

# Muskrat Falls Project Oversight Committee

Committee Report – December 2015





# Table of Contents

<b>Introduction</b> .....	2
<b>Committee Observations</b> .....	4
<b>Project Schedule</b> .....	5
Current Schedule .....	5
Construction Activities .....	5
Manufacturing Activities .....	14
Long-term Schedule .....	17
<b>Project Costs</b> .....	19
<b>Project Risks</b> .....	25
<b>Other Oversight Activities</b> .....	28
Independent Engineer .....	28
Other Assurance Reviews.....	28
<b>Next Report</b> .....	33
<b>Appendix A:</b> Project Budget Summary Expenditure Categories.....	34
<b>Appendix B:</b> Contingency Changes, Period September – December 2015.....	35

# Introduction

The Muskrat Falls Oversight Committee (the Committee) was established by the Government of Newfoundland and Labrador in March 2014 to strengthen the existing oversight of the Muskrat Falls Project (the Project). The Committee's mandate focuses on cost, schedule and risk management for the construction phase of the Project. Reports of the Committee are located at [www.gov.nl.ca/mfoversight](http://www.gov.nl.ca/mfoversight).

In order to incorporate the most current Project cost and schedule information, the Committee's last report included Project information up to the end of August 2015 as well as an update on the September 2015 revisions to the Project budget from \$6.99 billion to \$7.65 billion<sup>1</sup>.

This report details the Committee's observations and summarizes the progress reported for the Project to the end of December 2015. As outlined in Table 1 below, for the period ending



Muskrat Falls Site – Progress on Spillway and Powerhouse – December 2015

<sup>1</sup> Total Project costs include construction costs of \$7.65 billion plus interest and other financing costs of \$1.30 billion that will be incurred during construction, for an estimated total of \$9.05 billion.

December 2015, the capital construction cost estimates for the Project are \$7.65 billion and the incurred costs<sup>2</sup> to date are \$4.00 billion, representing 52.3 per cent of the total budget (committed costs<sup>3</sup> totaled \$6.58 billion). Table 1 also outlines the Project budget at sanction in December 2012.

**Table 1**  
**Budget and Incurred Costs by Sub-project** (in \$thousands)

Muskrat Falls Project: Sub-project	Percentage of Total Project Budget	Project Capital Budget at September 2015	Incurred Costs as of December 2015	Percentage of Budget Incurred	Project Capital Budget at Sanction Dec 2012
Muskrat Falls Generating Facility	48.1%	\$3,685,965	\$2,037,712	55.3%	\$2,901,158
Labrador-Island Transmission Link	40.4%	\$3,089,378	\$1,372,698	44.4%	\$2,609,749
Labrador Transmission Assets	11.5%	\$877,557	\$593,094	67.6%	\$691,582
Total	100.0%	\$7,652,900	\$4,003,504	52.3%	\$6,202,489

In December 2015, the Government of Newfoundland and Labrador, through the Committee, engaged Ernst & Young, LLP (EY) to conduct an independent review of the reasonableness of the Project cost and schedule forecast, the key associated risks and identification of opportunities for remediation or corrective action if necessary.

Nalcor is currently reviewing Project Milestones and undertaking a risk assessment to evaluate impacts to cost and schedule. As a result, EY was requested to issue an Interim Report, which focuses on a review of the reasonableness of the cost and schedule position of the Project as set in September 2015. Once the risk assessment is completed by Nalcor, EY will complete its review of cost and schedule performance and issue a final report. Observations from their interim review and a summary of the recommendations are included in this Committee report as they are relevant to the Project cost and schedule at December 2015. A full copy of the Interim Report and Nalcor's response is available at [www.gov.nl.ca/mfoversight](http://www.gov.nl.ca/mfoversight).

<sup>2</sup> Incurred costs represents the total estimated cumulative value of all goods and services provided to the Project up to the point in time regardless of whether it was paid during the current period or will be paid at some future point in time.

<sup>3</sup> Committed costs: the estimated value of an obligation made by the Project for the provision of goods or services; represented by a Financial Commitment. Committed costs are captured when a Financial Commitment is made and its value is based upon the original estimate for that Financial Commitment. A Financial Commitment is a legal agreement between Nalcor Energy – Lower Churchill Project (NE-LCP) and a third party that authorizes NE-LCP to proceed with the award/instruction to the third party to provide goods and/or services for an agreed price or in accordance with an agreed pricing structure. The value of the Financial Commitment is represented by the cumulative value of the original amount and any approved variation orders to the contracts or change orders to the purchase order (which may or may not be a Project scope change).

# Muskrat Falls Project

## Committee Observations

### Project Schedule

- Progress on the Muskrat Falls Generating Facility is significantly behind schedule. Schedule recovery will not be possible.
- First Power will not be achieved for December 2017. Other Project Milestone dates are impacted and remain under review.
- River Diversion in 2016 remains achievable.
- Construction progress for the Project at the end of December 2015 is 40.5 per cent, compared to planned progress of 49.5 per cent, resulting in a variance of 9.0 per cent behind schedule.
  - Progress on the Muskrat Falls Generating Facility continues to slip, with progress on the Powerhouse and Intake 29.0 per cent behind schedule.
  - Progress on the Labrador-Island Transmission Link is 4.1 per cent behind revised schedule. EY advises that while recent contractor performance for the HVdc Transmission Line has improved and potential mitigation for some of the schedule risk is available, risks remain to future schedule performance.
  - Progress on the Labrador Transmission Assets is 5.5 per cent ahead of plan.

### Project Cost

- Project capital budget of \$7.65 billion is under review.
- Incurred costs at December 31, 2015: \$4.00 billion.
- Committed costs at December 31, 2015: \$6.58 billion.
- EY advises that contingency level is low for the current stage of completion of the Project.
  - Remaining Contingency at December 2015: \$172.8 million.
  - EY advises that contingency for strategic risks are not included in the Project forecast and there is no quantified reserve held elsewhere.

# Project Schedule

This section provides information on actual schedule progress compared to planned schedule progress for the period ended December 2015, first on an overall Project basis, and then by each of the sub-projects. It also provides information on the long-term milestones for the sub-projects.

