to ascertain the information to form the Independent Engineer'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	Approved	Complete	Permit should reference Project

Document Reviewed			Reviewer's Assessment and Nalcor Comments	
Document No.	**Title**	**Status**	**Complete / Incomplete**	**Questions / Comments**
	Review C7 (5+800) Caroline's Brook			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-WEEP has been referenced in all applications; 2. The requirements P-WEEP 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
SLI-00008	Alter a Body of Water - Temporary Bridge 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: See SLI-00006
SLI-00082	DOEC Blanket Permit - Construction Power- Work within 15m	Approved	Complete	
SLI-00115	DFO Project Review - Water Use - C7 - C22	Approved	Complete	
SLI-00094	DFO Project Review Culvert 1 - Access Road to GD11	To Be Reviewed	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

Document Reviewed			Reviewer's Assessment and Nalcor Comments	
Document No.	**Title**	**Status**	**Complete / Incomplete**	**Questions / Comments**
				equipment, and working within 15 m of a water body. Nalcor Comment: See SLI-0006 Is there a need for water control/pumping contingency if higher stream discharges are encountered? Nalcor Comment: The contingency not required for this temporary structure; design is 1:5 year peak flow; if the flow exceeded, the road will be temporarily closed.
SLI-00079	Navigable Waters Protection Act (Muskrat Falls) p-WC-1e	To Be Reviewed	Complete	
SLI-00158	DOEC Alter a body of water - Dams	To Be Reviewed	Complete	
LCP-AM-CD-0000-EA-RP-0014-01	Fish Habitat Compensation Strategy	DRAFT		pg. 58-60: Would be helpful to have a map showing the various reaches referred to in the Total Phosphorous graphs. Reaches appear to be different from those shown in Figure 3.2. Nalcor Comment: Nalcor advised by DFO to keep additional figures to minimum; the reaches, as MWH notes are slightly different, however, they are known to the regulators. pg. 95: Figure 3.24 shows general cut and fill associated with Delta Compensation Works. Biological function of the delta habitat would likely improve if the placed excavated material elevations paralleled the original ground profile rather than being uniformly

Document Reviewed			Reviewer's Assessment and Nalcor Comments	
Document No.	**Title**	**Status**	**Complete / Incomplete**	**Questions / Comments**
				horizontal. Nalcor comment: Agree with the comment,, however, based on constructability and past experience, they selected least-cost solution recognizing that ice and high flows will modify the sections during post-construction. Fine sediments (i.e., silts and fine sands) would need to comprise <15-18% of the substrate composition if the proposed deltas are to be effective as spawning habitat for most fish (i.e., redd builders and broadcast spawners). It's mentioned that wave action will act to 'clean' the sediments in the new near shore terraces (pg. 96) that will be constructed for habitat compensation. Are all proposed terrace sites subject to sufficient wave action to ensure substrates remain functional for successful fish spawning / incubation? Will the benefits of wave action be outweighed by the effect of waves on shoreline stability/erosion and consequent sediment inputs to those habitats? The Edward's Brook (pg. 100) delta is located in a relatively protected bay. Will tributary discharges be sufficient to scour fine sediments and maintain the spawning function proposed for all the proposed new delta Compensation areas? For example, it appears unlikely that the Metchin River area (pg. 105), Minipi River (pg. 106), Elizabeth River (pg. 107), and West Mechin River (pg. 108) discharges will maintain spawning function within the entire area of the constructed deltas.

Document Reviewed			Reviewer's Assessment and Nalcor Comments	
Document No.	**Title**	**Status**	**Complete / Incomplete**	**Questions / Comments**
				pg.102: Does the Gull Island Plateau have groundwater upwelling? If it doesn't then brook trout spawning would be unlikely due to the importance of groundwater upwelling for selection of their spawning locations. Nalcor Comment: This is potential physical habitat construction option and is not included in the Fish Habitat Compensation Plan. It is being considered relevant for ongoing compensation considerations. Nalcor also includes a lengthy additional paragraph regarding this matter that is not included herein, for brevity.
TF8110486-LCD-DRAFT Compensation Plan, Dec 2020, 12 Rev 4[1]	Draft Fish Habitat Compensation Plan, Muskrat Falls Rev 4 Dec 2012	DRAFT		pg. 43: Predicted use of shoals for brook trout spawning will be unlikely due to the importance of groundwater upwelling for selection of their spawning locations. Also, what is the predicted functional life (i.e., number of years) of these shoals as viable spawning / incubation areas given the relatively low velocities and high water depths (see Table 5.5, pg. 40) and the predicted increase in TSS for the initial 10-15 years? pg. 49-50: Predicted use of deltas for brook trout spawning will be unlikely due to the importance of groundwater upwelling for selection of their spawning locations. Nalcor comment: Comment similar to above comment on upwelling RP-0014 pg. 51: Figure 5.14 shows general

Document Reviewed			Reviewer's Assessment and Nalcor Comments	
Document No.	Title	Status	Complete / Incomplete	Questions / Comments
				cut and fill associated with Delta Compensation Works. Biological function of the delta habitat would likely improve if the placed excavated material elevations paralleled the original ground profile rather than being uniformly horizontal. Nalcor Comment: Comment similar to above comment in RP-0014 pg. 53-54: Will high frequency flood discharges in Pinus River be sufficient to scour fine sediments and maintain the spawning function of proposed new delta Compensation area? What proportion of the delta is expected to be 'flushed' of fine sediments during a higher frequency event such as 2 yr. event? Nalcor Comment: Yes. Mean annual spring flows are pro-rated at 90 cms. Table 5.8 shows that at a discharge of 55 cms has the potential to flush up to 1 cm diameter material. A 2-yr event would be assumed to be of this magnitude. "..therefore, most of the delta is anticipated to flush, although there will be areas of deposition. Exact extent of substrate redistribution will not be known until monitoring begins after inundation." pg. 58: Have any habitat compensation options for improving / creating spawning and rearing habitat been explored within the cross section of the existing tributaries upstream of the FSL?

Document Reviewed			Reviewer's Assessment and Nalcor Comments	
Document No.	Title	Status	Complete / Incomplete	Questions / Comments
				Nalcor Comment: Yes. As part of the stakeholder consultation process (both Framework and strategy stages) all potential options were presented, and on the table, including compensation outside the entire watershed as well as areas of existing tributaries upstream of the FSL. It was indicated by some stakeholders, similar to other projects in Labrador, that any extension of physical works outside the proposed project area would be an extension of the project footprint. Therefore, compensation options were directed at fish species within the reservoir with physical construction constrained within the reservoir boundary. pg. 63: If slope in Tables 5.7 and 5.8 is in percent (as stated), then Incipient Particle Diameters (cm) should be divided by 100. Similarly, potential calculation error in Table 5.09 and 5.10. For the tractive force equation in Newbury and Gaboury (1993), slope is measured as m/m. Nalcor Comment: Correction required. The values of slope are in m/m however the column headings for slope in Tables 5.7 and 5.9l indicate %. The headings have been revised. pg. 83+88: Grain size analysis should also be done at some spawning redd sites to determine percent fines and therefore the suitability of the substrate for incubation. Nalcor Comment: As stated on page 87, grain size distributions

Document Reviewed			Reviewer's Assessment and Nalcor Comments	
Document No.	**Title**	**Status**	**Complete / Incomplete**	**Questions / Comments**
				will be determined for material placed in each delta so that they can be used to determine the degree of substrate shifting and movement. The geotechnical programs have provided data related to existing material as well and will be used for comparisons. Baseline samples of existing instream material can be collected in 2013 and added to the material baseline.
TF1010486_LCHG EEM_Rev3_Dec20 12[1]	Aquatic Environmental Effects Monitoring Program Dec 2012	DRAFT		Generally, the proposed EEM program appears to be quite comprehensive and appropriate in breadth for monitoring effects downstream of Muskrat Falls dam. pg. 27: The frequency and intensity / duration of field sampling events of, for example, turbine entrainment, fish habitat utilization, and fish population assessments, in the mainstem and tributaries should be clearly stated or shown in a table. pg. 43: Why is the trigger for injury/survival rate not provided? Will it be established prior to conducting the monitoring?

Responses to our questions and comments on Permits, Fish Compensation Strategy, Draft Fish Habitat Compensation Plan and Aquatic Environmental Effects Monitoring Program were provided by Nalcor in response to our requests. We acknowledge that our questions pertaining to these four subjects were satisfactorily answered by Nalcor and, in our opinion, conclude that the adopted approach is satisfactory.

Included in Appendix H section of this report is a complete list of the permits and licenses as provided to the Independent Engineer, which is current to March 2013 [ARE ANY MORE PERMITS AVAILABLE? NALCOR IS REQUESTED TO RESPOND.]. Additional permits will be required for the LITL that are not yet included on the list. We also note that Nalcor Energy advises that all permits are current. We have not independently checked to verify that this represents the current conditions and have not directly talked to Government Agencies about any of the permits, relying solely on the input we receive from Nalcor Energy.

8.3 FUNDING OF ENVIRONMENTAL STUDIES AND ADEQUACY OF BUDGET AMOUNT

8.3.1 Current Studies Funding

Table 8-3 contains the information currently available from Nalcor Energy that lists budget funding for current environmental studies.

Table 8-3

CURRENT STUDIES FUNDING MUSKRAT FALLS

AND LABRADOR-ISLAND TRANSMISSION LINK

Control Account Description	Control Account	Budget Items	2013 Budget
Environmental Affairs - General Consultation	5.1.300.0000.0303.02.00	NE-LCP General	$44,787
		Consultation Database	$25,000
		Environmental Affairs - General Consultation	$19,787
	5.1.300.0000.0303.02.00 Total		**$44,787**
Environmental Effects Monitoring	5.1.360.0000.0310.02.00	Both Gull and Muskrat Falls Generation	$1,442,500
		Aerial surveys of the river and surrounding locations for waterfowl and analyze temporal use of traditional ashkui sites.	$25,000
		Ambient air quality monitoring (AAQM) program	$50,000
		Caribou Program	$75,000
		Environmental Effects Monitoring	$900,000
		Mercury levels monitoring program	$100,000
		Nalcor will monitor and assess greenhouse gas fluxes as a result of Project activities.	$75,000
		Nalcor will monitor ice conditions and issue public advisories on the condition of ice.	$75,000
		Nalcor will monitor methylmercury levels in river otter feces.	$25,000
		Baseline methylmercury exposure program (HHRA)	$105,000
		Regionally uncommon terrestrial vegetation survey	$12,500
		Muskrat Falls – Generation	$255,000
		Comprehensive monitoring and follow-up program upon Project start-up, employing an adaptive management process	$80,000
		Nalcor will access marten data for post-Project trapping for analysis and comparison with pre-Project	$75,000

Control Account Description	Control Account	Budget Items	2013 Budget
		trapping data.	
		Nalcor will re-deploy GPS/VHF collars on bears in the river valley.	$50,000
		Winter aerial and ground or GPS telemetry surveys of moose	$50,000
		Mud Lake Drinking Water Baseline Study	$0
		Labrador - Island Transmission Link	$435,000
		Access Impacts Monitoring Program	$0
		Environmental Effects Monitoring Program	$210,000
		Furbearer Baseline Study	$75,000
		Harlequin Duck Baseline	$75,000
		Rare Plant Survey & Planning	$75,000
	5.1.360.0000.0310.02.00 Total		**$2,132,500**
Environmental Management Expert Legal Advice	5.1.300.0000.0103.02.10	E&AA Management	$132,782
		Environmental Management Expert Legal Advice	$132,782
	5.1.300.0000.0103.02.10 Total		**$132,782**
General (Response to Project Modifications)	5.4.330.0000.0000.02.00	Labrador - Island Transmission Link	$29,000
		General (Response to Project Modifications)	$24,000
		Labrador Woodland Caribou Recovery Team	$5,000
	5.4.330.0000.0000.02.00 Total		**$29,000**
LCP Aboriginal Agreements Consultation (Interpretation & Translation)	5.1.420.0000.0000.02.01	Aboriginal Affairs	$75,000
		LCP Aboriginal Agreements Consultation (Interpretation & Translation)	$25,000
		Continually engage Aboriginal groups throughout the construction and operation of the Project.	$25,000
		Aboriginal Affairs consultation - Linked to Item #1	$25,000
	5.1.420.0000.0000.02.01 Total		**$75,000**
LCP Aboriginal Agreements General Planning & Strategic Support	5.1.420.0000.0000.02.12	IBA	$210,148
		EMC	$55,000
		LCP Aboriginal Agreements General Planning & Strategic Support	$125,148
		IBA Implementation Committee shared costs with Innu Nation	$30,000
	5.1.420.0000.0000.02.12 Total		**$210,148**
LCP Aboriginal Planning Expert Advice	5.1.420.0000.0000.02.11	Aboriginal Affairs	$60,000

Control Account Description	Control Account	Budget Items	2013 Budget
		LCP Aboriginal Planning Expert Advice	$60,000
	5.1.420.0000.0000.02.11 Total		**$60,000**
LCP E&AA - Agreements with Other Aboriginal Groups	5.1.430.0000.0403.52.00	Aboriginal Affairs	$168,101
		LCP E&AA - Agreements with Other Aboriginal Groups	$168,101
	5.1.430.0000.0403.52.00 Total		**$168,101**
LCP E&AA - Isld Link EIS Response to IR's	5.4.330.0000.0306.02.00	Labrador - Island Transmission Link	$1,880,000
		LCP E&AA - Isld Link EIS Response to IR's	$1,880,000
	5.4.330.0000.0306.02.00 Total		**$1,880,000**
LCP E&AA - OAG Document Production	5.1.430.0000.0403.02.00	Aboriginal Affairs	$9,600
		LCP E&AA - OAG Document Production	$9,600
	5.1.430.0000.0403.02.00 Total		**$9,600**
LCP E&AA - OAG translation	5.1.430.0000.0403.02.01	Aboriginal Affairs	$15,596
		LCP E&AA - OAG translation	$15,596
	5.1.430.0000.0403.02.01 Total		**$15,596**
LCP E&AA - Project Commitments - Island Link Transmission	5.4.330.0000.0350.02.01	Labrador - Island Transmission Link	$250,000
		Caribou Considerations in Design	$0
		Environmental Effects Monitoring Program	$50,000
		LCP E&AA - Project Commitments - Island Link Transmission	$200,000
		Marine Fisheries Compensation Planning/Support	$0
		Rare Plant Mitigation Efforts	$0
		Socioeconomic Effects Monitoring Program	$0
	5.4.330.0000.0350.02.01 Total		**$250,000**
LCP E&AA Aboriginal Agreements Legal Support	5.1.400.0000.0103.02.00	IBA	$228,508
		EMC	$25,000
		LCP E&AA Aboriginal Agreements Legal Support	$203,508
	5.1.400.0000.0103.02.00 Total		**$228,508**
LCP E&AA Generation Project Commitments (WQM, Research, EMS etc.)	5.2.320.0000.0350.02.00	Both Gull and Muskrat Falls Generation	$518,870
		Caribou Program	$100,000
		Compensation program for flooded trap lines	$0
		LCP E&AA Generation Project Commitments (WQM, Research, EMS etc.)	$168,870

Control Account Description	Control Account	Budget Items	2013 Budget
		RTWQM	$250,000
		Muskrat Falls – Generation	$80,000
		Nalcor will conduct an amphibian relocation program prior to reservoir filling.	$0
		Nalcor will re-deploy GPS/VHF collars on bears in the river valley.	$40,000
		Winter aerial and ground or GPS telemetry surveys of moose	$40,000
	5.2.320.0000.0350.02.00 Total		**$598,870**
LCP E&AA Generation Updates and Supplements to Studies	5.2.320.0000.0304.02.10	Both Gull and Muskrat Falls Generation	$506,013
		LCP E&AA Generation Updates and Supplements to Studies	$506,013
		Muskrat Falls – Generation	$0
		Update to EcoRisk Assessment - Re-Baseline for Monitoring Program	$0
	5.2.320.0000.0304.02.10 Total		**$506,013**
LCP E&AA Island Transmission Aboriginal & Stakeholder Consultation	5.4.330.0000.0304.02.04	Labrador - Island Transmission Link	$147,801
		LCP E&AA Island Transmission Aboriginal & Stakeholder Consultation	$87,801
		Stakeholder Relations	$60,000
	5.4.330.0000.0304.02.04 Total		**$147,801**
LCP E&AA Management General Consultant Services	5.1.310.0000.0000.02.00	E&AA Management	$6,080
		LCP E&AA Management General Consultant Services	$6,080
	5.1.310.0000.0000.02.00 Total		**$6,080**
LCP E&AA Transmission Island Link DFO Compensation Strategy	5.4.330.0000.0320.02.00	Labrador - Island Transmission Link	$710,000
		LCP E&AA Transmission Island Link DFO Compensation Strategy	$360,000
		Labrador - Island Transmission Link DFO Compensation Strategy	$350,000
	5.4.330.0000.0320.02.00 Total		**$710,000**
LCP E&AA Transmission Island Link Document Production	5.4.330.0000.0305.02.02	Labrador - Island Transmission Link	$154,806
		LCP E&AA Transmission Island Link Document Production	$154,806
	5.4.330.0000.0305.02.02 Total		**$154,806**
LCP E&AA Transmission Island Link Legal Support	5.4.330.0000.0103.02.00	Labrador - Island Transmission Link	$579,661
		LCP E&AA Transmission Island Link Legal Support	$454,661
		L-ITL Environmental Management Plans	$50,000

Control Account Description	Control Account	Budget Items	2013 Budget
		Marine Fisheries Compensation Planning/Support	$50,000
		Socioeconomic Effects Monitoring Program	$25,000
	5.4.330.0000.0103.02.00 Total		**$579,661**
LCP EA GENERATION - PERMIT fees & Studies	5.2.350.0000.0320.02.00	Both Gull and Muskrat Falls Generation	$850,000
		LCP EA GENERATION - PERMIT fees & Studies	$750,000
		GI and MF Stream Surveys	$100,000
	5.2.350.0000.0320.02.00 Total		**$850,000**
LCP EA Generation (Aboriginal and Stakeholder Consultation)	5.2.320.0000.0303.02.00	Both Gull and Muskrat Falls Generation	$42,000
		LCP EA Generation (Aboriginal and Stakeholder Consultation)	$42,000
	5.2.320.0000.0303.02.00 Total		**$42,000**
LCP EA Generation DFO Compensation Strategy	5.2.320.0000.0320.02.00	Both Gull and Muskrat Falls Generation	$281,099
		LCP EA Generation DFO Compensation Strategy	$281,099
		Muskrat Falls – Generation	$350,000
		FHCP	$350,000
	5.2.320.0000.0320.02.00 Total		**$631,099**
LCP EA Generation Legal Support	5.2.300.0000.0103.02.00	Both Gull and Muskrat Falls Generation	$1,427,372
		Compensation program for flooded trap lines	$0
		LCP EA Generation Legal Support	$1,427,372
		Baseline methylmercury exposure program (HHRA)	$0
		Generation EA Court Injunction Legal Support	$0
		Muskrat Falls – Generation	$25,000
		FHCP	$25,000
		Aboriginal Affairs	$100,000
		Continually engage Aboriginal groups throughout the construction and operation of the Project.	$50,000
		Aboriginal Affairs consultation - Linked to Item #1	$50,000
	5.2.300.0000.0103.02.00 Total		**$1,552,372**
LCP EA Isld Link Process Costs (Panel, HADD, etc.)	5.4.330.0000.0310.02.00	Labrador - Island Transmission Link	$600,000
		LCP EA Isld Link Process Costs (Panel, HADD, etc.)	$450,000
		LCP EA Isld Link Process Costs	$150,000
	5.4.330.0000.0310.02.00 Total		**$600,000**

Control Account Description	Control Account	Budget Items	2013 Budget
LCP IBA Third Party Service (Document Preparation IBA, IMA)	5.1.420.0000.0000.02.00	IBA	$20,000
		LCP IBA Third Party Service (Document Preparation IBA, IMA)	$20,000
	5.1.420.0000.0000.02.00 Total		**$20,000**
Regulatory Compliance	5.1.360.0000.0000.00.00	Both Gull and Muskrat Falls Generation	$187,500
		Canada Yew relocation program	$0
		Historic and Archaeological Resources Contingency and Response Plan	$25,000
		Historic and Archaeological Resources Recovery	$100,000
		Historic Resources Overview Assessment pre-construction Stage 1	$50,000
		Regionally uncommon aquatic vegetation survey	$12,500
		Muskrat Falls – Generation	$75,000
		Active osprey nest survey and relocation program	$0
		Nalcor will conduct an amphibian relocation program prior to reservoir filling.	$25,000
		Nalcor will conduct surveys of forest avifauna (ruffed grouse and wetland songbird habitat) at key intervals during construction, and operation and maintenance.	$50,000
		Reservoir Beaver survey program	$0
		Fish Recovery/Relocation	$0
		Labrador - Island Transmission Link	$200,000
		Historic Resources Overview Assessment	$200,000
		Rare Plant Mitigation Efforts	$0
	5.1.360.0000.0000.00.00 Total		**$462,500**
LCP EA LITL - PERMIT fees & Studies	5.4.350.0000.0320.02.00	Labrador - Island Transmission Link	$500,000
		Stream Surveys	$500,000
	5.4.350.0000.0320.02.00 Total		**$500,000**
Generation Environmental Policy and Plan Development	5.2.360.0000.0000.00.00	Both Gull and Muskrat Falls Generation	$50,000
		Compensation program for flooded trap lines	$25,000
		Nalcor will develop mitigation measures for any species of plant to be in danger of extirpation in Labrador to the Project.	$25,000
	5.2.360.0000.0000.00.00 Total		**$50,000**

Control Account Description	Control Account	Budget Items	2013 Budget
LITL Environmental Policy and Plan Development	5.4.360.0000.0000.00.00	Labrador - Island Transmission Link	$325,000
		Adaptive Management	$0
		Avifauna Considerations in Design	$75,000
		Caribou Considerations during Operations	$0
		Caribou Considerations in Design	$75,000
		L-ITL Environmental Management Plans	$50,000
		Marine Fisheries Compensation Planning/Support	$50,000
		Marten Baseline Study & Considerations in Design	$50,000
		Socioeconomic Effects Monitoring Program	$25,000
	5.4.360.0000.0000.00.00 Total		**$325,000**

MWH has 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.

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 Muskrat Falls and the Labrador Transmission Assets;
- Commitments and anticipated requirements of the Labrador-Island Transmission Link EA;
- Environmental requirements of the Impacts and Benefits Agreement 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 Environmental Assessment 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.

Table 8-4

STUDIES AND SURVEYS TO BE PERFORMED DURING CONSTRUCTION

PROJECT/TOPIC	2012	2013	2014	2015	2016	2017	2018	Total
Muskrat Falls								
Historic Resources-- Stage 1		$50,000	$50,000					$100,000
Historic Resources-- Stage 3	$800,000	$100,000	$100,000					$1,000,000
Stream Surveys	$35,000	$25,000	$25,000	$25,000	$25,000			$135,000
Avifauna Management (Including Osprey nest relocation)	$70,000	$125,000	$125,000	$75,000				$395,000
Terrestrial Relocation (Beaver/Amphibian)			$100,000		$100,000			$200,000
Fish Recovery and Fish Relocation			$125,000		$125,000			$250,000
Subtotal	$905,000	$300,000	$525,000	$100,000	$250,000			$2,080,000
Labrador TL Asset								
Historic Resources— Stage 1		$12,500	$12,500					$25,000
Historic Resources— Stage 3		$75,000	$75,000					$150,000
Stream Surveys		$10,000	$10,000	$10,000				$30,000
Avifauna Management (Including Osprey nest relocation)		$50,000	$50,000	$50,000				$150,000
Rare Plant Survey (Aquatic)		$5,000	$5,000					$10,000
Subtotal		$152,500	$152,500	$60,000				$365,000
Island Link								
Historic Resources		$200,000	$150,000	$150,000	$75,000			$575,000
Stream Surveys		$50,000	$50,000	$50,000	$50,000			$200,000
Rare Plant Surveys		$50,000	$50,000	$50,000	$50,000			$200,000
Avifauna Management (Including Osprey nest relocation)		$100,000	$100,000	$100,000	$92,500			$392,500
Subtotal		$400,000	$350,000	$350,000	$267,500			$1,367,500
Total	**$90,500**	**$852,500**	**$1,027,500**	**$510,000**	**$517,500**			**$3,812,500**

8.3.3 Studies to be Performed During Project Operation and Environmental Monitoring

Nalcor has furnished budget estimates for funding programs/studies associated with environmental issues that will be conducted during the operating period of the project (current dollars). A summary of this information is contained in Table 8-5. [Comments by MWH will be furnished later.]

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Table 8-5

ENVIRONMENTAL PROGRAMS/STUDIES AND MONITORING COSTS

OPERATIONS PERIOD

Program	Year 1-5	Year 5-10	Year 10-15	Year 15-20	Year 20-25	Component	Comments
Bank Recession Rates downstream	$375,000	$375,000				MF	$75,000 per year up to year 10 and then assumed no longer required. Could be modified based on monitoring results
Bank Erosion with the Reservoir	$625,000	$625,000				MF	$125,000 per year up to year 10 and then assumed no longer required. Could be modified based on monitoring results
Sediment Transport	$375,000	$375,000				MF	$75,000 per year up to year 10 and then assumed no longer required. Could be modified based on monitoring results
Ice Formation - Reservoirs, downstream including Mud Lake	$100,000	$50,000				MF	2x year first 5 years (10,000 per trip including helicopters). Frequency after TBD based on results of monitoring. Assume 1 x per year for year 5 through 10 and then no further monitoring

Program	Year 1-5	Year 5-10	Year 10-15	Year 15-20	Year 20-25	Component	Comments
							required.
Water Quality Monitoring	$1,250,000	$625,000	$200,000	$200,000	$200,000	MF	For first 5 years use current then scale back based on monitoring results to gradually phase out system. Some level of monitoring to at least 25 years (nutrient levels predicted to return to background)
Green House Gas Flux	$30,000					MF	Cost of equipment - $20,000. High degree of confidence in prediction. Can be measured via plant staff so limited additional cost after installation.
Fish Habitat utilization upstream and Downstream	$750,000	$300,000				MF	Seven years required for Granite Canal authorization. Depends of monitoring results. Based on baseline monitoring
Nutrient Levels upstream and downstream	$500,000	$200,000				MF	Seven years required for Granite Canal authorization. Depends of monitoring results. Based on baseline

Program	Year 1-5	Year 5-10	Year 10-15	Year 15-20	Year 20-25	Component	Comments
							monitoring
Fish Growth, condition, fecundity, trophic feedings and age structure upstream and downstream	$750,000	$300,000				MF	Seven years required for Granite Canal authorization. Depends of monitoring results. Based on baseline monitoring
Entrainment	$75,000					MF	One time study. Assume results are acceptable.
Compensation Works for substrate placement, habitat stability	$500,000	$200,000				MF	Seven years required for Granite Canal authorization. Depends of monitoring results. Based on baseline monitoring
Benthic macro-invertebrates, primary and secondary productivity, and fish health and habitat utilization in reservoir	$500,000	$200,000				MF	Seven years required for Granite Canal authorization. Depends of monitoring results. Based on baseline monitoring. Based on 3 trips per year.
Monitoring Wetland habitat creation and development success	$500,000	$500,000				MF	Assume similar requirements as FHCP. 10 year monitoring program.
Methylmercury levels in river otter	$125,000					MF	Based on baseline monitoring costs. Not predicted to be an effect so monitoring will only be required for first

Program	Year 1-5	Year 5-10	Year 10-15	Year 15-20	Year 20-25	Component	Comments
							5 years to confirm predictions. May be revised based on monitoring results.
Monitoring of osprey methylmercury levels through feather collection	$125,000					MF	Based on baseline monitoring costs. Not predicted to be an effect so monitoring will only be required for first 5 years to confirm predictions. May be revised based on monitoring results.
Telemetry monitoring of black bears (included relocated bears)	$100,000					MF	Based on baseline monitoring costs. Not predicted to be an effect so monitoring will only be required for first few years to confirm predictions. May be revised based on monitoring results.
Aerial surveys to monitor the effectiveness of the beaver relocation program	$100,000					MF	Based on baseline monitoring costs. Not predicted to be an effect so monitoring will only be required for first few years to confirm predictions. May be revised based on monitoring results.

Program	Year 1-5	Year 5-10	Year 10-15	Year 15-20	Year 20-25	Component	Comments
Monitor relocated osprey nests	$100,000					MF	Based on baseline monitoring cost. Should determine success within first 2-3 years. High degree of confidence that no significant effect. Extensive experience with technique.
Winter and summer ground surveys of wildlife habitat association transects established as part of baseline to examine changes to distribution and abundance, will be conducted for furbearers and other wildlife	$200,000	$200,000				MF	Based on baseline monitoring costs. Not predicted to be an effect but may be longer term in terms of seeing effects. Monitoring may be required for first 10 years to confirm predictions. May be revised based on monitoring results.
Forest avifauna will be monitored for changes in distribution and abundance by resurveying along transects established in 2006 and 2007	$200,000	$100,000				MF	Based on baseline monitoring costs. Not predicted to be an effect but may be longer term in terms of seeing effects. Monitoring may be required for first 10 years to confirm predictions. May be revised based on monitoring results.

Program	Year 1-5	Year 5-10	Year 10-15	Year 15-20	Year 20-25	Component	Comments
Moose will be monitored using winter aerial surveys and/or GPS telemetry of moose in key wintering areas and areas where habitat is altered	$200,000					MF	Based on baseline monitoring costs. Not predicted to be an effect so monitoring will only be required for first 5 years to confirm predictions. May be revised based on monitoring results.
Assessment of trapping data post project will be conducted	$50,000					MF	Desk top review to confirm effects prediction. $10,000/year for first 5 years.
Methylmercury levels in the reservoirs will be monitored. Monitoring will include fish in the lower Churchill River, Goose Bay and Lake Melville. Monitoring will also include seals downstream of Muskrat Falls.	$400,000	$400,000	$400,000	$400,000	$400,000	MF	$75,000/year based on baseline program costs (upstream and downstream). Maybe scaled backed based on results but predicted to take 25 years to return to baseline levels.
Total MF	$7,930,000	$4,450,000	$600,000	$600,000	$600,000		
Monitor the effects on listed plants or induced effects resulting from improved access.	$50,000					LIL	Limited area to be monitored

Program	Year 1-5	Year 5-10	Year 10-15	Year 15-20	Year 20-25	Component	Comments
Monitoring of any compensation works as a result of Harmful Alteration, Disruption or Destruction (HADD) of marine fish habitat will be conducted according to a protocol acceptable to DFO. Initial monitoring (as-built monitoring) will be conducted to provide information on the structure of the compensation works, and subsequent effectiveness monitoring will also include a biological component to provide some measure of productivity occurring at the compensation works.	$600,000	$200,000				SOBI	Monitoring of the rock berms will be done using a remotely operated method such as ROV. $200 000 for data collection, data analysis and report preparation x 4 years (Year 2, 3, 5, &7) = $800,000

Assumptions

- Based on review of Generation EIS limited monitoring for Labrador Transmission Assets
- Based on review of LIL EIS there are limited commitments for the overland transmission. Subject to conditions of EA release (i.e. assume no freshwater habitat monitoring for DFO)

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8.3.4 Mitigation During Construction

Nalcor furnished to MWH a list of studies and mitigation measures that they intend to conduct during construction of the Project. As noted previously, the mitigation measures were designed to maintain compliance with the applicable legislation, Environmental Assessment commitments and requirements, and to minimize effects on the habitat. We have repeated the items that contain mitigation measures in Table 8-6 that were taken from Table 8-4 without knowledge of any study work that was included with the mitigation since there was no breakout of the mitigation costs from study costs. The IE has confirmed with Nalcor that the bulk of the cost is for mitigation of the items listed in Table 8-6. Nalcor has informed MWH that if additional funds are necessary for mitigation, Nalcor will provide the funds to ensure that habitat is fully protected.

Table 8-6

MITIGATION COSTS DURING CONSTRUCTION

PROJECT/TOPIC	2012	2013	2014	2015	2016	2017	2018	TOTAL
Muskrat Falls								
Historic Resources—Stage 3	$800,000	$100,000	$100,000					$1,000,000
Avifauna Management (Including Osprey nest relocation)	$70,000	$125,000	$125,000	$75,000				$395,000
Terrestrial Relocation (Beaver/Amphibian)			$100,000		$100,000			$200,000
Fish Recovery and Fish Relocation			$125,000		$125,000			$250,000
SUBTOTAL	$870,000	$225,000	$450,000	$75,000	$225,000			$1,845,000
Labrador TL Asset								
Historic Resources—Stage 3		$75,000	$75,000					$150,000
Avifauna Management (including Osprey nest relocation)		$50,000	$50,000	$50,000				$150,000
SUBTOTAL		$125,000	$125,000	$50,000				$300,000
Island Link								
Historic Resources		$200,000	$150,000	$150,000	$75,000			$575,000
Avifauna Management (including Osprey nest relocation)		$100,000	$100,000	$100,000	$92,500			$392,500
SUBTOTAL		$300,000	$250,000	$250,000	$167,500			$967,500
TOTAL	**$870,000**	**$650,000**	**$825,000**	**$375,000**	**$392,500**			**$3,112,500**

8.4 ENVIRONMENTAL FLOW

To maintain and provide environmental habitat downstream of the Project, studies were performed to establish the minimum flow release required from the Muskrat Falls facilities when the power station was shut down. Usually these studies employ instream flow incremental methodology (IFIM) techniques requiring habitat assessment at numerous cross sections along the river and for different depths of water that relate to flow releases. These assessments in turn are related to the requirements of different fish species to arrive at the most desired range of depth, associated with the amount of habitat in which the fish can be sustained. Information provided to MWH indicates that the minimum release flow established for the project (the environmental flow) is 350 cms. We have not independently reviewed the data to support this determination of minimum flow and have requested it from Nalcor Energy for our review and subsequent independent opinion as to it being adequate to maintain the fishery.

During the period while the reservoir is filling, estimated to be about 10 to 12 days, releases will be made that amount to 30% of the normal flow for the period. Once the reservoir is filled to full surface level (FSL), flows will be released equal to the inflow. The reservoir during the winter period will be maintained at El 25 meters, and during the spring, summer and fall at EL 24 meters.

8.5 ASSESS TECHNICAL REQUIREMENTS AND CONSTRAINTS

From an environmental perspective, Nalcor Energy identified a number of constraints during the planning process that were considered in the design and execution of the Project. Constraints and methods and means of mitigation to address the issues are summarized in Table 8-7.

Table 8-7

CONSTRAINTS AND PROVIDED MITIGATION

Constraint	Mitigation
Harmful Alteration, Disruption or Destruction of Fish and Fish Habitat, including fish mortality	- Obtain authorization from Dept. of Fisheries and Oceans based on a comprehensive habitat compensation program, environmental effects monitoring program and an approved environmental protection plan. - Used a unique approach to leverage the incidental habitat gained with the reservoir to obtain habitat units. - Committed to compensation flow during impoundment to reduce fish mortality caused by dewatering.
Stream Crossings	Addressed through a blanket approval process with the Dept. of Environment and Conservation and standard mitigation approach accepted by DFO. Navigable water

Constraint	Mitigation
	crossings identified and approval provided for navigable waters.
Historic Resources	Historic Resources potential mapping created and an investigation approach agreed with the provincial archeology office. Recovery plan approved for known sites and a contingency plan in place for inadvertent discoveries.
Wetlands	- Environmental protection plan approved which includes mitigation measures for wetlands. - A wetland compensation strategy has been proposed and a plan will be developed to address wetland losses within the reservoir. - Potential partnerships with wetland conservation agencies are to be explored.
Downstream Effects (including mercury)	Extensive analysis and modeling as part of the environmental assessment process indicates no significant downstream effects beyond Goose Bay. An environmental effects monitoring program has been developed to confirm effects predictions and an adaptive management approach will be employed.
Avifauna and Migratory Birds Convention Act	An avifauna management plan based on comprehensive surveys has been developed to allow project activities to continue during the migratory bird nesting season and to avoid raptor nesting.
Red Wine Mountain Caribou and Endangered Species (including rare plants)	The approved environmental protection plan includes measures to protect caribou and other endangered species. An environmental effects management plan has also been developed for caribou and species at risk.
Transmission Line Routing	Constraint mapping developed for all transmission lines and environmental constraints considered in conjunction with technical and economic constraints to optimize routing.
Reservoir Clearing	Reservoir clearing methodology selected to optimize technical and economic constraints as well as ensure wildlife access, navigation and aesthetics during operations.

The Independent Engineer has reviewed the EA requirements and Fisheries Act Authorization and is of the opinion that the prescribed conditions will not restrict the Project given the design will accommodate the prescribed conditions to mitigate the issues. Nalcor Energy has advised MWH that during the Project'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 Independent Engineer has not established a contact with Government since we are waiting to be transferred to the Government of Canada where there will be time to establish the contact (s) they recommend to be made by the IE to discuss the Project.

8.7 TECHNICAL AND COMMERCIAL ISSUES

Nalcor Energy 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 Project and includes the adopted mitigation for resolution of the issue.

Table 8-8

TECHNICAL AND COMMERCIAL ISSUES AND PROVIDED MITIGATION

Issue	Mitigation
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 Project.
Requirement for the provision of minimum downstream flow during impoundment and operations.	Flow values required align with available inflows and the water management agreement with the Upper Churchill plant.

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

8.8 REVIEW ENVIRONMENTAL SITE ASSESSMENT REPORT

We have included in Section 8.2 our review of typical permits prepared for the Muskrat Falls project since there are currently over 300 permits that are current which do not include those being prepared for the LITL Project. We have also reviewed the Environmental Impact Statement, Executive Summary, for the LITL project during this early phase of our studies. The Summary presents a comprehensive review of the topics that were studied and included in Table 16-3, starting on page 85 of this document, the 'Cumulative Environmental Effects Summary: Socio-economic Environment' for the findings to date. Table 8-9 is a simplified version of the EIS Summary and is presented below to be a readily available resource for further assessment by the IE.

Table 8-9

ABBREVIATED SUMMARY OF ENVIRONMENTAL EFFECTS FINDINGS OF EIS

SOCIOECONOMIC ENVIRONMENT

LABRADOR-ISLAND TRANSMISSION LINK

TOPIC	FINDING	FINDING	REMARKS
VALUED ENVIRONMENTAL COMPONENT (VEC)	LIKELY CUMULATIVE ENVIRONMENTAL EFFECTS OF OTHER FUTURE PROJECTS AND ACTIVITIES	CUMULATIVE ENVIRONMENTAL EFFECTS SUMMARY	
HISTORIC AND HERITAGE RESURCES	GROUND DISTURBANCE LCH;GENERAL INFRASTRUCTURE; INCREASED OHV ACCESS WITH FORESTRY ROADS; COULD CONTRIBUTE TO CUMULATIVE EFFECTS NEAR COMMUNITIES	NOT SIGNIFICANT	
COMMUNITIES	MAY BE DEMAND ON HEALTH-RELATED INFRASTRUCTURE DURING CONSTRUCTION; HEALTH CONCERNS WITH PROJECT OPERATION; UNIQUE TO THIS TYPE OF PROJECT	NOT SIGNIFICANT	
ECONOMY, EMPLOYMENT AND BUSINESS	MAY HAVE EFFECTS THAT OVERLAP WITH PROJECT EFFECTS; MAY RESULT IN LABOR SHORTAGES AND HIGH LABOR COSTS; CAPACITY OF PROVINCIAL COMPANIES TO SUPPLY MATERIALS AND SERVICES TO	NOT SIGNIFICANT	

TOPIC	FINDING	FINDING	REMARKS
	THE PROJECT AND OTHER PROJECTS MAY BE COMPROMISED; PROVINCIAL REVENUE BENEFIT FROM PROJECT AND OTHER PROJECTS		
LAND AND RESOURCE USE	LIMITED PROPOSED DEVELOPMENT ACTIVITY OR LIKELY CHANGES IN NATURE AND INTENSITY OF EXISTING ACTIVITIES	NOT SIGNIFICANT	
MARINE FISHERIES	NO KNOWN OR LIKELY CHANGES TO THE NATURE AND INTENSITY OF VESSEL TRAFFIC, OR ANY OTHER PROPOSED DEVELOPMENT PROJECTS IN THE AREA	NOT SIGNIFICANT	
TOURISM	INSUFFICENT SUPPLY OF SHORT-TERM ACCOMMODATIONS AND INCREASED DEMAND FOR RESTAURANTS AND RETAIL SERVICES; INCREASED TRAFFIC ON ROUTE 510 AND ROUTE 430; INCREASED NUMBER OF WORKERS AS RESULT OF GENERAL ECONOMIC DEVELOPMENT COULD AFFECT THE ABILITY OF TOURISTS TO FIND AVAILABLE ACCOMODATION	NOT SIGNIFICANT	

TOPIC	FINDING	FINDING	REMARKS
	DURING THE PEAK TOURISM SEASON		
VISUAL AESTHETICS	ALTERATIONS TO THE EXISTING VIEWSCAPES DUE TO VEGETATION CLEARING TO ACCOMMODATE ACTIVITIES, OR INFRASTRUCTURE CONSTRUCION RELATED TO OHER PROJECTS	NOT SIGNIFICANT	

8.8.1 Aquatic Environmental Effects Monitoring Program

MWH has also reviewed the DRAFT of the Aquatic Environmental Effects Monitoring Program, Muskrat Falls, December 2012, to gain insight into this program, but will not comment on this program at this time and will wait until the final Program is developed before reviewing this document. [WHEN WILL IT BE AVAILABLE? NALCOR IS REQUESTED TO RESPOND.]