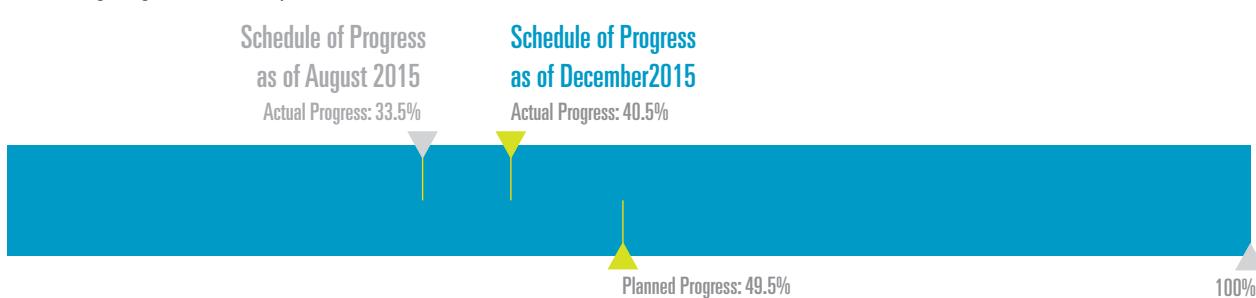
## Current Schedule

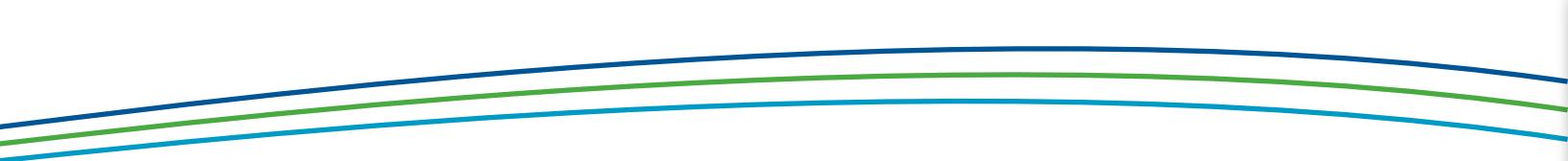
Nalcor monitors and reports schedule progress on all activities, both construction and manufacturing. Construction activities include all those activities occurring at site locations in the province. Manufacturing activities include those supply/install contracts that take place outside the province (e.g. the turbines and generators are being manufactured in China).

### 1. Construction Activities

Construction activities are mainly monitored and reported on an ongoing installation/construction progress basis. Construction has continued to advance on the Muskrat Falls Project since the last reporting period of August 2015. As outlined in Figure 1 and detailed in Table 2, overall Project schedule progress at the end of December 2015 is 40.5 per cent as compared to a planned schedule progress of 49.5 per cent, a variance of 9.0 per cent lower than planned (August 2015 actual progress was 33.5 per cent).

**Figure 1**  
**Muskrat Falls Project – Schedule of Progress at December 2015**  
(including August 2015 comparison)





Schedule progress is distributed among the three sub-projects as outlined in Table 2. Progress variance continues to relate primarily to the Muskrat Falls Generating Facility, which continues to track behind schedule.

Table 2

**Planned Construction Schedule Progress vs. Actual Schedule Progress – December 2015**

Muskrat Falls Project: Sub-project	Planned Schedule Progress – December 2015	Actual Schedule Progress – December 2015	Variance December 2015
Muskrat Falls Generating Facility	56.6%	39.7%	-16.9%
Labrador-Island Transmission Link	37.9%	33.8%	-4.1%
Labrador Transmission Assets	63.5%	69.0%	5.5%
Total	49.5%	40.5%	-9.0%

## Sub-Project: Muskrat Falls Generating Facility



Muskrat Falls Generating Facility

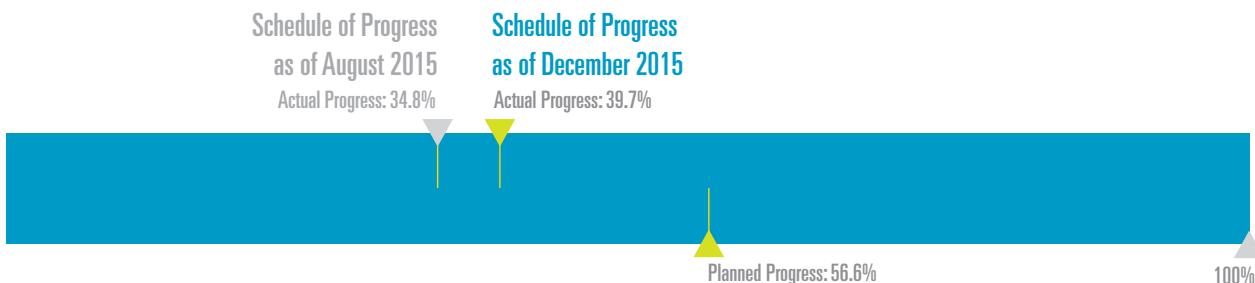
## Current Schedule: Muskrat Falls Generating Facility

As of the end of December 2015, the actual construction progress for the generating facility was 39.7 per cent complete, compared to a planned progress of 56.6 per cent complete, a variance of 16.9 per cent behind the planned schedule (August 2015 actual progress was 34.8 per cent).

Figure 2

## Muskrat Falls Generating Facility – Schedule of Progress at December 2015

(including August 2015 comparison)



The slippage on the Generating Facility is mainly attributable to the work on the Powerhouse and Intake. As of the end of December 2015, the actual construction progress for the Powerhouse and Intake was 23.2 per cent complete, compared to a planned progress of 52.2 per cent complete, a variance of 29.0 per cent behind the planned schedule (August 2015 actual progress was 18.5 per cent).

Total concrete poured for the Muskrat Falls Generating Facility at the end of December 2015 was 150,248 m<sup>3</sup>, or 42 per cent of total planned concrete placement of 357,438 m<sup>3</sup>. No concrete was placed in December, and the current focus for winter 2016 is on formwork and rebar installation in preparation for concrete pours, which begin again in March 2016. The integrated cover system was in the process of being removed during December (and was fully removed during the month of February 2016), which will assist readiness for concrete placement resumption.



Progress on the Powerhouse at the Muskrat Falls Site – January 2016

In the August 2015 report, the Committee identified that the Project Milestone Dates for the Muskrat Falls Generating Facility and Critical Path to First Power were under review. Nalcor has advised that while concrete placement rates have improved, full schedule recovery is not possible. First Power will not be achieved by December 2017, and the revised Milestone Date remains under review.

For the period August to December 2015, Nalcor continued to make progress on the Spillway and Gates sub-project. As of the end of December 2015, the actual construction progress was 66.1 per cent complete, compared to a planned progress of 63.0 per cent complete, a variance of 3.1 per cent ahead of the planned schedule. Nalcor has advised that Spillway work continues to allow for achievement of River Diversion in 2016. Construction also progressed on the North Spur Stabilization Works (4.4 per cent ahead of schedule as of December 2015), and excavation activities on the upstream and downstream embankment continued until early December, at which time work for the 2015 season shut down. Nalcor advises that activities are scheduled to resume in spring 2016.



Progress on the Spillway at the Muskrat Falls Site – January 2016

# Sub-project: Labrador-Island Transmission Link



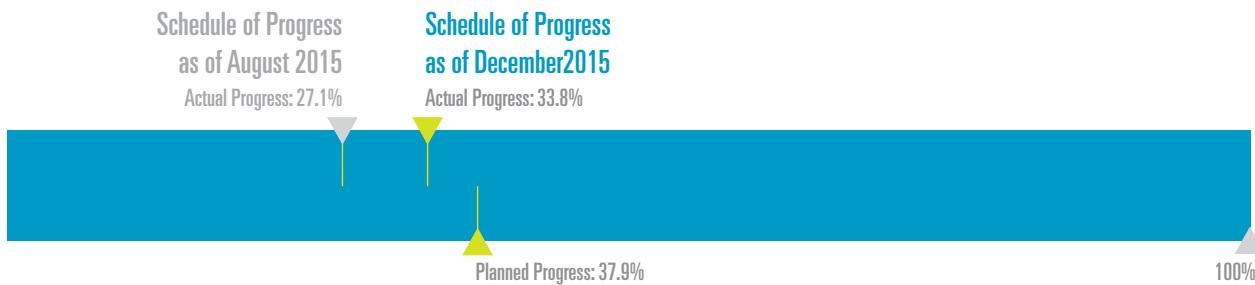
## Current Schedule: Labrador-Island Transmission Link

As of December 2015, the actual construction progress for the Labrador-Island Transmission Link was 33.8 per cent, compared to a planned progress of 37.9 per cent complete, a variance of 4.1 per cent behind planned schedule (August 2015 actual progress was 27.1 per cent).

Figure 3

### Labrador-Island Transmission Link – Schedule of Progress at December 2015

(including August 2015 comparison)



As shown in Table 3, this slippage has been primarily attributable to the progress on the transmission lines.

Table 3

### December 2015 – Construction Activity for the Labrador-Island Transmission Link

Planned Progress vs. Actual Progress

Construction Activity	December 2015 Cumulative %		
	Planned	Actual	Variance
HVdc Transmission Line Segment 1/2	47.4%	44.8%	-2.6%
HVdc Transmission Line Segment 3/4/5	14.1%	8.0%	-6.1%

In outlining the above progress measures, the Committee highlights that since the August 2015 report, the planned schedule progress baseline was adjusted in September 2015 to reflect revised Project execution plans for certain activities. Table 4 outlines the adjustments for the HVdc Transmission Line. This is important in recognizing that the variance from plan reported in Table 3 is based on the revised September 2015 plan progress measures. If these measures had not been adjusted in September, the variances in Table 3 would be higher accordingly.

Table 4

### December 2015 – Construction Activity for the Labrador-Island Transmission Link

Planned Progress vs. Actual Progress

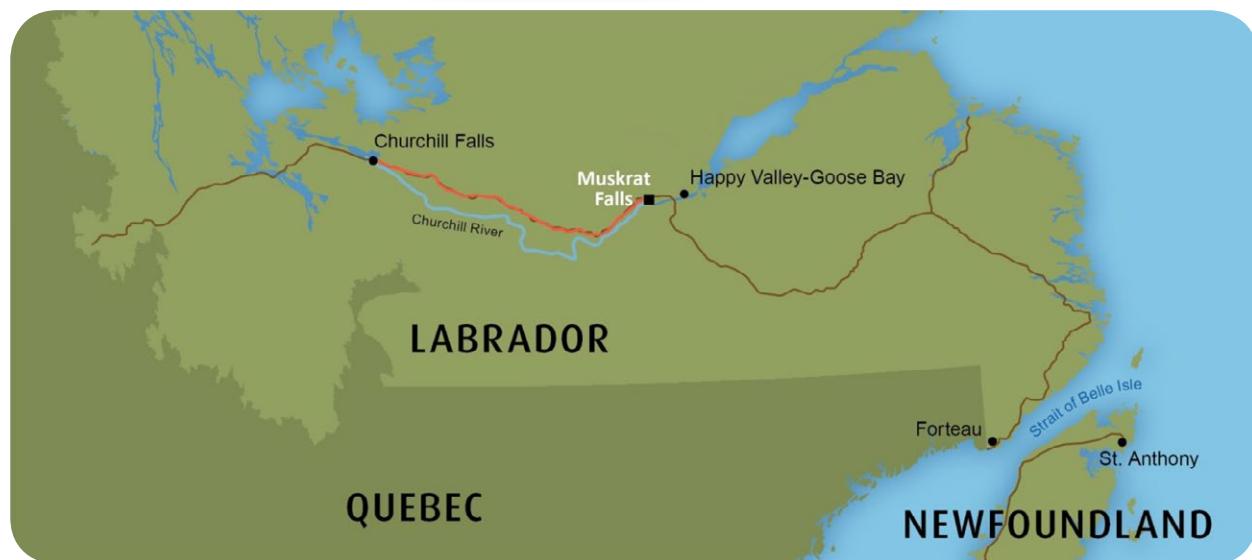
Construction Activity	Planned August 2015	Revised Planned September 2015	Variance
HVdc Transmission Line Segment 1/2	36.4%	31.4%	-5.0%
HVdc Transmission Line Segment 3/4/5	20.1%	6.3%	-13.8%

EY advises that in the first nine months of the 32-month contract duration, actual progress under the HVdc Transmission Line contract has been only 50 per cent of plan. Nalcor advises and EY concurs that recent contractor performance has improved and that potential mitigation for some of the schedule risk may be available by mobilizing additional skilled crews from the successful execution of the Labrador Transmission Assets HVac contract, which is being executed by the same contractor. There is also an ability to proceed on multiple work fronts, which can also improve progress. It is noted that risks remain to future schedule performance, such as contractor performance and weather conditions. Nalcor advises it has continued to address the management challenges by increasing project site team representation. The committee notes that there is also cost exposure with respect to the access and clearing activity for the transmission line, as unfavourable weather conditions can increase cost pressure associated with this scope of work.