8.9 SALT WATER INTRUSION

In an early study performed by Hatch for Nalcor Energy, a salt water intrusion 3D Model Study was performed to determine the effects of the reservoirs and new schedule of releases that would be necessary for the Muskrat Falls generating complex and the effects in the Churchill River and the Estuary from Goose Bay. Salinity and temperature modeling was conducted using a software program DHI MIKE 3 using data from bathymetric surveys of the Churchill River and the 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 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. The 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 its 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 extend even without the release of any compensation flow.' Based on this early study, there should be no issues with saline penetrations with the LCH in operation, in the IE's opinion.

8.10 RESERVOIR FILLING AND MANAGEMENT STRATEGIES

The Independent Engineer 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, that the compensation flow (minimum flow of 350 cms) will be modified, if necessary based on monitoring results. This will allow for flexibility based on what the monitoring results reveal to allow proper adjustments in the flow. It is uncertain if the permits provide for this adjustment and 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 the fish and the 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 the 9-11 days; this alternative was apparently selected. This alternative notes that it has the least amount of adult morality, 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 would like further clarification on this issue since there was a trade-off made, apparently where more data was presented. – NALCOR TO FURNISH]

8.11 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, the documentation presented supports the conclusions in the opinion of the Independent Engineer. No information has yet been presented on permits and studies performed for the LITL project to allow the IE to form any opinions at this time (July 12, 2012).

For other studies for example, the saline study as discussed in Section 8.9, the documentation presented by Nalcor Energy support the conclusion there will be no effect from Project operations.

8.12 UNUSUAL CIRCUMSTANCES

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

Table 8-10

UNUSUAL CIRCUMSTANCES AND PROVIDED MITIGATION

Circumstance	Mitigation
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 does not know of any other significant unusual circumstances that should be identified and discussed herein.

8.13 STATUS AND COST OF REMEDIAL ACTIVITIES

MWH, based on the information provided by Nalcor Energy to MWH pertaining to costs associated with the environmental surveys, studies, monitoring and mitigation that are currently on-going and will be during and after construction, are summarizes in Table 8-10. Tables where this information can be found are listed in the column: “Table No.” Detailed information on the costs is found in each of the tables referenced. Current status of the funds spent is unknown to MWH and has not been provided to them.

Table 8-10

SUMMARY AND STATUS OF REMEDIAL ACTIVITIES ASSOCIATED WITH

ENVIRONMENTAL WORK

Table No.	Title	Cost to Date	Status	Remarks
8--3	Current Studies Funding Muskrat Falls and Labrador-Island Transmission Link	unknown	unknown	No information pertaining to the Maritime Link is included in this Table or IE’s Report

Table No.	Title	Cost to Date	Status	Remarks
8--4	Studies and Surveys to be Performed During Construction	unknown	unknown	
8--5	Environmental Programs/Studied and Monitoring Costs, Operating Period	Period has not started	Not Applicable	
8--6	Mitigation Costs During Construction	unknown	unknown	These costs are only for mitigation and do not include studies which are included in Table No. 8--4

SECTION 9

NALCOR ENERGY'S PROJECT FINANCIAL PRO FORMA

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SECTION 9

NALCOR ENERGY'S PROJECT FINANCIAL PRO FORMA

The purpose of this section is to review Nalcor's[1] financial planning for the Lower Churchill Project (the "Project" or "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 several factors including the following:

- Development of the Project 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; and
- The Power Purchase Agreement ("PPA"), the Interconnection Facilities Agreement, the Operation and Maintenance ("O&M") Agreement and perhaps other relevant contracts and agreements that support the assumptions made are not yet available.

The review of overall Project economics has been narrowed by these constraints, and focus is placed on technical content and analysis of the Nalcor financial models and the Federal Loan Guarantee ("FLG").

The scope of the review covers three projects [note lower case "p"] being developed by Nalcor for the Province of Newfoundland and Labrador, namely the Muskrat Falls Generation Facility ("MF"), Labrador Transmission Assets ("LTA"), and Labrador Island Link ("LIL"), collectively

[1] Nalcor Energy (herein "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.

comprising the LCP. The review does not include the Maritime Link ("ML") project being developed by Emera for the Province of Nova Scotia.

9.2 CAPITAL COSTS

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

9.2.1 Cost Estimating Methodology

Construction cost estimates were prepared by Nalcor and its cost estimating consultants. The Independent Engineer ("IE"), MWH, 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 (Association for Advancement of Cost Engineering, International), 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 estimates 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 list 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 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 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 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 on 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.

9.2.2 Capital Cost Estimates

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

A deterministic 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 input into the Nalcor financial models, already in AACEI Class 2 category, differ (see Table 9-1) from those shown in Decision Gate 3 (“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

		MF	LTA	LIL	Total
DG3 Base Estimate	(1)	$ 2,511,923,504	$ 601,311,778	$ 2,359,610,970	$ 5,472,846,252
DG3 Growth Allowance	(1)(2)	389,234,769	90,270,587	250,137,947	729,643,303
Total DG3 Capital Cost Estimate	(1)	$ 2,901,158,273	$ 691,582,365	$ 2,609,748,917	$ 6,202,489,555
Additional Capitalized Costs	(3)	351,231,727	80,237,635	587,118,083	1,018,587,445
Total Costs to be Funded		$ 3,252,390,000	$ 771,820,000	$ 3,196,867,000	$ 7,221,077,000
Nalcor financial models total capex		$ 2,901,158,288	$ 691,582,485	$ 2,609,748,917	$ 6,202,489,690
Variance Nalcor model data vs. DG3		$ (15)	$ (120)	$ 0	$ (135)
		0.00%	0.00%	0.00%	0.00%
Growth allowance components					
P50 contingency		$ 226,700,000	$ 54,800,000	$ 86,500,000	$ 368,000,000
Escalation		162,545,000	35,441,000	163,658,000	361,643,000
Total		$ 389,245,000	$ 90,241,000	$ 250,158,000	$ 729,643,000
Variance of growth allowances		$ 10,231	$ (29,587)	$ 20,053	$ (303)

Notes:
(1) Source: "DG3 Capital Cost and Schedule Estimate Summary Report" Table 3, p.15
(2) DG-3 Growth Allowance = Estimate Contingency + Escalation Allowance
(3) Includes financing fees, IDC, DSRA and LRA (terms are explained in narrative)

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% (“P50”), making it an AACEI Class 3 estimate, with a level of accuracy within a +/- 20 percent band.

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 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) indicates minimal variation between DG3 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 measurable 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, intereste 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 $30k (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 +/- 20 percent of the estimate, expected outcomes may be in the range of $5.0B to $7.4B.

9.2.3 Cost Escalation

Estimated capital costs included in DG3 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.

The long duration of the development, construction and operation phases of the Project subject project costs to escalation either 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 9-3 summarizes the annual escalation through 2018.

Table 9-2

ANNUAL COST ESCALATION

ESCALATION	2012	2013	2014	2015	2016	2017	2018
MUSKRAT FALLS							
CUMMULATIVE	1.1%	2.8%	5.8%	8.3%	10.1%	10.6%	10.2%
ANNUAL	1.1%	17%	2.9%	2.3%	1.7%	0.5%	-0.3%
LABRADOR TRANSMISSION ASSETS							
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%	
LABRADOR ISLAND LINK							
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%
TOTAL PROJECT ESCALATION							
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 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 AACEI'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 those two parameters. Total aggregate contingency percentage is about 6 percent. These contingency values appear low for this stage of project development, in our opinion.

Table 9-3

CONTINGENCY ALLOWANCE

	MF	LTA	LIL	Total
Total DG3 Capital Cost Estimate	$ 2,901,158,273	$ 691,582,365	$ 2,609,748,917	$ 6,202,489,555
Growth allowance components				
P50 contingency	$ 226,700,000	$ 54,800,000	$ 86,500,000	$ 368,000,000
P50 contingency % of Nalcor total capex	7.81%	7.92%	3.31%	5.93%

9.2.5 Indirect Costs

An important component capitalized into the LCP funding mechanisms is the cost of financing. This cost category includes bond counsel, financial advisory, underwriter discount, official statement printing and distribution and other costs. Because of the very high credit worthiness of the financing securities, there will be no cost of bond insurance premiums or surety costs.

Financing costs for the three Projects included in the models total more than $123.11M, as follows:

MF $52.85M

LTA...$12.54M

LIL $57.72M

Sum $123.11M

Other indirect costs included in DG3 include:

- project management;
- integrated commissioning;
- project vehicles / helicopter support;
- insurance / commercial;
- land acquisition and permits;
- quality surveillance and inspection;
- 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% 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

Costs of capital cost that have occurred or shall have occurred prior to project financing are included in the DG3. 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.

For the LCP, the FLG stipulates at its §4.14 that “Construction costs shall be funded only with equity [i.e., no debt] prior to Financial Close”. The LCP Historical Cost projects have been funded with equity, according to Nalcor, in conformance with the FLG requirement.

Nalcor’s DG3 cost estimate and financial planning models include more than $186M in pre-operating construction costs. Table 9-4 summarizes these costs by Project.

Table 9-4

HISTORICAL COSTS

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

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

Inclusion of Historical Costs in DG3 and in the Nalcor financial models implies that the Historical Costs will be refunded (with equity not debt) with the proceeds to be repaid to the equity fund from which the money was borrowed. We assume there is no interest due with the remittance of the borrowed money, but have not verified this assumption.

9.2.7 Interest During Construction

The DG3 construction cost estimate does not include costs of interest during construction ("IDC"), also called allowance for funds used during construction ("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.

Table 9-5

FINANCING COST AND INTEREST DURING CONSTRUCTION COST

PROJECT	IDC
MF	$403,270,000
LTA	$95,700,000
LIL	$462,976,000
TOTALS	$961,946,000

9.2.8 Renewals and Replacements

Nalcor advised the IE that the financial planning for the projects does did 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 is 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 that 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.

Table 9-6

MAJOR MAINTENANCE ACTIVITIES PLANNING

Hydro Power Plant Major Maintenance Activity	Interval (years)	Activity Duration	Activity Cost
Replace bearings	Turbine 25-35 Generator 40-50 Thrust 40-50	4 days	$75,000/bearing
Replace wicket gate bushing	25-50	1 month	$400,000
Replace shaft seal	15-30	2 days	$40,000
Clean rotor and stator	50-75	1 month	$350,000
Repair cavitation	25-50	2 weeks	$60,000
Replace generator cooler	35-50	1 week	$90,000/cooler
Rewind generator	60-80	1.5 months	$9,000,000
Replace exciter	15-20	5 weeks	$1,300,000
Replace governor	15-20	5 weeks	$650,000
Replace voltage regulator	15-20	5 weeks	$300,000

9.2.9 Summary of Capital Costs

While the Capital Cost estimate is reviewed in Section 5 of this report, it is relevant to note here that the figures used as input to the pro forma appear to be a reasonable representation of the Total Cost, as can best be assumed and projected based on the information available at this time.

Refinement will be required, and will take place, as the level of engineering progresses, design drawings reach a higher level of completion and the construction packages become better defined, and contracts are awarded. Such refinement must take place prior to financial closing.

Table 9-7

CAPITAL COST ESTIMATE SUMMARY

DECISION GATE 3

(not including Growth Allowances)

MUSKRAT FALLS	
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/GSU's/Collector Lines	$484,012,733
Telecommunications	$17,298,550
Site Services	$248,312,374
Spares	$1,500,000
Sub-Total	**$2,077,401,708**
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
Sub-Total	**$337,218,632**
Historical Cost	**$97,303,164**
TOTAL, MF	**$2,511,923,504**
LABRADOR TRANSMISSION ASSETS	
OL Transmission CF-MF	$288,254,205
Switchyards	$192,087,214
Telecommunications	$15,467,507
Spares	$2,960,613
Sub-Total	**$498,769,539**
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
Quality Surveillance & Inspection / Freight Forwarding Services	$1,600,000
Sub-Total	**$98,346,146**
Historical Cost	**$4,196,093**
TOTAL, LTA	**$601,311,778**
LABRADOR-ISLAND LINK	
Converters / Transition Compounds/Synch Condensers/SP Switchyard	$639,805,781
Electrode Sites / Island Upgrades	$77,613,063
OL Transmission MF-SP	$929,045,619
SOBI Marine Crossing	$337,440,262
Telecommunications	$21,433,995
Spares	$6,724,135
Sub-Total	**$2,012,062,855**
Project Management	$194,893,751

Integrated Commissioning Services	$3,053,762
Project Vehicles / Helicopter Support	$10,311,000
Insurance / Commercial	$15,674,421
Land Acquisition and Permits	$18,472,787
Quality Surveillance & Inspection / Freight Forwarding Services	$8,100,000
Environmental & Aboriginal Affairs	$11,735,229
Sub-Total	**$262,240,951**
Historical Cost	**$85,307,165**
TOTAL, LIL	**$2,359,610,970**
GRAND TOTAL (not including Growth Allowances)	**$5,472,846,252**
GRAND TOTAL (including Growth Allowances)	**$6,202,489,555**

9.3 FINANCIAL PLANNING

The Nalcor financial planning/pro forma models are comprehensive and evaluate of nearly every variable of project cost, financing and debt repayment. The models address the three basic project elements, MF, LTA and LIL, each in two separate Excel workbooks. Nalcor has modeled the effects of providing a single financing for each element as well as a series of tranched issues to reduce reinvestment earning management and to engage, perhaps, more local Canadian investment banks in the underwriting of the large $6.2B capital formation for construction of the three LCP projects mentioned above. The MF workbook identifies an option of melding of the MF and LTA project capital requirements into single financing packages, consistent with the terms of the FLG.

Although the details are complex, the basic plan of finance is relatively straightforward primarily due to the vision and institutional coordination of the Government of Canada, the Province of Newfoundland and Labrador (“NL”), and the Province of Nova Scotia (“NS”). The intergovernmental arrangement they agreed upon in late 2012 entails a guarantee by the Canadian government that, in effect, provides that bonds sold for the LCP will be rated Aaa (Moodys) and thus will bear very attractive interest rates. The guarantee is capped at $6.3B. Cost above that amount will be equity financed by the two provinces. It is assumed that the equity portion will also be repaid including interest, but again the rates are likely to be relatively attractive in comparison with independent financings such as with bond sales without the federal guarantee.

The loan and equity guarantee is a unique arrangement for public service project financing. It does not require a separate pledge of net revenues or asset collateral to secure the financing.

9.3.1 Federal Loan Guarantee

On November 30, 2012, the Canadian Federal government, the Province of Newfoundland and Labrador and the Province of Nova Scotia signed the FLG that promised securities sold to finance construction of the LCP will be secured by the federal government’s credit. The guarantee covers project cost up to $6.3 billion in aggregate. The FLG "shall be binding on the parties" and it is "irrevocable, legal, valid and binding obligation of the parties, enforceable in accordance with its terms."

There are a number of key points in the agreement, including the following:

- Lenders [such as investment banks] "will purchase debt securities [such as bonds] to be issued by … Borrower [Nalcor] … which will be guaranteed by Canada…."
- Canada's Guarantee is "an absolute, unconditional and irrevocable guarantee of payment (not collection) when due of the Guaranteed Debt of the relevant Borrower [Nalcor] to the Lenders [investment banks]. [Underscore added for emphasis.]
- Project debt will receive AAA/Aaa credit rating – best in the world – resulting from Canada's excellent credit worthiness.
- The agreement guarantees that any interest savings must be used to reduce electricity rates.
- The debt is capped at $6.3-billion, and will not cover cost overruns.
- Additional capital required beyond the guaranteed debt will be funded by Provincial equity: NL for the Nalcor MF, LTA and LIL projects and NS for the Emera ML project.

9.3.2 FLG Project Cost Caps

The loan guarantee is limited to include project estimated costs, but cost overruns will not be protected by federal credit. The effect of this credit enhancement (federal credit vs. provincial credit) has been reported to benefit provincial rate payers by upwards of $1 billion in interest savings over the maturity period of the bonds. Any costs beyond the $6.3B cap will be funded with equity provided by the two Provinces. MWH has not verified this project saving since it is beyond our scope of service.

The FLG stipulates [§3.1 A] that the total maximum amount of borrowing "shall be the lesser of the following" three sets of metrics for each of the projects as follows:

(a) Fixed dollar based cap allocated as follows:

- MF and LTA (combined) up to $2.6B construction cost,
- LIL up to $2.4B, and
- Maritime Link ("ML") up to $1.3B.

(b) Debt limited by debt to equity ratios (sometimes called "gearing") as follows:

- MF and LTA: 65% debt / 35% equity
- LIL, 75% debt / 25% equity,

- ML: 70% debt / 30% equity

(c) Such that the debt service coverage ratio (“DSCR”) be no less than 1.40 times debt service.

The first criterion, shown as “(A) Fixed dollar cap,” is specifically referred to in the FLG as “Individual Project Debt Caps.” Under this criterion the maximum amount of guaranteed debt financing would be $5B for the three Projects.

The second criterion is “(B) Debt to equity cap.” Under this criterion the maximum amount of guaranteed debt would be 65 percent for MF+LTA and 75 percent for LIL.

The third criterion is “(C) Debt service coverage ratio.” The Nalcor models indicate that the 1.4x criterion will be met. The FLG stipulates that Nalcor shall capitalize a Liquidity Reserve account using equity funds sufficient to always keep the DSCR at 1.4x or higher.

The Nalcor financial models indicate that the second criterion is the limiting criterion. Although the Nalcor financial planning process is still in a state of refinement, the current Nalcor Sources and uses of Capital Funds tables indicate how the capital requirement would be divided between debt and equity.

9.3.3 Sources and Uses of Capital Funds

Tables 9-8 and 9-9 show the sources and uses of funds for the MF and LTA projects, as configured in the Nalcor financial models. The MF and LTA projects have combined debt amounts about $2.6B ($2.114B + $502M). The total amounts to be debt and equity funded are shown at the bottom of the Uses columns of the two tables: $3.576B for MF and $0.836B for LTA.

From the total Uses, the value of the LRA (liquidity reserve) is deducted and as well the revenues and interest figures, leaving $3.252B to be financed. 65 percent of that amount is $2.114B to be debt financed. This is the figure shown in the Sources column as “Bond1”.

Table 9-8

MF SOURCES AND USES OF CAPITAL FUNDS

MF Sources & Uses of Funds During Funding Period					
Sources			**Uses**		
Equity	1,213.38	33.9%	Capex	2,901.16	81.1%
Bond1	2,114.01	59.1%	IDC	403.27	11.3%
Revenues	212.89	6.0%	Financing Upfront Fees	52.85	1.5%
Interest on BHA	5.00	0.1%	Opex	5.52	0.2%
Interest on Opt BHA	30.92	0.9%	Water Rental	7.90	0.2%
			LTA Tariff	39.41	1.1%
			DSRA Pre-Funding (Value)	59.46	1.7%
			LRA Funding	75.00	2.1%
			Innu Implementation Pmts	27.40	0.8%
			Innu Annual Pmts	2.76	0.1%
			Working Capital	1.48	0.0%
Total	3,576.20	100.0%	Total	3,576.20	100.0%

Table 9-9

LTA SOURCES AND USES OF CAPITAL FUNDS

LTA Sources & Uses of Funds During Funding Period					
Sources			**Uses**		
Equity	290.11	34.7%	Capex	691.58	82.7%
Bond1	501.71	60.0%	IDC	95.70	11.4%
Revenues	39.41	4.7%	Financing Upfront Fees	12.54	1.5%
Interest on BHA	1.10	0.1%	Opex	1.87	0.2%
Interest on Opt BHA	4.02	0.5%	DSRA Pre-Funding (Value)	14.11	1.7%
			LRA Funding	20.00	2.4%
			Working Capital	0.53	0.1%
Total	836.34	100.0%	Total	836.34	100.0%

Analysis of the LTA information, paralleling the above discussion for the MF project confirms the “Bond1” labeled debt financing amout of $0.502B for the LTA project.

The LIL models do not include Sources and Uses of Capital Funds tables, per se. An unpublished worksheet was provided by Nalcor that follows similar format and analytics. [Requires further communication with Nalcor before including comments herein.]

Financial planning must be revisited by Nalcor once the capital cost estimates, O&M cost estimates, and forms of long-term financings are better defined.

9.3.4 Debt Service Coverage Ratio

The FLG prescribes at its §4.1 that the DSCR shall be equal to or greater than 1.4 times annual debt service. The FLG defines DSCR to be Base Cash Flow (net revenues) divided by Debt Service, where Base Cash flow includes contracted (and other) revenues less O&M expense (net revenue) plus Liquidity Reserves. Liquidity Reserves are to be funded by Provincial equity (not capitalized into the guaranteed bond sale).

9.3.5 Issuing Entity

The FLG specifies that the Guarantor shall be Her Majesty the Queen in Right of Canada and that the Borrower (issuer) shall be:

- MFCo: a special purpose wholly-owned subsidiary of Nalcor;
- LTACo: a special purpose wholly-owned subsidiary of Nalcor; and
- LILCo: a special purpose limited partnership controlled by Nalcor and held by it alone or together with Emera. The obligations of LILCo will be guaranteed by LILOpCo, special purpose wholly-owned subsidiary of Nalcor.

Further, the financing structure, according to the FLG, "will be flexible enough to allow each Borrower to raise debt…"

Financial planning must be revisited once the capital cost estimates, O&M cost estimates, and forms of long-term financings are better defined.

9.4 ANNUAL COSTS

Annual costs may seem immaterially small in comparison with the capital costs of the project, but it will be important to forecast annual costs for the purposes of bond documents. Operations and maintenance, debt service, depreciation expense and pay-as-you-go annual capital requirements will be the largest annual costs.

9.4.1 Annual O&M Expenses

Annual O&M data have been estimated by Nalcor. The costs for each of the three projects include the following cost categories:

- Staff
- Vehicles
- Service contracts
- Miscellaneous costs.

The LIL cost estimate also includes O&M costs associated with Submarine Cable and Sea Electrodes.

Nalcor has provided projected annual O&M expenses from the time of commissioning, Year 2018, out fifty years. Table 9-10 summarizes the annual costs for the three projects.

Table 9-10

ANNUAL OPERATIONS AND MAINTENANCE EXPENSES

Year:	1	2	3	4	5	10	20	30	40	50
Muskrat Falls Generation	$ 6,345,025	$ 6,345,025	$ 6,345,025	$ 6,345,025	$ 6,345,025	$ 6,345,025	$ 6,345,025	$ 6,345,025	$ 6,345,025	$ 6,345,025
Labrador Transmisson Assets	$ 2,148,360	$ 2,148,360	$ 2,148,360	$ 2,148,360	$ 2,148,360	$ 2,148,360	$ 2,148,360	$ 2,148,360	$ 2,148,360	$ 2,148,360
Labrador - Island Transmisson Link	$15,970,624	$15,970,624	$14,623,124	$15,870,624	$14,623,124	$16,070,624	$14,823,124	$14,823,124	$14,823,124	$14,823,124
Total:	**$24,464,009**	**$24,464,009**	**$23,116,509**	**$24,364,009**	**$23,116,509**	**$24,564,009**	**$23,316,509**	**$23,316,509**	**$23,316,509**	**$23,316,509**

The data shown in Table 9-10 are based on January 2012 costs and include 15 contingency allowances. Each of the first five years, the tenth year and then each subsequent tenth year are indicated.

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.

Energy Control Centre (“ECC”) costs are allocated among two projects based on expected use. They are:

- LTA 25 percent; and
- LIL 75 percent.

9.4.2 Debt service

The financial models compute annual debt service, debt service coverage requirements, and debt service reserve account, as discussed above under financial planning. Annual debt service becomes an expense that must be paid by Nalcor using revenues generated by the sale of electricity. To comply with the terms of the FLG, Nalcor will use the “Cash Needs” approach[2] to revenue requirements determination for the MF/LTA and LIL projects. It will plan that rate revenue will be sufficient to meet (with the Liquidity Reserves) the DSCR stipulated in the FLG.

[2] This approach is defined and discussed in subsequent paragraphs.

9.4.3 Capital Revenue Requirements Methods

Revenue requirements for utility service providers are typically computed using either of two computational approaches to establish rates and charges. One way is called the "Utility Method"; the other is called the "Cash Needs Method." Both methods assume that full direct costs of O&M are to be paid from annual revenues produced by the sale of product (typically quantities x rates).

The methods differ in computation of revenue required to pay for capital projects, including debt service on borrowed funds. Under the **Utility Method**, the utility entity may include depreciation expense and a return on asset value as revenue requirements to be recovered in rate revenue. The return is computed by multiplying the weighted average cost of capital (debt and equity) – sometimes called "discount rate" – times "rate base." Rate base is the sum of depreciated original costs of buying/installing assets that are used and useful in the utility business. In addition to these two main components of revenue requirements (depreciation plus return), the utility may charge for other cost items including AFUDC (IDC), working capital reserve, value of construction work in progress (assumed to become used and useful assets) ("CWIP"), materials and supplies acquisitions and certain other capital related costs. Interest expense on debt is allowed but the principal payments on debt are not allowed.

Under the **Cash Needs Method**, capital related revenue requirements include pay-as-you-go capital outlay, debt service (principal and interest), funding of capital reserves, and all other capital related costs. In essence the "cash needs" include all direct and indirect annual costs that occur and are not offset by other (non-operating) revenues.

For the LCP, the assumed utilization of the FLG loan guarantees for project financing requires that the terms and conditions in the FLG be followed. As such, Nalcor will be using the "Cash Needs" approach. Schedule "A" of the FLG prescribe revenue requirements. The following are excerpts from Schedule "A".

> "NL Crown commits to the following:
>
> 3. Ensure that, upon MF achieving in-service, the regulated rates for [Nalcor] will allow it to collect sufficient revenue in each year to enable [Nalcor] to recover those amounts incurred for the purchase and delivery of energy from MF, including those costs incurred by [Nalcor] pursuant to any applicable power purchase agreement ("PPA") … that will provide for recovery of costs over the term of the PPA and relate to :
>
>   a. Initial and sustaining capital costs and related financing costs on both debt and equity including all debt service costs and a defined rate of return on equity over the term of the PPA;

b. Operation and maintenance cost, including those costs associated with transmission service for delivery of MF power of the LTA;

c. Applicable taxes and fees;

d. Payments pursuant to and applicable Impact & Benefit agreements;

e. Payments pursuant to the water lease and water management agreements; and

f. Extraordinary or emergency repairs."

Schedule "A" provides similar language for the revenue requirements of the LTA and LIL project.

It is noted that the "rate of return" language is referring to payment to the Province associated with the equity funding.

Because Nalcor will be using the "Cash Needs" approach, the ordinary protocol of estimating depreciation expense, rate base asset value, working capital reserve requirements, AFUCD, annual CWIP and other data that are necessary for estimating revenue production under the "Utility" methods, are not necessary for estimating revenue production with the "Cash Needs" approach. Instead, the focus is on estimating annual costs that require revenue for business reasons and for meeting the DSCR requirement.

9.5 REVENUE PROJECTIONS

The PPA has not been reviewed because it has not been received, as yet. Without access to this document, and its terms and conditions, and in particular, its capacity and energy payment structure, the scope of the review in this area is very limited and the opinion offered herein must be qualified accordingly.

Without the PPA, one of the aspects that could not be verified is the reported full cost recovery via a "take or pay" obligation on the part of the off-takers. If confirmed, the hydrologic risk becomes non-relevant to the Lenders. This is because the purchases must either buy a minimum agreed to amount of power or not to buy it, but then must pay for the power anyway at an agreed-to price (usually reduced price). If there is a shortage of power in a year because of dry hydrological conditions, the seller will have already taken this into consideration when it established the price of the power in the take or pay agreement, and thus its cost of capital will be secure since they will be paid regardless of what power is available that year.

Nalcor provides projections of revenue based on the assumed terms of the PPA and the average annual power forecast of 4.93 TWH in their model. Plant usage and internal usage of the other project facilities may or may not be included in the computations—confirmation of these power deductions has not been independent verified by the IE.

9.6 IMPLEMENTATION ISSUES

9.6.1 Dispatch Constraints

The dispatch of the Projects power is controlled by the Water Management Agreement under which the Water Management Committee selects the Independent Coordinator whose responsibility is to "…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 Energy and Churchill Falls (Labrador) Corporation Limited are the 'Suppliers' of power.

MWH currently does not see where a dispatch constraint could occur, in our opinion, with the Water Management Agreement in place and dutifully promulgated and with the information the Independent Engineer is currently provided with.

We have requested of Nalcor further information pertaining to any dispatch constraints and where and why they may occur, since this issue apparently was studied and risk assessments conducted.

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 Project 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 Lower Churchill Project, as presently configured and provided with the proposed adequate Operations and Maintenance and renewals and replacement budgets, will not produce satisfactory performance and will be a reliable and dependable resource.

9.6.3 Bonus/Penalty Arrangements

The Independent Engineer has reviewed only one contract (the RFP for Contract CH0007) that considers bonus provisions. Table 4-2, Item No. 13, summarizes the provisions for receiving a bonus for this RFP (Contract CH0007). Since the contract has not been awarded, there is no way to determine if the bonus provisions will still be intact as given in the RFP. We have been advised by Nalcor that the Courts in Canada do not prejudice a contract that does not have both penalties and bonus provisions as is the case for the USA and in some other countries. Nalcor advised that they have discussed bonus provisions for each of the contracts and determine that only the contracts where there is an advantage to have this provision, have they chosen to provide a bonus provision in the contract.

For contract CH0030 involving the turbines and generators, we have commented in Table 4 3, Item No. 13, herein that it is normal to provide a bonus if the units achieve efficiencies that surpass the guaranteed efficiency, but this has not been provided in this contract.

9.6.4 Project Operating Structure and Payment Structure

Included in Appendix R is a chart, prepared by Nalcor Energy, which depicts how the principal operating payment system has been structured to allow the payment of tariffs from the provinces' rate payers to be equitable distributed, based on contractual agreements among the operating companies who will own, operate and manage the Project components. The chart envisions that if any export revenues accrue to the project (a future possibly consideration), that they will flow from Newfoundland Labrador Hydro only to the Muskrat Falls operating company. The structure was devised by Nalcor Energy as a means to allow collateral Trustees for the Muskrat Falls Assets and Labrador Transmission Assets to disburse the payments in accordance with the priority order, established in the Agreements with the parties, not only to the owners and operators of the project, but with direct payments to the Lenders. Emera NL will be receiving payments as the chart structure depicts, and discussions concerning their participation in the project are covered under a separate Independent Engineer's Report associated with their Lender Groups and the Government of Canada.

At the present time, MWH has not received copies of any drafts or the Agreements from Nalcor Energy that would allow it to review and opine on the technical appropriateness of these documents other than the Water Management Agreement and the Water Lease Agreement. We have only been requested to opine on the Power Purchase Agreement (PPA), the Interconnection Facilities Agreement (IFA), the Water Management Agreement, and the O&M Agreements (See Section 7). The Fuel Supply and Transportation Agreement listed in the MWH Agreement with Nalcor Energy, but it applicable to a thermal power project and have been eliminated from our purview of Agreements.

MWH was not requested to opine on the structure presented in the Appendix R chart, but includes it with the IE Report to allow the reader to have a ready reference for this important consideration that the Lender Groups and the Government of Canada can use in conjunction with the special consultants that will be opining on the structures' appropriateness in repaying the debt.

SECTION 10

CONCLUSION AND INDEPENDENT ENGINEER'S OPINIONS

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SECTION 10

CONCLUSIONS AND INDEPENDENT ENGINEER'S OPINIONS

To be drafted later in 2013.

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APPENDICES

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APPENDIX A

Location Map

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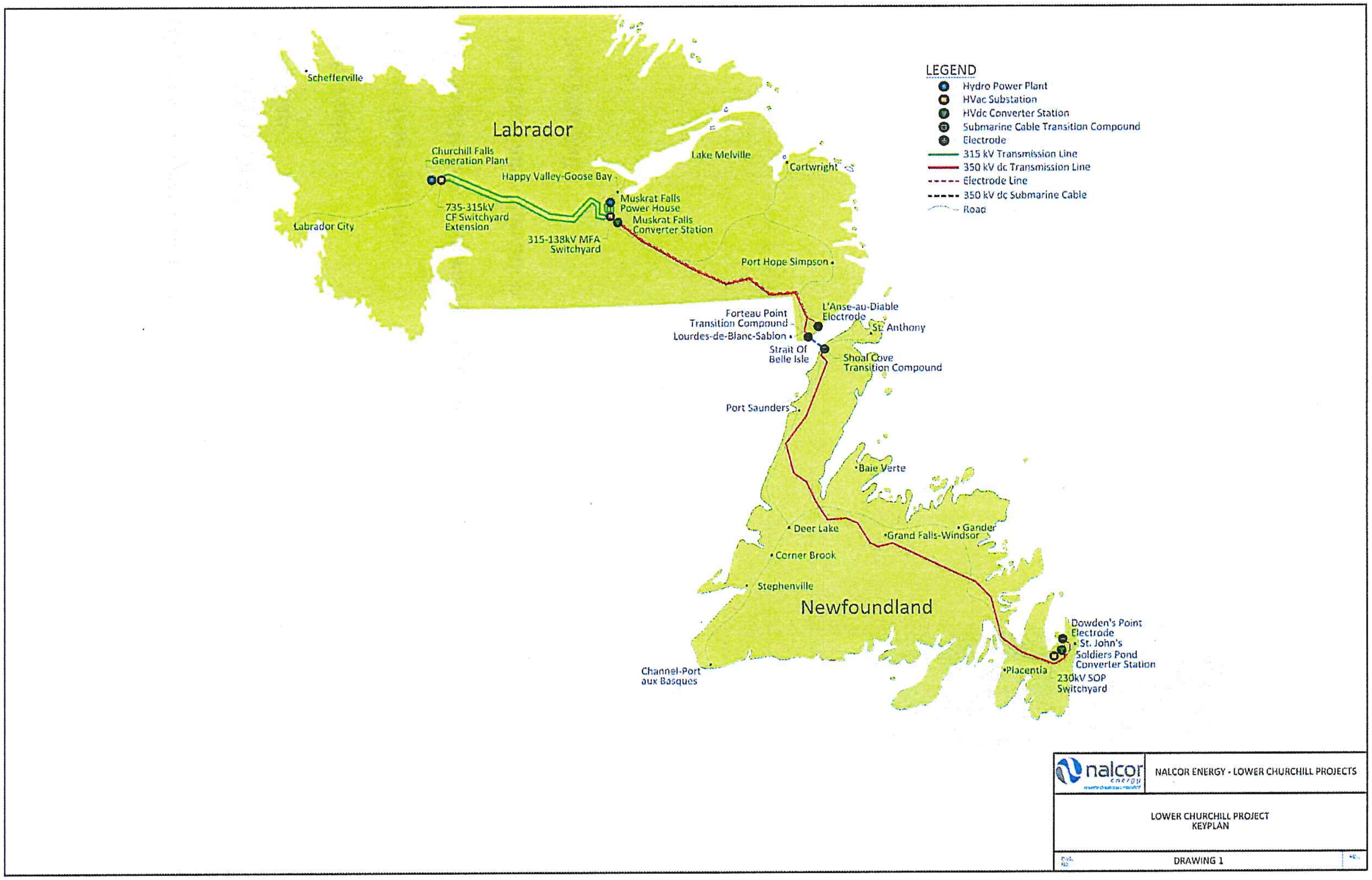
LEGEND
Hydro Power Plant
HVac Substation
HVdc Converter Station
Submarine Cable Transition Compound
Electrode
315 kV Transmission Line
350 kV dc Transmission Line
Electrode Line
350 kV dc Submarine Cable
Road
Labrador
Schefferville
Labrador City
Churchill Falls Generation Plant
735-315kV CF Switchyard Extension
Happy Valley-Goose Bay
Muskrat Falls Power House
Muskrat Falls Converter Station
315-138kV MFA Switchyard
Lake Melville
Cartwright
Port Hope Simpson
Forteau Point Transition Compound
Lourdes-de-Blanc-Sablon
L'Anse-au-Diable Electrode
St. Anthony
Strait Of Belle Isle
Shoal Cove Transition Compound
Port Saunders
Baie Verte
Deer Lake
Grand Falls-Windsor
Gander
Corner Brook
Stephenville
Newfoundland
Channel-Port aux Basques
Placentia
Dowden's Point Electrode
St. John's
Soldiers Pond Converter Station
230kV SOP Switchyard
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NALCOR ENERGY - LOWER CHURCHILL PROJECTS
LOWER CHURCHILL PROJECT KEYPLAN
DRAWING 1

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APPENDIX B

Site Plans

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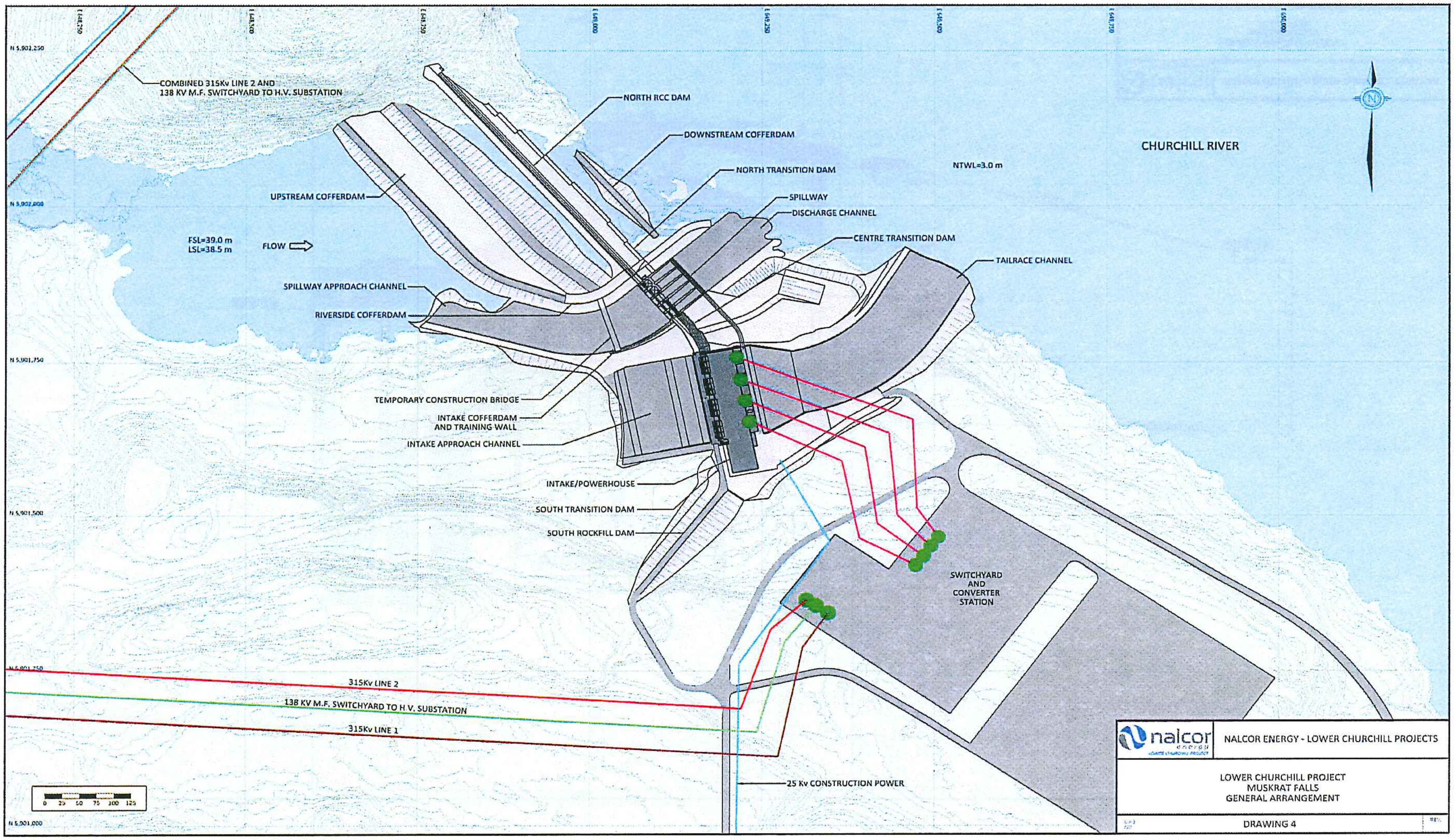
COMBINED 315Kv LINE 2 AND 138 KV M.F. SWITCHYARD TO H.V. SUBSTATION
NORTH RCC DAM
DOWNSTREAM COFFERDAM
NORTH TRANSITION DAM
CHURCHILL RIVER
NTWL=3.0 m
UPSTREAM COFFERDAM
SPILLWAY
DISCHARGE CHANNEL
CENTRE TRANSITION DAM
FSL=39.0 m
LSL=38.5 m
FLOW
TAILRACE CHANNEL
SPILLWAY APPROACH CHANNEL
RIVERSIDE COFFERDAM
TEMPORARY CONSTRUCTION BRIDGE
INTAKE COFFERDAM AND TRAINING WALL
INTAKE APPROACH CHANNEL
INTAKE/POWERHOUSE
SOUTH TRANSITION DAM
SOUTH ROCKFILL DAM
SWITCHYARD AND CONVERTER STATION
315Kv LINE 2
138 KV M.F. SWITCHYARD TO H.V. SUBSTATION
315Kv LINE 1
25 Kv CONSTRUCTION POWER
0 25 50 75 100 125
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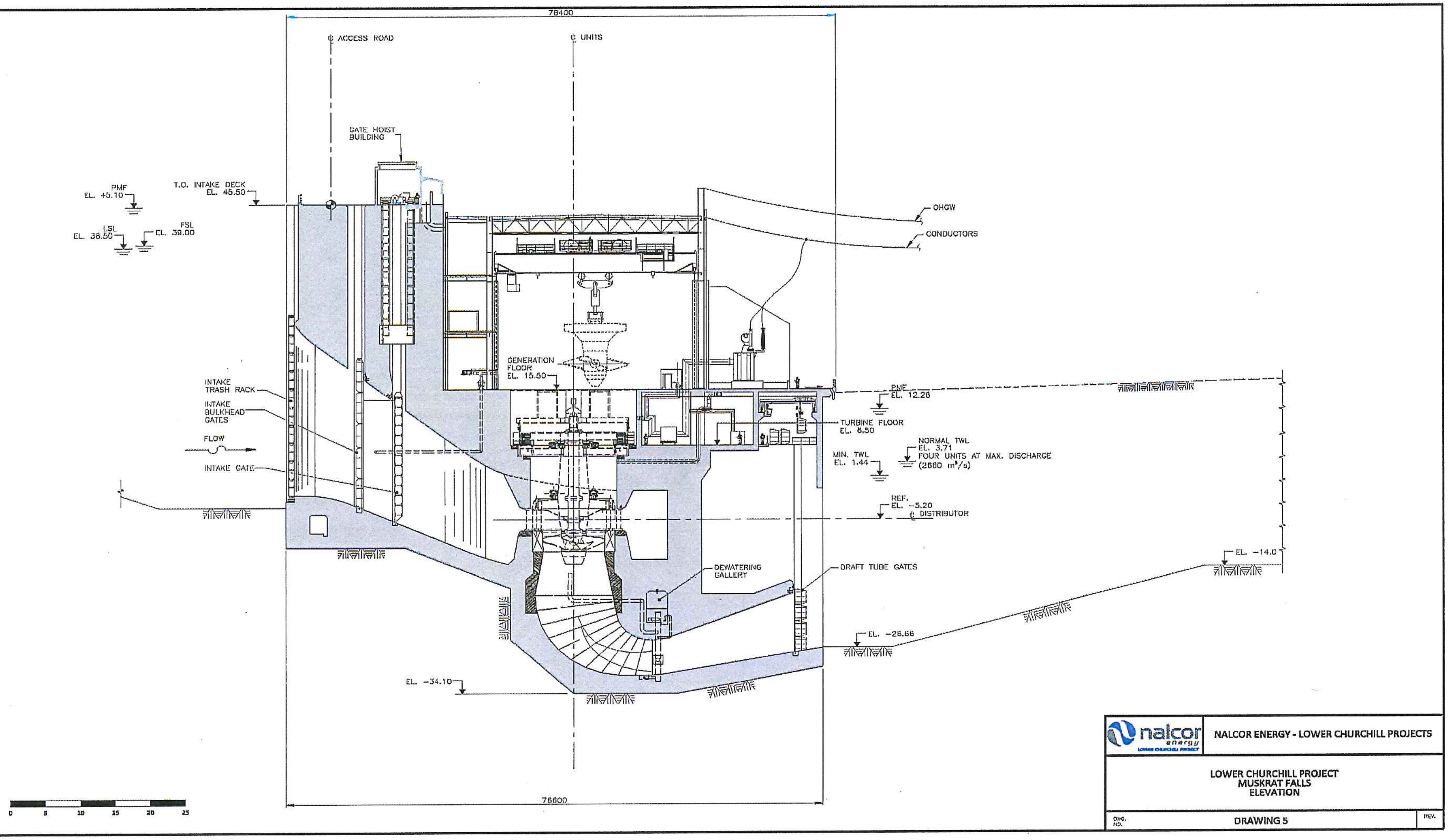
NALCOR ENERGY - LOWER CHURCHILL PROJECTS
LOWER CHURCHILL PROJECT
MUSKRAT FALLS
GENERAL ARRANGEMENT
DRAWING 4



NALCOR ENERGY - LOWER CHURCHILL PROJECTS

LOWER CHURCHILL PROJECT
MUSKRAT FALLS
ELEVATION

DWG. NO. DRAWING 5 REV.