Progress on the HVdc Transmission Line (Labrador-Island Transmission Link) – December 2015

## Sub-project: Labrador Transmission Assets



Route for the Transmission Line for the Labrador Transmission Assets

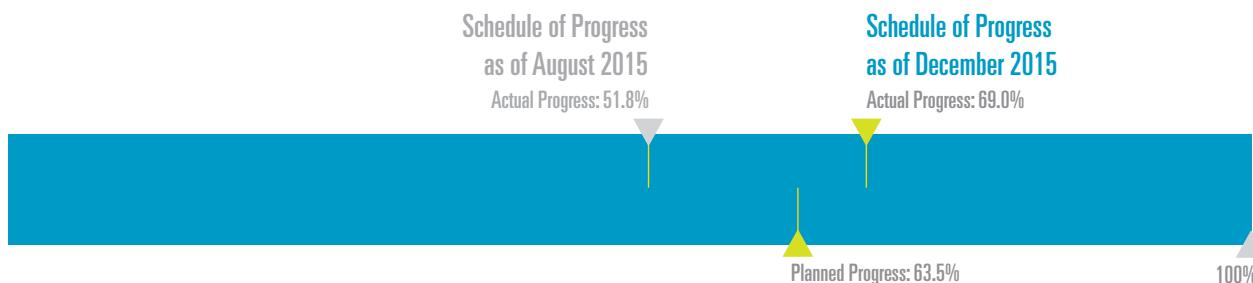
## Current Schedule: Labrador Transmission Assets

As of the end of December 2015, the actual construction progress for the Labrador Transmission Assets was 69.0 per cent complete as compared to a planned progress of 63.5 per cent complete, a variance of 5.5 per cent ahead of planned schedule (August 2015 actual progress was 51.8 per cent).

Figure 4

### Labrador Transmission Assets – Schedule of Progress at December 2015

(including August 2015 comparison)



Nalcor advised that progress is tracking ahead of schedule in large part due to a conscious effort by the Project management team and the contractor to achieve completion of this activity in order to move resources over to the Labrador-Island Transmission Link construction effort. The Project management team is actively managing resources and work priorities across the two sub-projects to optimize progress on both.

This contract is currently forecasting to complete three months ahead of schedule. Based on past performance and elimination of key Project risks with respect to the right of way, access and foundation installation, this schedule appears to be achievable.



Muskrat Falls Switchyard – October 2015

## 2. Manufacturing Activities

Manufacturing activities that are taking place outside the province are generally monitored and reported based on a milestone and/or delivery date basis. The six material manufacturing supply and install contracts awarded to date are as follows:

1. Turbines and Generators;
2. Spillway and Powerhouse Hydro-mechanical Equipment;
3. HVdc Converters and Transition Compounds;
4. Submarine Cable for the Strait of Belle Isle Crossing;
5. AC Substations; and
6. Synchronous Condensers for the Soldiers Pond Switchyard.

A summary of progress on these manufacturing activities is outlined as follows:

- 1. Turbine and Generators** – the contract continues to track behind the original contract schedule. The December 2015 Contractor Report indicates that actual progress is 45.8 per cent complete, compared to a planned progress of 61.3 per cent, representing a variance of 15.5 per cent (13.2 per cent in July 2015). The Contractor Report notes that manufacturing is behind plan, but this does not have a significant impact on subsequent phases of work (ie. delivery, installation and commissioning). In its Draw Certificate dated January 26, 2016, the Independent Engineer notes that continued monitoring of this activity is important since this is a significant contract to complete in accordance with the Integrated Project Schedule. Nalcor advises that while the baseline schedule is under review, completion of manufacturing remains on track to meet the required site installation dates.
- 2. Spillway and Powerhouse Hydro-mechanical Equipment** – the contract continues to track behind the original contract schedule. The December 2015 Contractor report indicates that actual progress is 37.0 per cent complete, compared to a planned progress of 60.4 per cent, representing a variance of 23.4 per cent (14.4 per cent in June 2015). The report indicates that the variance is primarily caused by a delay in logistics (delivery to site) and



Turbines and Generators Manufacturing (China) – October 2015

installation activities. The logistics delay is a management decision to store the components at the manufacturing site and not deliver these components until the spillway and powerhouse site is ready for installation. The Contractor now has full access to the work areas for the spillway and is now working an accelerated plan to meet the River Diversion Milestone. Nalcor advises that the River Diversion Milestone for November 2016 remains achievable. The baseline schedule for the Powerhouse is under review, but the completion of manufacturing remains on track to meet required site installation dates.

3. **HVdc Converters and Transition Compounds** – the contract continues to track behind the original contract schedule. The December 2015 Contractor report indicates that actual progress is 23.6 per cent complete, compared to a planned progress of 48.5 per cent, representing a variance of 24.9 per cent (6.8 per cent in May 2015). The report indicates that the slippage is primarily due to delays in engineering and procurement activities.

The contractor has identified a two-month delay. EY noted that even allowing for this two-month delay, the contractor would have to more than double its rate of progress to date to maintain the forecast schedule. Nalcor advises that it is working with the contractor to implement a recovery plan to mitigate risk and recover this delay. It will be important to monitor progress of this contract as installation and commissioning of this equipment is required for first power.



Final Subsea Cable Manufacturing (Japan) – October 2015



- 4. Submarine Cable for the Strait of Belle Isle Crossing** – the contract is generally on track to the original contract schedule. The December 2015 contractor report indicates that actual progress is 60.7 per cent complete, compared to a planned progress of 61.7 per cent, representing a variance of 1.0 per cent (3.9 per cent in August 2015). Nalcor advises that the land cable is complete and has been installed, and the submarine cable is complete and in transit to site as of the end of December 2015. Overall, this program is ahead of critical path requirements.
- 5. AC Substations** – the contract is tracking behind the original contract schedule. The December 2015 contractor report indicates that actual progress is 38.0 per cent complete, compared to a planned progress of 63.1 per cent, representing a variance of 25.1 per cent (0.3 per cent ahead of schedule in May 2015). The report notes that procurement has been a challenge, and therefore, immediate Project management priority and additional human resources are being committed to support the sourcing and procurement process. Nalcor advises that while the current contractor schedule shows no overall delay, there is potential that procurement and construction delays will result in a delay to the overall schedule. Nalcor advises that it is working with the contractor to implement a recovery plan to mitigate risk of schedule slippage.
- 6. Synchronous Condensers for the Soldiers Pond Switchyard** – the contract continues to track behind the original contract schedule. The December 2015 contractor report indicates that actual progress is 30.6 per cent complete, compared to a planned progress of 62.6 per cent, representing a variance of 32.0 per cent (11.4 per cent in June 2015). The contractor has identified a 59-day total overall schedule delay on the Static Commissioning of Units 1 and 2 due to procurement delays with delivery of the Stator Frame units. Nalcor is working with the contractor to implement measures to mitigate any schedule variances.

## Long-term Schedule

The August 2015 Committee report identified that schedule pressures continued to be experienced at the Muskrat Falls Generating Facility's Powerhouse and Intake and that Nalcor was establishing new baselines for the Project schedule, including Milestone Dates for First Power from Muskrat Falls.

Nalcor has advised that the re-baselining of the Muskrat Falls Generating Facility schedule is still ongoing; however, schedule recovery is not possible, and Nalcor confirms that First Power will not be achieved by December 2017.

Table 5 outlines the Milestone Dates at December 31, 2015.

Table 5  
**Milestone Schedule – As of December 2015**

Muskrat Falls Generating Facility	Previous Planned Date	Actual/Forecast December 2015
Project Sanction	December 2012	Complete
North Spur Works Ready for Diversion	September 2016	September 2016
River Diversion Complete	November 2016	November 2016
Reservoir Impoundment Complete	November 2017	Under review
Powerhouse Unit 1 Commissioned - Ready for Operation	December 2017	Under review
First Power from Muskrat Falls	December 2017	Under review
Powerhouse Unit 2 Commissioned - Ready for Operation	February 2018	Under review
Powerhouse Unit 3 Commissioned - Ready for Operation	April 2018	Under review
Powerhouse Unit 4 Commissioned - Ready for Operation	May 2018	Under review
Full Power from Muskrat Falls	May 2018	Under review
Commissioning Complete - Commissioning Certificate Issued	June 2018	Under review
Labrador-Island Transmission Link	Previous Planned Date	Actual/Forecast December 2015
Project Sanction	December 2012	Complete
SOBI Cable Systems Ready	October 2016	October 2016
MF Switchyard and Converter Station Ready for Operation	July 2017	September 2017
HVdc Transmission Line Construction Complete and Connected	July 2017	July 2017
Soldier's Pond Switchyard & Converter Stn. Ready for Operation	July 2017	September 2017
Ready for Power Transmission	September 2017	November 2017
Soldier's Pond Synchronous Condenser Ready for Operation	June 2017	July 2017
Commissioning Complete - Commissioning Certificate Issued	June 2018	Under review
Labrador Transmission Assets	Previous Planned Date	Actual/Forecast December 2015
Project Sanction	December 2012	Complete
HVac Transmission Line Construction Complete	September 2016	September 2016
Churchill Falls Switchyard Ready to Energize	May 2017	May 2017
Muskrat Falls Switchyard Ready to Energize	May 2017	May 2017
Ready for Power Transmission	May 2017	May 2017
Commissioning Complete - Commissioning Certificate Issued	June 2018	Under review

# Project Costs

This section provides information on costs incurred compared to planned costs for the period ended December 2015, first on an overall Project basis and then by each of the sub-projects.

## Current Cost – Overall Project Basis

Cumulative to the end of December 2015, the incurred costs for the Muskrat Falls Project totaled \$4.003 billion as compared to the planned costs of \$4.231 billion, a variance of \$227.5 million or 5.4 per cent lower than planned (August 2015 incurred costs were \$3.261 billion).

**Figure 5**  
**Muskrat Falls Project - Incurred Costs at December 2015**

(including August 2015 comparison)

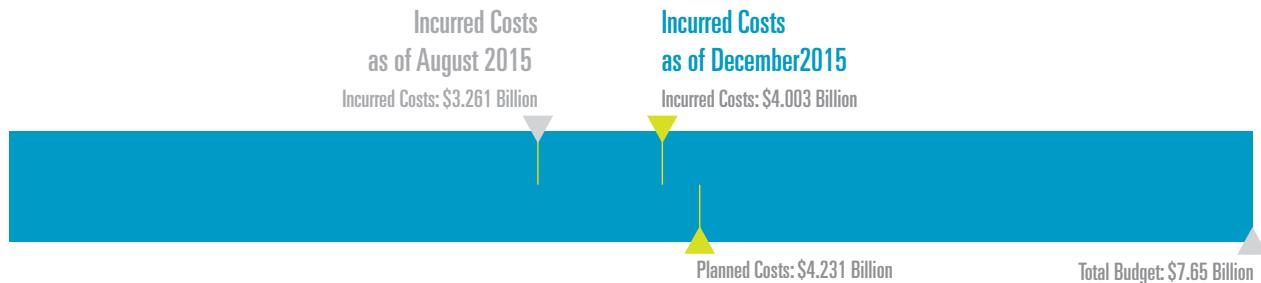


Table 6 shows the Project incurred costs to the end of December 2015 by expenditure category for each of the sub-projects. This table also includes the updated Project capital budget, as approved by the Boards of Directors in September 2015, compared to the Project Forecast Cost.

Table 6

**Summary of Project Budget vs. Project Forecast Cost** (in \$ thousands)

Muskrat Falls Generating Facility	Project Budget at September 2015	Incurred Costs at December 2015	Project Forecast Cost December 2015	Variance PFC from Budget
Expenditure Category	A	B	C	D=A-C
NE-LCP Owners Team, Admin and EPCM Services	\$408,723	\$302,353	\$408,714	\$9
Feasibility Engineering	\$17,949	\$17,949	\$17,949	\$0
Environmental & Regulatory Compliance	\$25,825	\$18,532	\$25,825	\$0
Aboriginal Affairs	\$13,314	\$7,519	\$13,314	\$0
Procurement & Construction	\$3,121,813	\$1,676,105	\$3,128,002	(\$6,189)
Commercial & Legal	\$25,239	\$15,254	\$25,239	\$0
Contingency	\$73,102	\$0	\$66,922	\$6,180
<b>Total for Sub-project</b>	<b>\$3,685,965</b>	<b>\$2,037,712</b>	<b>\$3,685,965</b>	<b>\$0</b>
Labrador-Island Transmission Link	Project Budget at September 2015	Incurred Costs at December 2015	Project Forecast Cost December 2015	Variance PFC from Budget
Expenditure Category	A	B	C	D=A-C
NE-LCP Owners Team, Admin and EPCM Services	\$221,293	\$166,990	\$221,286	\$7
Feasibility Engineering	\$21,252	\$21,252	\$21,252	\$0
Environmental & Regulatory Compliance	\$14,446	\$10,229	\$14,446	\$0
Aboriginal Affairs	\$2,684	\$614	\$2,684	\$0
Procurement & Construction	\$2,717,326	\$1,160,181	\$2,725,069	(\$7,743)
Commercial & Legal	\$16,490	\$13,432	\$16,490	\$0
Contingency	\$95,887	\$0	\$88,151	\$7,736
<b>Total for Sub-project</b>	<b>\$3,089,378</b>	<b>\$1,372,698</b>	<b>\$3,089,378</b>	<b>\$0</b>
Labrador Transmission Assets	Project Budget at September 2015	Incurred Costs at December 2015	Project Forecast Cost December 2015	Variance PFC from Budget
Expenditure Category	A	B	C	D=A-C
NE-LCP Owners Team, Admin and EPCM Services	\$144,958	\$93,439	\$144,958	\$0
Feasibility Engineering	\$220	\$220	\$220	\$0
Environmental & Regulatory Compliance	\$811	\$811	\$811	\$0
Aboriginal Affairs	\$188	\$1	\$188	\$0
Procurement & Construction	\$709,643	\$496,341	\$709,780	(\$137)
Commercial & Legal	\$3,891	\$2,282	\$3,891	\$0
Contingency	\$17,846	\$0	\$17,709	\$137
<b>Total for Sub-project</b>	<b>\$877,557</b>	<b>\$593,094</b>	<b>\$877,557</b>	<b>\$0</b>
<b>Total Project</b>	<b>\$7,652,900</b>	<b>\$4,003,504</b>	<b>\$7,652,900</b>	<b>\$0</b>