APPENDIX C

Technical Characteristics

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APPENDIX C

TECHNICAL CHARACTERISTICS OF THE PROJECT

MUSKRAT FALLS

Location: Labrador on the Churchill River

Latitude: Longitude:

River Km:

Reservoir Volume at Full Supply Level, EL. 39.0m: _______ Length of reservoir: 58 km

Drawdown allowed by Water License: _____m; Allowable variation in water level:______cm

Operating level: Winter: Summer:

Environmental Flow: 350 cms; Release: At the Gated Spillway

<u>Power Station:</u>

Length: 181.2 m; Width: 73.4m; Height: 79.6m Powerhouse upstream deck Elevation: 45.5; Downstream deck Elevation: 15.0

Substructure: Reinforced Concrete; Superstructure: Steel Frame and Steel Clad Building; two erection bays and 4 unit bays

No. Of Units: 4—

Number and type of turbine: 5-blade Kaplan turbines; Dia: 9.2m; Maximum hydraulic capacity: 2660 cms Design flow: ____cms Minimum flow:_____ cms Design head: 39 m Size: 206 MW

Vertical Axis Synchronous Generators: 4 rated at 229 MVA; PF=0.9; Voltage________V

Minimum tailwater: _____; Normal tailwater at station rated head and flow:_____; Tailwater at PMF_____; 1:100 years_____m (6,940 cms); 1:1,000 years_____m (8120 cms)

<u>Gated Spillway</u>

Length: 74.5 m; Width:72.5 m; Height: 43m from base to deck; 27.5m to Gate House roof

Operating deck Elevation: 45.5m

PMF El. 45.1m PMF: 25,060 cms Capacity of Gated Spillway at 45.1m: 15,770 cms

Reinforced concrete structure with fully enclosed superstructure

No. of openings: 5; Ogee Sill: EL18.0; Hydraulic Capacity at Full Pool:__________cms; Hydraulic Capacity of one Gate at Full Pool:_______cms

Gate Dimensions: Width:_10.5m; Height:_22?____m; Gate weight:________Kg

Hoist type and capacity: wire rope and drum

Power supply and Operation:____________

Energy Dissipation: __________________

Fixed Crest Spillway (North RCC Dam)

Length: 425 m; Width:__________; Height:__m; Crest El. 39.3 m; Crest type: ogee shape

RCC with conventional reinforced concrete overlay with drainage gallery

Hydraulic capacity: 13,300 CMS to pass the PMF with the Gated Spillway working in combination at Elevation: 45.1m

Energy dissipation: roller bucket and unpaved rock channel

South RCC Non- Overflow Dam

Length: 325 ?m; Width:_______m; Height:______m

North Spur Dike

Length: 220 m; Crest Elevation: 46.0m ; Height: 26m

APPENDIX D

Transmission Line Routes

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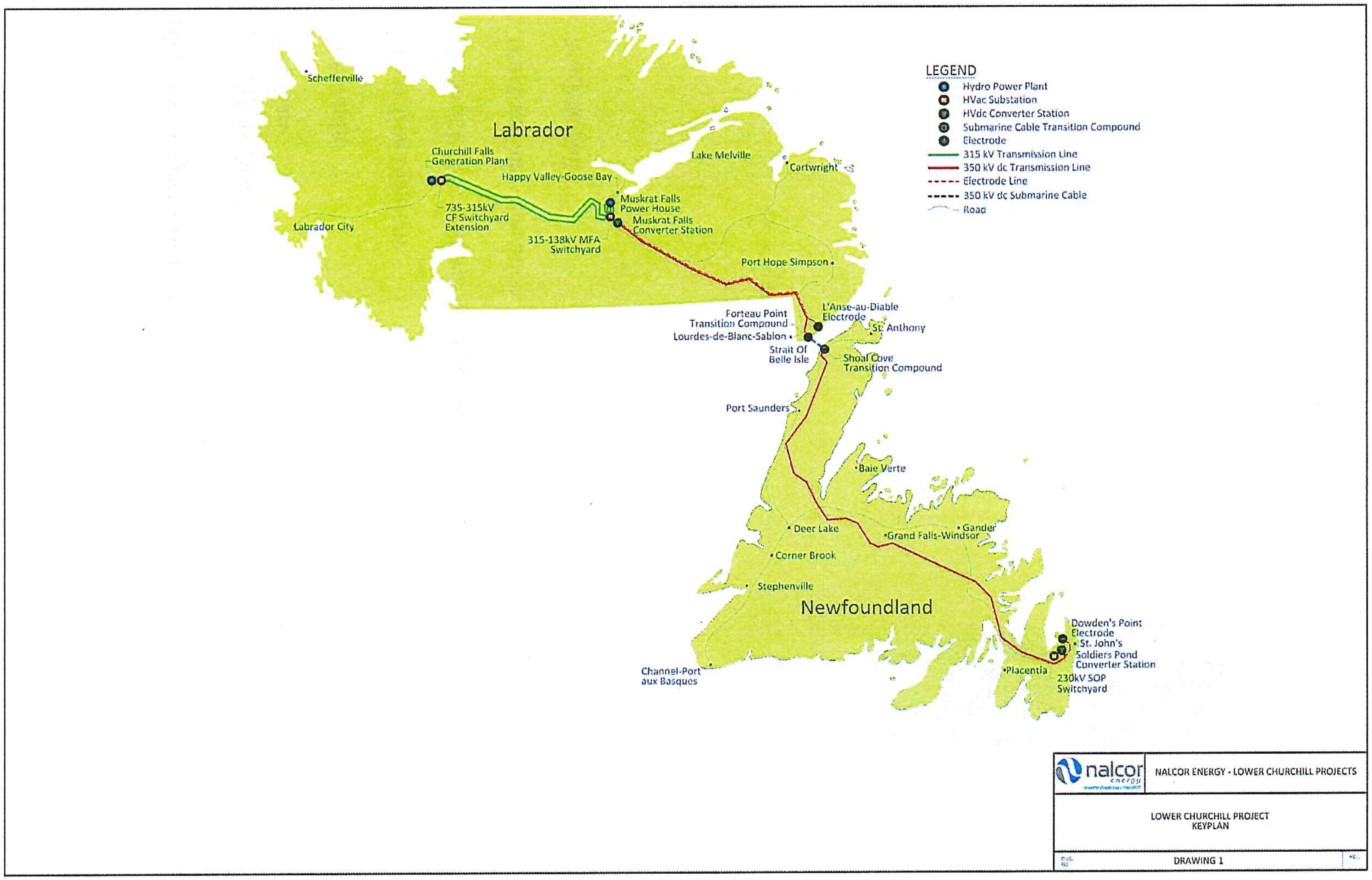
LEGEND
Hydro Power Plant
HVac Substation
HVdc Converter Station
Submarine Cable Transition Compound
Electrode
315 kV Transmission Line
350 kV dc Transmission Line
Electrode Line
350 kV dc Submarine Cable
Road
Labrador
Schefferville
Labrador City
Churchill Falls Generation Plant
735-315kV CF Switchyard Extension
Happy Valley-Goose Bay
Muskrat Falls Power House
Muskrat Falls Converter Station
315-138kV MFA Switchyard
Lake Melville
Cartwright
Port Hope Simpson
Forteau Point Transition Compound
Lourdes-de-Blanc-Sablon
L'Anse-au-Diable Electrode
St. Anthony
Strait Of Belle Isle
Shoal Cove Transition Compound
Port Saunders
Baie Verte
Deer Lake
Corner Brook
Grand Falls-Windsor
Gander
Stephenville
Newfoundland
Channel-Port aux Basques
Placentia
Dowden's Point Electrode
St. John's
Soldiers Pond Converter Station
230kV SOP Switchyard
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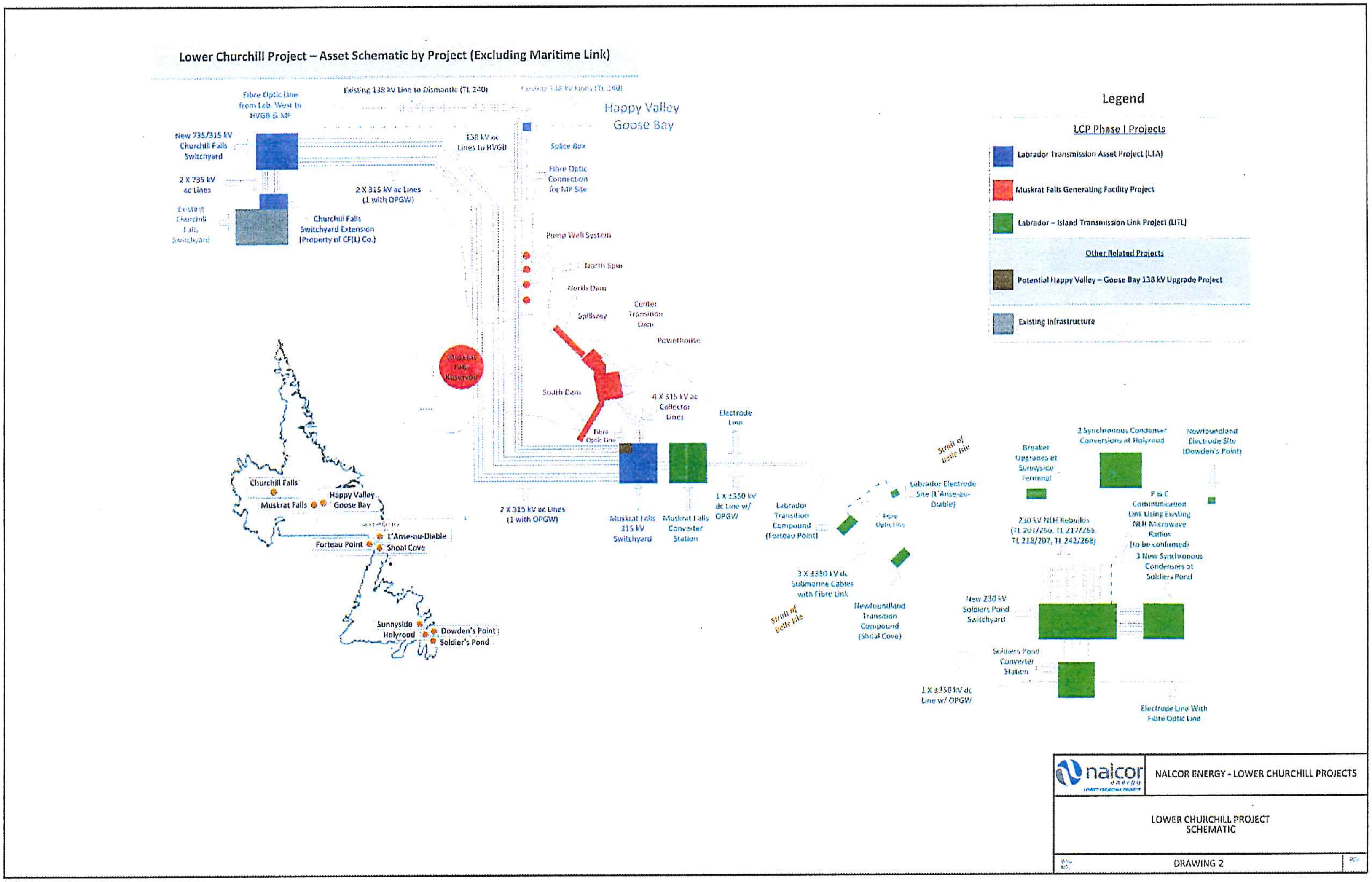
NALCOR ENERGY - LOWER CHURCHILL PROJECTS
LOWER CHURCHILL PROJECT
KEYPLAN
DRAWING 1


Lower Churchill Project – Asset Schematic by Project (Excluding Maritime Link)
Fibre Optic Line from Lab. West to HVGB & MF
Existing 138 kV Line to Dismantle (TL 240)
Happy Valley
Goose Bay
New 735/315 kV Churchill Falls Switchyard
2 X 735 kV ac Lines
138 kV ac Lines to HVGB
Splice Box
Fibre Optic Connection for MF Site
2 X 315 kV ac Lines (1 with OPGW)
Churchill Falls Switchyard Extension (Property of CF(L) Co.)
Pump Well System
North Spur
North Dam
Spillway
Center Transition Dam
Powerhouse
South Dam
4 X 315 kV ac Collector Lines
Electrode Line
Fibre Optic Line
2 X 315 kV ac Lines (1 with OPGW)
Muskrat Falls 315 kV Switchyard
Muskrat Falls Converter Station
1 X ±350 kV dc Line w/ OPGW
Churchill Falls
Muskrat Falls
Happy Valley Goose Bay
L'Anse-au-Diable
Forteau Point
Shoal Cove
Sunnyside
Holyrood
Dowden's Point
Soldier's Pond
Legend
LCP Phase I Projects
Labrador Transmission Asset Project (LTA)
Muskrat Falls Generating Facility Project
Labrador – Island Transmission Link Project (LITL)
Other Related Projects
Potential Happy Valley – Goose Bay 138 kV Upgrade Project
Existing Infrastructure
Strait of Belle Isle
Labrador Electrode Site (L'Anse-au-Diable)
Labrador Transition Compound (Forteau Point)
3 X ±350 kV dc Submarine Cables with Fibre Link
Newfoundland Transition Compound (Shoal Cove)
Breaker Upgrades at Sunnyside Terminal
2 Synchronous Condenser Conversions at Holyrood
Newfoundland Electrode Site (Dowden's Point)
230 kV NLH Rebuilds (TL 201/266, TL 217/265, TL 218/207, TL 242/268)
P & C Communication Link Using Existing NLH Microwave Radios (to be confirmed)
3 New Synchronous Condensers at Soldiers Pond
New 230 kV Soldiers Pond Switchyard
Soldiers Pond Converter Station
1 X ±350 kV dc Line w/ OPGW
Electrode Line With Fibre Optic Line
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NALCOR ENERGY - LOWER CHURCHILL PROJECTS
LOWER CHURCHILL PROJECT SCHEMATIC
DRAWING 2

APPENDIX E

List of Information Needed to Perform the IE Technical Evaluation Contract

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LOWER CHURCHILL PROJECT

LIST OF DOCUMENTS TO BE FURNISHED TO THE INDEPENDENT ENGINEER

1.1 Project Feasibility Report

1.2 Summary of Geotechnical investigations and the Geotechnical Reports for the following: Muskrat Falls Generating Project including the site and the switchyards; Labrador-Island Link Project including the converter stations, the transition compounds, the crossing of the Strait of Belle Isle, and the transmission lines. Of particular interest to our civil/structural engineers and our geologists is the study associated with the treatment of the left abutment (knoll) and its geology at Muskrat Falls dam. We would also like to review the borrow area reports for sources of riprap and aggregate for concrete as well as materials for roads.

1.3 Hydrologic Reports and Studies of selected Muskrat Falls site and the Basin
- 1.3.1 Basis for Power Production Estimates---Hydrology and Power Model
- 1.3.2 Hydrology and Power Estimates for the Planned Gulf Island upstream project
- 1.3.3 Precipitation and Climatological Data for Site
- 1.3.4 Diversion and Spillway Flood Studies
- 1.3.5 Sedimentation Data and Reservoir Useful Life Determination for Sustainability
- 1.3.6 Ice Berg studies and associated design criteria

1.4 Basis of Design Report

1.5 Drawings and Specifications
- 1.5.1 General Civil Works
- 1.5.2 Major Project Features of Muskrat Falls--Dams, Power Plant, Spillway, Switchyard
- 1.5.3 AC/DC Converter Stations
- 1.5.4 Submarine Cable Crossings: Strait of Belle Isle; Bathymetry along selected route
- 1.5.5 Switchyards
- 1.5.6 Transmission Lines
- 1.5.7 Transition Compounds

1.6 Contract with Design Engineer (EPCM) and Contact Names/Telephone/email/FAX
- 1.6.1 Design Engineer's Organization Chart
- 1.6.2 Resumes of the Lead Design Engineers/Specialists: Civil; Geology/Geotechnical; Hydrology and Hydraulic; Mechanical; Powerhouse Mechanical; Powerhouse Electrical; Environmental; Structural; Project Manager and Deputy Project Manager; Health and Safety Specialist; Project(s) CPM scheduler; Project (s) Cost Estimator
- 1.6.3 Resumes of the Lead Site Engineers: Project Manager; Geologist/Geotechnical; Civil; Structural; Mechanical; Electrical; Environmental; Health and Safety Specialist; Submarine Cable Lead Engineer; and Transmission Lines

1.7 Construction Contract (EPCM)—General Provisions and Contact Names/Telephone and Fax numbers; email

LOWER CHURCHILL PROJECT

1.8 Contract for Electrical and Mechanical Equipment and Contact Names/email/Telephone and Fax numbers
    1.8.1 List of Equipment and Suppliers
    1.8.2 Performance Criteria
    1.8.3 Performance Testing Protocol
1.9 Proposed CPM Construction Schedule for the Project
    1.9.1 Description of Construction Methodology
    1.9.2 River Diversion and Care of Water
    1.9.3 Source of Construction Materials
    1.9.4 List of Critical Events and Dates
    1.9.5 List of Float time for procured items and for principal construction activities
1.10 Current Construction Cost Estimate
    1.10.1 Schedule of Payments to Contractor/Vendors
    1.10.2 Estimate of Cost of Work Left to Complete
1.11 List of Construction Contractors and Subcontractors
1.12 Qualifications of Contractors and Principal Subcontractors and Equipment Suppliers
1.13 Permits and Licenses to Construct and Operate Project and Current Status
1.14 Power Sales Contract
1.15 Transmission and Interconnection Agreement (s)
1.16 Operation and Maintenance Agreement with EPCM Firm (SNC-Lavalin)
1.17 Projected Operation Results---Financial Pro Forma (Projection Model) with List of Assumptions and Description of Cases
1.18 Insurance Program
1.19 Safety Program
1.20 Environmental Checklist (World Bank Standards/Equator Principals)
1.21 Environmental Impact Statement and Project Handbook of Environmental Protection Measures
1.22 Emergency Action Plan for Construction, and Emergency Action Plan for Operation
1.23 Load Flow Studies Associated with the Transmission System
1.24 Health and Safety Plan
    1.24.1 EPCM Firm Health and Safety Plan
    1.24.2 Contractor's Health and Safety Plan
    1.24.3 Major Equipment Suppliers/Vendors Health and Safety Plan
1.25 Sustainability Plan for the Project
1.26 Warehousing Plan and Tracking System
1.27 Operations and Maintenance Plans
1.28 Operations and maintenance Budgets
1.29 Inter-connection Facilities Agreement

LOWER CHURCHILL PROJECT

1.30 Water management Agreement
1.31 Water Supply and Wastewater Disposal Agreements
1.32 Fuel and Transportation Agreements
1.33 Copies of the following contracts and other contracts that are planned to be issued.

1.33.1 Procurement Contracts for Transmission Line
- 1.33.1.1 Insulators for AC Lines-PT030
- 1.33.1.2 Conductor for AC Lines-PT0300
- 1.33.1.3 Tower Steel for AC Lines-PT0302
- 1.33.1.4 1.33.1.4 Hardware Accessories and Fittings for AC lines-PT0303
- 1.33.1.5 1.33.1.5 Optical Ground Wire Conductors for AC Lines-PT0304
- 1.33.1.6 Earthing Material for AC Lines-PT0305
- 1.33.1.7 Guy Wires for AC Towers-PT0306
- 1.33.1.8 Steel Grillage for AC Lines-PT0307
- 1.33.1.9 Overhead Shieldwire for AC Lines-PT0326
- 1.33.1.10 Rock Anchors and Anchor Bolts for AC Towers-PT0335

1.33.2 Procurement Contracts for Powerhouse
- 1.33.2.1 Supply of Generator Step-Up Transformer-PH0014
- 1.33.2.2 Supply of Isolated Phase Bus-PH0015
- 1.33.2.4 Supply of Generator Circuit Breakers-PH0016
- 1.33.2.5 Supply of Station Service Transformers-PH0035
- 1.33.2.6 Supply of Auxiliary Transformers-PH0036
- 1.33.2.7 Supply of 25kV Switchgear-PH0037
- 1.33.2.8 Supply of Emergency Diesel Generator-PH0038

1.33.3 Procurement Contracts for Substations
- 1.33.3.1 138 kV & 25 kV Circuit Breakers (Dead tank type)-PD0514
- 1.33.3.2 138 kV & 25kV Disconnect Switches (with & without ground switches)-PD0515
- 1.33.3.3 138 kV Capacitor Voltage Transformers (CVTs)-PD0518
- 1.33.3.4 25 kV Vacuum Interupters-PD0519
- 1.33.3.5 25 kV 6x4 MVAR Capacitor Banks-PD0520
- 1.33.3.6 Pre-fabricated Control Room Bldg.-PD0522
- 1.33.3.7 Substation Service Transformers-PD0523
- 1.33.3.8 25 kV Reclosers-PD0529
- 1.33.3.9 138 kV & 25 kV Surge Arresters-PD0530
- 1.33.3.10 MV Instrument Transformer (Combined CT & PT Unit)-PD0531

1.33.4 Construction Contracts for Intake, Dam, Powerhouse, Site Accommodations, T&G
- 1.33.4.1 Intake, Powerhouse, Spillway and Transitions Dams-CH0007
- 1.33.4.2 Accommodations Complex, Site Utilities-CH0005
- 1.33.4.3 Reservoir Clearing South Side-CH0023

LOWER CHURCHILL PROJECT

APPENDIX F

Performance Indexes and Equations

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APPENDIX F

PERFORMANCE INDEXES AND EQUATIONS

GENERAL INFORMATION

Appendix F discusses the relationships among the performance indexes calculated from the event and performance data outlined in Sections III and IV. The basis for these relationships is IEEE Standard No. 762 "Definitions for Use in Reporting Electric Generating Unit Reliability, Availability and Productivity."

SUMMARY OF VARIOUS TIME AND ENERGY FACTORS USED BY INDEXES

1.	Service Hours - SH	Sum of all Unit Service Hours.
2.	Synchronous Hours	Sum of all hours the unit is in the synchronous condensing mode. The units are considered to be in a non-generating service operation.
3.	Pumping Hours	Sum of all hours the pumped storage unit is in pumping mode. The units are considered to be in a non-generating service operation.
4.	Available Hours - AH	Sum of all Service Hours (SH) + Reserve Shutdown Hours (RSH) + Pumping Hours + Synchronous Condensing Hours.
5.	Planned Outage Hours - POH	Sum of all hours experienced during Planned Outages (PO) + Scheduled Outage Extensions (SE) of any Planned Outages (PO).
6.	Unplanned Outage Hours - UOH	Sum of all hours experienced during Unplanned (Forced) Outages (U1, U2, U3) + Startup Failures (SF) + Maintenance Outages (MO) + Scheduled Outage Extensions (SE) of any Maintenance Outages (MO).
7.	Unplanned (Forced) Outage Hours - FOH	Sum of all hours experienced during Unplanned (Forced) Outages (U1, U2, U3) + Startup Failures (SF).
8.	Maintenance Outage Hours - MOH	Sum of all hours experienced during Maintenance Outages (MO) + Scheduled Outage Extensions (SE) of any Maintenance Outages (MO).
9.	Unavailable Hours - UH	Sum of all Planned Outage Hours (POH) + Unplanned (Forced) Outage Hours (FOH) + Maintenance Outage Hours (MOH).

10.	Scheduled Outage Hours - SOH	Sum of all hours experienced during Planned Outages (PO) + Maintenance Outages (MO) + Scheduled Outage Extensions (SE) of any Maintenance Outages (MO) and Planned Outages (PO).
11.	Period Hours - PH	Number of hours in the period being reported that the unit was in the active state.
12.	Equivalent Seasonal Derated Hours - ESEDH	Net Maximum Capacity (NMC) Net Dependable Capacity (NDC) **x** Available Hours (AH) / Net Maximum Capacity (NMC). $\frac{(NMC - NDC) \times AH}{NMC}$
13a.	Equivalent Unplanned (Forced) Derated Hours - EFDH (D1, D2, D3)	Each individual Unplanned (Forced) Derating (D1, D2, D3) is transformed into equivalent full outage hour(s). This is calculated by multiplying the actual duration of the derating (hours) by the size of the reduction (MW) and dividing by the Net Maximum Capacity (NMC). These equivalent hour(s) are then summed. $\frac{\text{Derating Hours} \times \text{Size of Reduction}^{*}}{NMC}$ NOTE: Includes Unplanned (Forced) Deratings (D1, D2, D3) during Reserve Shutdowns (RS). See 11d, Page F-3.

* Size of Reduction is determined by subtracting the Net Available Capacity (NAC) from the Net Dependable Capacity (NDC). In cases of multiple deratings, the Size of Reduction of each derating will be determined by the difference in the Net Available Capacity of the unit prior to the derating and the reported Net Available Capacity as a result of the derating

13b. Equivalent Maintenance Derated Hours - EMDH (D4, DE of D4)

Each individual Maintenance Derating (D4, DE) is transformed into equivalent full outage hour(s). This is calculated by multiplying the actual duration of the derating (hours) by the size of reduction (MW) and dividing by the Net Maximum Capacity (NMC). These equivalent hour(s) are then summed.

$$\frac{\text{Derating Hours } \mathbf{x} \text{ Size of Reduction*}}{\text{NMC}}$$

13c. Equivalent Planned Derated Hours - EPDH (PD, DE of PD)

Each individual Planned Derating (PD, DE) is transformed into equivalent full outage hour(s). This is calculated by multiplying the actual duration of the derating (hours) by the size of reduction (MW) and dividing by the Net Maximum Capacity (NMC). These equivalent hour(s) are then summed.

$$\frac{\text{Derating Hours } \mathbf{x} \text{ Size of Reduction*}}{\text{NMC}}$$

NOTE: Includes Planned Deratings (PD) during Reserve Shutdowns (RS). See 11d, Page F-3.

13d. Equivalent Scheduled Derated Hours - ESDH (PD, DE of PD, D4 and DE of D4)

Each individual Planned Derating (PD, DE) and Maintenance Derating (D4, DE) is transformed into equivalent full outage hour(s). This is calculated by multiplying the actual duration of the derating (hours) by the size of reduction (MW) and dividing by the Net Maximum Capacity (NMC). These equivalent hour(s) are then summed.

$$\frac{\text{Derating Hours } \mathbf{x} \text{ Size of Reduction*}}{\text{NMC}}$$

* Size of Reduction is determined by subtracting the Net Available Capacity (NAC) from the Net Dependable Capacity (NDC). In cases of multiple deratings, the Size of Reduction of each derating will be determined by the difference in the Net Available Capacity of the unit prior to the derating and the reported Net Available Capacity as a result of the derating

13e. Equivalent Unplanned Derated Hours - EUDH (D1, D2, D3, D4, DE)

Each individual Unplanned Derating (D1, D2, D3, D4, DE) is transformed into equivalent full outage hour(s). This is calculated by multiplying the actual duration of the derating (hours) by the size of reduction (MW) and dividing by the Net Maximum Capacity (NMC). These equivalent hour(s) are then summed.

$$\frac{\text{Derating Hours } \mathbf{x} \text{ Size of Reduction*}}{\text{NMC}}$$

NOTE: Incudes Unplanned Deratings (D1, D2, D3, D4, DE) during Reserve Shutdowns (RS). See 11d below.

13f. Equivalent Unplanned (Forced) Derated Hours During Reserve Shutdowns - EFDHRS (D1, D2, D3)

Each individual Unplanned (Forced) Derating (D1, D2, D3) or the portion of any Unplanned (Forced) derating which occurred during a Reserve Shutdown (RS) is transformed into equivalent full outage hour(s). This is calculated by multiplying the actual duration of the derating (hours) by the size of the reduction (MW) and dividing by the Net Maximum Capacity (NMC). These equivalent hour(s) are then summed.

$$\frac{\text{Derating Hours } \mathbf{x} \text{ Size of Reduction*}}{\text{NMC}}$$

13g. Equivalent Planned Derated Hours During Reserve Shutdowns - EPDHRS (PD)

Each individual Planned Derating (PD) or the portion of any Planned derating which occurred during a Reserve Shutdown (RS) is transformed into equivalent full outage hour(s). This is calculated by multiplying the actual duration of the derating (hours) by the size of the reduction (MW) and dividing by the Net Maximum Capacity (NMC). These equivalent hour(s) are then summed.

$$\frac{\text{Derating Hours } \mathbf{x} \text{ Size of Reduction*}}{\text{NMC}}$$

13h. Equivalent Maintenance Derated Hours During Reserve Shutdowns - EMDHRS (D4)

Each individual Maintenance Derating (D4) or the portion of any Maintenance derating which occurred during a Reserve

		Shutdown (RS) is transformed into equivalent full outage hour(s). This is calculated by multiplying the actual duration of the derating (hours) by the size of the reduction (MW) and dividing by the Net Maximum Capacity (NMC). These equivalent hour(s) are then summed. $\frac{\text{Derating Hours } \mathbf{x} \text{ Size of Reduction*}}{\text{NMC}}$
14.	Number of Planned Outages (PO) which occur from in-service state only	A count of the number of all Planned Outages (PO) reported on the GADS Event Report (97). (Since Scheduled Outage Extensions (SE) of Planned Outages are considered part of the original Planned Outage (PO), they are not included in this count.)
15.	Number of Unplanned Outages (MO, U1, U2, U3) which occur from in-service state only	A count of the number of all Unplanned Outages (U1, U2, U3, MO) reported on the GADS Event Report (97). (IEEE Standard 762 does not include Startup Failures (SF) in this count.)

* Size of Reduction is determined by subtracting the Net Available Capacity (NAC) from the Net Dependable Capacity (NDC). In cases of multiple deratings, the Size of Reduction of each derating will be determined by the difference in the Net Available Capacity of the unit prior to the derating and the reported Net Available Capacity as a result of the derating

16.	Number of Unplanned (Forced) Outages (U1, U2, U3) which occur from in-service state only	A count of the number of all Unplanned (Forced) Outages (U1, U2, U3) reported on the GADS Event Report (97). (IEEE Standard 762 does not include Startup Failures (SF) in this count.)
17.	Number of Maintenance Outages (MO) which occur from in-service state only	A count of the number of all Maintenance Outages (MO) reported on the GADS Event Report (97). (Since Scheduled Outage Extensions (SE) of Maintenance Outages are considered part of the original Maintenance Outage (MO), they are not included in this count.)

* Size of Reduction is determined by subtracting the Net Available Capacity (NAC) from the Net Dependable Capacity (NDC). In cases of multiple deratings, the Size of Reduction of each derating will be determined by the difference in the Net Available Capacity of the unit prior to the derating and the reported Net Available Capacity as a result of the derating.

PERFORMANCE INDEXES

The following sections describe performance indexes used to measure the performance of generating units. The sections are divided into:

1) Unweighted (time-based) methods for calculating single unit statistics.
2) Unweighted (time-based) methods for pooled (grouping) unit statistics
3) Weighted (capacity-based) methods for pooling (grouping) unit statistics.
4) Weighted (capacity-based) statistics excluding problems outside management control. (See Appendix K for more details.) This fourth section is used Europe and other places in the world for measuring the productivity of plant personnel.

SOME WORDS ABOUT CALCULATIONS

Please note that when you are calculating a single generating unit's performance statistics, it does not matter if you use unweighted- or weighted-based statistics. The answer will generally be the same. The real difference between the unweighted and weighted statistics is in pooling (or grouping) of a set of generating units. In such cases, a group of units of similar size will show little or no differences but a for group of units where the MW size is very different (greater than 50 MW), the statistics will be very different.

With unweighted statistics, all units are considered equal in outage impact. In the unweighted equations, no MW size is introduced into the equations and the results are based on time, not energy produced (or not produced.) In such cases, a 50 MW gas turbine and a 1,000 MW nuclear unit have the same impact of the resulting statistics.

With weighted statistics, the larger MW size unit in the group has more impact on the final statistics than a smaller generating unit. That is because the MW size of the unit (NMC) is part of the equation. In such cases, a 1,000 MW nuclear unit would have 20 times impact on the final outcome of the calculation than would its 50 MW gas turbine companion.

MORE WORDS ABOUT DATA POOLING

When grouping a fleet of units of dissimilar size and/or duty cycle, weighting puts the proper relative weight of each unit's contribution into the fleet's composite indexes.

Using the unweighted equations currently in the IEEE 762 Standard (Section 7), an older, smaller, little-run unit will have just as much weight as a newer, larger, base-load unit. The effect of this could unrealistically and disproportionately swing the fleet unweighted averages too high (for a very high availability on a small unit) or too low (for a very low availability on a small unit).

The current IEEE 762 Standard's unweighted equations should not be abandoned, however, even for group statistics. There are valid applications for this method as well. (One being purely to evaluate equipment reliability and availability regardless of size).

The weighted calculations, although primarily needed for grouping units' performance indexes, may apply to individual units as well. The effect will be minimal, but over the months or years, many units' net maximum capacities (NMC) do change somewhat.

SPECIAL NOTE: To weight an equation, one does not simply take each unit's EFOR, for example, and multiply the EFOR by the NMC, add them up and divide by the sum of the NMCs. Each term in the equation must be multiplied by the NMC and then all the products are summed over all the units.

UNWEIGHTED (TIME-BASED) PERFORMANCE INDEXES SINGLE UNIT CALCULATIONS

1. Planned Outage Factor – POF

$$POF = \frac{POH}{PH} \times 100\%$$

2. Unplanned Outage Factor - UOF

$$UOF = \frac{UOH}{PH} \times 100\%$$

$$UOF = \frac{MOH + FOH + SE\ of\ MO}{PH} \times 100\%$$

3. Forced Outage Factor - FOF

$$FOF = \frac{FOH}{PH} \times 100\%$$

4. Maintenance Outage Factor - MOF

$$MOF = \frac{MOH}{PH} \times 100\%$$

5. Scheduled Outage Factor - SOF

$$SOF = \frac{SOH}{PH} \times 100\%$$

$$SOF = \frac{POH + MOH}{PH} \times 100\%$$

6. Unavailability Factor - UF

$$UF = \frac{UH}{PH} \times 100\%$$

$$UF = \frac{POH + MOH + FOH}{PH} \times 100\%$$

7. Availability Factor - AF

$$AF = \frac{AH}{PH} \times 100\%$$

$$AF = \frac{SH + RSH + \text{Synchronous Hours} + \text{Pumping Hours}}{PH} \times 100\%$$

8. Service Factor - SF

$$SF = \frac{SH}{PH} \times 100\%$$

9. Seasonal Derating Factor - SEDF

$$SEDF = \frac{ESEDH}{PH} \times 100\%$$

10. Unit Derating Factor - UDF

$$UDF = \frac{EPDH + EUDH}{PH} \times 100\%$$

$$UDF = \frac{EPDH + EMDH + EFDH}{PH} \times 100\%$$

11. Equivalent Unavailability Factor - EUF

$$EUF = \frac{UOH + POH + EUDH + EPDH}{PH} \times 100\%$$

$$EUF = \frac{FOH + SOH + EFDH + ESDH}{PH} \times 100\%$$

$$EUF = \frac{FOH + MOH + POH + EFDH + EMDH + EPDH}{PH} \times 100\%$$

12. Equivalent Availability Factor - EAF

$$EAF = \frac{AH - EPDH - EUDH - ESEDH}{PH} \times 100\%$$

$$EAF = \frac{AH - EPDH - EFDH - EMDH - ESEDH}{PH} \times 100\%$$

13. Gross Capacity Factor - GCF

$$GCF = \frac{\text{Gross Actual Generation}}{PH \times GMC} \times 100\%$$

14. Net Capacity Factor - NCF

$$NCF = \frac{\text{Net Actual Generation}}{PH \times NMC} \times 100\%$$

Note: *Net capacity factor calculated using this equation can be negative during a period when the unit is shutdown.*

15. Gross Output Factor - GOF

$$GOF = \frac{\text{Gross Actual Generation}}{SH \times GMC} \times 100\%$$

16. Net Output Factor - NOF

$$NOF = \frac{\text{Net Actual Generation}}{SH \times NMC} \times 100\%$$

17. Equivalent Maintenance Outage Factor -- EMOF

$$EMOF = \frac{(MOH + EMDH)}{PH} \times 100\%$$

18. Equivalent Planned Outage Factor – EPOF

$$EPOF = \frac{(POH + EPDH)}{PH} \times 100\%$$

19. Equivalent Forced Outage Factor -- EFOF

$$EFOF = \frac{(FOH + EFDH)}{PH} \times 100\%$$

20. Equivalent Scheduled Outage Factor -- ESOF

$$ESOF = \frac{(SOH + ESDH)}{PH} \times 100\%$$

$$ESOF = \frac{(MOH + POH + EMDH + EPDH)}{PH} \times 100\%$$

21. Equivalent Unplanned Outage Factor -- EUOF

$$EUOF = \frac{(UOH + EUDH)}{PH} \times 100\%$$

$$EUOF = \frac{(MOH + FOH + EMDH + EFDH)}{PH} \times 100\%$$

(NOTE: This EUOF is identical to the Unit Capability Loss Factor except this equation includes all events, including those outside plant management control.)