The Project Contingency for the Muskrat Falls Project at December 2015 is \$172.8 million, a draw-down of \$14.0 million from the available budget of \$186.8 million established in September 2015. Table 7 below outlines the changes in Contingency by sub-project. Appendix B provides further detail on the main reasons for the changes to the Contingency budget during this period.

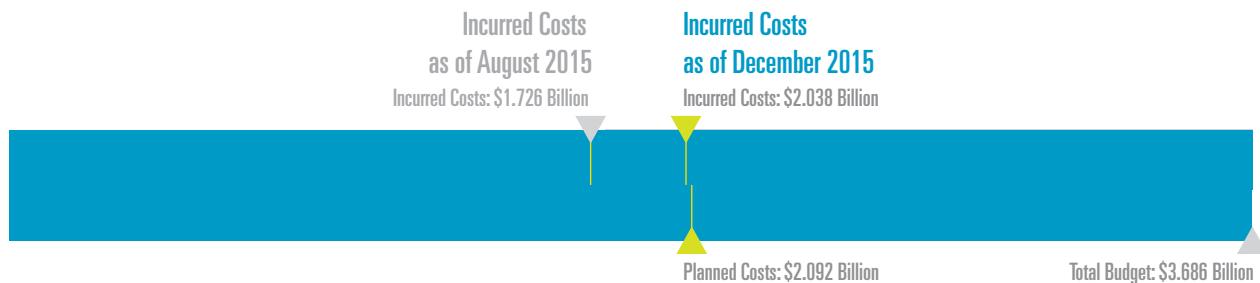
**Table 7**  
**Summary of Change in Project Contingency** (in \$thousands)

Contingency	Project Budget at September 2015	Contingency at December 2015	Contingency Draw-down \$	Contingency Draw-down %
Sub-project	A	B	C = B-A	D = C/A
Muskrat Falls Generating Facility	\$73,102	\$66,922	\$6,180	8.5%
Labrador-Island Transmission Link	\$95,887	\$88,151	\$7,736	8.1%
Labrador Transmission Asset	\$17,846	\$17,709	\$137	0.8%
Total	\$186,835	\$172,782	\$14,053	7.5%

## Muskrat Falls Generating Facility

The Muskrat Falls Generating Facility comprises 48.1 per cent of the total Project budget. As of the end of December 2015, the incurred costs for the Generating Facility totaled \$2.038 billion as compared to the planned costs of \$2.092 billion, which was \$54.5 million or 2.6 per cent lower than planned (August 2015 incurred costs were \$1.726 billion).

Figure 6  
**Muskrat Falls Generating Facility - Incurred Costs at December 2015**  
(including August 2015 comparison)



Nalcor advises that there are two main factors contributing to the lower than planned expenditures. First, progress on the Turbines and Generators manufacturing continues to be slower than planned, and this has resulted in a reduced rate of incurred costs on these manufactured items. Secondly, the Project management team has continued its strategy to defer start-up of the Reservoir Clearing upstream of Muskrat Falls, thereby deferring associated costs.

As noted in the previous section on the current schedule, progress on the Powerhouse and Intake is significantly behind schedule. The payment mechanism for this contract is based upon person-hours worked rather than cubic meters of concrete poured. In their report, EY advises that as of December 2015, the proportion of contract value paid to the contractor is significantly greater than the proportion of the concrete that had been placed. Thus, although significantly behind schedule, the costs based upon person-hours worked are incurred. Nalcor advises the contract was designed in this manner to realize possible savings in construction labour productivity and to also protect from possible labour cost overruns that might be experienced by the contractor as the contract included a maximum labour cost component. The contract decoupled labour from the units of physical work (e.g., m<sup>3</sup> of concrete placement) and provided a shared savings incentive to the contractor if work was accomplished under the labour budget.

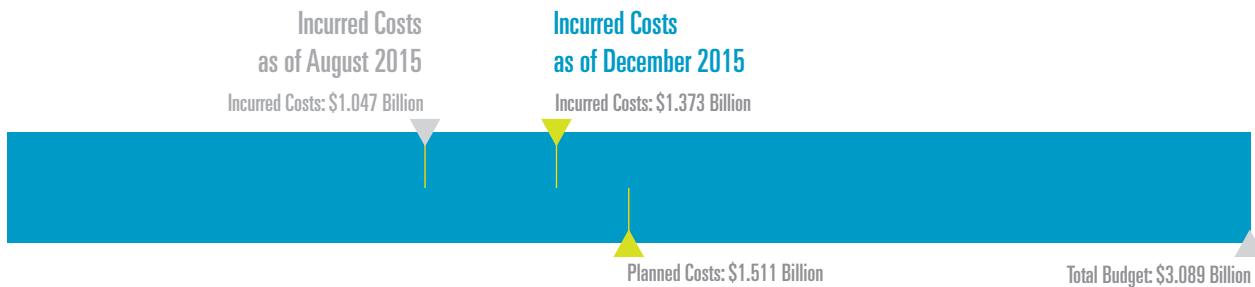
## Labrador-Island Transmission Link

The Labrador-Island Transmission Link comprises 40.4 per cent of the total Project budget. As of the end of December 2015, the incurred costs for the Labrador-Island Transmission Link totaled \$1.373 billion as compared to the planned costs of \$1.511 billion, which was \$138.2 million or 9.1 per cent lower than planned (August 2015 incurred costs were \$1.047 billion).

Figure 7

### Labrador-Island Transmission Link - Incurred Costs at December 2015

(including August 2015 comparison)



Nalcor advises that progress on some of the procurement and manufacturing activities associated with the HVdc Specialties is slower than planned, and this has affected the rate of incurred costs on these items; for example, delays in procuring equipment for the synchronous condensers has resulted in lower incurred costs. In addition, Nalcor notes that incurred costs associated with the HVdc transmission line construction is also tracking behind schedule due to slower than expected progress, as previously outlined. Nalcor expects that incurred costs will realign with planned cost in the future, as the Project management team is actively working with contractors to ensure delivery dates on procurement and manufacturing activities are met and schedule slippage on the HVdc transmission line construction is recovered.

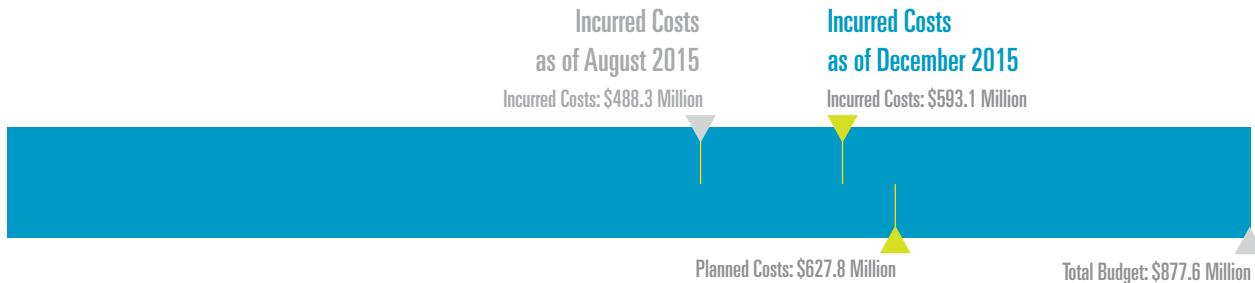
## Labrador Transmission Assets

The Labrador Transmission Assets comprise 11.5 per cent of the total Project budget. As of the end of December 2015, the incurred costs for the Labrador Transmission Assets totaled \$593.1 million as compared to the planned costs of \$627.8 million, which was \$34.7 million or 5.5 per cent lower than planned (August 2015 incurred costs were \$488.3 million).

Figure 8

### Labrador Transmission Assets - Incurred Costs at December 2015

(including August 2015 comparison)





The monthly Project reports indicate that construction activities on the Labrador Transmission Assets have been tracking ahead of schedule, and incurred costs, were also proportionately higher than planned in October and November 2015. However, with the winter shutdown, rate of expenditure dropped off, which resulted in lower-than-planned expenditure for the period ending December 2015. Nalcor advises that as construction activities resume in 2016, it is expected that incurred costs will realign with planned.

# Project Risks

Given the size and complexity of the Project, it is important that any risks continue to be proactively identified and monitored and that mitigation measures are implemented as appropriate. The Committee continues to review Nalcor's monthly risk report and meets regularly with Nalcor officials to discuss major Project risks and mitigation strategies. The Committee also considered the findings and recommendations from the EY Interim Report.

Based on these activities the Committee focused on providing updates with respect to the following risks:

## 1 Risk for Project Schedule Delays

In the report for August 2015, the Committee noted that it would be critical for the civil contractor to sustain the production improvements to avoid further schedule slippage and may require additional efforts from certain Project contractors. It was also identified that the Project Milestone Dates for the Muskrat Falls Generating Facility and Critical Path to First Power were under review. Nalcor has advised and EY concurs that schedule recovery is not possible. First Power will not be achieved by December 2017, and the revised Project Schedule remains under review.

EY has also noted the risk reported by a contractor of a multiple-month delay to completion of the HVdc Transmission Line as a result of a number of delivery challenges that have been experienced to date and the risk associated with the remaining scope, where full mitigation may not be possible. The contractor for the HVdc Converter is reporting a two-month delay, and EY indicates that there is a risk of additional schedule delay. Mitigation plans are being implemented to maintain the forecast and recover this delay, however, the contractor would be required to more than double their rate of progress to date to maintain the forecast schedule. Nalcor further advises that there are measures in the contract to incentivize the contractor to meet their delivery dates. It will be important to monitor progress of this contract as installation and commissioning of this equipment is required for power transfer from Labrador to the island.

## Risk of Project Cost Escalation

### 1. **Unawarded Contracts**

As noted in the August 2015 Committee report, all major Project contracts have been awarded, with the exception of the Mechanical and Electrical Auxiliaries Supply and Installation contract, which was proceeding through advanced evaluation. Since this time, Nalcor sought new bids which are currently in the evaluation stage. The Committee notes that until this contract is awarded, the associated costs and any impact on the contingency budget for the Project will remain uncertain.

### 2. **Contractor Performance**

The August 2015 Committee report identified that delays on the Muskrat Falls Generating Facility could impact costs beyond the Project execution risk contingency that has been established. As noted, schedule recovery on the Powerhouse and Intake will not be possible and First Power will be delayed. EY advises that the direct and indirect consequences of this delay are expected to have material impacts on cost and schedule. For example, for each month completion is delayed, additional Owner Management Team and Camp Operations costs will be incurred. Additionally, EY has noted this delay will also have a “knock on” impact to costs of other impacted contracts. These types of additional costs are not reflected in the September 2015 Forecast.

### 3. **Project Contingency**

EY notes that the Project defines risks to be either tactical or strategic – the latter are those considered by Nalcor to be outside of the controllable scope of the Project team. The following risks were classified by Nalcor at Project Sanction as strategic:

- Schedule risks – relating to bad weather, to the volume of work required to deliver the powerhouse (particularly given the challenging performance assumptions for powerhouse concrete), and schedule challenges for certain sections of the transmission line;
- Performance risks – the risks of not being able to achieve the performance rates and productivity assumed in the schedule estimate and the challenges associated with being able to attract the quality of experienced front-line supervision required to manage performance; and
- Skilled labour risks – risks of budgeted labour rates being exceeded.



EY notes that a quantitative assessment of “strategic risks”, as classified by Nalcor, was made at the time of the sanction process, but no explicit allowance was made in the form of a quantified reserve in the sanction budget. Thus, the contingency included in the September 2015 forecast includes the tactical risks but does not include a quantified reserve for the strategic risks.