22. Forced Outage Rate - FOR

$$FOR = \frac{FOH}{FOH + SH + \text{Synchronous Hrs} + \text{Pumping Hrs}} \times 100\%$$

23. Forced Outage Rate Demand- FORd ***<u>(See Notes 1 and 2 at the end of this section)</u>***

$$FORd = \frac{FOHd}{[FOHd + SH]} \times 100\%$$

where

FOHd = f x FOH

$$f = \left(\frac{1}{r} + \frac{1}{T}\right) / \left(\frac{1}{r} + \frac{1}{T} + \frac{1}{D}\right)$$

r=Average Forced outage deration = (FOH) / (# of FO occurrences)
D=Average demand time = (SH) / (# of unit actual starts)
T=Average reserve shutdown time = (RSH) / (# of unit attempted starts)

24 Equivalent Forced Outage Rate - EFOR

$$\text{EFOR} = \frac{\text{FOH} + \text{EFDH}}{\text{FOH} + \text{SH} + \text{Synchronous Hrs} + \text{Pumping Hrs} + \text{EFDHRS}} \times 100\%$$

25. Equivalent Forced Outage Rate demand – EFORd ***(See Notes 1 and 2 at the end of this section)***

$$\text{EFORd} = \frac{[\text{FOHd} + (\text{EFDHd})]}{[\text{SH} + \text{FOHd}]} \times 100\%$$

where

FOHd = f x FOH

EFDHd = (EFDH – EFDHRS) if reserve shutdown events reported, or

= (fp x EFDH) if no reserve shutdown events reported – an approximation.

fp = (SH/AH)

$$f = \left(\frac{1}{r} + \frac{1}{T}\right) \Big/ \left(\frac{1}{r} + \frac{1}{T} + \frac{1}{D}\right)$$

r=Average Forced outage deration = (FOH) / (# of FO occurrences)

D=Average demand time = (SH) / (# of unit actual starts)

T=Average reserve shutdown time = (RSH) / (# of unit attempted starts)

26. Equivalent Planned Outage Rate -- EPOR

$$\text{EPOR} = \frac{\text{POH} + \text{EPDH}}{\text{POH} + \text{SH} + \text{Synchronous Hrs} + \text{Pumping Hrs} + \text{EPDHRS}} \times 100\%$$

27. Equivalent Maintenance Outage Rate -- EMOR

$$\text{EMOR} = \frac{\text{MOH} + \text{EMDH}}{\text{MOH} + \text{SH} + \text{Synchronous Hrs} + \text{Pumping Hrs} + \text{EMDHRS}} \times 100\%$$

28. Equivalent Unplanned Outage Rate -- EUOR

$$\text{EUOR} = \frac{(\text{UOH} + \text{EUDH})}{\text{UOH} + \text{SH} + \text{Synchronous Hrs} + \text{Pumping Hrs} + \text{EUDHRS}} \times 100\%$$

$$\text{EUOR} = \frac{\text{FOH} + \text{EFDH} + \text{MOH} + \text{EMDH}}{\text{FOH} + \text{MOH} + \text{SH} + \text{Synchronous Hrs} + \text{Pumping Hrs} + \text{EFDHRS} + \text{EMDHRS}} \times 100\%$$

29. Average Run Time - ART

$$ART = \frac{SH}{\text{Actual Unit Starts}} \times 100\%$$

30. Starting Reliability - SR

$$SR = \frac{\text{Actual Unit Starts}}{\text{Attempted Unit Starts}} \times 100\%$$

Mean Service Time to Outage:

31a. Mean Service Time to Planned Outage - MSTPO

$$MSTPO = \frac{\begin{array}{l}\text{Service Hours + Synchronous Condensing Hours + Pumping Hours}\\ \text{(which occur from in-service state only)}\end{array}}{\begin{array}{l}\text{Number of Planned Outages}\\ \text{(which occur from in-service state only)}\end{array}}$$

31b. Mean Service Time to Unplanned Outage - MSTUO

$$MSTUO = \frac{\begin{array}{l}\text{Service Hours + Synchronous Condensing Hours + Pumping Hours}\\ \text{(which occur from in-service state only)}\end{array}}{\begin{array}{l}\text{Number of Unplanned Outages}\\ \text{(which occur from in-service state only)}\end{array}}$$

31c. Mean Service Time To Forced Outage - MSTFO

$$MSTFO = \frac{\begin{array}{l}\text{Service Hours + Synchronous Condensing Hours + Pumping Hours}\\ \text{(which occur from in-service state only)}\end{array}}{\begin{array}{l}\text{Number of (Unplanned) Forced Outages}\\ \text{(which occur from in-service state only)}\end{array}}$$

31d. Mean Service Time to Maintenance Outage - MSTMO

$$MSTMO = \frac{\begin{array}{l}\text{Service Hours + Synchronous Condensing Hours + Pumping Hours}\\ \text{(which occur from in-service state only)}\end{array}}{\begin{array}{l}\text{Number of Maintenance Outages}\\ \text{(which occur from in-service state only)}\end{array}}$$

Mean Outage Duration:

32a. Mean Planned Outage Duration - MPOD

$$MPOD = \frac{\text{Planned Outage Hours (which occur from in-service state only)}}{\text{Number of Planned Outages (which occur from in-service state only)}}$$

32b. Mean Unplanned Outage Duration - MUOD

$$MUOD = \frac{\text{Unplanned Outage Hours (which occur from in-service state only)}}{\text{Number of Unplanned Outages (which occur from in-service state only)}}$$

32c. Mean Forced Outage Duration - MFOD

$$MFOD = \frac{\text{Unplanned (Forced) Outage Hours (which occur from in-service state only)}}{\text{Number of Unplanned (Forced) Outages (which occur from in-service state only)}}$$

32d. Mean Maintenance Outage Duration - MMOD

$$MMOD = \frac{\text{Maintenance Outage Hours (which occur from in-service state only)}}{\text{Number of Maintenance Outages (which occur from in-service state only)}}$$

UNWEIGHTED (TIME-BASED) PERFORMANCE INDEXES POOLING UNIT CALCULATIONS

33. Planned Outage Factor – POF

$$POF = \frac{\Sigma\, POH}{\Sigma\, PH} \times 100\%$$

34. Unplanned Outage Factor – UOF

$$UOF = \frac{\Sigma\, (FOH + MOH)}{\Sigma\, PH} \times 100\%$$

35. Forced Outage Factor – FOF

$$FOF = \frac{\Sigma\ FOH}{\Sigma\ PH} \times 100\%$$

36. Maintenance Outage Factor – MOF

$$MOF = \frac{\Sigma\ MOH}{\Sigma\ PH} \times 100\%$$

37. Scheduled Outage Factor – SOF

$$SOF = \frac{\Sigma\ (POH + MOH)}{\Sigma\ PH} \times 100\%$$

38. Unavailability Factor – UF

$$UF = \frac{\Sigma\ (POH + MOH + FOH)}{\Sigma\ PH} \times 100\%$$

39. Availability Factor – AF

$$AF = \frac{\Sigma\ AH}{\Sigma\ PH} \times 100\%$$

$$AF = \frac{\Sigma\ (SH + RSH + \text{Synchronous Hours} + \text{Pumping Hours})}{\Sigma\ PH} \times 100\%$$

40. Service Factor – SF

$$SF = \frac{\Sigma\ SH}{\Sigma\ PH} \times 100\%$$

41. Seasonal Derating Factor – SEDF

$$SEDF = \frac{\Sigma\ ESEDH}{\Sigma\ PH} \times 100\%$$

42. Unit Derating Factor – UDF

$$UDF = \frac{\Sigma\ (EUDH + EPDH)}{\Sigma\ PH} \times 100\%$$

$$UDF = \frac{\Sigma\ (EFDH + EMDH + EPDH)}{\Sigma\ PH} \times 100\%$$

43. Equivalent Unavailability Factor – EUF

$$EUF = \frac{\Sigma\ (POH + UOH + EUDH + EPDH)}{\Sigma\ PH} \times 100\%$$

$$EUF = \frac{\Sigma\ (SOH + FOH + ESDH + EFDH)}{\Sigma\ PH} \times 100\%$$

$$EUF = \frac{\Sigma\ (POH + MOH + FOH + EFDH + EMDH + EPDH)}{\Sigma\ PH} \times 100\%$$

44. Equivalent Availability Factor – EAF

$$EAF = \frac{\Sigma\ (AH - EUDH - EPDH - ESEDH)}{\Sigma\ PH} \times 100\%$$

$$EAF = \frac{\Sigma\ (AH - EFDH - EMDH - EPDH - ESEDH)}{\Sigma\ PH} \times 100\%$$

45. * Gross Capacity Factor – GCF

$$GCF = \frac{\Sigma\ (\text{Gross Actual Generation})}{\Sigma\ (GMC \times PH)} \times 100\%$$

46. * Net Capacity Factor – NCF

$$NCF = \frac{\Sigma\ (\text{Net Actual Generation})}{\Sigma\ (NMC \times PH)} \times 100\%$$

* NOTE: Special energy-weighted equations are not necessary for “energy terms” (GCF, NCF, GOF, NOF), because these factors are inherently energy-weighted. These equations are the same as 7.12 – 7.15. But when calculating for a group of units (or a unit that has a varying capacity value over time), do not simply average these factors. Follow the equations.

47. * Gross Output Factor – GOF

$$GOF = \frac{\Sigma \text{ (Gross Actual Generation)}}{\Sigma \text{ (GMC x SH)}} \text{ x } 100\%$$

48. * Net Output Factor – NOF

$$NOF = \frac{\Sigma \text{ (Net Actual Generation)}}{\Sigma \text{ (NMC x SH)}} \text{ x } 100\%$$

.

49. Equivalent Maintenance Outage Factor -- EMOF

$$EMOF = \frac{\Sigma \text{ (MOH + EMDH)}}{\Sigma \text{ PH}} \text{ x } 100\%$$

50. Equivalent Planned Outage Factor -- EPOF

$$EPOF = \frac{\Sigma \text{ (POH + EPDH)}}{\Sigma \text{ PH}} \text{ x } 100\%$$

51. Equivalent Forced Outage Factor -- EFOF

$$EFOF = \frac{\Sigma \text{ (FOH + EFDH)}}{\Sigma \text{ PH}} \text{ x } 100\%$$

52. Equivalent Scheduled Outage Factor -- ESOF

$$ESOF = \frac{\Sigma \text{ (SOH + ESDH)}}{\Sigma \text{ PH}} \text{ x } 100\%$$

$$ESOF = \frac{\Sigma \text{ (MOH + POH + EMDH + EPDH)}}{\Sigma \text{ PH}} \text{ x } 100\%$$

* NOTE: Special energy-weighted equations are not necessary for “energy terms” (GCF, NCF, GOF, NOF), because these factors are inherently energy-weighted. These equations are the same as 7.12 – 7.15. But when calculating for a group of units (or a unit that has a varying capacity value over time), do not simply average these factors. Follow the equations.

53. Equivalent Unplanned Outage Factor -- EUOF

$$EUOF = \frac{\Sigma\,(UOH + EUDH)}{\Sigma\,PH} \times 100\%$$

$$EUOF = \frac{\Sigma\,(MOH + FOH + EMDH + EFDH)}{\Sigma\,PH} \times 100\%$$

54. Forced Outage Rate – FOR

$$FOR = \frac{\Sigma\;FOH}{\Sigma\,(FOH + SH + \text{Synchronous Hours} + \text{Pumping Hours})} \times 100\%$$

55. Forced Outage Rate demand – FORd ***<u>(See Notes 1 and 2 at the end of this section)</u>***

$$FORd = \frac{\Sigma\,FOHd}{\Sigma\,FOHd + SH} \times 100\%$$

Where

FOHd = f x FOH

$$f = \left(\tfrac{1}{r} + \frac{1}{T}\right) / \left(\frac{1}{r} + \frac{1}{T} + \frac{1}{D}\right)$$

r = Average Forced outage deration = (FOH) / (# of FO occurrences)
D = Average demand time = (SH) / (# of unit actual starts)
T = Average reserve shutdown time = (RSH) / (# of unit attempted starts)

56. Equivalent Forced Outage Rate – EFOR

$$EFOR = \frac{\Sigma\,(\,FOH + EFDH\,)}{\Sigma\,(FOH + SH + \text{Synchronous Hours} + \text{Pumping Hours} + EFDHRS)} \times 100\%$$

57. Equivalent Forced Outage Rate demand – EFORd ***(See Notes 1 and 2 at the end of this section)***

$$EFORd = \left[\frac{\Sigma\,[FOHd + (EFDHd)]}{\Sigma\,(SH + FOHd)}\right] \times 100\%$$

where

FOHd = f x FOH

EFDHd = (EFDH – EFDHRS) if reserve shutdown events reported, or

= (fp x EFDH) if no reserve shutdown events reported – an approximation.

fp = (SH/AH)

$$f = \left(\frac{1}{r} + \frac{1}{T}\right) \Big/ \left(\frac{1}{r} + \frac{1}{T} + \frac{1}{D}\right)$$

r = Average Forced outage deration = (FOH) / (# of FO occurrences)
D = Average demand time = (SH) / (# of unit actual starts)
T = Average reserve shutdown time = (RSH) / (# of unit attempted starts)

58. Equivalent Planned Outage Rate -- EPOR

$$EPOR = \frac{\Sigma\,(POH + EPDH)}{\Sigma\,(POH + SH + \text{Synchronous Hours} + \text{Pumping Hours} + EPDHRS)} \times 100\%$$

59. Equivalent Maintenance Outage Rate -- EMOR

$$EMOR = \frac{\Sigma\,(MOH + EMDH)}{\Sigma\,(MOH + SH + \text{Synchronous Hours} + \text{Pumping Hours} + EMDHRS)} \times 100\%$$

60. Equivalent Unplanned Outage Rate -- EUOR

$$EUOR = \frac{\Sigma\,(UOH + EUDH)}{\Sigma\,(UOH + SH + \text{Synchronous Hours} + \text{Pumping Hours} + EUDHRS)} \times 100\%$$

$$EUOR = \frac{\Sigma\,(FOH + MOH + EFDH + EMDH)}{\Sigma\,(FOH+MOH+SH+ \text{Synchronous Hours}+\text{Pumping Hours}+EFDHRS+EMDHRS)} \times 100\%$$

61. Average Run Time - ART

$$ART = \frac{\Sigma\,SH}{\Sigma\,(\text{Actual Unit Starts})} \times 100\%$$

62. Starting Reliability - SR

$$SR = \frac{\Sigma \text{ (Actual Unit Starts)}}{\Sigma \text{ (Attempted Unit Starts)}} \times 100\%$$

Mean Service Time to Outage:

63a. Mean Service Time to Planned Outage - MSTPO

$$MSTPO = \frac{\Sigma \text{ (Service Hours + Synchronous Condensing Hours + Pumping Hours)}}{\Sigma \text{ (Number of Planned Outages) (which occur from in-service state only)}}$$

63b. Mean Service Time to Unplanned Outage - MSTUO

$$MSTUO = \frac{\Sigma \text{(Service Hours + Synchronous Condensing Hours + Pumping Hours)}}{\Sigma \text{ (Number of Unplanned Outages) (which occur from in-service state only)}}$$

63c. Mean Service Time To Forced Outage - MSTFO

$$MSTFO = \frac{\Sigma \text{ (Service Hours + Synchronous Condensing Hours + Pumping Hours)}}{\Sigma \text{ (Number of (Unplanned) Forced Outages) (which occur from in-service state only)}}$$

63d. Mean Service Time to Maintenance Outage - MSTMO

$$MSTMO = \frac{\Sigma \text{ (Service Hours + Synchronous Condensing Hours + Pumping Hours)}}{\Sigma \text{ (Number of Maintenance Outages) (which occur from in-service state only)}}$$

Mean Outage Duration:

64a. Mean Planned Outage Duration - MPOD

$$\text{MPOD} = \frac{\Sigma\ (\text{Planned Outage Hours})}{\Sigma\ (\text{Number of Planned Outages})}$$

(which occur from in-service state only)

64b. Mean Unplanned Outage Duration - MUOD

$$\text{MUOD} = \frac{\Sigma\ (\text{Unplanned Outage Hours})}{\Sigma\ (\text{Number of Unplanned Outages})}$$

(which occur from in-service state only)

64c. Mean Forced Outage Duration - MFOD

$$\text{MFOD} = \frac{\Sigma\ (\text{Unplanned (Forced) Outage Hours})}{\Sigma\ (\text{Number of Unplanned (Forced) Outages})}$$

(which occur from in-service state only)

64d. Mean Maintenance Outage Duration - MMOD

$$\text{MMOD} = \frac{\Sigma\ (\text{Maintenance Outage Hours})}{\Sigma\ (\text{Number of Maintenance Outages})}$$

(which occur from in-service state only)

WEIGHTED (CAPACITY-BASED) PERFORMANCE INDEXES
POOLING UNIT CALCULATIONS

65. Weighted Forced Outage Factor – WFOF

$$WFOF = \frac{\Sigma\ (FOH \times NMC)}{\Sigma\ (PH \times NMC)} \times 100\%$$

66. Weighted Maintenance Outage Factor – WMOF

$$WMOF = \frac{\Sigma\ (MOH \times NMC)}{\Sigma\ (PH \times NMC)} \times 100\%$$

67. Weighted Planned Outage Factor – WPOF

$$WPOF = \frac{\Sigma\ (POH \times NMC)}{\Sigma\ (PH \times NMC)} \times 100\%$$

68. Weighted Unplanned Outage Factor – WUOF

$$WUOF = \frac{\Sigma\ [(UOH) \times NMC]}{\Sigma\ (PH \times NMC)} \times 100\%$$

$$WUOF = \frac{\Sigma\ [(FOH+MOH) \times NMC]}{\Sigma\ (PH \times NMC)} \times 100\%$$

69. Weighted Scheduled Outage Factor – WSOF

$$WSOF = \frac{\Sigma\ [(SOH) \times NMC]}{\Sigma\ (PH \times NMC)} \times 100\%$$

$$WSOF = \frac{\Sigma\ [(POH+MOH) \times NMC]}{\Sigma\ (PH \times NMC)} \times 100\%$$

70. Weighted Unavailability Factor – WUF

$$WUF = \frac{\Sigma\ [(POH+MOH+POH) \times NMC]}{\Sigma\ (PH \times NMC)} \times 100\%$$

71. Weighted Availability Factor – WAF

$$WAF = \frac{\Sigma\ (AH \times NMC)}{\Sigma\ (PH \times NMC)} \times 100\%$$

72. Weighted Service Factor – WSF

$$WSF = \frac{\Sigma\ (SH \times NMC)}{\Sigma\ (PH \times NMC)} \times 100\%$$

73. Weighted Seasonal Derating Factor – WSEDF

$$WSEDF = \frac{\Sigma\ (ESEDH \times NMC)}{\Sigma\ (PH \times NMC)} \times 100\%$$

74. Weighted Unit Derating Factor – WUDF

$$WUDF = \frac{\Sigma\ [(EUDH + EPDH) \times NMC]}{\Sigma\ (PH \times NMC)} \times 100\%$$

$$WUDF = \frac{\Sigma\ [(EFDH + EMDH + EPDH) \times NMC]}{\Sigma\ (PH \times NMC)} \times 100\%$$

75. Weighted Equivalent Unavailability Factor – WEUF

$$WEUF = \frac{\Sigma\ [(POH + UOH + EUDH + EPDH) \times NMC]}{\Sigma\ (PH \times NMC)} \times 100\%$$

$$WEUF = \frac{\Sigma\ [(SOH + FOH + ESDH + EFDH) \times NMC]}{\Sigma\ (PH \times NMC)} \times 100\%$$

$$WEUF = \frac{\Sigma\ [(POH + MOH + FOH + EFDH + EMDH + EPDH) \times NMC]}{\Sigma\ (PH \times NMC)} \times 100\%$$

76. Weighted Equivalent Availability Factor – WEAF

$$WEAF = \frac{\Sigma\ [(AH - EUDH - EPDH - ESEDH) \times NMC]}{\Sigma\ (PH \times NMC)} \times 100\%$$

$$WEAF = \frac{\Sigma\ [(AH - EFDH - EMDH - EPDH - ESEDH) \times NMC]}{\Sigma\ (PH \times NMC)} \times 100\%$$

77. * Gross Capacity Factor – GCF

$$GCF = \frac{\Sigma\ (\text{Gross Actual Generation})}{\Sigma\ (GMC \times PH)} \times 100\%$$

78. * Net Capacity Factor – NCF

$$NCF = \frac{\Sigma\ (\text{Net Actual Generation})}{\Sigma\ (NMC \times PH)} \times 100\%$$

79. * Gross Output Factor – GOF

$$GOF = \frac{\Sigma\ (\text{Gross Actual Generation})}{\Sigma\ (GMC \times SH)} \times 100\%$$

80. * Net Output Factor – NOF

$$NOF = \frac{\Sigma\ (\text{Net Actual Generation})}{\Sigma\ (NMC \times SH)} \times 100\%$$

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81. Weighted Equivalent Maintenance Outage Factor -- WEMOF

$$WEMOF = \frac{\Sigma\ [(MOH+EMDH) \times NMC]}{\Sigma\ (PH \times NMC)} \times 100\%$$

82. Weighted Equivalent Planned Outage Factor -- WEPOF

$$WEPOF = \frac{\Sigma\ [(POH+EPDH) \times NMC]}{\Sigma\ (PH \times NMC)} \times 100\%$$

83. Weighted Equivalent Forced Outage Factor -- WEFOF

$$WEFOF = \frac{\Sigma\ [(FOH+EFDH) \times NMC]}{\Sigma\ (PH \times NMC)} \times 100\%$$

84. Weighted Equivalent Scheduled Outage Factor -- WESOF

$$WESOF = \frac{\Sigma\ [(SOH + ESDH) \times NMC]}{\Sigma\ (PH \times NMC)} \times 100\%$$

$$WESOF = \frac{\Sigma\ [(MOH+POH+EMDH+EPDH) \times NMC]}{\Sigma\ (PH \times NMC)} \times 100\%$$

* NOTE: Special energy-weighted equations are not necessary for “energy terms” (GCF, NCF, GOF, NOF), because these factors are inherently energy-weighted. These equations are the same as 7.12 – 7.15. But when calculating for a group of units (or a unit that has a varying capacity value over time), do not simply average these factors. Follow the equations.

85. Weighted Equivalent Unplanned Outage Factor -- WEUOF

$$WEUOF = \frac{\Sigma\,[(UOH + EUDH) \text{ x } NMC]}{\Sigma\,(PH \text{ x } NMC)} \text{ x } 100\%$$

$$WEUOF = \frac{\Sigma\,[(MOH + FOH + EFDH + EMDH) \text{ x } NMC]}{\Sigma\,(PH \text{ x } NMC)} \text{ x } 100\%$$

(NOTE: This is identical to the Weighted Unit Capability Loss Factor except this equation includes all events, including those outside plant management control.)

86. Weighted Forced Outage Rate – WFOR

$$WFOR = \frac{\Sigma\,(FOH \text{ x } NMC)}{\Sigma\,[(FOH + SH + \text{Synchronous Hours} + \text{Pumping Hours}) \text{ x } NMC]} \text{ x } 100\%$$

87. Weighted Forced Outage Rate demand – WFORd ***<u>(See Notes 1 and 2 at the end of this section)</u>***

$$WFORd = \frac{\Sigma\,[FOHd \text{ x } NMC]}{\Sigma\,[(SH + FOHd) \text{ x } NMC]} \text{ x } 100\%$$

Where

FOHd = f x FOH

$$f = \left(\frac{1}{r} + \frac{1}{T} \right) / \left(\frac{1}{r} + \frac{1}{T} + \frac{1}{D} \right)$$

r = Average Forced outage deration = (FOH) / (# of FO occurrences)
D = Average demand time = (SH) / (# of unit actual starts)
T = Average reserve shutdown time = (RSH) / (# of unit attempted starts)

88. Weighted Equivalent Forced Outage Rate – WEFOR

$$WEFOR = \frac{\Sigma\,[(FOH + EFDH) \text{ x } NMC]}{\Sigma\,[(FOH + SH + \text{Synchronous Hours} + \text{Pumping Hours} + EFDHRS) \text{ x } NMC]} \text{ x } 100\%$$

89. Weighted Equivalent Forced Outage Rate demand – WEFORd ***(See Notes 1 and 2 at the end of this section)***

$$WEFORd = \left[\frac{\Sigma [(FOHd + (EFDHd) x NMC]}{\Sigma [(SH + FOHd) x NMC]} \right] x 100\%$$

where

FOHd = f x FOH
EFDHd = (EFDH – EFDHRS) if reserve shutdown events reported, or
= (fp x EFDH) if no reserve shutdown events reported – an approximation.
fp = (SH/AH)

$$f = \left(\frac{1}{r} + \frac{1}{T} \right) / \left(\frac{1}{r} + \frac{1}{T} + \frac{1}{D} \right)$$

r = Average Forced outage deration = (FOH) / (# of FO occurrences)
D = Average demand time = (SH) / (# of unit actual starts)
T = Average reserve shutdown time = (RSH) / (# of unit attempted starts)

90. Weighted Equivalent Planned Outage Rate -- WEPOR

$$WEPOR = \frac{\Sigma [(POH + EPDH) x NMC]}{\Sigma [(POH+SH+ \text{Synchronous Hours} + \text{Pumping Hours} + EPDHRS) x NMC]} x 100\%$$

91. Weighted Equivalent Maintenance Outage Rate -- WEMOR

$$WEMOR = \frac{\Sigma [(MOH + EMDH) x NMC]}{\Sigma [(MOH+SH+ \text{Synchronous Hours} + \text{Pumping Hours} +EMDHRS) x NMC]} x 100\%$$

92. Weighted Equivalent Unplanned Outage Rate -- WEUOR

$$WEUOR = \frac{\Sigma [(UOH + EUDH) x NMC]}{\Sigma [(UOH+SH+ \text{Synchronous Hours} + \text{Pumping Hours} + EUDHRS) x NMC]} x 100\%$$

Mean Service Time to Outage:

93a. Weighted Mean Service Time to Planned Outage - MSTPO

$$WMSTPO = \frac{\Sigma [(\text{Service Hours} + \text{Synchronous Condensing Hours} + \text{Pumping Hours}) x NMC]}{\Sigma [(\text{Number of Planned Outages}) x NMC]}$$

(which occur from in-service state only)

93b. Weighted Mean Service Time to Unplanned Outage - MSTUO

$$WMSTUO = \frac{\Sigma\ [(\text{Service Hours} + \text{Synchronous Condensing Hours} + \text{Pumping Hours}) \times NMC]}{\Sigma\ [(\text{Number of Unplanned Outages}) \times NMC]\ \text{(which occur from in-service state only)}}$$

93c. Weighted Mean Service Time To Forced Outage - MSTFO

$$WMSTFO = \frac{\Sigma\ [(\text{Service Hours} + \text{Synchronous Condensing Hours} + \text{Pumping Hours}) \times NMC]}{\Sigma\ [(\text{Number of (Unplanned) Forced Outages}) \times NMC]\ \text{(which occur from in-service state only)}}$$

93d. Weighted Mean Service Time to Maintenance Outage - MSTMO

$$WMSTMO = \frac{\Sigma\ [(\text{Service Hours} + \text{Synchronous Condensing Hours} + \text{Pumping Hours}) \times NMC]}{\Sigma\ [(\text{Number of Maintenance Outages}) \times NMC]\ \text{(which occur from in-service state only)}}$$

Mean Outage Duration:

94a. Weighted Mean Planned Outage Duration - MPOD

$$WMPOD = \frac{\Sigma\ [(\text{Planned Outage Hours}) \times NMC]}{\Sigma\ [(\text{Number of Planned Outages}) \times NMC]\ \text{(which occur from in-service state only)}}$$

94b. Weighted Mean Unplanned Outage Duration - MUOD

$$WMUOD = \frac{\Sigma\ [(\text{Unplanned Outage Hours}) \times NMC]}{\Sigma\ [(\text{Number of Unplanned Outages}) \times NMC]\ \text{(which occur from in-service state only)}}$$

94c. Weighted Mean Forced Outage Duration - MFOD

$$WMFOD = \frac{\Sigma\ [(\text{Unplanned (Forced) Outage Hours}) \times NMC]}{\Sigma\ [(\text{Number of Unplanned (Forced) Outages}) \times NMC]\ \text{(which occur from in-service state only)}}$$

94d. Weighted Mean Maintenance Outage Duration - MMOD

$$\text{WMMOD} = \frac{\Sigma\ [(\text{Maintenance Outage Hours}) \times \text{NMC}]}{\Sigma\ [(\text{Number of Maintenance Outages}) \times \text{NMC}]}$$

(which occur from in-service state only)

UNWEIGHTED (TIME-BASED) PERFORMANCE INDEXES OUTSIDE MANAGEMENT CONTROL UNIT CALCULATIONS SINGLE UNIT AND POOLING UNIT CALCULATIONS

(Note: The equations for calculating unweighted (time-based) performance using outside management control (OMC) are identical to those shown earlier in this Appendix. The only differences are that the selected OMC cause codes are treated as non-curtailing events when analyzing the event records during the time of evaluation. In other words, the OMC events are ignored and not used in the calculations.

The list of OMC cause codes, conditions and method for removing OMC events from the calculations is described in Appendix K.

95. OMC Planned Outage Factor – XPOF

(See equations 1 and 33 of this Appendix)

96. OMC Unplanned Outage Factor - XUOF

(See equations 2 and 34 of this Appendix)

97. OMC Forced Outage Factor - XFOF

(See equations 3 and 35 of this Appendix)

98. OMC Maintenance Outage Factor - XMOF

(See equations 4 and 36 of this Appendix)

99. OMC Scheduled Outage Factor - XSOF

(See equations 5 and 37 of this Appendix)

100. OMC Unavailability Factor - XUF

(See equations 6 and 38 of this Appendix)

101. OMC Availability Factor - XAF

(See equations 7 and 39 of this Appendix)

102. OMC Service Factor - XSF

(See equations 8 and 40 of this Appendix)

103. OMC Unit Derating Factor - XUDF

(See equations 10 and 42 of this Appendix)

104. OMC Equivalent Unavailability Factor - XEUF

(See equations 11 and 43 of this Appendix)

105. OMC Equivalent Availability Factor - XEAF

(See equations 12 and 44 of this Appendix)

106. OMC Equivalent Maintenance Outage Factor -- XEMOF

(See equations 17 and 49 of this Appendix)

107. OMC Equivalent Planned Outage Factor – XEPOF

(See equations 18 and 50 of this Appendix)

108. OMC Equivalent Forced Outage Factor -- XEFOF

(See equations 19 and 51 of this Appendix)

109. OMC Equivalent Scheduled Outage Factor -- XESOF

(See equations 20 and 52 of this Appendix)

110. OMC Equivalent Unplanned Outage Factor -- XEUOF

(See equations 21 and 53 of this Appendix)

111. OMC Forced Outage Rate - XFOR

(See equations 22 and 54 of this Appendix)

112. OMC Forced Outage Rate Demand- XFORd ***(See Notes 1 and 2 at the end of this section)***

(See equations 23 and 55 of this Appendix)

113. OMC Equivalent Forced Outage Rate - XEFOR

(See equations 24 and 56 of this Appendix)

114. OMC Equivalent Forced Outage Rate demand – XEFORd ***(See Notes 1 and 2 at the end of this section)***

(See equations 25 and 57 of this Appendix)

115. OMC Equivalent Planned Outage Rate -- XEPOR

(See equations 26 and 58 of this Appendix)

116. OMC Equivalent Maintenance Outage Rate -- XEMOR

(See equations 27 and 59of this Appendix)

117. OMC Equivalent Unplanned Outage Rate -- XEUOR

(See equations 28 and 60 of this Appendix)

118. OMC Average Run Time - XART

(See equations 29 and 61 of this Appendix)

WEIGHTED (CAPACITY-BASED) PERFORMANCE INDEXES
OUTSIDE MANAGEMENT CONTROL UNIT CALCULATIONS
POOLING UNIT CALCULATIONS

(Note: The equations for calculating weighted (capacity-based) performance using outside management control (OMC) are identical to those shown earlier in this Appendix. The only differences are that the selected OMC cause codes are treated as non-curtailing events when analyzing the event records during the time of evaluation. In other words, the OMC events are ignored and not used in the calculations.

The list of OMC cause codes, conditions and method for removing OMC events from the calculations is described in Appendix K.

119. OMC Weighted Forced Outage Factor – XWFOF

(See equation 65 of this Appendix)

120. OMC Weighted Maintenance Outage Factor – XWMOF

(See equation 66 of this Appendix)

121. OMC Weighted Planned Outage Factor – XWPOF

(See equation 67 of this Appendix)

122. OMC Weighted Unplanned Outage Factor – XWUOF

(See equation 685 of this Appendix)

123. OMC Weighted Scheduled Outage Factor – XWSOF

(See equation 69 of this Appendix)

124. OMC Weighted Unavailability Factor – XWUF

(See equation 70 of this Appendix)

125. OMC Weighted Availability Factor – XWAF

(See equation 71 of this Appendix)

126. OMC Weighted Service Factor – XWSF

(See equation 72 of this Appendix)

127. OMC Weighted Unit Derating Factor – XWUDF

(See equation 74 of this Appendix)

128. OMC Weighted Equivalent Unavailability Factor – XWEUF

(See equation 75 of this Appendix)

129. OMC Weighted Equivalent Availability Factor – XWEAF (also known as Unit Capability Factor in Europe and other parts of the world)

(See equation 76 of this Appendix)

130. OMC Weighted Equivalent Maintenance Outage Factor -- XWEMOF

(See equation 81 of this Appendix)

131. OMC Weighted Equivalent Planned Outage Factor -- XWEPOF

(See equation 82 of this Appendix)

132. OMC Weighted Equivalent Forced Outage Factor -- XWEFOF

(See equation 83 of this Appendix)

133. OMC Weighted Equivalent Scheduled Outage Factor -- XWESOF

(See equation 84 of this Appendix)

134. OMC Weighted Equivalent Unplanned Outage Factor – XWEUOF (also known as Unit Capability Loss Factor in Europe and other parts of the world.)

(See equation 85 of this Appendix)

135. OMC Weighted Forced Outage Rate – XWFOR

(See equation 86 of this Appendix)

136. OMC Weighted Forced Outage Rate demand – XWFORd ***(See Notes 1 and 2 at the end of this section)***

(See equation 87 of this Appendix)

137. OMC Weighted Equivalent Forced Outage Rate – XWEFOR

(See equation 88 of this Appendix)

138. OMC Weighted Equivalent Forced Outage Rate demand – XWEFORd ***(See Notes 1 and 2 at the end of this section)***

(See equation 89 of this Appendix)

139. OMC Weighted Equivalent Planned Outage Rate -- XWEPOR

(See equation 90 of this Appendix)

140. OMC Weighted Equivalent Maintenance Outage Rate -- XWEMOR

(See equation 91 of this Appendix)

141. OMC Weighted Equivalent Unplanned Outage Rate -- XWEUOR

(See equation 92 of this Appendix)

NOTE #1 FOR APPENDIX F

INTRODUCTION TO NOTE #1:
The information below comes from IEEE 762 Annex F. This section reviews several different methods for pooling EFORd only. Because of the nature of this equation, it can be pooled in several different methods as shown below.

PLEASE NOTE THAT after much consideration, NERC GADS will use Method 2 in all its EFORd calculations. The reason for method 2 is:

- ✓ Consistancy – all other GADS equations sum hours in both the denominator and numerator before division.
- ✓ Allow calculations of smaller groups. By allowing sums, smaller groups of units can be used to calculate EFORd without experiencing the divide by zero problem (see Note #2 for Appendix F).

FROM IEEE 762, ANNEX F:

EFORd Pooling Sample

A comparison of 3 EFORd pooling methodologies.

Method (I): Pooled individual Unit Demand Studies

This method can give more weight to individual units with extreme $EFOR_d$ that have very few service hours, but with longer study time periods the difference between the results of Methods I and II should be less.

Method (II): Group Demand Studies

This method may be more applicable in studying group statistics on units with known similar demand patterns, especially for forecasting and modeling. By calculating the f-factors over the group's total FOH, SH, RSH, and starts, the f-factor is "smoothed" and not subject to be unduly influenced by an one or more single units statistics that may have very high or very low hours or starts.

Method (III): Capacity Weighted Average of individually calculated $EFOR_d$ used by PJM to calculate pool average "unforced capacity" values for capacity market purposes.

In order to clearly demonstrate how these methods are used, two sets of comparison will be needed – the first uses the unweighted, time-based calculations as shown in Appendix F. The second will use a weighted version of these pooling methods.

Time-Based Pooling

This comparison of the three (3) pooling methodologies is based on the sample data and calculations found in the following two tables. The first table shows the raw data reported by 5 steam turbine generating units. The second table shows the interim values of the calculations used to produce the individual $EFOR_d$ for each unit In the interest of simplicity each unit reported sufficient data to allow the $EFOR_d$ calculation without the need for any substituted values.

Raw data used as sample

Unit	Capacity (MW)	SH	RSH	AH	ACTUAL STARTS	ATTEMPTED STARTS	EFDH	FOH	FO Events
48	55	4556	1963	6519	31	31	110.51	407	5
49	57	4856	2063	6918	34	34	146.99	773	12
50	60	6460	516	6978	17	18	131.03	340	14
51	53	3942	3694	7635	36	36	19.92	504	11
52	55	6904	62	6968	14	16	35.81	138	12
TOTAL	280	26718	8298	35018	132	135	444.26	2162	54

Calculated Values used in EFORd formula

Unit	1/r	1/t	1/D	F	f x FOH	fp	fp x EFDH	EFORd x MW	EFORd
48	0.0123	0.0158	0.0068	0.8049	327.608	0.6989	77.233	4.5594	8.290%
49	0.0155	0.0165	0.0070	0.8205	634.247	0.7019	103.178	7.6560	13.432%
50	0.0412	0.0349	0.0026	0.9666	328.630	0.9258	121.303	3.9766	6.628%
51	0.0218	0.0097	0.0091	0.7756	390.920	0.5163	10.285	4.9075	9.259%
52	0.0870	0.2581	0.0020	0.9942	137.194	0.9908	35.481	1.3488	2.452%
METHOD 1 SUMMED					1818.598		347.480		7.591%
Method 2 Calculated from reported totals	0.0250	0.0163	0.0049	0.8930	1930.734	0.762979	338.961		7.922%
Method 3 Summed								22.4483	8.017%

Using this data, the 3 pooling methods can be shown as follows – Note that methods 1 and 2 are unweighted, time-based calculations.

- **Method 1** uses the sums of SH and the calculated values (f x FOH), (fp x EFDH) giving a pooled EFORd of 7.591%.
    - $$\frac{(1818.598 + 347.480)}{(1818.598 + 26718)} = 7.591\%$$
- **Method 2** uses the sums of the reported data to represent the average unit and then calculates the pooled EFORd to be 7.922%
    - $$\frac{(1930.734 + 338.961)}{(1930.734 + 26718)} = 7.922\%$$

- **Method 3** weights the individual EFORd values with the unit capacity (EFORd x MW) and uses the total capacity to calculate a numeric average EFORd as 8.017%.

  - $\frac{22.4483}{280} = 8.017\%$

Weighted Pooling

This method weights all time values by the Net Max Capactiy of the individual unit. The raw data is the same as in the first example. Here a third table is added to show the weighted values used in the calculations.

Weighted Values used in EFORd formula

Unit	wSH	wFOH	wEFDH	F	wFOHd	fp	wEFDHd	wEFORd
48	250580	22385	6078.05	0.8049	18018.42	0.69888	4247.829	8.290%
49	276792	44061	8378.43	0.8205	36152.06	0.701937	5881.130	13.432%
50	387600	20400	7861.80	0.9666	19717.79	0.925767	7278.193	6.628%
51	208926	26712	1055.76	0.7756	20718.75	0.516306	545.096	9.259%
52	379720	7590	1969.55	0.9942	7545.65	0.990815	1951.460	2.452%
METHOD 1 SUMMED	1503618				102152.67		19903.71	7.601%
Method 2 Calculated from reported totals	1503618	121148	25343.59	0.8930	108185.164	0.763	19337.16	7.912%
Average wEFORd								8.012%

Weighted values in the above table are denoted with preceding w to indicate that the value has been weighted by its NMC. Below we substitue the weighted value for the expanded multiplication – $wFOR_d$ in place of (FOR_d x NMC)

- **Method 1** uses the sums of wSH and the weighted values (f x FOH x NMC), (fp x EFDH x NMC) giving a pooled $wEFOR_d$ of 7.601%.

  - $\frac{\sum(wFOHd + wEFDHd)}{\sum(wFOHd + wSH)} = wEFORd\ (pooled)$

  - $\frac{(102152.67 + 19903.71)}{(102152.67 + 1503618)} = 7.601\%$

- **Method 2** uses the sums of the weighted reported data to represent the weighted average unit and then calculates the pooled EFORd to be 7.912%
  - $$\frac{\left(\left(f \times \left(\sum wFOH\right)\right) + \left(fp \times \left(\sum wEFDH\right)\right)\right)}{\left(\sum wSH + \left(fp \times \sum wFOH\right)\right)} = wEFOR_d(pooled)$$
  - $$\frac{((0.8930 \times 121148) + (0.7630 \times 25343.59))}{(1503618 + (0.7630 \times 121148))} = 7.912\%$$

- **Average wEFORd** uses the sum of the weighted unit $EFOR_d$ values to calculate the numerical average.
  Notes: From Section 7.12.2 $EFOR_d = (FOH_d + EFDH_d) * 100 / (FOH_d + SH)$
  From section 9, To energy-weight an equation, one does not simply take each unit's EFOR, for example, and multiply the EFOR by the NMC, add them up and divide by the sum of the NMCs. Each term in the equation must be multiplied by the NMC. Further, to calculate the sum of each term, EACH unit must be multiplied by its NMC, then all those products summed over ALL THE UNITS, before the rest of the calculation is performed.

  Weighted individual $EFOR_d = (wFOH_d + wEFDH_d) * 100 / (wFOH_d + wSH)$

Another Sample

Compare this sample to the samples above, and you will see that the relationship between the methods does not remain constant and is dependant on the distribution of the data.

Raw data used as sample

Unit	Capacity (MW)	SH	RSH	AH	ACTUAL STARTS	ATTEMPTED STARTS	EFDH	FOH	FO Events
41	100	183	8576	8759	35	35	0	1	1
42	150	198	8562	8760	31	31	0	0	0
43	125	186	6867	7052	37	38	0	9	2
44	170	105	4128	4233	29	29	0	4528	3
45	180	62	8259	8319	20	20	0	98	1
TOTAL	725	734	36392	37123	152	153	0	4636	7

Calculated Values used in $EFOR_d$ formula

Unit	1/r	1/t	1/D	F	f x FOH	fp	fp x EFDH	EFORd x MW	EFORd
41	1.000	0.004	0.191	0.840	0.840	0.021	0.000	0.457	0.457%
42	0.000	0.004	0.157	0.023	0.000	0.023	0.000	0.000	0.000%
43	0.222	0.006	0.199	0.534	4.804	0.026	0.000	3.147	2.518%
44	0.001	0.007	0.276	0.027	122.623	0.025	0.000	91.581	53.871%
45	0.010	0.002	0.323	0.038	3.691	0.007	0.000	10.114	5.619%
METHOD 1 SUMMED					131.959		0.000		**15.238%**
Method 2 Calculated from reported totals	0.002	0.004	0.207	0.027	124.488	0.020	0.000		**14.501%**
Method 3 Summed								105.299	**37.607%**

Weighted Values used in $EFOR_d$ formula

Unit	wSH	wFOH	wEFDH	F	wFOHd	fp	wEFDHd	wEFORd
41	18300.000	100.000	0.000	0.840	84.000	0.021	0.000	0.457%
42	29700.000	0.000	0.000	0.023	0.000	0.023	0.000	0.000%
43	23250.000	1125.000	0.000	0.534	600.509	0.026	0.000	2.518%
44	17850.000	769760.000	0.000	0.027	20845.957	0.025	0.000	53.871%
45	11160.000	17640.000	0.000	0.038	664.418	0.007	0.000	5.619%
METHOD 1 SUMMED	100260.000				22194.884		0.000	**18.125%**
Method 2 Calculated from reported totals	100260.000	788625.000	0.000	0.027	21176.435	0.020	0.000	**17.438%**
Average wEFORd								**12.493%**

NOTE #2 FOR APPENDIX F

INTRODUCTION TO NOTE #2:
The information below comes from IEEE 762 Annex G. This section reviews why (in some cases) Equivalent Forced Outage Rate – Demand (EFORd) and other demand-related equations can not be calculated or produce a reasonable result. The discussion below demonstrations that a pool of information for a short period of time OR a long period for a single unit is needed so that none of the hour elements are zero and there will not be a divide by zero problem. A "long period" means at least 12 months or more.

This section also shows that a number can be forced but the results are not reasonable. The user of the EFORd calculation must be aware of what may come from a number if the EFORd calculation is forced (see the notes at the end of the section.)

PLEASE NOTE THAT NERC GADS will follow the recommendations of IEEE in calculating EFORd numbers. This means that in some GADS reports, there will not be an EFORd number because a calculated EFORd would be meaningless.

FROM IEEE 762, ANNEX G:

Limiting conditions for Forced Outage Indexes

(Informational)

Typically performance indexes are calculated using performance data over at least a year. However, if any of the variables SH, FOH, or RSH is zero in a period, one practice has been to assign a default value of 0.001 for computing indexes. Similarly, if any of the variables "number of FOH occurrences", "number of attempted starts", or "number of actual starts" is zero in the period, a value of 1 is assigned for computing indexes. The default values can give meaningless indices in some cases as indicated in Table H-1. Discretion based on history and other factors may be used to estimate FORd and EFORd even if they can be calculated using the equations in the standard in some cases.

Table G.1 – Limiting Conditions for Forced Outage Indexes

Case	SH	FOH	RSH	FORd	EFORd
Base	>0	>0	>0	Applicable	Applicable
1	0	>0	>0	Cannot be determined	Cannot be determined
2	0	0	>0	Cannot be determined	Cannot be determined
3	0	>0	0	Cannot be determined	Cannot be determined
4	>0	0	>0	0	EFDH/AH
5	>0	0	0	0	EFDH/SH
6	>0	>0	0	FOR	EFOR
7	0	0	0	Cannot be determined	Cannot be determined

The following numerical example illustrates the limiting conditions and how the indexes can become meaningless.

Case	FOH	EFDH	SH	No. of FO	RSH	Attempted Starts	Actual Starts	AH	r	T	D	f factor	fp Factor	FORd%	EFORd%
Base	50	30	400	5	1600	80	80	2000	10	20	5	0.4	0.2	5.1	6.5
1	50	30	**0**	5	1600	**1**	**1**	2000	10	1600	0.001	0.0	0.0	83.4	83.7
2	**0**	30	**0**	1	1600	**1**	**1**	2000	0	1600	0.001	0.5	0.0	33.3	34.3
3	50	30	**0**	5	**0**	**1**	**1**	2000	10	0	0.001	0.5	0.0	100.0	100
4	**0**	30	400	1	1600	80	80	2000	0	20	5	1.0	0.2	0	1.5
5	**0**	30	400	1	**0**	**1**	**1**	2000	0	0	400	1.0	0.2	0	1.5
6	50	30	400	5	**0**	**1**	**1**	2000	10	0	400	1.0	0.2	11.1	12.4
7	**0**	30	**0**	1	**0**	**1**	**1**	0	0	0	0.001	0.7	1.0	40.0	1800040

Notes:
Zero hours are made 0.001. Attempted and Actual Starts are made 1 when SH or RSH is zero. Number of forced outages is made 1 when FOH is zero.

Terms r, T, D, f, fp, FORd, and EFORd are defined in 7.16.2 and 7.17.2.

Base case is a normal case.

Cases 1, 2, 3, 7: Computed FORd, EFORd are meaningless; they should not be calculated using the equations in this standard.

Cases 4, 5, 6: Computed FORd, EFORd are valid.

APPENDIX G

Evaluation for Environmental Impacts and Schedule for Environmental Actions

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APPENDIX H

List of Permits and Licensees

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LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	**Document No.**	**Revision**	**Title**	**Status**	**File Name**
1	LCP-00001	1	Application for Crown Lands - Muskrat Falls South Side Access Road	Approved	MF South Side Access Road.ZIPX
2	LCP-00002	1	Application for Crown Lands - AC Transmission	Approved	AC Transmission.zip
3	LCP-00003	0	Muskrat Falls Fibre Line	To Be Reviewed	CL App Fibre Line.ZIPX
4	LCP-00004	0	Muskrat Falls Construction Site	To Be Reviewed	CL app MF construction site 4 June 2012.pdf
5	LCP-00005	0	Muskrat Falls Construction Site Shoreline Reservation	To Be Reviewed	CL app MF SS reservation area 6 June 1012.pdf
6	LCP-00006	0	Muskrat Falls Owner's Laydown Area	To Be Reviewed	CL app MF owners lay down 4 June 2012[1].pdf
7	LCP-00007	0	Application for Crown Lands - Access Road Gatehouse	To Be Reviewed	CL app MF gatehouse 7June12.pdf
8	LCP-00008	0	Churchill Falls Terminal Station Expansion - PRZ Regs.	Approved	PRZ_service nl _CFLco ter stn.pdf
9	LCP-00009	0	Muskrat Falls Access Road Gatehouse - PRZ Regs.	To Be Reviewed	PRZ_service nl _MF gatehouse.pdf
10	LCP-00011	0	Stage 2 Historic Resources Impact Assessment	To Be Reviewed	Muskrat Falls Stage 2 2012 Permit Application.pdf
11	LCP-00012	0	Access TLH-1 - Protected Road Zone Application	To Be Reviewed	TLH-1.ZIPX
12	LCP-00013	0	Stage 3 Historic Resources Impact Assessment	To Be Reviewed	Muskrat Falls Stage 3 2012 Permit Application.pdf
13	LCP-00014	0	Construction Power Distribution Line	Approved	Construction Power.ZIPX
14	LCP-00015	0	Muskrat Falls Substation	Approved	MF Substation.ZIPX

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	**Document No.**	**Revision**	**Title**	**Status**	**File Name**
15	LCP-00016	0	Muskrat Falls Accommodations Complex	Approved	main accommodations complex.zip
16	LCP-00017	0	Access TLH-2 - Protected Road Zone Application	To Be Reviewed	TLH-2.ZIPX
17	LCP-00018	0	Access TLH-3 - Protected Road Zone Application	To Be Reviewed	TLH-3.ZIPX
18	LCP-00019	0	Access TLH-4 - Protected Road Zone Application	To Be Reviewed	TLH-4.ZIPX
19	LCP-00020	0	Access TLH-5 - Protected Road Zone Application	To Be Reviewed	TLH-5.ZIPX
20	LCP-00021	0	Access TLH-6 - Protected Road Zone Application	To Be Reviewed	TLH-6.ZIPX
21	LCP-00022	0	Access TLH-7 - Protected Road Zone Application	To Be Reviewed	TLH-7.ZIPX
22	LCP-00023	0	Access TLH-8 - Protected Road Zone Application	To Be Reviewed	TLH-8.zip
23	LCP-00026	0	Application for Crown Lands - 15m Shoreline Reservation (North Side)	To Be Reviewed	app Crown land MF shoreline res. (north).pdf
24	LCP-00027	0	Application for Crown Lands - Water Lot for Muskrat Falls Dam	To Be Reviewed	CL app. for water lot for dam (LTO).pdf
25	LCP-00059	0	Application for Crown Lands - Gull Island Camp	To Be Reviewed	CL app Camp 1 Gull Island.pdf
26	LCP-00060	0	Application for Crown Lands - Camp at Churchill Falls East	To Be Reviewed	CL app Camp 2 East of Churchill Falls.pdf

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	**Document No.**	**Revision**	**Title**	**Status**	**File Name**
27	LCP-00061	0	PRZ Application to Develop Land: AC Transmission Camp (2)	To Be Reviewed	CAMP 2.pdf
28	LCP-00062	0	PRZ Application to Develop Land: AC Transmission Camp (1)	To Be Reviewed	CAMP 1.pdf
29	LCP-00063	0	PRZ Application to Develop Land: Access Roads to AC Transmission (AT-240-54)	To Be Reviewed	AT-240-54.pdf
30	LCP-00064	0	PRZ Application to Develop Land: Access Roads to AC Transmission (AT-240-47)	To Be Reviewed	AT-240-47.pdf
31	LCP-00067	0	PRZ Regulations: AC transmission Line Access (AT-240-161)	To Be Reviewed	AT-240-161.pdf
32	LCP-00068	0	PRZ Regulations: AC transmission Line Access (AT-240-165)	To Be Reviewed	AT-240-165.pdf
33	LCP-00069	0	PRZ Regulations: AC transmission Line Access (AT-240-167)	To Be Reviewed	AT-240-167.pdf
34	LCP-00070	0	PRZ Regulations: AC transmission Line Access (AT-240-170)	To Be Reviewed	AT-240-170.pdf
35	LCP-00071	0	PRZ Regulations: AC transmission Line Access (AT-240-18)	To Be Reviewed	AT-240-18.pdf
36	LCP-00072	0	PRZ Regulations: AC transmission Line Access (AT-240-19)	To Be Reviewed	AT-240-19.pdf
37	LCP-00073	0	PRZ Regulations: AC transmission Line Access (AT-240-23)	To Be Reviewed	AT-240-23.pdf
38	LCP-00074	0	PRZ Regulations: AC transmission Line Access (AT-240-24)	To Be Reviewed	AT-240-24.pdf

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	**Document No.**	**Revision**	**Title**	**Status**	**File Name**
39	LCP-00075	0	PRZ Regulations: AC transmission Line Access (AT-82)	To Be Reviewed	AT 82.pdf
40	LCP-00076	0	PRZ Regulations: AC transmission Line Access (AT-85)	To Be Reviewed	AT 85.pdf
41	LCP-00077	0	PRZ Regulations: AC transmission Line Access (AT-86)	To Be Reviewed	AT 86.pdf
42	LCP-00078	0	PRZ Regulations: AC transmission Line Access (AT-90)	To Be Reviewed	AT 90.pdf
43	LCP-00079	0	PRZ Regulations: AC transmission Line Access (AT-95)	To Be Reviewed	AT 95.pdf
44	LCP-00080	0	PRZ Regulations: AC transmission Line Access (AT-99)	To Be Reviewed	AT 99.pdf
45	LCP-00081	0	PRZ Regulations: AC transmission Line Access (AT-240-10)	To Be Reviewed	AT-240-10.pdf
46	LCP-00082	0	PRZ Regulations: AC transmission Line Access (AT-240-111)	To Be Reviewed	AT-240-111.pdf
47	LCP-00083	0	PRZ Regulations: AC transmission Line Access (AT-240-44)	To Be Reviewed	AT-240-44.pdf
48	LCP-00084	0	PRZ Regulations: AC transmission Line Access (AT-240-26)	To Be Reviewed	AT-240-26.pdf
49	LCP-00085	0	PRZ Regulations: AC transmission Line Access (AT-240-52)	To Be Reviewed	AT-240-52.pdf
50	LCP-00086	0	PRZ Regulations: AC transmission Line Access (AT-240-48)	To Be Reviewed	AT-240-48.pdf

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	**Document No.**	**Revision**	**Title**	**Status**	**File Name**
51	LCP-00087	0	PRZ Regulations: AC transmission Line Access (AT-240-8)	To Be Reviewed	AT-240-8.pdf
52	LCP-00088	0	PRZ Regulations: AC transmission Line Access (AT-240-67)	To Be Reviewed	AT-240-67.pdf
53	LCP-00089	0	PRZ Regulations: AC transmission Line Access (AT-240-9)	To Be Reviewed	AT-240-9.pdf
54	LCP-00090	0	PRZ Regulations: AC transmission Line Access (AT-172)	To Be Reviewed	AT 172.pdf
55	LCP-00091	0	PRZ Regulations: AC transmission Line Access (AT-171)	To Be Reviewed	AT 171.pdf
56	LCP-00092	0	PRZ Regulations: AC transmission Line Access (AT-17)	To Be Reviewed	AT 17.pdf
57	LCP-00093	0	PRZ Regulations: AC transmission Line Access (AT-168)	To Be Reviewed	AT 168.pdf
58	LCP-00094	0	PRZ Regulations: AC transmission Line Access (AT-164)	To Be Reviewed	AT 164.pdf
59	LCP-00095	0	PRZ Regulations: AC transmission Line Access (AT-163)	To Be Reviewed	AT 163.pdf
60	LCP-00096	0	PRZ Regulations: AC transmission Line Access (AT-160)	To Be Reviewed	AT 160.pdf
61	LCP-00097	0	PRZ Regulations: AC transmission Line Access (AT-16)	To Be Reviewed	AT 16.pdf
62	LCP-00098	0	PRZ Regulations: AC transmission Line Access (AT-183)	To Be Reviewed	AT 183.pdf

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	**Document No.**	**Revision**	**Title**	**Status**	**File Name**
63	LCP-00099	0	PRZ Regulations: AC transmission Line Access (AT-182)	To Be Reviewed	AT 182.pdf
64	LCP-00100	0	PRZ Regulations: AC transmission Line Access (AT-181)	To Be Reviewed	AT 181.pdf
65	LCP-00101	0	PRZ Regulations: AC transmission Line Access (AT-180)	To Be Reviewed	AT 180.pdf
66	LCP-00102	0	PRZ Regulations: AC transmission Line Access (AT-179)	To Be Reviewed	AT 179.pdf
67	LCP-00103	0	PRZ Regulations: AC transmission Line Access (AT-177)	To Be Reviewed	AT 177.pdf
68	LCP-00104	0	PRZ Regulations: AC transmission Line Access (AT-176)	To Be Reviewed	AT 176.pdf
69	LCP-00105	0	PRZ Regulations: AC transmission Line Access (AT-174)	To Be Reviewed	AT 174.pdf
70	LCP-00106	0	PRZ Regulations: AC transmission Line Access (AT-60)	To Be Reviewed	AT 60.pdf
71	LCP-00107	0	PRZ Regulations: AC transmission Line Access (AT-62)	To Be Reviewed	AT 62.pdf
72	LCP-00108	0	PRZ Regulations: AC transmission Line Access (AT-51)	To Be Reviewed	AT 51.pdf
73	LCP-00109	0	PRZ Regulations: AC transmission Line Access (AT-58)	To Be Reviewed	AT 58.pdf
74	LCP-00110	0	PRZ Regulations: AC transmission Line Access (AT-36)	To Be Reviewed	AT 36.pdf

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	Document No.	Revision	Title	Status	File Name
75	LCP-00111	0	PRZ Regulations: AC transmission Line Access (AT-38)	To Be Reviewed	AT 38.pdf
76	LCP-00112	0	PRZ Regulations: AC transmission Line Access (AT-20)	To Be Reviewed	AT 20.pdf
77	LCP-00113	0	PRZ Regulations: AC transmission Line Access (AT-3)	To Be Reviewed	AT 3.pdf
78	LCP-00114	0	PRZ Regulations: AC transmission Line Access (AT-74)	To Be Reviewed	AT 74.pdf
79	LCP-00115	0	PRZ Regulations: AC transmission Line Access (AT-75)	To Be Reviewed	AT 75.pdf
80	LCP-00116	0	PRZ Regulations: AC transmission Line Access (AT-7)	To Be Reviewed	AT 7.pdf
81	LCP-00117	0	PRZ Regulations: AC transmission Line Access (AT-72)	To Be Reviewed	AT 72.pdf
82	LCP-00118	0	PRZ Regulations: AC transmission Line Access (AT-66)	To Be Reviewed	AT 66.pdf
83	LCP-00119	0	PRZ Regulations: AC transmission Line Access (AT-68)	To Be Reviewed	AT 68.pdf
84	LCP-00120	0	PRZ Regulations: AC transmission Line Access (AT-63)	To Be Reviewed	AT 63.pdf
85	LCP-00121	0	PRZ Regulations: AC transmission Line Access (AT-65)	To Be Reviewed	AT 65.pdf
86	LCP-00122	0	PRZ Regulations: AC transmission Line Access (AR-79)	To Be Reviewed	AR 79.pdf

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	Document No.	Revision	Title	Status	File Name
87	LCP-00123	0	PRZ Regulations: AC transmission Line Access (AT-76)	To Be Reviewed	AR 76.pdf
88	LCP-00124	0	PRZ Regulations: AC transmission Line Access (AR-93)	To Be Reviewed	AR 93.pdf
89	LCP-00125	0	PRZ Regulations: AC transmission Line Access (AR-87)	To Be Reviewed	AR 87.pdf
90	LCP-00126	0	PRZ Regulations: AC transmission Line Access (AR-50)	To Be Reviewed	AR 50.pdf
91	LCP-00127	0	PRZ Regulations: AC transmission Line Access (AR-45)	To Be Reviewed	AR 45.pdf
92	LCP-00128	0	PRZ Regulations: AC transmission Line Access (AR-69)	To Be Reviewed	AR 69.pdf
93	LCP-00129	0	PRZ Regulations: AC transmission Line Access (AR-53)	To Be Reviewed	AR 53.pdf
94	LCP-00130	0	PRZ Regulations: AC transmission Line Access (AT-112)	To Be Reviewed	AT 112.pdf
95	LCP-00131	0	PRZ Regulations: AC transmission Line Access (AT-11)	To Be Reviewed	AT 11.pdf
96	LCP-00132	0	PRZ Regulations: AC transmission Line Access (AT-114)	To Be Reviewed	AT 114.pdf
97	LCP-00133	0	PRZ Regulations: AC transmission Line Access (AT-113)	To Be Reviewed	AT 113.pdf
98	LCP-00134	0	PRZ Regulations: AC transmission Line Access (AT-100)	To Be Reviewed	AT 100.pdf

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	Document No.	Revision	Title	Status	File Name
99	LCP-00135	0	PRZ Regulations: AC transmission Line Access (AR-96)	To Be Reviewed	AR 96.pdf
100	LCP-00136	0	PRZ Regulations: AC transmission Line Access (AT-107)	To Be Reviewed	AT 107.pdf
101	LCP-00137	0	PRZ Regulations: AC transmission Line Access (AT-105)	To Be Reviewed	AT 105.pdf
102	LCP-00138	0	PRZ Regulations: AC transmission Line Access (AT-126)	To Be Reviewed	AT 126.pdf
103	LCP-00139	0	PRZ Regulations: AC transmission Line Access (AT-13)	To Be Reviewed	AT 13.pdf
104	LCP-00140	0	PRZ Regulations: AC transmission Line Access (AT-130)	To Be Reviewed	AT 130.pdf
105	LCP-00141	0	PRZ Regulations: AC transmission Line Access (AT-137)	To Be Reviewed	AT 137.pdf
106	LCP-00142	0	PRZ Regulations: AC transmission Line Access (AT-115)	To Be Reviewed	AT 115.pdf
107	LCP-00143	0	PRZ Regulations: AC transmission Line Access (AT-12)	To Be Reviewed	AT 12.pdf
108	LCP-00144	0	PRZ Regulations: AC transmission Line Access (AT-122)	To Be Reviewed	AT 122.pdf
109	LCP-00145	0	PRZ Regulations: AC transmission Line Access (AT-125)	To Be Reviewed	AT 125.pdf
110	LCP-00146	0	PRZ Regulations: AC transmission Line Access (AT-149)	To Be Reviewed	AT 149.pdf

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	**Document No.**	**Revision**	**Title**	**Status**	**File Name**
111	LCP-00147	0	PRZ Regulations: AC transmission Line Access (AT-15)	To Be Reviewed	AT 15.pdf
112	LCP-00148	0	PRZ Regulations: AC transmission Line Access (AT-151)	To Be Reviewed	AT 151.pdf
113	LCP-00149	0	PRZ Regulations: AC transmission Line Access (AT-140)	To Be Reviewed	AT 140.pdf
114	LCP-00150	0	PRZ Regulations: AC transmission Line Access (AT-142)	To Be Reviewed	AT 142.pdf
115	LCP-00151	0	PRZ Regulations: AC transmission Line Access (AT-146)	To Be Reviewed	AT 146.pdf
116	LCP-00152	0	PRZ Regulations: AC transmission Line Access (AT-147)	To Be Reviewed	AT 147.pdf
117	LCP-00153	0	PRZ Regulations: AC transmission Line Access (AR-101)	To Be Reviewed	AR 101.pdf
118	LCP-00154	0	PRZ Regulations: AC transmission Line Access (AR-123)	To Be Reviewed	AR 123.pdf
119	LCP-00155	0	PRZ Regulations: AC transmission Line Access (AR-119)	To Be Reviewed	AR 119.pdf
120	LCP-00156	0	PRZ Regulations: AC transmission Line Access (AR-117)	To Be Reviewed	AR 117.pdf
121	LCP-00157	0	PRZ Regulations: AC transmission Line Access (AR-108)	To Be Reviewed	AR 108.pdf
122	LCP-00158	0	PRZ Regulations: AC transmission Line Access (AR-144)	To Be Reviewed	AR 144.pdf

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	**Document No.**	**Revision**	**Title**	**Status**	**File Name**
123	LCP-00159	0	PRZ Regulations: AC transmission Line Access (AR-152)	To Be Reviewed	AR 152.pdf
124	LCP-00160	0	PRZ Regulations: AC transmission Line Access (AR-127)	To Be Reviewed	AR 127.pdf
125	LCP-00161	0	PRZ Regulations: AC transmission Line Access (AR-14)	To Be Reviewed	AR 14.pdf
126	LCP-00162	0	PRZ Regulations: AC transmission Line Access (AR-157)	To Be Reviewed	AR 157.pdf
127	LCP-00163	0	PRZ Regulations: AC transmission Line Access (AR-158)	To Be Reviewed	AR 158.pdf
128	LCP-00164	0	PRZ Regulations: AC transmission Line Access (AR-154)	To Be Reviewed	AR 154.pdf
129	LCP-00165	0	PRZ Regulations: AC transmission Line Access (AR-155)	To Be Reviewed	AR 155.pdf
130	LCP-00166	0	PRZ Regulations: AC transmission Line Access (AR-192)	To Be Reviewed	AR 192.pdf
131	LCP-00167	0	PRZ Regulations: AC transmission Line Access (AR-195)	To Be Reviewed	AR 195.pdf
132	LCP-00168	0	PRZ Regulations: AC transmission Line Access (AR-159)	To Be Reviewed	AR 159.pdf
133	LCP-00169	0	PRZ Regulations: AC transmission Line Access (AR-178)	To Be Reviewed	AR 178.pdf
134	LCP-00170	0	PRZ Regulations: AC transmission Line Access (AR-34)	To Be Reviewed	AR 34.pdf

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	**Document No.**	**Revision**	**Title**	**Status**	**File Name**
135	LCP-00171	0	PRZ Regulations: AC transmission Line Access (AR-35)	To Be Reviewed	AR 35.pdf
136	LCP-00172	0	PRZ Regulations: AC transmission Line Access (AR-21)	To Be Reviewed	AR 21.pdf
137	LCP-00173	0	PRZ Regulations: AC transmission Line Access (AR-28)	To Be Reviewed	AR 28.pdf
138	LCP-00174	0	PRZ Regulations: Access to AC Transmission Line (BT-70)	To Be Reviewed	BT 70.pdf
139	LCP-00175	0	PRZ Regulations: Access to AC Transmission Line (BT-92)	To Be Reviewed	BT 92.pdf
140	LCP-00176	0	PRZ Regulations: Access to AC Transmission Line (BT-98)	To Be Reviewed	BT 98.pdf
141	LCP-00177	0	PRZ Regulations: Access to AC Transmission Line (BT-184)	To Be Reviewed	BT 184.pdf
142	LCP-00178	0	PRZ Regulations: Access to AC Transmission Line (BT-30)	To Be Reviewed	BT 30.pdf
143	LCP-00179	0	PRZ Regulations: Access to AC Transmission Line (BT-56)	To Be Reviewed	BT 56.pdf
144	LCP-00180	0	PRZ Regulations: Access to AC Transmission Line (BT-61)	To Be Reviewed	BT 61.pdf
145	LCP-00181	0	PRZ Regulations: Access to AC Transmission Line (BT-106)	To Be Reviewed	BT 106.pdf
146	LCP-00182	0	PRZ Regulations: Access to AC Transmission Line (BT-124)	To Be Reviewed	BT 124.pdf

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	Document No.	Revision	Title	Status	File Name
147	LCP-00183	0	PRZ Regulations: Access to AC Transmission Line (BT-162)	To Be Reviewed	BT 162.pdf
148	LCP-00184	0	PRZ Regulations: Access to AC Transmission Line (BT-169)	To Be Reviewed	BT 169.pdf
149	LCP-00185	0	PRZ Regulations: Access to AC Transmission Line (BT-104)	To Be Reviewed	BT 104.pdf
150	LCP-00186	0	PRZ Regulations: Access to AC Transmission Line (BT-103)	To Be Reviewed	BT 103.pdf
151	LCP-00187	0	PRZ Regulations: Access to AC Transmission Line (BT-102)	To Be Reviewed	BT 102.pdf
152	LCP-00188	0	PRZ Application to Develop Land: AC Transmission Line (Crossing 18)	To Be Reviewed	CROSSING18.pdf
153	LCP-00189	0	PRZ Application to Develop Land: AC Transmission Line (Crossing 17)	To Be Reviewed	CROSSING17.pdf
154	LCP-00190	0	PRZ Application to Develop Land: AC Transmission Line (Crossing 2)	To Be Reviewed	CROSSING2.pdf
155	LCP-00191	0	PRZ Application to Develop Land: AC Transmission Line (Crossing 19)	To Be Reviewed	CROSSING19.pdf
156	LCP-00192	0	PRZ Application to Develop Land: AC Transmission Line (Crossing 4)	To Be Reviewed	CROSSING4.pdf
157	LCP-00193	0	PRZ Application to Develop Land: AC Transmission Line (Crossing 3)	To Be Reviewed	CROSSING3.pdf
158	LCP-00194	0	PRZ Application to Develop Land: AC Transmission Line (Crossing 6)	To Be Reviewed	CROSSING6.pdf

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	**Document No.**	**Revision**	**Title**	**Status**	**File Name**
159	LCP-00195	0	PRZ Application to Develop Land: AC Transmission Line (Crossing 5)	To Be Reviewed	CROSSING5.pdf
160	LCP-00196	0	PRZ Application to Develop Land: AC Transmission Line (Crossing 10)	To Be Reviewed	CROSSING10.pdf
161	LCP-00197	0	PRZ Application to Develop Land: AC Transmission Line (Crossing 1)	To Be Reviewed	CROSSING1.pdf
162	LCP-00198	0	PRZ Application to Develop Land: AC Transmission Line (Crossing 12)	To Be Reviewed	CROSSING12.pdf
163	LCP-00199	0	PRZ Application to Develop Land: AC Transmission Line (Crossing 11)	To Be Reviewed	CROSSING11.pdf
164	LCP-00200	0	PRZ Application to Develop Land: AC Transmission Line (Crossing 14)	To Be Reviewed	CROSSING14.pdf
165	LCP-00201	0	PRZ Application to Develop Land: AC Transmission Line (Crossing 13)	To Be Reviewed	CROSSING13.pdf
166	LCP-00202	0	PRZ Application to Develop Land: AC Transmission Line (Crossing 16)	To Be Reviewed	CROSSING16.pdf
167	LCP-00203	0	PRZ Application to Develop Land: AC Transmission Line (Crossing 15)	To Be Reviewed	CROSSING15.pdf
168	LCP-00204	0	PRZ Application to Develop Land: AC Transmission Line (Section 13)	To Be Reviewed	sect13.pdf
169	LCP-00205	0	PRZ Application to Develop Land: AC Transmission Line (Section 14)	To Be Reviewed	sect14.pdf
170	LCP-00206	0	PRZ Application to Develop Land: AC Transmission Line (Section 15)	To Be Reviewed	sect15.pdf

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	**Document No.**	**Revision**	**Title**	**Status**	**File Name**
171	LCP-00207	0	PRZ Application to Develop Land: AC Transmission Line (Section 3)	To Be Reviewed	sect3.pdf
172	LCP-00208	0	PRZ Application to Develop Land: AC Transmission Line (Section 4)	To Be Reviewed	sect4.pdf
173	LCP-00209	0	PRZ Application to Develop Land: AC Transmission Line (Section 5)	To Be Reviewed	sect5.pdf
174	LCP-00210	0	PRZ Application to Develop Land: AC Transmission Line (Section 6)	To Be Reviewed	sect6.pdf
175	LCP-00211	0	PRZ Application to Develop Land: AC Transmission Line Access (AT-188)	To Be Reviewed	AT 188.pdf
176	LCP-00212	0	PRZ Application to Develop Land: AC Transmission Line (Section 7)	To Be Reviewed	sect7.pdf
177	LCP-00213	0	PRZ Application to Develop Land: AC Transmission Line Access (AR-187)	To Be Reviewed	AR 187.pdf
178	LCP-00214	0	PRZ Application to Develop Land: AC Transmission Line (Crossing 7)	To Be Reviewed	CROSSING7.pdf
179	LCP-00215	0	PRZ Application to Develop Land: AC Transmission Line (Crossing 8)	To Be Reviewed	CROSSING8.pdf
180	LCP-00216	0	PRZ Application to Develop Land: AC Transmission Line (Crossing 9)	To Be Reviewed	CROSSING9.pdf
181	LCP-00217	0	PRZ Application to Develop Land: Muskrat Falls Access Road Bypass	To Be Reviewed	PRZ - south side Bypass access road.pdf
182	LCP-00218	0	PRZ Application to Develop Land: AC Transmission Line (Section 1&2)	To Be Reviewed	sect1&2.pdf

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	Document No.	Revision	Title	Status	File Name
183	LCP-00219	0	PRZ Application to Develop Land: AC Transmission Line (Section 10)	To Be Reviewed	sect10.pdf
184	LCP-00220	0	PRZ Application to Develop Land: AC Transmission Line (Section 11)	To Be Reviewed	sect11.pdf
185	LCP-00221	0	PRZ Application to Develop Land: AC Transmission Line (Section 12)	To Be Reviewed	sect12.pdf
186	LCP-00222	0	PRZ Application to Develop Land: AC Transmission Line (Section 9)	To Be Reviewed	sect9.pdf
187	LCP-00223	0	PRZ Application to Develop Land: AC Transmission Line (Section 8)	To Be Reviewed	sect8.pdf
188	LCP-00224	0	Application for Crown Lands - Converter Station at Muskrat Falls	To Be Reviewed	CL app. for converter station.pdf
189	SLI-00001	0	Commercial Cutting / Operating Permit - South Side Access Road	Approved	SSAR Clearing Permit Package.zip
190	SLI-00002	0	Quarry # 1 Permit - SSAR	Approved	Quarry 1 Permit Package.zip
191	SLI-00003	0	Quarry # 2 SSAR Permit	Approved	Quarry 2 Permit Package.zip
192	SLI-00004	0	Quarry #3 Permit SSAR	Approved	Quarry 3 Permit Package.zip
193	SLI-00005	0	Quarry # 4 Permit SSAR	Approved	Quarry 4 Permit Package.zip
194	SLI-00006	0	DFO Project Review C7 (5+800) Caroline's Brook	Approved	DFO C7 Permit Package.zip
195	SLI-00008	0	Alter a Body of Water - Temporary Bridge C7 (5+8000 Caroline's Brook	Approved	DOEC C7 Permit Package.zip
196	SLI-00010	0	Alter a Body of Water - Fording C7 (5+800) Caroline's Brook	Approved	4E-SLI-1100-0005_Fording.pdf
197	SLI-00012	0	Quarry # 5 SSAR	Approved	Quarry 5 Permit Package.zip
198	SLI-00013	0	Quarry # 6 SSAR	Approved	Quarry 6 Permit Package.zip
199	SLI-00014	0	Quarry # 7 SSAR	Approved	Quarry 7 Permit Package.zip
200	SLI-00015	0	Quarry # 8 SSAR	Approved	Quarry 8 Permit Package.zip
201	SLI-00016	0	Quarry # 9 SSAR	Approved	Quarry 9 Permit Package.zip

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	**Document No.**	**Revision**	**Title**	**Status**	**File Name**
202	SLI-00017	0	DFO Project Review (5+672 C7A) SSAR	Approved	DFO C7A Permit Package.zip
203	SLI-00021	0	DFO Project Review (C8 7+590) SSAR	Approved	DFO C8 Permit Package.zip
204	SLI-00024	0	Alter a body of Water - Culvert (C8 7+590) SSAR	Approved	DOEC C8 Permit Package.zip
205	SLI-00025	1	Alter a body of water - Culvert (C9 10+571)	Approved	Doec C9 Permit Package.zip
206	SLI-00027	0	DFO Project Review (C9 10+571) SSAR	Approved	DFO C9 Permit Package.zip
207	SLI-00031	0	Quarry # 10 SSAR	Approved	Quarry 10 Permit package.zip
208	SLI-00032	0	Quarry # 11 SSAR	Approved	Quarry 11 Permit Package.zip
209	SLI-00033	0	Quarry # 12 SSAR	Approved	Quarry 12 Permit Package.zip
210	SLI-00035	0	DFO Project Review - Culvert C10 (11+837)	Approved	DFO C10 Permit Package.zip
211	SLI-00036	0	Alter a Body of Water - Culverts C10 (11+837)	Approved	DOEC C10 Permit Package.zip
212	SLI-00037	0	Alter a Body of Water - Culvert ACC (0+699) Road to Accommodations Complex	Approved	DOEC ACC (0+699) Permit Package.zip
213	SLI-00038	0	DFO Project Review ACC (0+699) Road to Accommodations Complex	Approved	DFO ACC (0+699) Permit Package.zip
214	SLI-00040	0	Alter a Body of Water - Bridge - C13 (14+234)	Approved	DOEC C13 Permit Package.zip
215	SLI-00041	0	DFO Project Review C13 (14+234)	Approved	DFO C13 Permt Package.zip
216	SLI-00042	0	DOEC Alter a Body of Water Culvert C12 (13+368)	Approved	DOEC C12 Permit Package.zip
217	SLI-00043	0	DFO Project Review C12 (13+368)	Approved	DFO C12 Permit Package.zip
218	SLI-00047	0	DFO Project Review C19 (20+000)	Approved	DFO C19 Permit Package.zip
219	SLI-00049	0	Alter a body of Water - Bridge C19 (20+000)	Approved	DOEC C19 Permit Package.zip

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	**Document No.**	**Revision**	**Title**	**Status**	**File Name**
220	SLI-00056	0	Alter a Body of Water - Work within 15 m_North Spur Geotechnical Investigation	To Be Reviewed	4E-SLI-2000-0005_Alterations_Geotech2012.pdf
221	SLI-00059	0	Quarry Permit_GD5	Approved	4E-SLI-2000-0027_Quarry GD5.zip
222	SLI-00060	0	Quarry Permit_GD8	Approved	4E-SLI-2000-0034_Quarry GD8.zip
223	SLI-00061	0	Quarry Permit_TD7	Approved	4E-SLI-2000-0046_Quarry TD7.zip
224	SLI-00062	0	Quarry Permit_TD8	Approved	4E-SLI-2000-0048_Quarry TD8.zip
225	SLI-00064	1	Exploration Approval & Quarry Material Exploration_GD1	To Be Reviewed	4E-SLI-2000-0006_GD1_rev 1.pdf
226	SLI-00065	1	Exploration Approval & Quarry Material Exploration_GD11	To Be Reviewed	4E-SLI-2000-0007_GD11_rev 1.pdf
227	SLI-00069	01	DFO - Project Review C14 (14+906) SSAR	Approved	DFO C14 Permit Package.zip
228	SLI-00070	01	Alter a body of water - C14 (14+906) SSAR	Approved	DOEC C14 Permit Package.zip
229	SLI-00071	01	DFO Project Review C17 (15+710) SSAR	Approved	DFO C17 Permit Package.zip
230	SLI-00072	01	Alter a body of water - C17 (15+710)	Approved	DOEC C17 Permit Package.zip
231	SLI-00073	01	DFO Project Review - C18 (15+791) SSAR	Approved	DFO C18 Permit Package.zip
232	SLI-00074	01	Alter a Body of Water - C18 (15+791) SSAR	Approved	DOEC C18 Permit Package.zip
233	SLI-00075	01	DFO Project Review C20 (20+774) SSAR	Approved	DFO C20 Permit Package.zip
234	SLI-00076	01	Alter a body of water - C20 (20+774) SSAR	Approved	DOEC C20 Permit Package.zip
235	SLI-00077	01	DFO Project Review C21 (21+149) SSAR	Approved	DFO C21 Permit Package.zip

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	**Document No.**	**Revision**	**Title**	**Status**	**File Name**
236	SLI-00078	01	Alter a body of water C21 (21+149) SSAR	Approved	DOEC C21 Permit Package.zip
237	SLI-00079	0	Navigable Waters Protection Act (Muskrat Falls) p-WC-1e	To Be Reviewed	4E-SLI-1320-0005_Nav Waters Muskrat Falls (p-WC-1e).zip
238	SLI-00080	01	DOEC Blanket Permit Construction Power - Fording	Approved	Construction power fording.zip
239	SLI-00081	01	DOEC Blanket Permit Construction Power - Temp. Structures	Approved	construction power temporary bridge.zip
240	SLI-00082	01	DOEC Blanket Permit - Construction Power- Work within 15m	Approved	Work Within 15 Package.zip
241	SLI-00083	0	Alter a Body of Water - Fording_Shoal Cove Geotechincal C3	To Be Reviewed	Shoal Cove Fording.ZIPX
242	SLI-00084	0	DFO Project Review - Fording_Geotechnical Component 3	To Be Reviewed	4E-SLI-8000-0010_DFO.pdf
243	SLI-00085	01	Alter a body of water - C22 (21+827) - SSAR	Approved	C22.zip
244	SLI-00086	01	DFO Project Review - C22 (21+827) SSAR	To Be Reviewed	DFO C22 SSAR Permit Package.zip
245	SLI-00087	01	Alter a body of water - Stream Diversion_bulk excavation	Approved	diversion.zip
246	SLI-00088	0	Quarry # 13 Permit - Existing Quarry	Approved	Quarry 13 Approval.zip
247	SLI-00090	01	DFO Project Review C22 (21+827) Bulk Excavation	Approved	4E-SLI-2000-0057_DFO Project Review Stream Diversion.zip
248	SLI-00091	0	Permit to Alter a Body of Water - Culvert - Access Road to GD8	Approved	Access to GD8.zip
249	SLI-00092	0	Alter a Body of Water - Culvert 1 - Access Road to GD11	Approved	Access to GD11.zip
250	SLI-00093	0	Alter a Body of Water - Culvert 2 - Access Road to GD11	Approved	Access to GD11.zip
251	SLI-00094	0	DFO Project Review Culvert 1 - Access Road to GD11	To Be Reviewed	4E-SLI-2000-0042_45.pdf

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	**Document No.**	**Revision**	**Title**	**Status**	**File Name**
252	SLI-00095	0	DFO Project Review - Culvert 2 - Access Road to GD11	To Be Reviewed	4E-SLI-2000-0042_45.pdf
253	SLI-00096	0	DFO Project Review - Culvert Access Road to GD8	To Be Reviewed	4E-SLI-2000-0037.pdf
254	SLI-00097	0	Section 19, Endangered Species Act Permit	To Be Reviewed	4E-SLI-0000-0014_Section 19.pdf
255	SLI-00098	0	Permit to Alter a Body of Water - Schedule H (Other Alterations) - Contractors Laydown Area	Approved	contractor's laydown.zip
256	SLI-00099	0	DFO Project Review - Contractors Laydown Area	To Be Reviewed	4E-SLI-2000-0047_DFO.pdf
257	SLI-00100	0	Commercial Cutting/Operating Permit - Additional South Side Work	To Be Reviewed	4E-SLI-1100-0004_NEW.pdf
258	SLI-00101	0	DOEC Water Use License - C7 (5+800)	Approved	C7 Water Use Permit Package.zip
259	SLI-00102	0	DOEC Water Use License - C7A (5+672)	Approved	C7A DOEC Water Use Permit Package.zip
260	SLI-00103	0	DOEC Water Use License - C8 (7+590)	Approved	C8 DOEC Water Use Permit Package.zip
261	SLI-00104	0	DOEC Water Use License - C9 (10+572)	To Be Reviewed	C9 DOEC Water Use Permit Package.zip
262	SLI-00105	0	DOEC Water Use License - C10 (11+837)	Approved	C10 DOEC Water Use Permit Package.zip
263	SLI-00106	0	DOEC Water Use License - C12 (13+221)	Approved	C12 DOEC Water Use Permit Package.zip
264	SLI-00107	0	DOEC Water Use License - C13 (14+084)	Approved	C13 DOEC Water Use Permit Package.zip
265	SLI-00108	0	DOEC Water Use License - C14 (14+906)	Approved	C14 DOEC Water Use Permit Package.zip

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	**Document No.**	**Revision**	**Title**	**Status**	**File Name**
266	SLI-00109	0	DOEC Water Use License - C17 (15+710)	Approved	C17 DOEC Water Use Permit Package.zip
267	SLI-00110	0	DOEC Water Use License - C18 (15+791)	Approved	C18 DOEC Water Use Permit Package.zip
268	SLI-00111	0	DOEC Water Use License - C19 (19+864 McKenzie Brook)	Approved	C19 DOEC Water Use Permit Package.zip
269	SLI-00112	0	DOEC Water Use License - C20 (20+625)	Approved	C20 DOEC Water Use Permit Package.zip
270	SLI-00113	0	DOEC Water Use License - C21 (21+149)	Approved	C21 DOEC Water Use Permit Package.zip
271	SLI-00114	0	DOEC Water Use License - C22 (21+827)	Approved	C22 DOEC Water Use Permit Package.zip
272	SLI-00115	0	DFO Project Review - Water Use - C7 - C22	Approved	C7-22 DFO Water Use Permit Package.zip
273	SLI-00116	0	Used Oil Storage Tank System	To Be Reviewed	4E-CON-1100-0016_Used Oil Application.pdf
274	SLI-00117	0	DFO Op Statement - temporary crossing (Construction Power)	To Be Reviewed	4E-SLI-1320-0004.pdf
275	SLI-00118	0	Mobile Fuel Storage Tank Relocation Form	Approved	4E-CON-1100-0018_tank relocation.zip
276	SLI-00119	0	Navigable Waters Protection Act_p-WC-1-e_HVac Line	To Be Reviewed	4E-SLI-6100-0025_p-WC-1e.pdf
277	SLI-00120	0	Building Accessibility Design Registration / Exemption Registration for Control Building/Substation	Approved	4E-SLI-1320-0007_Control Build.zip
278	SLI-00121	0	Fire and Life Safety Review Plan (National Building Code) for Control Building/Substation	Approved	4E-SLI-1320-0008_Control Build.zip
279	SLI-00122	0	Building Exemption MF 10x30	To Be Reviewed	4E-CON-1320-0001_BuildingExemption_MF_10x30.pdf

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	**Document No.**	**Revision**	**Title**	**Status**	**File Name**
280	SLI-00123	0	Fire and Life Safety Review Plan (National Building Code) MF 10x30	To Be Reviewed	4E-CON-1320-0002_FireSafety_MF_10x30.pdf
281	SLI-00124	0	Building Exemption MF 10x40	To Be Reviewed	4E-CON-1100-0020_C18_DFO.pdf
282	SLI-00125	0	Fire and Life Safety Review Plan (National Building Code) MF 10x40	To Be Reviewed	4E-CON-1320-0004_FireSafety_MF_10x40.pdf
283	SLI-00126	0	Building Exemption CF 10x30	To Be Reviewed	4E-CON-1320-0005_BuildingExemption_CF_10x30.pdf
284	SLI-00127	0	Fire and Life Safety Review Plan (National Building Code) CF 10x30	To Be Reviewed	4E-CON-1320-0006_FireSafety_CF_10x30.pdf
285	SLI-00128	0	Building Exemption CF 10x40	To Be Reviewed	4E-CON-1320-0007_BuildingExemption_CF_10x40.pdf
286	SLI-00129	0	Fire and Life Safety Review Plan (National Building Code) CF 10x40	To Be Reviewed	4E-CON-1320-0008_FireSafety_CF_10x40.pdf
287	SLI-00130	0	DFO Op Statement - Overhead Lines (Construction Power)	To Be Reviewed	4E-SLI-1320-0006.pdf
288	SLI-00131	1	Blanket Permit - AC Line _Res. Clearing - Temp Structure	To Be Reviewed	4E-SLI-0000-0015.pdf
289	SLI-00132	0	Blanket Permit - AC Line_Res. Clearing - Fording	To Be Reviewed	4E-SLI-0000-0016.pdf
290	SLI-00133	1	Blanket Permit - AC Line - Res. Clearing - Work Within 15	To Be Reviewed	4E-SLI-0000-0017.pdf
291	SLI-00134	0	Application of a Quarry Material Exploration Licence_GD1	Approved	4E-SLI-2000-0009_Exploration Licence_GD1.zip
292	SLI-00135	0	Application for A Quarry Materials Exploration Licence_SSAR Deposits	Approved	4E-SLI-2000-0011_Exploration Licence_SSAR.zip

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	Document No.	Revision	Title	Status	File Name
293	SLI-00136	0	Alter a Body of Water - Blanket permit for fording_SSAR Existing Forest Access Road	To Be Reviewed	4E-SLI-1100-0068_fording.pdf
294	SLI-00137	0	Alter a Body of Water - Blanket permit for work within 15 m of a waterbody_SSAR Existing Forest Access Road	To Be Reviewed	4E-SLI-1100-0069_work within.pdf
295	SLI-00138	01	DFO Project Review- Culvert ACC1	Approved	4E-SLI-1100-0034_DFO.zip
296	SLI-00139	01	Nav Waters Assessment - temp bridges_HVac ROW	Approved	4E-SLI-6100-0053.zip
297	SLI-00140	01	Nav Waters Assessment - Access Road Temp Bridges_HVac line	Approved	4E-SLI-6100-0054_NWPA access roads.zip
298	SLI-00141	01	Nav Waters Assessment - Overhead lines_HVac	Approved	4E-SLI-6100-0055_NWPA lines.zip
299	SLI-00142	01	DFO Project Review - Clear Span Bridge C19	Approved	C19 temp bridge.zip
300	SLI-00143	0	Quarry Permit # 14 - SSAR accommodations complex site	To Be Reviewed	4E-SLI-0000-0018_Quarry #14.pdf
301	SLI-00144	01	DOEC alter a body of water - temporary bridge - C19 Amendment	Approved	C19 Temp Bridge Amendment.zip
302	SLI-00145	0	Fire and Life Safety Review Plan (National Buidling Code) GB 11x60	To Be Reviewed	4E-CON-1320-0010_FireSafety_GB_11x60.pdf
303	SLI-00146	0	Buidling Accessibility Design Registration / Exemption Registration GB 11x60	To Be Reviewed	4E-CON-1320-0009_Buildling Exemption_GB_11x60.pdf
304	SLI-00147	0	Used Oil Storage Tank System Application_Crusher	To Be Reviewed	4E-CON-1100-0017_Used Oil Tank_ Crusher.pdf
305	SLI-00148	0	Mobile Fuel Storage Tank Relocation_Crusher	To Be Reviewed	4E-CON-1100-0019_Diesel Tank_Crushers.pdf
306	SLI-00149	0	Mobile Fuel Storage Tank Relocation_Crusher 2	To Be Reviewed	4E-CON-1100-0020_Diesel Tank_Crushers 2.pdf

LIST OF PERMITS AND LICENSES -Lower Churchill Project Permit Registry					
Item	Document No.	Revision	Title	Status	File Name
307	SLI-00150	0	Diesel Generator Registration_Site Trailers	To Be Reviewed	4E-CON-1100-0021_Diesel Gen Reg Form_Site Trailers.pdf
308	SLI-00151	0	DOEC Water Use License - Geotech Program	Approved	4E-SLI-6100-0056_DOEC Geotech.zip
309	SLI-00153	0	DFO Project Review - Water Use - Geotech Program	Approved	4E-SLI-6100-0058_DFO Geotech.zip
310	SLI-00154	0	Alter a Body of Water - Culvert - C30 - Access Road to the Spoil Area	To Be Reviewed	4E-SLI-2000-0016.pdf
311	SLI-00156	0	TC NWPA_bridges for access raods for Hvac Line	To Be Reviewed	4E-SLI-6100-0004_TC Application.pdf
312	SLI-00158	01	DOEC Alter a body of water - Dams	To Be Reviewed	4E-SLI-2000-0013.pdf

APPENDIX I

Liquidated Damages Calculations

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The following table provides four illustrations of how the Performance Liquidated Damages will be calculated for the Muskrat Falls turbine generators.

		Example A	Example B	Example C	Example D
1	Contractor's Guaranteed kW Unit Output (Exhibit 1-Appendix B, 1.3.2)(229MVA*.9=206,100kW)	206,100 kW	206,100 kW	206,100 kW	206,100 kW
2	Actual Power Output as tested in accordance with Specifications (from Performance Tests)	204,500 kW	206,100 kW	206,900 kW	205,900 kW
3	Difference in Unit Output = [(2)-(1)*4units]	-1,600 kW	0 kW	+800 kW	-200 kW
4	Evaluation of Guaranteed kW Unit Output payment (Contract Price = $160M*.05=**$8M** LD cap, Article 36.3 b (i)	6,000*1,600= **$9,600,000** **Exceeds cap must fix**	0	0	6,000*500= **$3,000,000**
5	Guaranteed Weighted Average Unit Efficiency (Exhibit 1-Appendix B , 1.4.3)	94.40%	94.40%	94.40%	94.40%
6	Actual Weighted Average Unit Efficiency (from Performance Tests)	93.40%	94.00%	92.40%	94.40
7	Test Uncertainty for example purposes is (1.2%) Max allowed per spec is 1%	1	1	1	1
7	Difference in Weighted Average Unit Efficiency = [(5) – (6+7)]	0 %	0 %	1%	0%
8	Evaluation of Guaranteed Weighted Unit Efficiency per	$0	$0	+$5,000,000*1*4units=	$0

	Unit = $5,000,000*(item 7)			**$20,000,000**	
	(Contract Price = $160M*.05=$8M LD cap, Article 36.3 b (i))	No LDs	No LDs	Exceeds cap must fix	No LDs
9	Guaranteed Mean Wicket gate Leakage per Unit per Exhibit 1-Appendix B section 1.5.1.1	6.0 m3/s	6.0 m3/s	6.0 m3/s	6.0 m3/s
10	Actual Mean Wicket Gate Leakage per test	5.8 m3/s	6.0m3/s	5.6 m3/s	5.0 m3/s
11	Difference = [(9) - (10)]	.2 m3/s	0	.4 m3/s	1 m3/s
12	Evaluation of Losses = $400,000* (11)*4units	**$400,000**	**0**	**$800,000**	**$1,600,000**
13	Combined evaluation of Unit Output, Efficiency, and leakage =[(4)+(8)+(12)]	**$10,000,000**	**$0**	**$20,800,000**	**$4,600,000**
14	Overall LDs Payable for Performance cannot exceed 10% Contract Price per Article 36.3 (b) = $16M	**Must Fix until LDs cover shortfall**	**$0**	**Must Fix until LDs cover shortfall**	**Pay LDs**

APPENDIX J

Construction Budget

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Muskrat Falls Generation Base Estimate by Physical Component

A - Muskrat Falls Generation	
A.4 - T&G's/Powerhouse Mechanical and Electrical Auxilaries/Hydro Mechanical Equipment/GSU's/ Collector Lines	$484,012,733
2400 - Spillway - General	$3,163,861
2420 - Gates, Guides Stoplogs and Hoist	$50,794,781
3240 - Intake Gates Trash racks Stoplogs & Hoists	$7,656,779
3320 - Superstructure	$7,819,466
3330 - Draft Tube Gates and Hoists	$93,868,389
3340 - Building Electrical Services	$15,782,541
3350 - Building Mechanical Services	$13,335,025
3360 - Powerhouse Crane	$8,872,175
3400 - Power Generation	$8,995,349
3410 - Turbine	$200,000,000
3420 - Generator	$7,394,645
3430 - Electrical Ancillary / Auxiliary Systems	$2,999,701
3431 - DC Power / UPS System	$1,517,500
3435 - Station Service Transformers	$1,914,704
3436 - Bus Duct	$1,860,952
3440 - Mechanical Ancillary / Auxiliary Systems	$17,554,583
3441 - Service Air System	$1,162,641
3442 - Governor Air System	$1,172,654
3443 - Fire Protection System	$3,732,122
3444 - Pump Drainage System	$2,695,481
3445 - Pump Dewatering System	$2,448,322
3446 - Hydraulic Oil Handling and Filtration System	$862,322
3447 - Oily Water interception System	$591,758
3448 - Cooling Water System	$2,438,534
3449 - Service Water System	$1,599,297
3460 - Generator Transformers	$19,731,483
3470 - Spare Parts and Special Tools	$277,079
6160 - Collector Lines Powerhouse to Switchyard	$3,770,591
A.5 - Telecomunications	$17,298,550
1420 - Construction Telecommunications - Muskrat Falls	$15,389,554
9200 - Operations Telecommunications Systems	$250,000
9220 - Operations Telecommunication System - Muskrat Falls	$1,658,996
A.6 - Site Services	$248,312,374
0000 - No Physical Component	$213,662,374
1570 - Site Services	$34,650,000
A.7 - Spares	$1,500,000
0000 - No Physical Component	$1,500,000
Grand Total	**$2,077,401,708**

LTA Base Estimate by Physical Component

C - Labrador Transmission Assets	
C.1 - OL Transmission CF-MF	$288,254,205
6140 - Muskrat Falls to Churchill Falls	$286,136,710
6180 - 735 kV AC line at Churchill Falls	$2,117,495
C.2 - Switchyards	$192,087,214
1500 - Accommodation Complex / Temporary Buildings	$7,520,683
1570 - Site Services	$9,822,840
4000 - Switchyards - General	$6,898,868
4100 - Churchill Falls Extension	$113,795,889
4300 - Muskrat Falls Switchyard	$50,425,661
7520 - 315 kV / 138 kV Switchyard at Muskrat Falls	$3,623,272
C.3 - Telecomunications	$15,467,507
1450 - Construction Telecommunications - LTA	$2,115,329
9250 - Operations Telecommunication System - LTA	$13,352,178
C.4 - Spares	$2,960,613
0000 - No Physical Component	$1,500,000
6140 - Muskrat Falls to Churchill Falls	$1,460,613
Grand Total	**$498,769,539**

LITL Base Estimate by Physical Component

B - Labrador - Island Transmission Link	
B.1 - Converters/Transition Compunds/Synch Condensers/SP Switchyard	$639,805,781
1110 - Access Roads	$3,500,000
4500 - Soldiers Pond Switchyard	$99,132,568
7120 - New Synchronous Condensers	$110,776,909
8200 - dc Specialties - Converter Stations	$11,788,175
8210 - Labrador Converter Station	$179,430,514
8220 - Soldiers Pond Converter Station	$187,199,083
8500 - dc Specialties - Transition Compounds	$10,498,800
8510 - Transition Compound - Labrador	$19,313,421
8520 - Transition Compound - Northern Peninsula	$18,166,312
B.2 - Electode Sites/Island Upgrades	$77,613,063
6221 - Island Overland DC Transmission	$1,500,000
6310 - Electrode Line - Labrador	$215,030
6320 - Electrode Line - Newfoundland East	$3,493,381
7110 - Unit Conversion at Holyrood to Synchronous Condensers	$30,800,000
7130 - Breakers	$6,700,000
7140 - AC Line Rebuilds	$7,536,772
8600 - dc Specialties - Electrodes	$420,745
8610 - Electrode Labrador	$14,896,752
8620 - Electrode Newfoundland East	$12,050,384
B.3 - OL Transmission MF-SP	$929,045,619
6200 - HVdc Overland Transmission	$3,800,000
6221 - Island Overland DC Transmission	$532,587,951
6224 - Labrador Overland DC Transmission	$386,800,163
6310 - Electrode Line - Labrador	$4,823,487
6320 - Electrode Line - Newfoundland East	$1,034,018
B.4 - SOBI Marine Crossing	$337,440,262
8110 - dc Specialties - Marine Crossings - SOBI - General	$110,000
8111 - SOBI Cables Supply	$173,366,767
8113 - SOBI Landfall	$85,344,240
8114 - SOBI Protection	$78,619,255
B.5 - Telecommunications	$21,433,995
1430 - Construction Telecommunications - Island Link	$3,745,517
9200 - Operations Telecommunications Systems	$2,000,000
9230 - Operations Telecommunication System - Island Link	$15,688,478
B.6 - Spares	$6,724,135
0000 - No Physical Component	$2,000,000
6200 - HVdc Overland Transmission	$4,724,135
Grand Total	$2,012,062,855

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APPENDIX K

Construction Schedule

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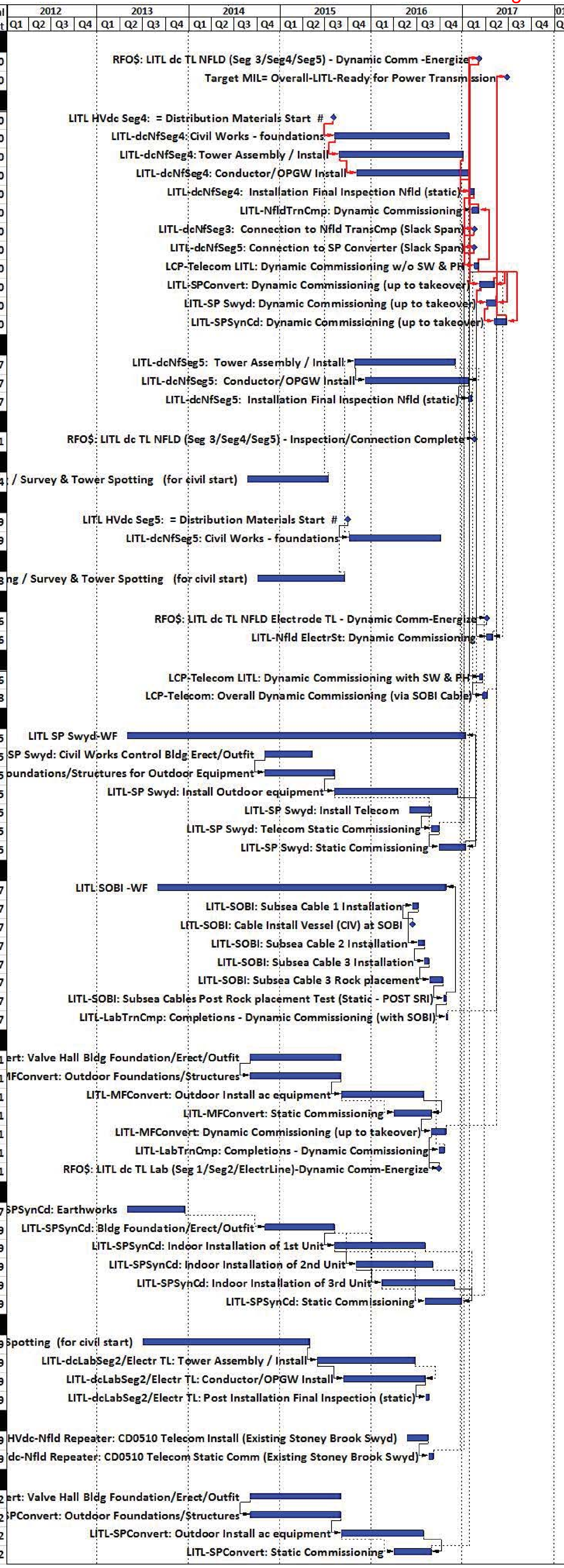
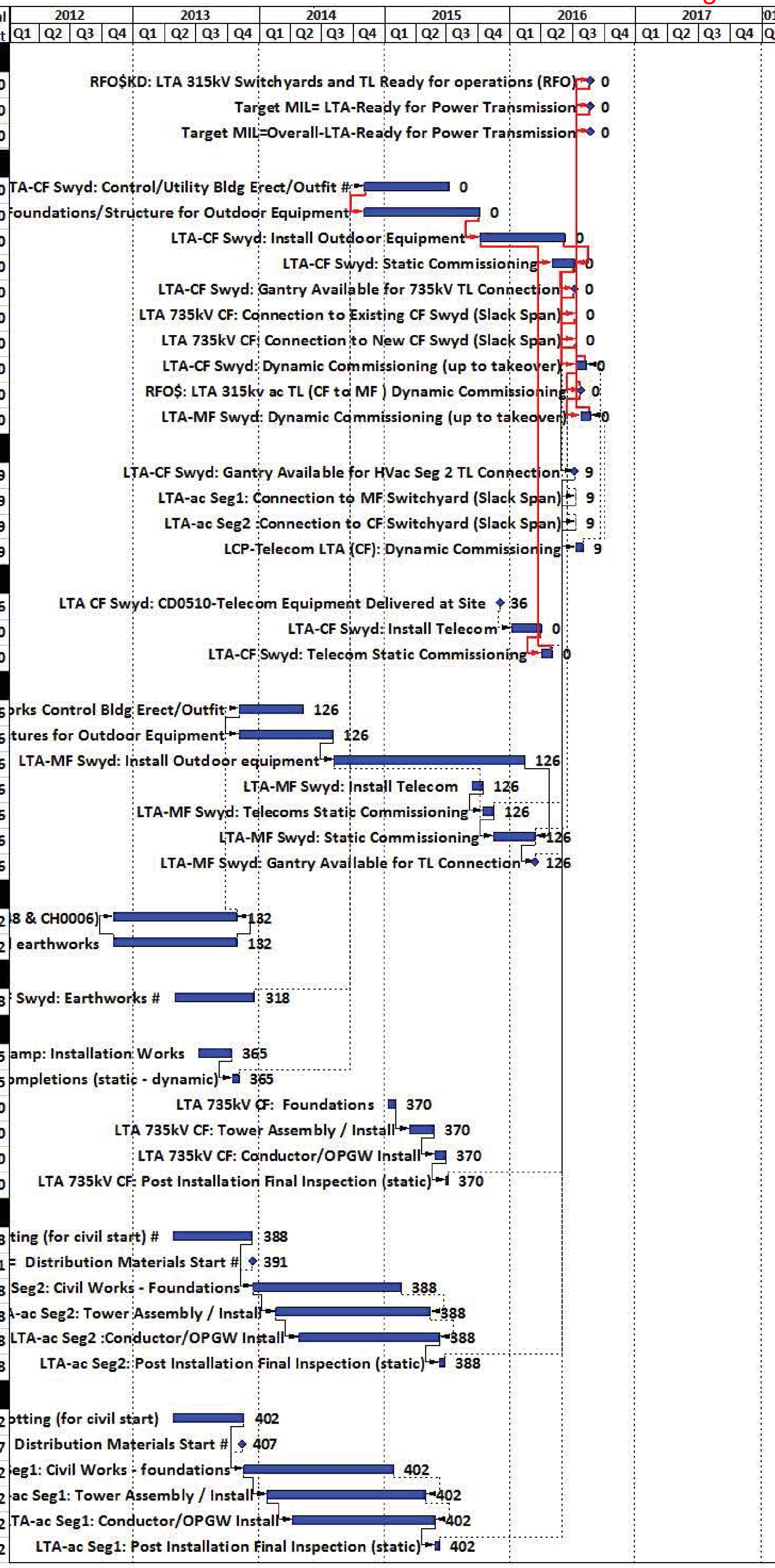
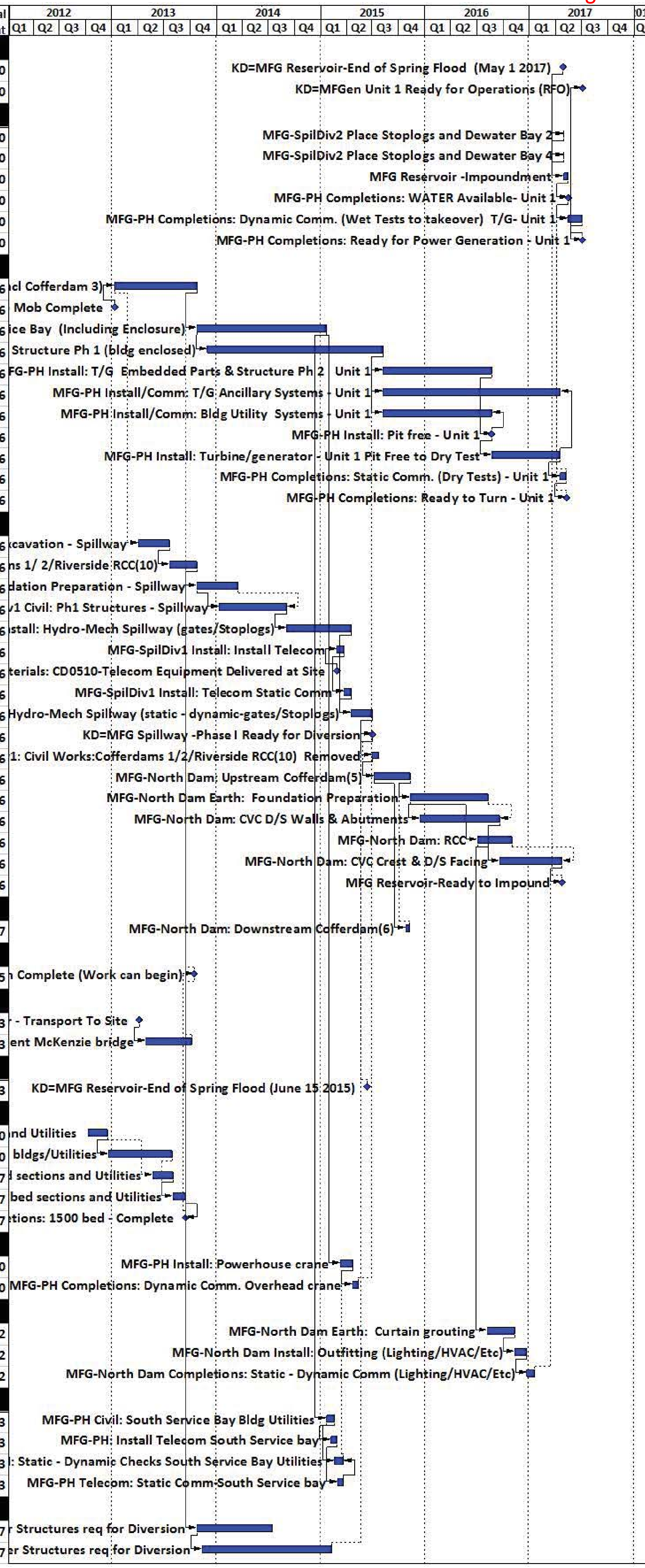
Activity Name	Total Float
LITL Critical Path - Key Dates	
RFO$: LITL dc TL NFLD (Seg 3/Seg4/Seg5) - Dynamic Comm -Energize	0
Target MIL= Overall-LITL-Ready for Power Transmission	0
LITL Critical Path	
LITL HVdc Seg4: = Distribution Materials Start #	0
LITL-dcNfSeg4: Civil Works - foundations	0
LITL-dcNfSeg4: Tower Assembly / Install	0
LITL-dcNfSeg4: Conductor/OPGW Install	0
LITL-dcNfSeg4: Installation Final Inspection Nfld (static)	0
LITL-NfldTrnCmp: Dynamic Commissioning	0
LITL-dcNfSeg3: Connection to Nfld TransCmp (Slack Span)	0
LITL-dcNfSeg5: Connection to SP Converter (Slack Span)	0
LCP-Telecom LITL: Dynamic Commissioning w/o SW & PH	0
LITL-SPConvert: Dynamic Commissioning (up to takeover)	0
LITL-SP Swyd: Dynamic Commissioning (up to takeover)	0
LITL-SPSynCd: Dynamic Commissioning (up to takeover)	0
LITL Sub-Critical Path 1	
LITL-dcNfSeg5: Tower Assembly / Install	7
LITL-dcNfSeg5: Conductor/OPGW Install	7
LITL-dcNfSeg5: Installation Final Inspection Nfld (static)	7
LITL Sub-Critical Path 2	
RFO$: LITL dc TL NFLD (Seg 3/Seg4/Seg5) - Inspection/Connection Comple	21
LITL Sub-Critical Path 3	
LITL-dcNfSeg4: ROW Clearing / Survey & Tower Spotting (for civil start)	24
LITL Sub-Critical Path 4	
LITL HVdc Seg5: = Distribution Materials Start #	29
LITL-dcNfSeg5: Civil Works - foundations	29
LITL Sub-Critical Path 5	
LITL-dcNfSeg5: ROW Clearing / Survey & Tower Spotting (for civil start)	48
LITL Sub-Critical Path 6	
RFO$: LITL dc TL NFLD Electrode TL - Dynamic Comm-Energize	56
LITL-Nfld ElectrSt: Dynamic Commissioning	56
LITL Sub-Critical Path 7	
LCP-Telecom LITL: Dynamic Commissioning with SW & PH	56
LCP-Telecom: Overall Dynamic Commissioning (via SOBI Cable)	78
LITL Sub-Critical Path 8	
LITL SP Swyd-WF	85
LITL-SP Swyd: Civil Works Control Bldg Erect/Outfit	85
LITL-SPSwyd: Civil Works Foundations/Structures for Outdoor Equipmen	85
LITL-SP Swyd: Install Outdoor equipment	85
LITL-SP Swyd: Install Telecom	85
LITL-SP Swyd: Telecom Static Commissioning	85
LITL-SP Swyd: Static Commissioning	85
LITL Sub-Critical Path 9	
LITL SOBI -WF	97
LITL-SOBI: Subsea Cable 1 Installation	97
LITL-SOBI: Cable Install Vessel (CIV) at SOBI	97
LITL-SOBI: Subsea Cable 2 Installation	97
LITL-SOBI: Subsea Cable 3 Installation	97
LITL-SOBI: Subsea Cable 3 Rock placement	97
LITL-SOBI: Subsea Cables Post Rock placement Test (Static - POST SRI)	97
LITL-LabTrnCmp: Completions - Dynamic Commissioning (with SOBI)	97
LITL Sub-Critical Path 10	
LITL-MFConvert: Valve Hall Bldg Foundation/Erect/Outfit	101
LITL-MFConvert: Outdoor Foundations/Structures	101
LITL-MFConvert: Outdoor Install ac equipment	101
LITL-MFConvert: Static Commissioning	101
LITL-MFConvert: Dynamic Commissioning (up to takeover)	101
LITL-LabTrnCmp: Completions - Dynamic Commissioning	101
RFO$: LITL dc TL Lab (Seg 1/Seg2/ElectrLine)-Dynamic Comm-Energize	101
LITL Sub-Critical Path 11	
LITL-SPSynCd: Earthworks	447
LITL-SPSynCd: Bldg Foundation/Erect/Outfit	129
LITL-SPSynCd: Indoor Installation of 1st Unit	129
LITL-SPSynCd: Indoor Installation of 2nd Unit	129
LITL-SPSynCd: Indoor Installation of 3rd Unit	129
LITL-SPSynCd: Static Commissioning	129
LITL Sub-Critical Path 12	
LITL-dcLabSeg2/Electr TL: ROW Clearing / Survey & Tower Spotting (for	139
LITL-dcLabSeg2/Electr TL: Tower Assembly / Install	139
LITL-dcLabSeg2/Electr TL: Conductor/OPGW Install	139
LITL-dcLabSeg2/Electr TL: Post Installation Final Inspection (static)	139
LITL Sub-Critical Path 13	
LITL HVdc-Nfld Repeater: CD0510 Telecom Install (Existing Stoney Brook S	149
LITL HVdc-Nfld Repeater: CD0510 Telecom Static Comm (Existing Stoney E	149
LITL Sub-Critical Path 14	
LITL-SPConvert: Valve Hall Bldg Foundation/Erect/Outfit	172
LITL-SPConvert: Outdoor Foundations/Structures	172
LITL-SPConvert: Outdoor Install ac equipment	172
LITL-SPConvert: Static Commissioning	172



Activity Name	Total Float
LTA Critical Path - Key Dates	
RFO$KD: LTA 315kV Switchyards and TL Ready for operations (RFO)	0
Target MIL= LTA-Ready for Power Transmission	0
Target MIL=Overall-LTA-Ready for Power Transmission	0
LTA Critical Path	
LTA-CF Swyd: Control/Utility Bldg Erect/Outfit #	0
LTA-CF Swyd: Foundations/Structure for Outdoor Equipment	0
LTA-CF Swyd: Install Outdoor Equipment	0
LTA-CF Swyd: Static Commissioning	0
LTA-CF Swyd: Gantry Available for 735kV TL Connection	0
LTA 735kV CF: Connection to Existing CF Swyd (Slack Span)	0
LTA 735kV CF: Connection to New CF Swyd (Slack Span)	0
LTA-CF Swyd: Dynamic Commissioning (up to takeover)	0
RFO$: LTA 315kv ac TL (CF to MF) Dynamic Commissioning	0
LTA-MF Swyd: Dynamic Commissioning (up to takeover)	0
LTA Sub- Critical Path 1	
LTA-CF Swyd: Gantry Available for HVac Seg 2 TL Connection	9
LTA-ac Seg1: Connection to MF Switchyard (Slack Span)	9
LTA-ac Seg2 :Connection to CF Switchyard (Slack Span)	9
LCP-Telecom LTA (CF): Dynamic Commissioning	9
LTA Sub- Critical Path 2	
LTA CF Swyd: CD0510-Telecom Equipment Delivered at Site	36
LTA-CF Swyd: Install Telecom	0
LTA-CF Swyd: Telecom Static Commissioning	0
LTA Sub- Critical Path 3	
LTA-MF Swyd: Civil Works Control Bldg Erect/Outfit	126
LTA-MF Swyd: Civil Works Foundations/Structures for Outdoor Equipme	126
LTA-MF Swyd: Install Outdoor equipment	126
LTA-MF Swyd: Install Telecom	126
LTA-MF Swyd: Telecoms Static Commissioning	126
LTA-MF Swyd: Static Commissioning	126
LTA-MF Swyd: Gantry Available for TL Connection	126
LTA Sub- Critical Path 4	
LTA-MF Swyd: Earthworks (CH0048 & CH0006)	132
MFG-PH Earth: MF Switchyard earthworks	132
LTA Sub- Critical Path 6	
LTA-CF Swyd: Earthworks #	318
LTA Sub- Critical Path 7	
LTA-CF Camp: Installation Works	365
LTA-CF Camp: Completions (static - dynamic)	365
LTA 735kV CF: Foundations	370
LTA 735kV CF: Tower Assembly / Install	370
LTA 735kV CF: Conductor/OPGW Install	370
LTA 735kV CF: Post Installation Final Inspection (static)	370
LTA Sub- Critical Path 8	
LTA-ac Seg2: ROW Clearing / Survey & Tower Spotting (for civil start) #	388
LTA HVac Seg2: CT0319 = Distribution Materials Start #	391
LTA-ac Seg2: Civil Works - Foundations	388
LTA-ac Seg2: Tower Assembly / Install	388
LTA-ac Seg2 :Conductor/OPGW Install	388
LTA-ac Seg2: Post Installation Final Inspection (static)	388
LTA Sub- Critical Path 9	
LTA-ac Seg1: ROW Clearing / Survey & Tower Spotting (for civil start)	402
LTA HVac Seg1: CT0319 = Distribution Materials Start #	407
LTA-ac Seg1: Civil Works - foundations	402
LTA-ac Seg1: Tower Assembly / Install	402
LTA-ac Seg1: Conductor/OPGW Install	402
LTA-ac Seg1: Post Installation Final Inspection (static)	402



Activity Name	Total Float
MFG Critical Path - Key Dates	
KD=MFG Reservoir-End of Spring Flood (May 1 2017)	0
KD=MFGen Unit 1 Ready for Operations (RFO)	0
MFG Critical Path	
MFG-SpilDiv2 Place Stoplogs and Dewater Bay 2	0
MFG-SpilDiv2 Place Stoplogs and Dewater Bay 4	0
MFG Reservoir -Impoundment	0
MFG-PH Completions: WATER Available- Unit 1	0
MFG-PH Completions: Dynamic Comm. (Wet Tests to takeover) T/G- Unit	0
MFG-PH Completions: Ready for Power Generation - Unit 1	0
MFG Sub-Critical Path 1	
MFG-PH Excavation: Powerhouse (incl Cofferdam 3)	6
KD=MFG-PH: CH0006 Bulk Exca Equip Mob Complete	6
MFG-PH Civil: South Service Bay (Including Enclosure)	6
MFG-PH Civil: Unit 1 Structure Ph 1 (bldg enclosed)	6
MFG-PH Install: T/G Embedded Parts & Structure Ph 2 Unit 1	6
MFG-PH Install/Comm: T/G Ancillary Systems - Unit 1	6
MFG-PH Install/Comm: Bldg Utility Systems - Unit 1	6
MFG-PH Install: Pit free - Unit 1	6
MFG-PH Install: Turbine/generator - Unit 1 Pit Free to Dry Test	6
MFG-PH Completions: Static Comm. (Dry Tests) - Unit 1	6
MFG-PH Completions: Ready to Turn - Unit 1	6
MFG Sub-Critical Path 2	
MFG-SpilDiv1: Excavation - Spillway	6
MFG-SpilDiv1: Civil Works: Cofferdams 1/ 2/Riverside RCC(10)	6
MFG-SpilDiv1 Civil:: Ph1 Foundation Preparation - Spillway	6
MFG-SpilDiv1 Civil: Ph1 Structures - Spillway	6
MFG-SpilDiv1 Install: Hydro-Mech Spillway (gates/Stoplogs)	6
MFG-SpilDiv1 Install: Install Telecom	6
MFG-SpilDiv1 Materials: CD0510-Telecom Equipment Delivered at Site	6
MFG-SpilDiv1 Install: Telecom Static Comm	6
MFG-SpilDiv1 Completions: Hydro-Mech Spillway (static - dynamic-gates/	6
KD=MFG Spillway -Phase I Ready for Diversion	6
MFG-SpilDiv1: Civil Works:Cofferdams 1/2/Riverside RCC(10) Removed	6
MFG-North Dam: Upstream Cofferdam(5)	6
MFG-North Dam Earth: Foundation Preparation	6
MFG-North Dam: CVC D/S Walls & Abutments	6
MFG-North Dam: RCC	6
MFG-North Dam: CVC Crest & D/S Facing	6
MFG Reservoir-Ready to Impound	6
MFG Sub-Critical Path 3	
MFG-North Dam: Downstream Cofferdam(6)	7
MFG Sub-Critical Path 4	
MFG-SW CH0007 Mobilization Complete (Work can begin)	15
MFG Sub-Critical Path 5	
MFG-South Side Site Access Bridge Rebar - Transport To Site	23
MFG-South Side Site Access permanent McKenzie bridge	23
MFG Sub-Critical Path 6	
KD=MFG Reservoir-End of Spring Flood (June 15 2015)	23
MFG Sub-Critical Path 7	
MFG-Camp Installation: Starter Camp (150 bed) and Utilities	50
MFG-Camp Installation: 500 bed sections/Admin bldgs/Utilities	50
MFG-Camp Installation: 1000 bed sections and Utilities	47
MFG-Camp Installation: 1500 bed sections and Utilities	47
MFG-Camp Completions: 1500 bed - Complete	47
MFG Sub-Critical Path 8	
MFG-PH Install: Powerhouse crane	90
MFG-PH Completions: Dynamic Comm. Overhead crane	90
MFG Sub-Critical Path 9	
MFG-North Dam Earth: Curtain grouting	102
MFG-North Dam Install: Outfitting (Lighting/HVAC/Etc)	102
MFG-North Dam Completions: Static - Dynamic Comm (Lighting/HVAC/Et	102
MFG Sub-Critical Path 10	
MFG-PH Civil: South Service Bay Bldg Utilities	123
MFG-PH: Install Telecom South Service bay	123
MFG-PH: Static - Dynamic Checks South Service Bay Utilities	123
MFG-PH Telecom: Static Comm-South Service bay	123
MFG Sub-Critical Path 11	
MFG-SpilDiv1 Civil: Ph1 Foundation Preparation - other Structures req fo	147
MFG-SpilDiv1 Civil: Ph1 Structures - other Structures req for Diversion	147



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APPENDIX L

Bathymetry Profile of Submarine Cables for Labrador- Island Link

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APPENDIX M

Site Photographs and Artist Rendering

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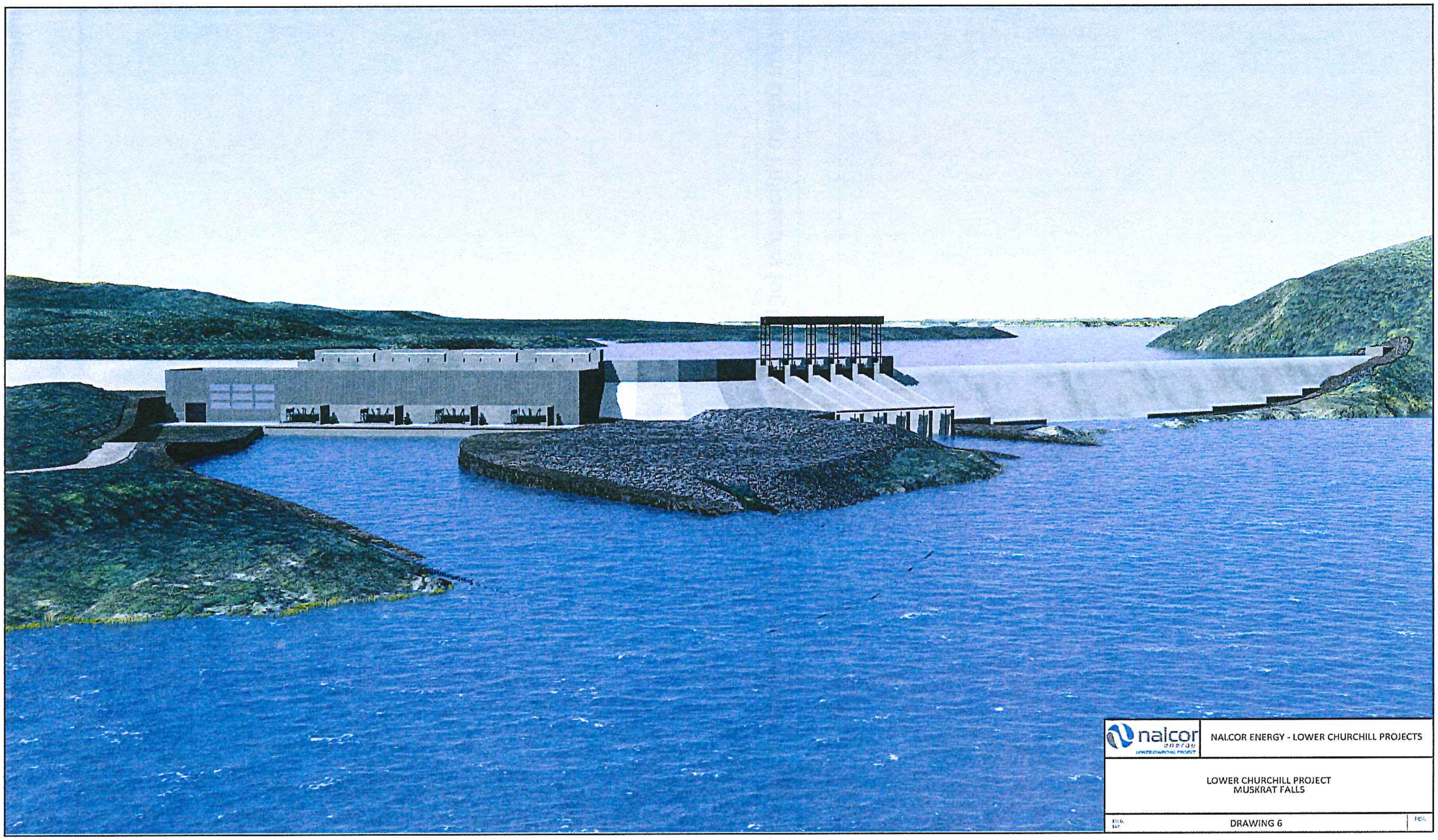
nalcor energy
NALCOR ENERGY - LOWER CHURCHILL PROJECTS
LOWER CHURCHILL PROJECT
MUSKRAT FALLS
DRAWING 6

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APPENDIX N

Milestone Schedule and Major Contract Packages Completion

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Estimated Award and Completion Date
Major Contract Packages - Lower Churchill Project

Major Packages required for Final Disclosure				
				Updated Award Date - IE Key Contracts (01-Mar-2013)
		PO/Contract Award Dates		
Muskrat Falls (MF)				
Pkg Ref. No.	**Contract Pkg. Title**	**Baseline Finish**	**Forecast Finish**	
CH0002	Supply and Install Accommodations Complex Buildings			Contract Awarded on Oct. 22, 2012
CH0003	Supply and Install Administrative Buildings.	22-Apr-13	2-Aug-13	
CH0004	Construction of Southside Access Road			Contract Awarded on May 25, 2012
CH0005	Supply and Install Accommodation Complex Site Utilities.	7-May-13	16-Aug-13	
CH0006	Construction of Bulk Excavation Works			Contract Awarded on Nov. 06, 2012
CH0007	Construction of Intake and Powerhouse, Spillway and Transition Dams	31-Jul-13	31-Jul-13	
CH0008	Construction of North Spur Stabilization Works	1-Oct-13	26-Jan-14	
CH0009	Construction of North and South Dams	30-May-14	9-Jul-14	
CH0023	Construction of Reservoir Clearing - South Bank	16-Aug-13	16-Aug-13	Could be awarded earlier (based on CH0024 award expected in May 2013)
CH0030	Supply and Install Turbine and Generators			Contract Awarded on Jan. 02, 2013
CH0031	Supply and Install Mechanical and Electrical Auxiliaries (MF)	7-Mar-14	20-Mar-14	
CH0048	Construction of Site Clearing Access Road & Ancillary Areas			Contract Awarded on Apr. 20, 2012
CH0050	Supply Concrete Including Batch Plant (MF) **Deleted Scope now in CH0007 Package**			
PH0014	Generator Step-Up Transformer	29-Jul-13	29-Jul-13	
PH0016	Generator Circuit Breakers	31-Jul-13	31-Jul-13	
Labrador Transmission Assets (LTA)				
CT0319	Construction of 315 kV Hvac Transmission Line (MF to CF)	9-Apr-13	21-May-13	
CT0341	Clearing of Right of Way for 315 kV Hvac Transmission Line (MF to CF)	16-Apr-13	16-Apr-13	Bids In - Award Pending
CD0502	Construction of AC Substations & Synchronous Condenser Facilities	10-Jul-13	10-Jul-13	
CD0503	Construction of Earth Works at Power Distribution Sites	3-Apr-13	18-Apr-13	
PD0505	Switchyard Equipment AC Substations CF, MF, and SP **Deleted Scope now in CD0502 Package**			
Labrador Island Transmission Link (LITL)				
CD0501	Supply & Install Converters, Harmonic Filters and Transition Compounds	15-Dec-13	22-Oct-13	
CD0502	Construction of AC Substations and Synchronous Condensers Facilities	24-Mar-14	15-Dec-13	
CD0503	Construction of Earth Works at Power Distribution Sites	10-Jul-13	10-Jul-13	
CD0508	Construction of Electrode Sites	30-Apr-14	30-Apr-14	
CD0534	Supply and Install Soldiers Pond Synchronous Condensers	31-Jan-14	31-Jan-14	
CT0327	Construction of 350 kV HVdc Transmission Line - Section 1	23-Oct-13	23-Oct-13	
CT0343	Clearing of Right of Way for HVdc Transmission Line - Section 1 **Deleted Scope now in CT0327**			
CT0345	Clearing of Right of Way for HVdc Transmission Line - Section 2	7-Mar-14	7-Mar-14	
CT0346	Construction of 350 kV HVdc Transmission Line - Section 2	23-Sep-14	23-Sep-14	
LC-SB-003	Strait of Belle Isle Submarine Cable			Contract Awarded on Nov. 29, 2012
	After August 2013			

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APPENDIX O

List of Contracts Planned to be Issued by Nalcor Energy

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Attachment B.1 to LCP-PT-MD-0000-PM-ST-0002-01 Rev. B1

Contract Package List
Excluding SOBI Crossing (as of 3-Feb-2012)

EPCM Component Reference	Type	Code	Package Name	SPV Reference			Package Count
				MF	LTA	LITL	
C1	C - Contract	CH0002	Supply and Install Accommodations Complex Buildings	X			
C1	C - Contract	CH0003	Supply and Install Administrative Buildings	x			
C1	C - Contract	CH0004	Construction of Southside Access Road	x			
C1	C - Contract	CH0005	Supply nad Install Accommodations Complex Site Utilities	x			
C1	C - Contract	CH0006	Construction of Bulk Excavation Works and Associated Civil Works	x			
C1	C - Contract	CH0007	Construction of Intake and Powerhouse, Spillway and Transition Dams	x			
C1	C - Contract	CH0008	Construction of North Spur Stabilization Works	x			
C1	C - Contract	CH0009	Construction of North and South Dams	x			
C1	C - Contract	CH0023	Construction of Reservoir Clearing South Bank	x			
C1	C - Contract	CH0024	Construction of Reservoir Clearing North Bank	x			
C1	C - Contract	CH0029	Construction of Site Restoration at Muskrat Falls	x			
C1	C - Contract	CH0030	Supply and Install Turbines and Generators	x			
C1	C - Contract	CH0031	Supply and Install Mechanical and Electrical Auxiliaries (MF)	x			
C1	C - Contract	CH0032	Supply and Install Powerhouse Hydro-Mechanical Equipment	x			
C1	C - Contract	CH0033	Supply and Install Powerhouse Cranes	x			
C1	C - Contract	CH0034	Supply and Install Powerhouse Elevator	x			
C1	C - Contract	CH0039	Supply and Install McKenzies River Permanent Bridge	x			
C1	C - Contract	CH0046	Supply and Install Spillway Hydro-Mechanical Equipment	x			
C1	C - Contract	CH0048	Construction of Site Clearing Access Road & Ancillary Areas	x			
C1	C - Contract	CH0049	Supply and Install Log Booms	x			
C1	C - Contract	CH0050	Supply of Concrete including Batch Plant (MF)	x			
C1	C - Contract	CH0052	Construction of Habitat Compensation Works	x			
C1	P - Purchase Order	PH0014	Supply of Generator Step-up Transformer	x			
C1	P - Purchase Order	PH0015	Supply of Isolated Phase Bus	x			
C1	P - Purchase Order	PH0016	Supply of Generator Circuit Breakers	x			
C1	P - Purchase Order	PH0035	Supply of 15kV Switchgear and Station Service Breakers	x			
C1	P - Purchase Order	PH0036	Supply of Auxiliary Transformers	x			
C1	P - Purchase Order	PH0037	Supply of 25kV Switchgear	x			
C1	P - Purchase Order	PH0038	Supply of Emergency Diesel Generators	x			
C1	S - Service Contract	SH0001	Physical Hydraulic Model	x			
C1	S - Service Contract	SH0018	Provision of Catering, Housekeeping and Janitorial Services (MF)	x			
C1	S - Service Contract	SH0019	Provision of Security Services	x			
C1	S - Service Contract	SH0020	Provision of Medical Services	x			
C1	S - Service Contract	SH0021	Provision of Road Maintenance and Snow Clearing Services (MF)	x			
C1	S - Service Contract	SH0022	Provision of Fuel Supply and Dispensing Services (MF)	x			
C1	S - Service Contract	SH0040	Provision of Garbage Removal and Disposal Services (MF)	x			
C1	S - Service Contract	SH0041	Provision of Ground Transportation Services (HVGB to MF)	x			
C1	S - Service Contract	SH0051	Provision of Buildings Maintenance Services (MF)	x			
							38

Contract Package List
Excluding SOBI Crossing (as of 3-Feb-2012)

EPCM Component Reference	Type	Code	Package Name	SPV Reference			Package Count
				MF	LTA	LITL	
C3	C - Contract	CD0501	Supply and Install Converters and Cable Transition Compounds			X	
C3	C - Contract	CD0502	Construction of AC Substations and Synchronous Condensers Facilities		X		
C3	C - Contract	CD0503	Construction of Earthworks at Various Power Distribution Sites		X	X	
C3	C - Contract	CD0508	Supply and Install of Electrode Sites			X	
C3	C - Contract	CD0509	Construction Telecommunication Services - Phase 2	X			
C3	C - Contract	CD0510	Supply and Install Permanent Communication Systems	X	X	X	
C3	C - Contract	CD0512	Construction of Construction Power Facilities	X			
C3	C - Contract	CD0534	Supply and Install Soldiers Pond Synchronous Condensers			X	
C3	C - Contract	CD0535	Construction Telecommunication Services - Phase 2 Remote Camps		X	X	
C3	C - Contract	CD0538	Supply and Install Accommodations Camp (CF)		X		
C3	C - Contract	CD0564	Construction of Land Mobile Radio System - Labrador	X	X	X	
C3	P - Purchase Order	PD0505	Supply of Switchyard Equipment, AC Substations at CF, MF and SP		X	X	
C3	P - Purchase Order	PD0513	Supply of 138/25 kV Transformers	X			
C3	P - Purchase Order	PD0514	Supply of 138 kV & 25 kV Circuit Breakers	X			
C3	P - Purchase Order	PD0515	Supply of 138 kV & 25 kV Disconnect Switches	X			
C3	P - Purchase Order	PD0518	Supply of 138 kV Capacitor Voltage Transformers	X			
C3	P - Purchase Order	PD0519	Supply of 25 kV Vacuum Interrupters	X			
C3	P - Purchase Order	PD0520	Supply of 25 kV 6 x 3.6 MVAR Capacitor Banks	X			
C3	P - Purchase Order	PD0522	Supply of Pre-fabricated Control Room Building	X			
C3	P - Purchase Order	PD0523	Supply of Substation Service Transformer	X			
C3	P - Purchase Order	PD0529	Supply of 25 kV Reclosers, MV Switches & Fuse Cut-outs	X			
C3	P - Purchase Order	PD0530	Supply of 138 kV & 25 kV Surge Arrestors	X			
C3	P - Purchase Order	PD0531	Supply of MV Instrument Transformer	X			
C3	P - Purchase Order	PD0533	Supply and Install Early Works Telecom Devices	X			
C3	P - Purchase Order	PD0537	Supply of Power Transformers, AC Substations at CF, MF and SP		X	X	
C3	P - Purchase Order	PD0561	Supply of D20 RTU and Cabinet (CF) - Construction Power	X			
C3	P - Purchase Order	PD0562	Supply of Specific Relays and Test Switches (CF) - Construction Power	X			
C3	P - Purchase Order	PD0563	Supply of 138 kV Circuit Switcher (CF) - Construction Power	X			
C3	S - Service Contract	SD0536	Provision of Integrated Commissioning Support Services	X	X	X	
C3	S - Service Contract	SD0560	Provision of Early Works Construction Telecommunication Services (MF)	X			
C3	S - Service Contract	SD0565	Provision of Land Mobile Radio System - Newfounland			X	
							31

Contract Package List
Excluding SOBI Crossing (as of 3-Feb-2012)

EPCM Component Reference	Type	Code	Package Name	SPV Reference			Package Count
				MF	LTA	LITL	
C4	C - Contract	CT0319	Construction of 315 kV HVac Transmission Line (MF to CF)		X		
C4	C - Contract	CT0327	Construction of 350 kV HVdc Transmission Line - Section 1			X	
C4	C - Contract	CT03141	Clearing of Right of Way for 315 kV KVac Transmission Line (MF to CF)		X		
C4	C - Contract	CT0342	Construction of AC Transmission Lines - Island			X	
C4	C - Contract	CT0343	Clearing of Right of Way for HVdc Transmission Line - Section 1			X	
C4	C - Contract	CT0345	Clearing of Right of Way for HVdc Transmission Line - Section 2			X	
C4	C - Contract	CT0346	Construction of 350 kV HVdc Transmission Line - Section 2			X	
C4	P - Purchase Order	PT0300	Supply of Transmission Line Conductors - 315 kV HVac		X		
C4	P - Purchase Order	PT0301	Supply of HVac Insulators - 315 kV HVac		X		
C4	P - Purchase Order	PT0302	Supply of Steel Towers - 315 kV HVac		X		
C4	P - Purchase Order	PT0303	Supply of Tower Hardware - 315 kV HVac		X		
C4	P - Purchase Order	PT0304	Supply of Optical Ground Wire (OPGW) - 315 kV HVac		X		
C4	P - Purchase Order	PT0307	Supply of Steel Tower Foundations - 315 kV HVac		X		
C4	P - Purchase Order	PT0308	Supply of Steel Tower Foundations - 350 kV HVdc			X	
C4	P - Purchase Order	PT0313	Purchase of Electrode Line Wood Poles			X	
C4	P - Purchase Order	PT0326	Supply of Steel Wires - 315 kV HVac		X		
C4	P - Purchase Order	PT0328	Supply of Transmission Line Conductors - 350 kV HVdc			X	
C4	P - Purchase Order	PT0329	Supply of HVdc Insulators - 350 kV HVdc			X	
C4	P - Purchase Order	PT0330	Supply of Steel Towers - 350 kV HVdc			X	
C4	P - Purchase Order	PT0331	Supply of Tower Hardware - 350 kV HVdc			X	
C4	P - Purchase Order	PT0334	Supply of Steel Wires - 350 kV HVdc			X	
C4	P - Purchase Order	PT0335	Supply of Anchor Materials - 315 kV HVac			X	
C4	P - Purchase Order	PT0336	Supply of 25 kV Distribution Line Hardware	X			
C4	P - Purchase Order	PT0337	Supply of 25 kV Distribution Line ADSS Fibre Optic Cable	X			
C4	P - Purchase Order	PT0338	Supply of 25 kV Distribution Line Conductors	X			
C4	P - Purchase Order	PT0339	Supply of 25 kV Distribution Line Insulators	X			
C4	P - Purchase Order	PT0340	Supply of Wood Poles for 138/25 kV Distribution Line	X			
C4	P - Purchase Order	PT0347	Supply of Re-terminations Materials			X	
C4	P - Purchase Order	PT0351	Supply of Wood Poles			X	
C4	P - Purchase Order	PT0352	Supply of Anchor Materials - 350 kV HVdc			X	
C4	P - Purchase Order	PT0353	Supply of Optical Ground Wire (OPGW) - 350 kV HVdc			X	
C4	S - Service Contract	ST0309	Provisions of Geotechnical Investigation Services - 315 kV HVac		X		
C4	S - Service Contract	ST0310	Provisions of Geotechnical Investigation Services - 350 kV HVdc			X	
C4	S - Service Contract	ST0311	Provision of Survey Services - 315 kV HVac		X		
C4	S - Service Contract	ST0312	Provision of Survey Services - 350 kV HVdc			X	
							35

Contract Package List
Excluding SOBI Crossing (as of 3-Feb-2012)

EPCM Component Reference	Type	Code	Package Name	SPV Reference MF	LTA	LITL	Package Count
SM	S - Service Contract	SM0700	Provision of General Freight Forwarding Services	X	X	X	
SM	S - Service Contract	SM0701	Provision of Third Party Quality Surveillance & Inspection Services	X	X	X	
SM	S - Service Contract	SM0703	Provision of Happy Valley-Goose Bay Project Office Space	X	X	X	
SM	S - Service Contract	SM0704	Provision of Surveying Services	X	X	X	
SM	S - Service Contract	SM0705	Provision of Laboratory Services	X	X	X	
SM	S - Service Contract	SM0706	Supply and Maintenance of Project Vehicles	X	X	X	
SM	S - Service Contract	SM0707	Provision of Helicopter Services	X	X	X	
SM	S - Service Contract	SM0709	Provision of Air Transportation Services	X	X	X	
SM	S - Service Contract	SM0710	Supply and Maintenance of various IT Equipment	X	X	X	
SM	S - Service Contract	SM0713	Provision of Geotechnical Investigation Services		X	X	
SM	S - Service Contract	SM0714	Provision of EPCM Services - SNC Lavalin Inc.	X	X	X	
SM	S - Service Contract	SM0715	Provision of Expediting Services	X	X	X	
							12
						Grand Total	**116**

APPENDIX P

MWH Milestone Schedule

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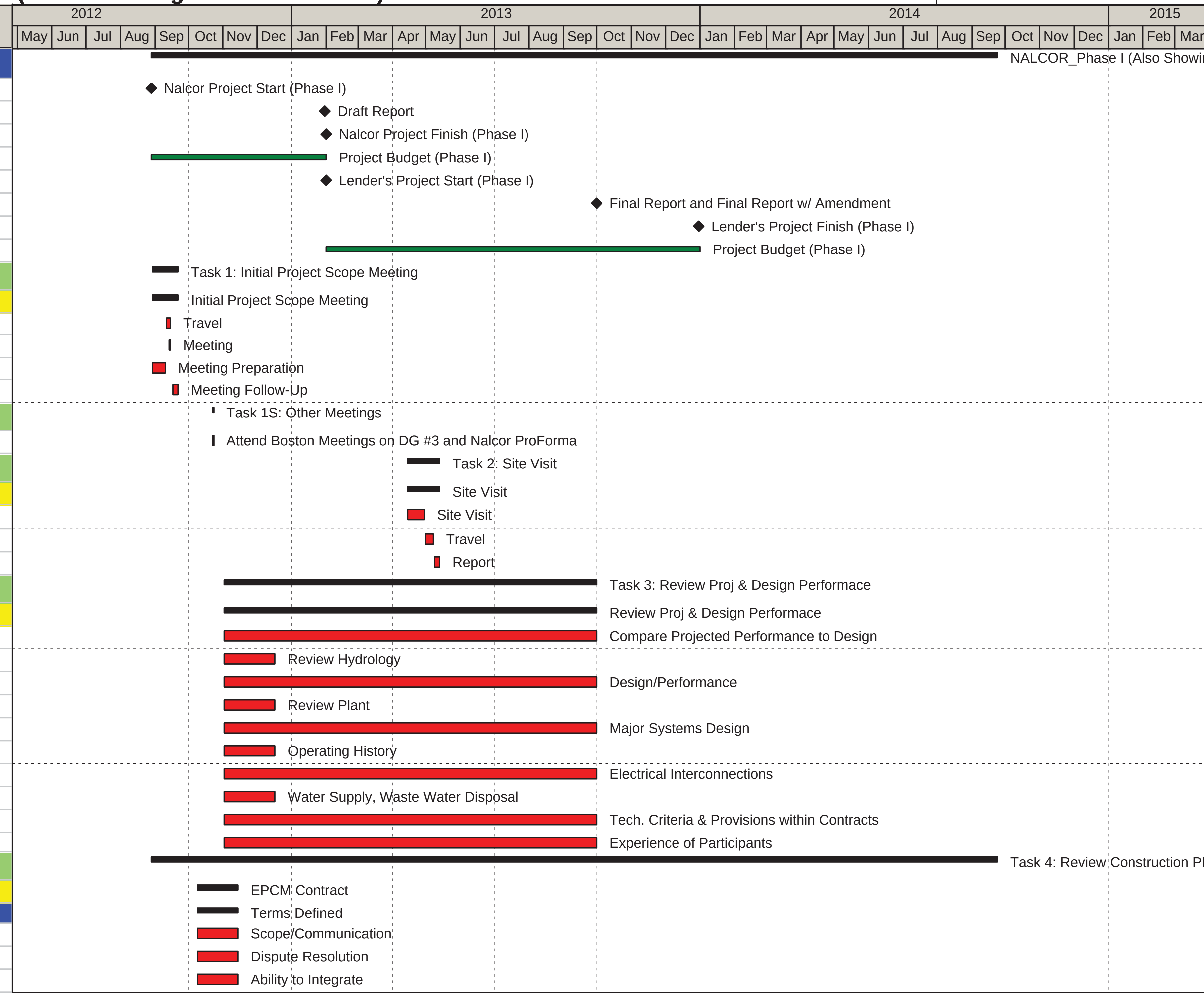
NALCOR_Phase I (Also Showing Lenders Phase I)

Activity ID	Activity Name	Rem Duration	Start	Finish
NALCOR_Phase I (Also Showing Lenders P...		524.00d	28-Aug-12	23-Sep-14
A2340	Nalcor Project Start (Phase I)	0.00d	28-Aug-12*	
A2341	Draft Report	0.00d		31-Jan-13*
A2342	Nalcor Project Finish (Phase I)	0.00d		31-Jan-13*
A2343	Project Budget (Phase I)	107.50d	28-Aug-12	31-Jan-13
A2350	Lender's Project Start (Phase I)	0.00d	01-Feb-13*	
A2351	Final Report and Final Report w/ Amendment	0.00d		30-Sep-13*
A2352	Lender's Project Finish (Phase I)	0.00d		31-Dec-13*
A2353	Project Budget (Phase I)	232.50d	01-Feb-13	31-Dec-13
Task 1: Initial Project Scope Meeting		16.00d	30-Aug-12	21-Sep-12
Initial Project Scope Meeting		16.00d	30-Aug-12	21-Sep-12
A1090	Travel	4.00d	11-Sep-12*	14-Sep-12
A1100	Meeting	2.00d	13-Sep-12*	14-Sep-12
A1110	Meeting Preparation	7.00d	30-Aug-12*	10-Sep-12
A1120	Meeting Follow-Up	5.00d	17-Sep-12*	21-Sep-12
Task 1S: Other Meetings		2.00d	22-Oct-12	23-Oct-12
A3230	Attend Boston Meetings on DG #3 and Nalcor ProFo...	2.00d	22-Oct-12*	23-Oct-12
Task 2: Site Visit		21.00d	15-Apr-13	13-May-13
Site Visit		21.00d	15-Apr-13	13-May-13
A1130	Site Visit	11.00d	15-Apr-13*	29-Apr-13
A1140	Travel	6.00d	30-Apr-13*	07-May-13
A1150	Report	4.00d	08-May-13*	13-May-13
Task 3: Review Proj & Design Performace		230.00d	01-Nov-12	30-Sep-13
Review Proj & Design Performace		230.00d	01-Nov-12	30-Sep-13
A1160	Compare Projected Performance to Design	230.00d	01-Nov-12*	30-Sep-13
A1170	Review Hydrology	32.00d	01-Nov-12*	17-Dec-12
A1180	Design/Performance	230.00d	01-Nov-12*	30-Sep-13
A1190	Review Plant	32.00d	01-Nov-12*	17-Dec-12
A1200	Major Systems Design	230.00d	01-Nov-12*	30-Sep-13
A1210	Operating History	32.00d	01-Nov-12*	17-Dec-12
A1220	Electrical Interconnections	230.00d	01-Nov-12*	30-Sep-13
A1230	Water Supply, Waste Water Disposal	32.00d	01-Nov-12*	17-Dec-12
A1240	Tech. Criteria & Provisions within Contracts	230.00d	01-Nov-12*	30-Sep-13
A1250	Experience of Participants	230.00d	01-Nov-12*	30-Sep-13
Task 4: Review Construction Plan & Schedule		524.00d	28-Aug-12	23-Sep-14
EPCM Contract		28.00d	08-Oct-12	14-Nov-12
Terms Defined		28.00d	08-Oct-12	14-Nov-12
A1260	Scope/Communication	28.00d	08-Oct-12*	14-Nov-12
A1270	Dispute Resolution	28.00d	08-Oct-12*	14-Nov-12
A1280	Ability to Integrate	28.00d	08-Oct-12*	14-Nov-12



MWH Milestone Schedule

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BUILDING A BETTER WORLD

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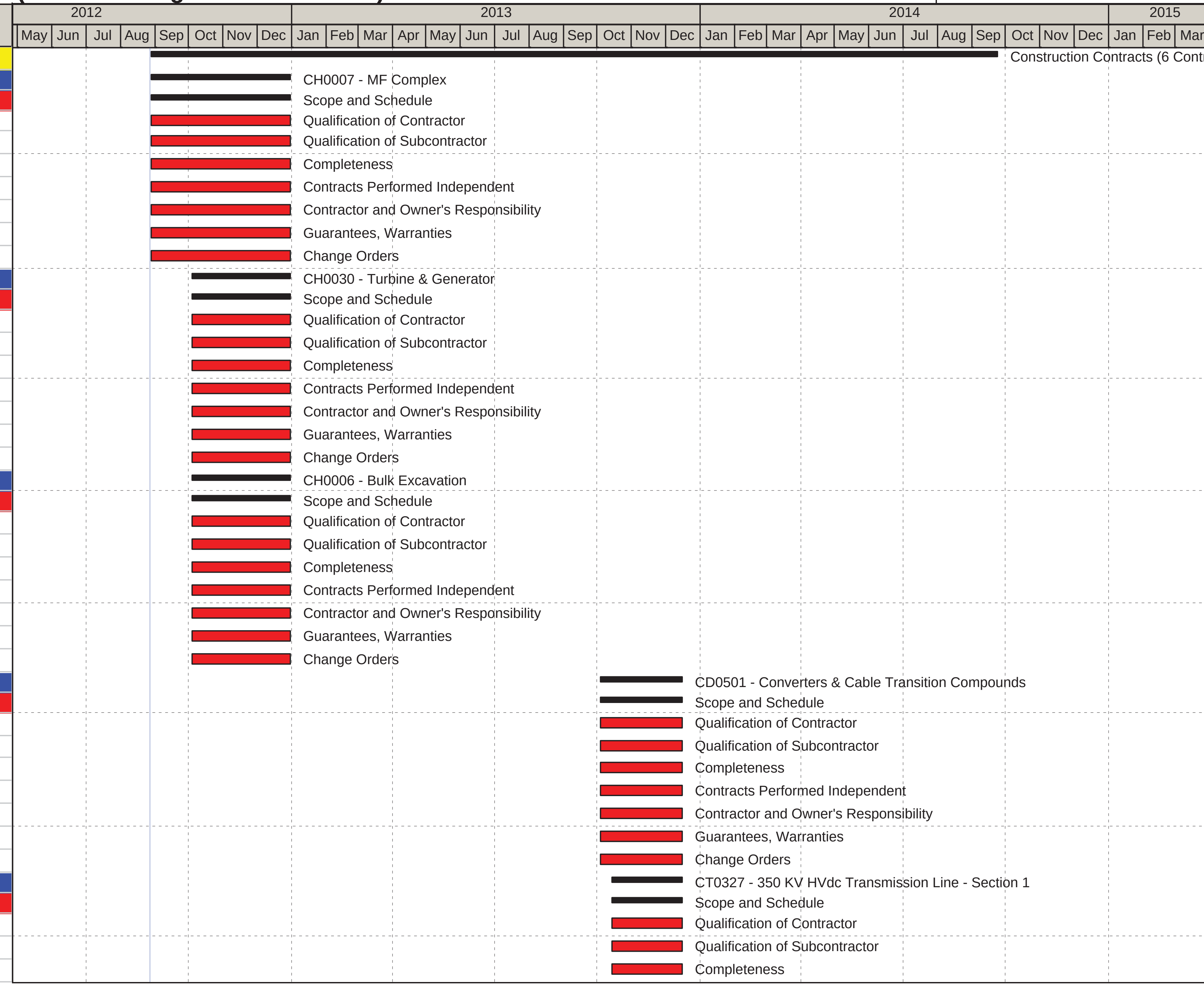
- Remaining Level of Effort
- Actual Level of Effort
- Remaining Work
- Actual Work
- Critical Remaining Work
- Milestone
- Summary

NALCOR_Phase I (Also Showing Lenders Phase I)

Activity ID	Activity Name	Rem Duration	Start	Finish
Construction Contracts (6 Contracts)		524.00d	28-Aug-12	23-Sep-14
CH0007 - MF Complex		86.00d	28-Aug-12	31-Dec-12
Scope and Schedule		86.00d	28-Aug-12	31-Dec-12
A1290	Qualification of Contractor	86.00d	28-Aug-12*	31-Dec-12
A1300	Qualification of Subcontractor	86.00d	28-Aug-12*	31-Dec-12
A1310	Completeness	86.00d	28-Aug-12*	31-Dec-12
A1320	Contracts Performed Independent	86.00d	28-Aug-12*	31-Dec-12
A1330	Contractor and Owner's Responsibility	86.00d	28-Aug-12*	31-Dec-12
A1340	Guarantees, Warranties	86.00d	28-Aug-12*	31-Dec-12
A1350	Change Orders	86.00d	28-Aug-12*	31-Dec-12
CH0030 - Turbine & Generator		60.00d	04-Oct-12	31-Dec-12
Scope and Schedule		60.00d	04-Oct-12	31-Dec-12
A2410	Qualification of Contractor	60.00d	04-Oct-12*	31-Dec-12
A2420	Qualification of Subcontractor	60.00d	04-Oct-12*	31-Dec-12
A2430	Completeness	60.00d	04-Oct-12*	31-Dec-12
A2440	Contracts Performed Independent	60.00d	04-Oct-12*	31-Dec-12
A2450	Contractor and Owner's Responsibility	60.00d	04-Oct-12*	31-Dec-12
A2460	Guarantees, Warranties	60.00d	04-Oct-12*	31-Dec-12
A2470	Change Orders	60.00d	04-Oct-12*	31-Dec-12
CH0006 - Bulk Excavation		60.00d	04-Oct-12	31-Dec-12
Scope and Schedule		60.00d	04-Oct-12	31-Dec-12
A2530	Qualification of Contractor	60.00d	04-Oct-12*	31-Dec-12
A2540	Qualification of Subcontractor	60.00d	04-Oct-12*	31-Dec-12
A2550	Completeness	60.00d	04-Oct-12*	31-Dec-12
A2560	Contracts Performed Independent	60.00d	04-Oct-12*	31-Dec-12
A2570	Contractor and Owner's Responsibility	60.00d	04-Oct-12*	31-Dec-12
A2580	Guarantees, Warranties	60.00d	04-Oct-12*	31-Dec-12
A2590	Change Orders	60.00d	04-Oct-12*	31-Dec-12
CD0501 - Converters & Cable Transition Compounds		51.00d	04-Oct-13	16-Dec-13
Scope and Schedule		51.00d	04-Oct-13	16-Dec-13
A2650	Qualification of Contractor	51.00d	04-Oct-13*	16-Dec-13
A2660	Qualification of Subcontractor	51.00d	04-Oct-13*	16-Dec-13
A2670	Completeness	51.00d	04-Oct-13*	16-Dec-13
A2680	Contracts Performed Independent	51.00d	04-Oct-13*	16-Dec-13
A2690	Contractor and Owner's Responsibility	51.00d	04-Oct-13*	16-Dec-13
A2700	Guarantees, Warranties	51.00d	04-Oct-13*	16-Dec-13
A2710	Change Orders	51.00d	04-Oct-13*	16-Dec-13
CT0327 - 350 KV HVdc Transmission Line - Section 1		45.00d	14-Oct-13	16-Dec-13
Scope and Schedule		45.00d	14-Oct-13	16-Dec-13
A2770	Qualification of Contractor	45.00d	14-Oct-13*	16-Dec-13
A2780	Qualification of Subcontractor	45.00d	14-Oct-13*	16-Dec-13
A2790	Completeness	45.00d	14-Oct-13*	16-Dec-13



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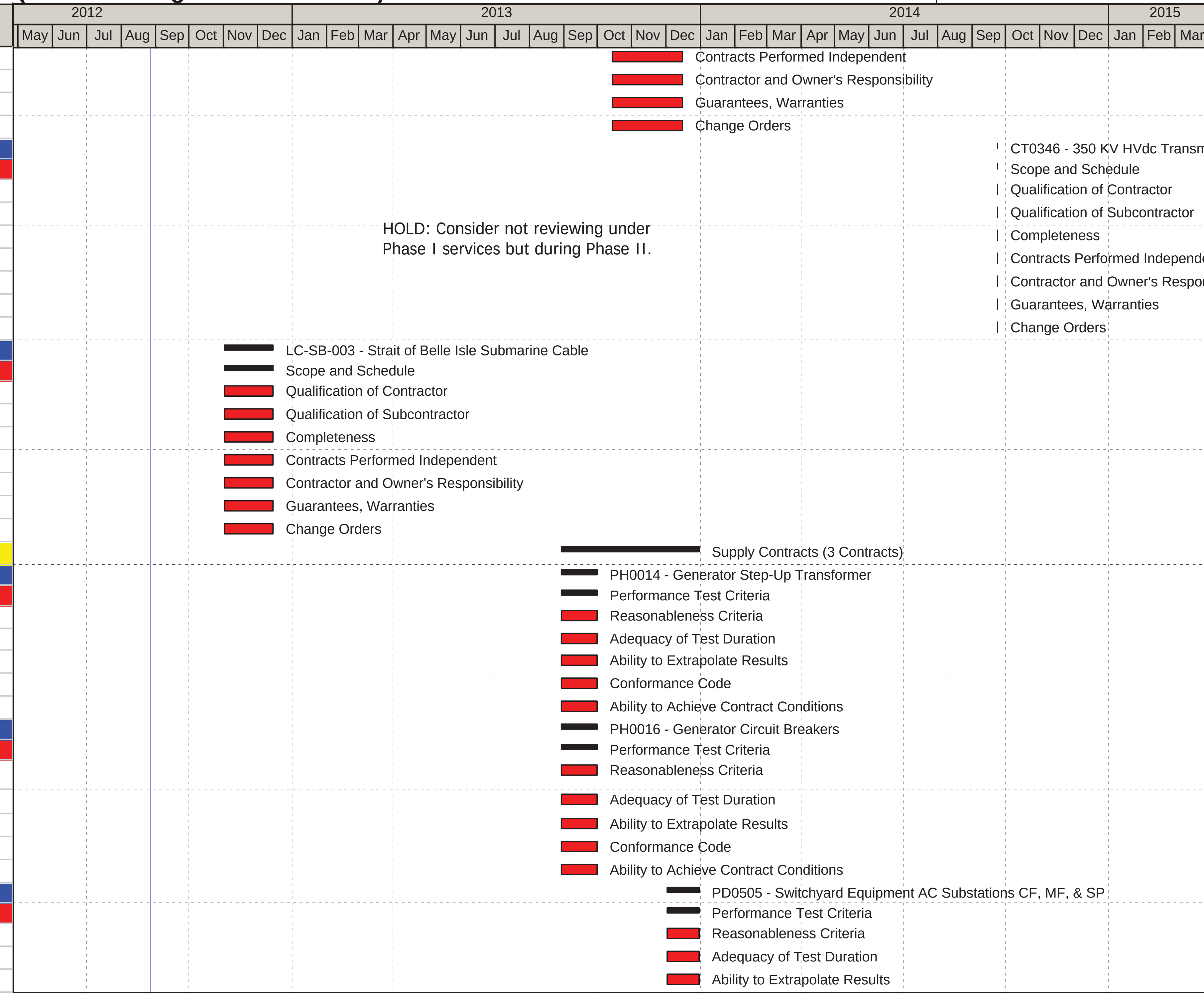
NALCOR_Phase I (Also Showing Lenders Phase I)

Activity ID	Activity Name	Rem Duration	Start	Finish
A2800	Contracts Performed Independent	45.00d	14-Oct-13*	16-Dec-13
A2810	Contractor and Owner's Responsibility	45.00d	14-Oct-13*	16-Dec-13
A2820	Guarantees, Warranties	45.00d	14-Oct-13*	16-Dec-13
A2830	Change Orders	45.00d	14-Oct-13*	16-Dec-13
CT0346 - 350 KV HVdc Transmission Line - Section 2		0.00d	23-Sep-14	23-Sep-14
Scope and Schedule		0.00d	23-Sep-14	23-Sep-14
A2890	Qualification of Contractor	0.00d	23-Sep-14*	23-Sep-14
A2900	Qualification of Subcontractor	0.00d	23-Sep-14*	23-Sep-14
A2910	Completeness	0.00d	23-Sep-14*	23-Sep-14
A2920	Contracts Performed Independent	0.00d	23-Sep-14*	23-Sep-14
A2930	Contractor and Owner's Responsibility	0.00d	23-Sep-14*	23-Sep-14
A2940	Guarantees, Warranties	0.00d	23-Sep-14*	23-Sep-14
A2950	Change Orders	0.00d	23-Sep-14*	23-Sep-14
LC-SB-003 - Strait of Belle Isle Submarine Cable		31.00d	01-Nov-12	14-Dec-12
Scope and Schedule		31.00d	01-Nov-12	14-Dec-12
A3010	Qualification of Contractor	31.00d	01-Nov-12*	14-Dec-12
A3020	Qualification of Subcontractor	31.00d	01-Nov-12*	14-Dec-12
A3030	Completeness	31.00d	01-Nov-12*	14-Dec-12
A3040	Contracts Performed Independent	31.00d	01-Nov-12*	14-Dec-12
A3050	Contractor and Owner's Responsibility	31.00d	01-Nov-12*	14-Dec-12
A3060	Guarantees, Warranties	31.00d	01-Nov-12*	14-Dec-12
A3070	Change Orders	31.00d	01-Nov-12*	14-Dec-12
Supply Contracts (3 Contracts)		84.00d	30-Aug-13	31-Dec-13
PH0014 - Generator Step-Up Transformer		21.00d	30-Aug-13	30-Sep-13
Performance Test Criteria		21.00d	30-Aug-13	30-Sep-13
A3080	Reasonableness Criteria	21.00d	30-Aug-13*	30-Sep-13
A3090	Adequacy of Test Duration	21.00d	30-Aug-13*	30-Sep-13
A3100	Ability to Extrapolate Results	21.00d	30-Aug-13*	30-Sep-13
A3110	Conformance Code	21.00d	30-Aug-13*	30-Sep-13
A3120	Ability to Achieve Contract Conditions	21.00d	30-Aug-13*	30-Sep-13
PH0016 - Generator Circuit Breakers		21.00d	30-Aug-13	30-Sep-13
Performance Test Criteria		21.00d	30-Aug-13	30-Sep-13
A3130	Reasonableness Criteria	21.00d	30-Aug-13*	30-Sep-13
A3140	Adequacy of Test Duration	21.00d	30-Aug-13*	30-Sep-13
A3150	Ability to Extrapolate Results	21.00d	30-Aug-13*	30-Sep-13
A3160	Conformance Code	21.00d	30-Aug-13*	30-Sep-13
A3170	Ability to Achieve Contract Conditions	21.00d	30-Aug-13*	30-Sep-13
PD0505 - Switchyard Equipment AC Substations CF, MF, & SP		20.00d	02-Dec-13	31-Dec-13
Performance Test Criteria		20.00d	02-Dec-13	31-Dec-13
A3180	Reasonableness Criteria	20.00d	02-Dec-13*	31-Dec-13
A3190	Adequacy of Test Duration	20.00d	02-Dec-13*	31-Dec-13
A3200	Ability to Extrapolate Results	20.00d	02-Dec-13*	31-Dec-13



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Actual Level of Effort
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Actual Work
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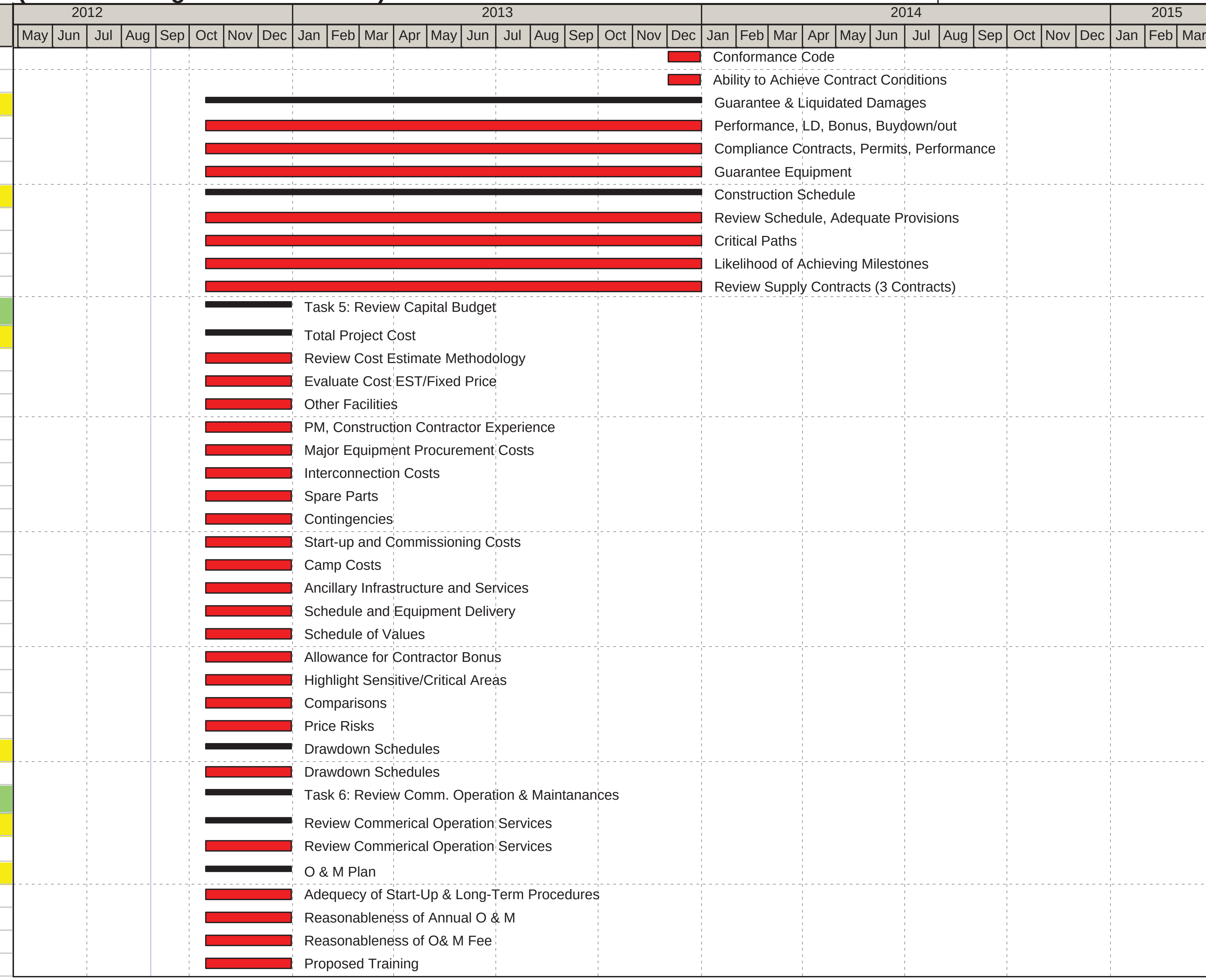
Activity ID	Activity Name	Rem Duration	Start	Finish
A3210	Conformance Code	20.00d	02-Dec-13*	31-Dec-13
A3220	Ability to Achieve Contract Conditions	20.00d	02-Dec-13*	31-Dec-13
Guarantee & Liquidated Damages		307.00d	15-Oct-12	31-Dec-13
A1360	Performance, LD, Bonus, Buydown/out	307.00d	15-Oct-12*	31-Dec-13
A1370	Compliance Contracts, Permits, Performance	307.00d	15-Oct-12*	31-Dec-13
A1380	Guarantee Equipment	307.00d	15-Oct-12*	31-Dec-13
Construction Schedule		307.00d	15-Oct-12	31-Dec-13
A1390	Review Schedule, Adequate Provisions	307.00d	15-Oct-12*	31-Dec-13
A1400	Critical Paths	307.00d	15-Oct-12*	31-Dec-13
A1410	Likelihood of Achieving Milestones	307.00d	15-Oct-12*	31-Dec-13
A1420	Review Supply Contracts (3 Contracts)	307.00d	15-Oct-12*	31-Dec-13
Task 5: Review Capital Budget		53.00d	15-Oct-12	31-Dec-12
Total Project Cost		53.00d	15-Oct-12	31-Dec-12
A1480	Review Cost Estimate Methodology	53.00d	15-Oct-12*	31-Dec-12
A1490	Evaluate Cost EST/Fixed Price	53.00d	15-Oct-12*	31-Dec-12
A1500	Other Facilities	53.00d	15-Oct-12*	31-Dec-12
A1510	PM, Construction Contractor Experience	53.00d	15-Oct-12*	31-Dec-12
A1520	Major Equipment Procurement Costs	53.00d	15-Oct-12*	31-Dec-12
A1530	Interconnection Costs	53.00d	15-Oct-12*	31-Dec-12
A1540	Spare Parts	53.00d	15-Oct-12*	31-Dec-12
A1550	Contingencies	53.00d	15-Oct-12*	31-Dec-12
A1560	Start-up and Commissioning Costs	53.00d	15-Oct-12*	31-Dec-12
A1570	Camp Costs	53.00d	15-Oct-12*	31-Dec-12
A1580	Ancillary Infrastructure and Services	53.00d	15-Oct-12*	31-Dec-12
A1590	Schedule and Equipment Delivery	53.00d	15-Oct-12*	31-Dec-12
A1600	Schedule of Values	53.00d	15-Oct-12*	31-Dec-12
A1610	Allowance for Contractor Bonus	53.00d	15-Oct-12*	31-Dec-12
A1620	Highlight Sensitive/Critical Areas	53.00d	15-Oct-12*	31-Dec-12
A1630	Comparisons	53.00d	15-Oct-12*	31-Dec-12
A1640	Price Risks	53.00d	15-Oct-12*	31-Dec-12
Drawdown Schedules		53.00d	15-Oct-12	31-Dec-12
A1650	Drawdown Schedules	53.00d	15-Oct-12*	31-Dec-12
Task 6: Review Comm. Operation & Maintanan...		53.00d	15-Oct-12	31-Dec-12
Review Commerical Operation Services		53.00d	15-Oct-12	31-Dec-12
A1660	Review Commerical Operation Services	53.00d	15-Oct-12*	31-Dec-12
O & M Plan		53.00d	15-Oct-12	31-Dec-12
A1670	Adequecy of Start-Up & Long-Term Procedures	53.00d	15-Oct-12*	31-Dec-12
A1680	Reasonableness of Annual O & M	53.00d	15-Oct-12*	31-Dec-12
A1690	Reasonableness of O& M Fee	53.00d	15-Oct-12*	31-Dec-12
A1700	Proposed Training	53.00d	15-Oct-12*	31-Dec-12



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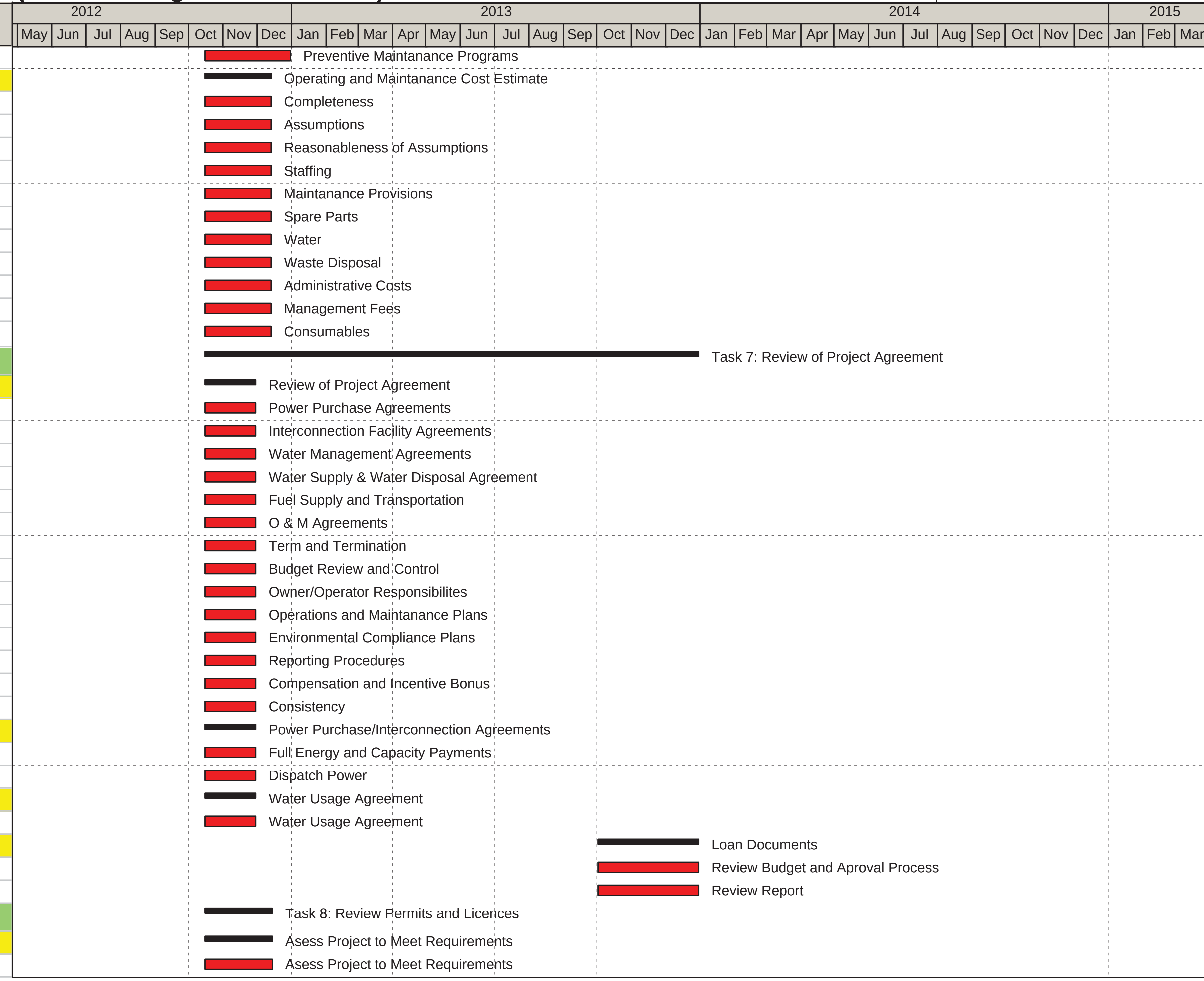
Actual Level of Effort
Remaining Work
Actual Work
Critical Remaining Work
Milestone
Summary

NALCOR_Phase I (Also Showing Lenders Phase I)

Activity ID	Activity Name	Rem Duration	Start	Finish
A1710	Preventive Maintanance Programs	53.00d	15-Oct-12*	31-Dec-12
	Operating and Maintanance Cost Estimate	43.00d	15-Oct-12	13-Dec-12
A1720	Completeness	43.00d	15-Oct-12*	13-Dec-12
A1730	Assumptions	43.00d	15-Oct-12*	13-Dec-12
A1740	Reasonableness of Assumptions	43.00d	15-Oct-12*	13-Dec-12
A1750	Staffing	43.00d	15-Oct-12*	13-Dec-12
A1760	Maintanance Provisions	43.00d	15-Oct-12*	13-Dec-12
A1770	Spare Parts	43.00d	15-Oct-12*	13-Dec-12
A1780	Water	43.00d	15-Oct-12*	13-Dec-12
A1790	Waste Disposal	43.00d	15-Oct-12*	13-Dec-12
A1800	Administrative Costs	43.00d	15-Oct-12*	13-Dec-12
A1810	Management Fees	43.00d	15-Oct-12*	13-Dec-12
A1820	Consumables	43.00d	15-Oct-12*	13-Dec-12
	Task 7: Review of Project Agreement	306.50d	15-Oct-12	31-Dec-13
	Review of Project Agreement	34.00d	15-Oct-12	30-Nov-12
A1920	Power Purchase Agreements	34.00d	15-Oct-12*	30-Nov-12
A1930	Interconnection Facility Agreements	34.00d	15-Oct-12*	30-Nov-12
A1950	Water Management Agreements	34.00d	15-Oct-12*	30-Nov-12
A1960	Water Supply & Water Disposal Agreement	34.00d	15-Oct-12*	30-Nov-12
A1970	Fuel Supply and Transportation	34.00d	15-Oct-12*	30-Nov-12
A1980	O & M Agreements	34.00d	15-Oct-12*	30-Nov-12
A1990	Term and Termination	34.00d	15-Oct-12*	30-Nov-12
A2000	Budget Review and Control	34.00d	15-Oct-12*	30-Nov-12
A2010	Owner/Operator Responsibilites	34.00d	15-Oct-12*	30-Nov-12
A2020	Operations and Maintanance Plans	34.00d	15-Oct-12*	30-Nov-12
A2030	Environmental Compliance Plans	34.00d	15-Oct-12*	30-Nov-12
A2040	Reporting Procedures	34.00d	15-Oct-12*	30-Nov-12
A2050	Compensation and Incentive Bonus	34.00d	15-Oct-12*	30-Nov-12
A2060	Consistency	34.00d	15-Oct-12*	30-Nov-12
	Power Purchase/Interconnection Agreements	34.00d	15-Oct-12	30-Nov-12
A2070	Full Energy and Capacity Payments	34.00d	15-Oct-12*	30-Nov-12
A2110	Dispatch Power	34.00d	15-Oct-12*	30-Nov-12
	Water Usage Agreement	34.00d	15-Oct-12	30-Nov-12
A2080	Water Usage Agreement	34.00d	15-Oct-12*	30-Nov-12
	Loan Documents	63.00d	01-Oct-13	31-Dec-13
A2090	Review Budget and Aproval Process	63.00d	01-Oct-13*	31-Dec-13
A2100	Review Report	63.00d	01-Oct-13*	31-Dec-13
	Task 8: Review Permits and Licences	44.00d	15-Oct-12	14-Dec-12
	Asess Project to Meet Requirements	44.00d	15-Oct-12	14-Dec-12
A1910	Asess Project to Meet Requirements	44.00d	15-Oct-12*	14-Dec-12



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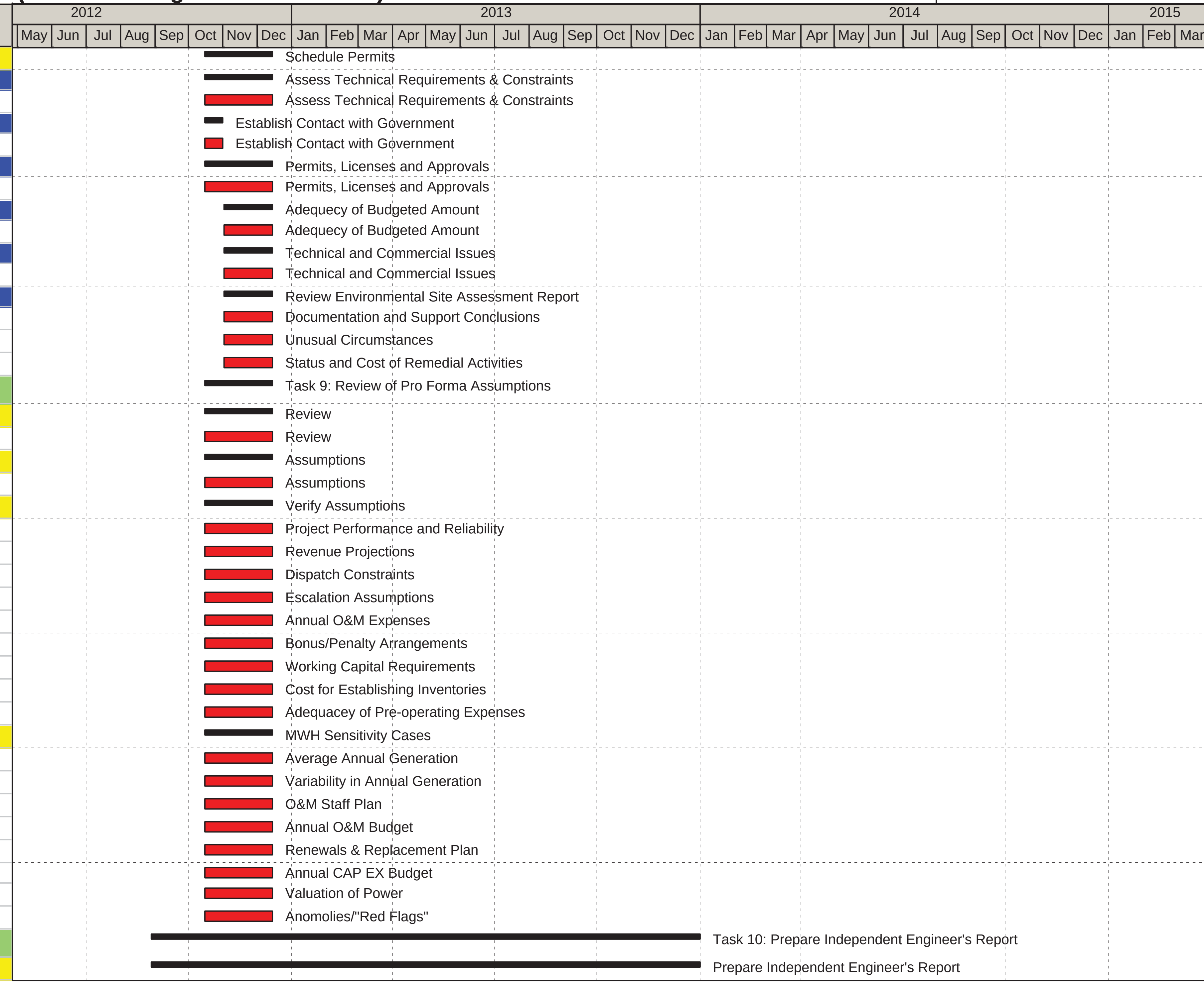
Actual Level of Effort
Remaining Work
Actual Work
Critical Remaining Work
Milestone
Summary

NALCOR_Phase I (Also Showing Lenders Phase I)

Activity ID	Activity Name	Rem Duration	Start	Finish
Schedule Permits		44.00d	15-Oct-12	14-Dec-12
Assess Technical Requirements & Constraints		44.00d	15-Oct-12	14-Dec-12
A1830	Assess Technical Requirements & Constraints	44.00d	15-Oct-12*	14-Dec-12
Establish Contact with Government		13.00d	15-Oct-12	31-Oct-12
A1840	Establish Contact with Government	13.00d	15-Oct-12*	31-Oct-12
Permits, Licenses and Approvals		44.00d	15-Oct-12	14-Dec-12
A1850	Permits, Licenses and Approvals	44.00d	15-Oct-12*	14-Dec-12
Adequecy of Budgeted Amount		31.00d	01-Nov-12	14-Dec-12
A1860	Adequecy of Budgeted Amount	31.00d	01-Nov-12*	14-Dec-12
Technical and Commercial Issues		31.00d	01-Nov-12	14-Dec-12
A1870	Technical and Commercial Issues	31.00d	01-Nov-12*	14-Dec-12
Review Environmental Site Assessment Report		31.00d	01-Nov-12	14-Dec-12
A1880	Documentation and Support Conclusions	31.00d	01-Nov-12*	14-Dec-12
A1890	Unusual Circumstances	31.00d	01-Nov-12*	14-Dec-12
A1900	Status and Cost of Remedial Activities	31.00d	01-Nov-12*	14-Dec-12
Task 9: Review of Pro Forma Assumptions		44.00d	15-Oct-12	14-Dec-12
Review		44.00d	15-Oct-12	14-Dec-12
A2120	Review	44.00d	15-Oct-12*	14-Dec-12
Assumptions		44.00d	15-Oct-12	14-Dec-12
A2130	Assumptions	44.00d	15-Oct-12*	14-Dec-12
Verify Assumptions		44.00d	15-Oct-12	14-Dec-12
A2140	Project Performance and Reliability	44.00d	15-Oct-12*	14-Dec-12
A2150	Revenue Projections	44.00d	15-Oct-12*	14-Dec-12
A2160	Dispatch Constraints	44.00d	15-Oct-12*	14-Dec-12
A2170	Escalation Assumptions	44.00d	15-Oct-12*	14-Dec-12
A2180	Annual O&M Expenses	44.00d	15-Oct-12*	14-Dec-12
A2190	Bonus/Penalty Arrangements	44.00d	15-Oct-12*	14-Dec-12
A2200	Working Capital Requirements	44.00d	15-Oct-12*	14-Dec-12
A2210	Cost for Establishing Inventories	44.00d	15-Oct-12*	14-Dec-12
A2220	Adequacey of Pre-operating Expenses	44.00d	15-Oct-12*	14-Dec-12
MWH Sensitivity Cases		44.00d	15-Oct-12	14-Dec-12
A2230	Average Annual Generation	44.00d	15-Oct-12*	14-Dec-12
A2240	Variability in Annual Generation	44.00d	15-Oct-12*	14-Dec-12
A2250	O&M Staff Plan	44.00d	15-Oct-12*	14-Dec-12
A2260	Annual O&M Budget	44.00d	15-Oct-12*	14-Dec-12
A2270	Renewals & Replacement Plan	44.00d	15-Oct-12*	14-Dec-12
A2280	Annual CAP EX Budget	44.00d	15-Oct-12*	14-Dec-12
A2290	Valuation of Power	44.00d	15-Oct-12*	14-Dec-12
A2300	Anomolies/"Red Flags"	44.00d	15-Oct-12*	14-Dec-12
Task 10: Prepare Independent Engineer's Report		340.00d	28-Aug-12	31-Dec-13
Prepare Independent Engineer's Report		340.00d	28-Aug-12	31-Dec-13



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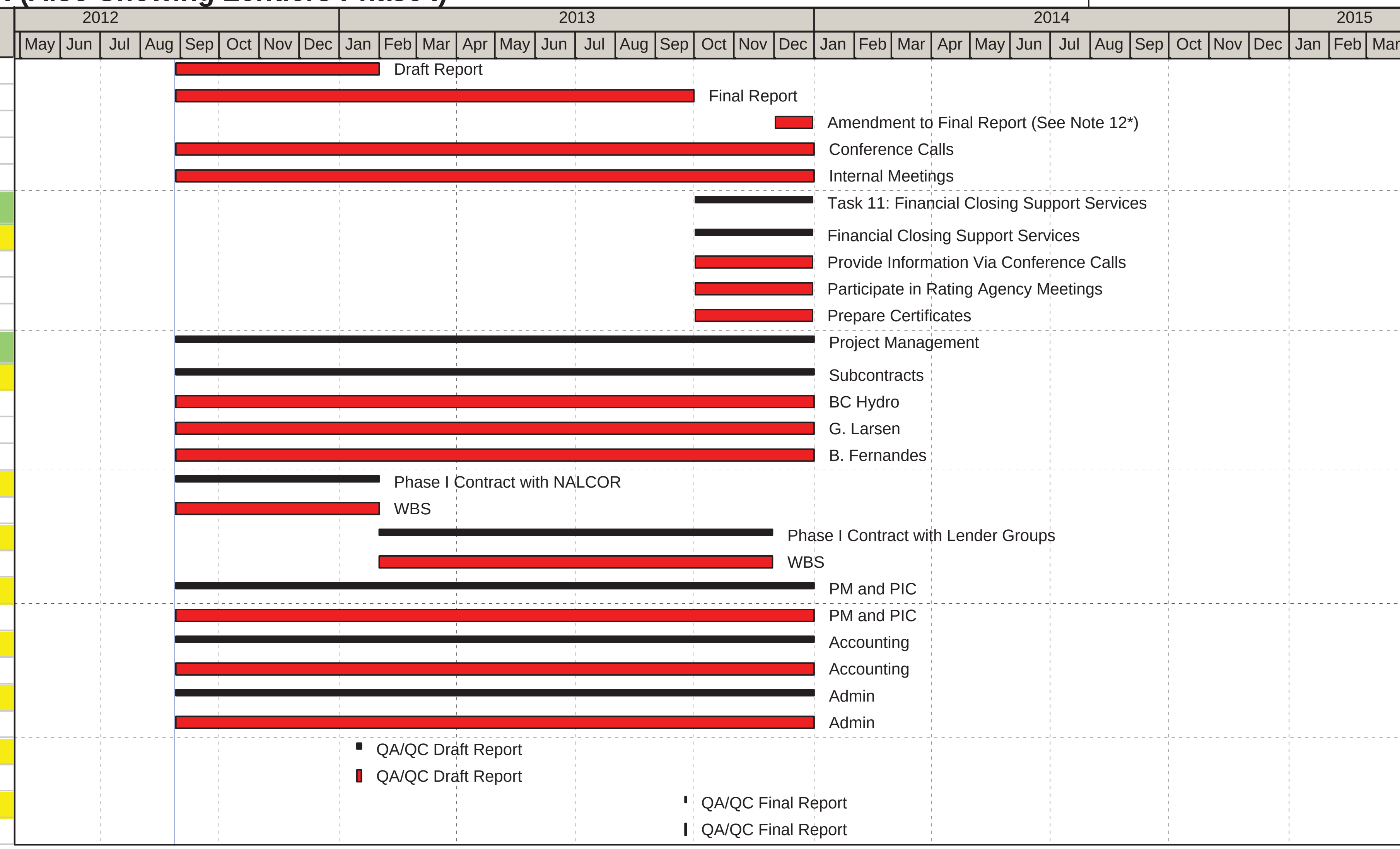
NALCOR_Phase I (Also Showing Lenders Phase I)

Activity ID	Activity Name	Rem Duration	Start	Finish
A2360	Draft Report	107.00d	28-Aug-12*	31-Jan-13
A2370	Final Report	276.00d	28-Aug-12*	30-Sep-13
A2375	Amendment to Final Report (See Note 12*)	20.00d	02-Dec-13*	31-Dec-13
A2380	Conference Calls	340.00d	28-Aug-12*	31-Dec-13
A2390	Internal Meetings	340.00d	28-Aug-12*	31-Dec-13
Task 11: Financial Closing Support Services		63.00d	01-Oct-13	31-Dec-13
Financial Closing Support Services		63.00d	01-Oct-13	31-Dec-13
A2310	Provide Information Via Conference Calls	63.00d	01-Oct-13*	31-Dec-13
A2320	Participate in Rating Agency Meetings	63.00d	01-Oct-13*	31-Dec-13
A2330	Prepare Certificates	63.00d	01-Oct-13*	31-Dec-13
Project Management		340.00d	28-Aug-12	31-Dec-13
Subcontracts		340.00d	28-Aug-12	31-Dec-13
A1000	BC Hydro	340.00d	28-Aug-12*	31-Dec-13
A1010	G. Larsen	340.00d	28-Aug-12*	31-Dec-13
A1020	B. Fernandes	340.00d	28-Aug-12*	31-Dec-13
Phase I Contract with NALCOR		107.00d	28-Aug-12	31-Jan-13
A1030	WBS	107.00d	28-Aug-12*	31-Jan-13
Phase I Contract with Lender Groups		212.00d	01-Feb-13	29-Nov-13
A1035	WBS	212.00d	01-Feb-13*	29-Nov-13
PM and PIC		340.00d	28-Aug-12	31-Dec-13
A1040	PM and PIC	340.00d	28-Aug-12*	31-Dec-13
Accounting		340.00d	28-Aug-12	31-Dec-13
A1050	Accounting	340.00d	28-Aug-12*	31-Dec-13
Admin		340.00d	28-Aug-12	31-Dec-13
A1060	Admin	340.00d	28-Aug-12*	31-Dec-13
QA/QC Draft Report		4.00d	15-Jan-13	18-Jan-13
A1070	QA/QC Draft Report	4.00d	15-Jan-13*	18-Jan-13
QA/QC Final Report		2.00d	23-Sep-13	24-Sep-13
A1080	QA/QC Final Report	2.00d	23-Sep-13*	24-Sep-13



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APPENDIX Q

Electoral and Municipal Boundary Crossings

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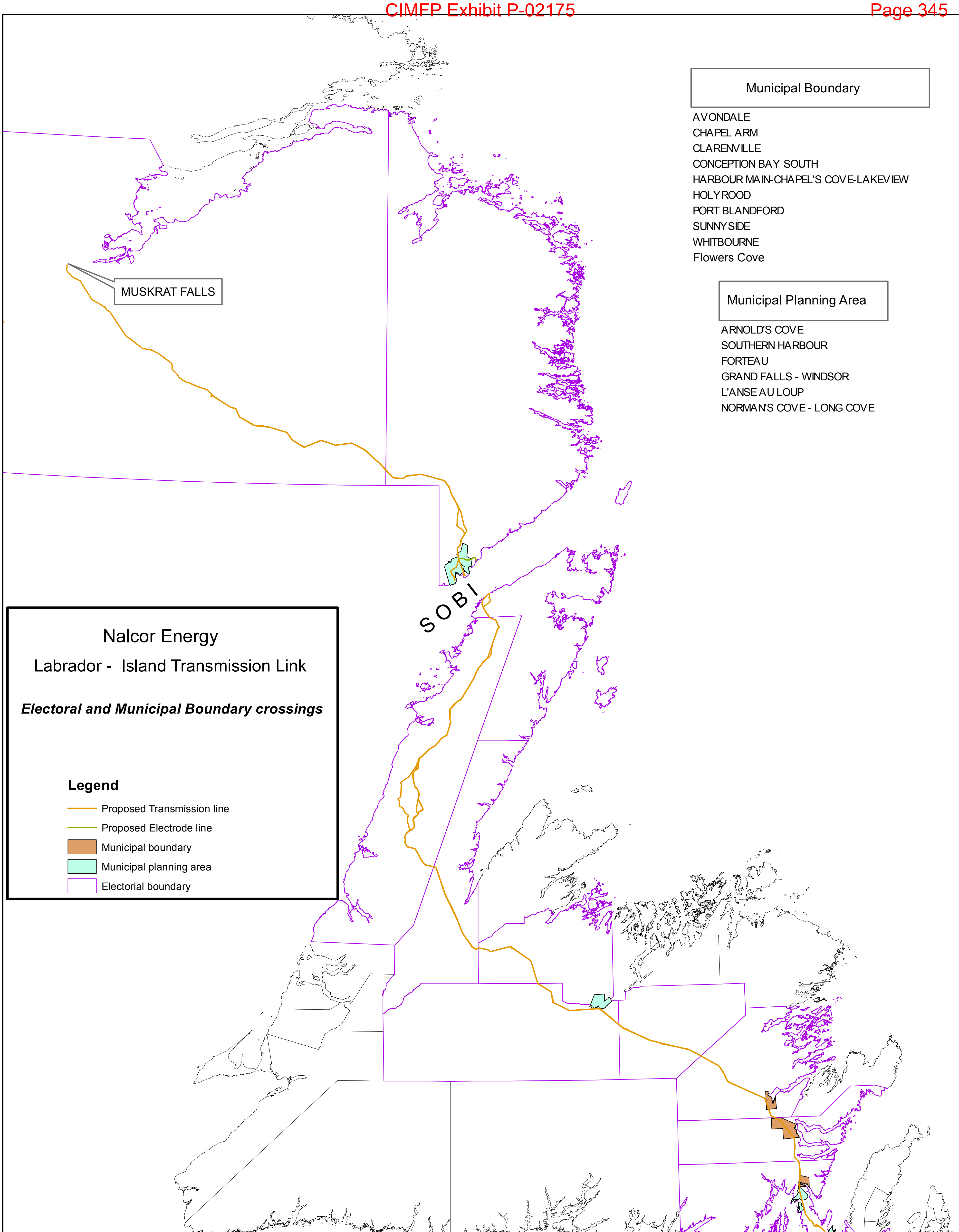

Electoral Districts

Name	Member
Bellevue	Calvin Peach (PC)
Cartwright-L'Anse au Clair	Yvonne Jones (Lib)
Conception Bay South	Terry French (PC)
Ferryland	Keith Hutchings (PC)
Gander	Kevin O'Brien (PC)
Grand Falls-Windsor/Buchans	Susan Sullivan (PC)
Grand Falls-Windsor/Green Bay South	Ray Hunter (PC)
Harbour Main	Tom Hedderson (PC)
Humber Valley	Dwight Ball (lib)
Lake Melville	Keith Russell (PC)
Placentia - St. Mary's	Felix Collins (PC)
St. Barbe	Jim Bennett (Lib)
Terra Nova	Sandy Collins (PC)
The Straits - White Bay North	Christopher Mitchelmore (NDP)
Trinity North	Ross Wiseman (PC)

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APPENDIX R

Key Operating Cash Flow Chart

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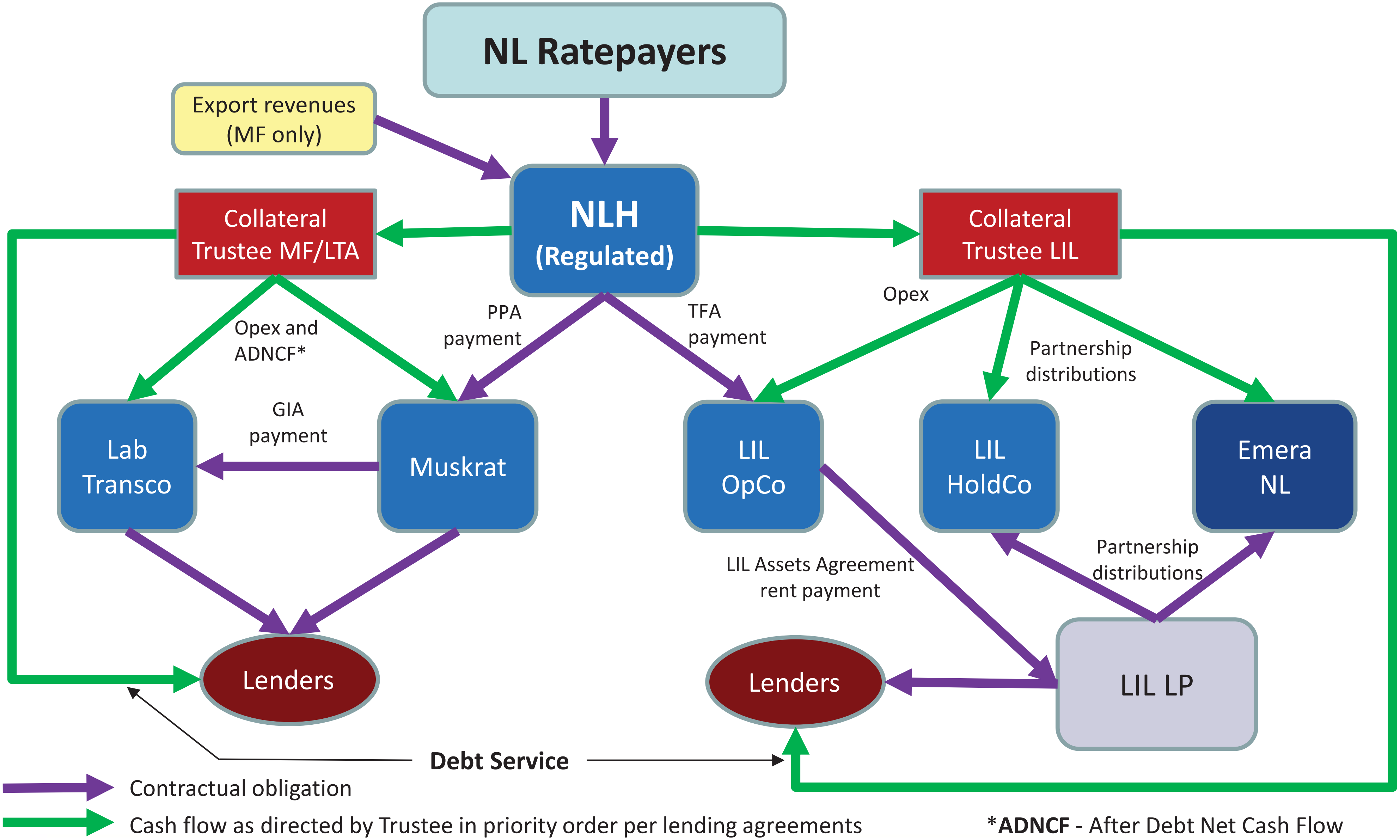
Structure – Key Operating Cash Flows



***ADNCF** - After Debt Net Cash Flow

nalcor energy

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