EY has expressed the opinion that the crystallization of risks classified by Nalcor as strategic was the main driver for the cost increases seen to date on the Project. Risks that would be classified as strategic are expected to continue to impact the remaining scope of the Project.

EY noted that Nalcor has identified and documented risks associated with all remaining scope, including commissioning and integration, and regularly evaluates potential cost and schedule impacts of these risks; however, Nalcor does not develop, on a periodic basis, an aggregate position, compare it to contingency levels or integrate it into the Project Forecast to provide a risk-adjusted forecast. EY notes that the impact of these risks on cost and schedule is not adequately reflected in the September 2015 Forecast.

EY notes that there is opportunity to mitigate some of these risks, and the contract structures in place provide some protection for cost and schedule risk. Nalcor is currently undertaking a risk assessment that should be used to inform the amount of contingency required.

EY notes that the current contingency level representing 4.7 per cent of the cost to complete, or 2.3 per cent of total cost is low for the current stage of completion of the Project. More than 50 per cent of the work on the Project has now been completed, and just over 40 per cent of the construction work has been finished. EY advises that while the majority of the design, engineering and procurement work is complete, there is a significant amount of physical construction work remaining that will be followed by commissioning and integration. This construction work is challenging in terms of its scale, time and geography, and as such is exposed to a wide range of execution risks.

# Other Oversight Activities

The Committee provides the following updates with respect to additional oversight activities.

## Independent Engineer

The Independent Engineer attended a briefing and participated in site visits and meetings on the Project during September 21 to 24, 2015. The Independent Engineer's report on the site visit was issued on November 21, 2015. The report indicates that, in general, most of the ongoing work at Soldiers Pond, slope stabilization measures at the North Spur and concrete works in the Spillway structures conforms to current schedules. However, the Independent Engineer noted that progress on the Powerhouse construction is behind schedule and that this work is on the critical path and directly impacts initial power generation at Muskrat Falls.

The Independent Engineer, accompanied by Committee representatives, also made a site visit from November 2 to 6, 2015. The report was issued on February 5, 2016. The report indicated that works at the North Spur site are proceeding well and are generally ahead of schedule, and work on the Spillway is at a very advanced stage, with 100 per cent of the concrete placement of the main structure being completed. The Independent Engineer also noted that there has been schedule slippage at the Powerhouse and Intake, and Nalcor is working with the contractor to update the schedule by the end of March 2016.

The Independent Engineer's official report relating to the September 2015 and the November 2015 site visits can be found on the Committee's website at: [www.gov.nl.ca/mfoversight/engineer/](http://www.gov.nl.ca/mfoversight/engineer/) or, on Nalcor's website at: <https://muskratfalls.nalcorenergy.com/newsroom/reports/>

## Other Assurance Reviews

In fulfilling its mandate, throughout the construction period the Committee will examine issues such as whether management processes and controls are well designed and followed. The Committee provides the following updates:

## 1. Project Controls for Cost and Schedule

On December 21, 2015 the Committee released a report completed by EY, in its role as consultant to the Committee, titled “Review of Muskrat Falls Cost and Schedule Management Processes and Controls” (“the Report”).

The scope of the review included an assessment of the:

- Adequacy of Nalcor’s cost and schedule management processes and controls as it manages and reports on the execution of the Project;
- Consistency of Nalcor’s use of those processes and controls in key areas of the Project; and,
- Extent of reliance the Oversight Committee could place on Nalcor’s management reporting forecast and schedule forecasts.

EY made the following observations with respect to the Project’s management and control systems:

1. Key Project control process have been developed, including:
  - a. Core Project management and control processes for cost and schedule, including the development of an Integrated Project Schedule (IPS) for the program, identification of baseline, committed and incurred costs as well as linkage of cost and schedule baselines to change management processes and controls;
  - b. A Project Execution Plan defining the basis of the schedule and the estimate, and key assumptions supporting Project baseline cost and schedule; and
  - c. Coordination procedures for administration, execution control and management of the contractors’ cost and schedule.
2. Project reporting summarizes key information on construction cost and schedule, including:
  - a. Schedule forecast and progress leveraging the IPS, including critical path and float review; and
  - b. Cost forecasting, including Estimate To Complete, Estimate At Complete, variances and trends, as well as basic contingency forecasting.
3. Nalcor’s continued efforts to work with contractors on maintaining a disciplined approach to Project management, control and reporting.
4. Proactive measures were being taken to manage potential claims.
5. Cost and schedule issues and risks arising during the Project were subject to active formalized management.
6. A matrix organization structure has been established, responsible for managing the Project as a whole. Key roles in this organizational structure had been staffed with resources experienced in cost and schedule management.

EY further made the following observations with respect to key aspects of the management processes and controls that were not fully developed and deployed at the time of their review:

### **Key schedule management process and control risks and issues**

1. Certain baseline documents defining contractor schedules as well as the documents defining the control of Project schedules were not yet complete.
2. Contractors' schedule updates were not being systematically rolled up into the Nalcor IPS that forms the basis of reporting to the Oversight Committee.
3. A completion date had not been established for finalizing an integrated baseline of contractor and IPS schedules to correct the issues noted in 1 and 2 above.
4. The IPS development and maintenance process is not fully documented.

### **Key cost management process and control risks and issues**

1. The conditions and processes for rebaselining cost and schedule are not defined in the Project's control processes and procedures. The Oversight Committee's understanding of such conditions and processes is an important foundation as it conducts its oversight activities.
2. Nalcor uses a relatively basic approach to its updating of forecasted contingency requirements, which in the experience of EY is not consistent with the expected practices for a project of this scale and complexity. Given this, it is not clear whether the cost contingency as forecasted in reports for the Project will be adequate.
3. The Project does not define thresholds for variance management, reporting and escalation purposes. EY would normally expect these to be in place as they assist in giving clear indications of the severity of issues and the need to escalate to key stakeholders, such as the Oversight Committee.
4. Fully quantified risks or trends have not been documented for certain significant challenges on the Project. The scale of potential challenges is also not quantified in the summary reporting made available to the Oversight Committee.

EY recognized that Nalcor is using many conventional management processes and controls for the Project. However, while certain contractor earned value data is being collected, Nalcor is not reporting using a full Earned Value Management System across the whole of the Project. Reporting on Earned Value performance would, however, provide additional useful data and information to the Oversight Committee on both individual contractor and overall Project performance where available.

Until such time as the management process and control risks and issues identified in this report and the detailed supplementary report are addressed, the completeness and accuracy of Project cost and schedule status reporting to the Oversight Committee cannot be fully verified.

## Key recommendations

EY recommended that the Oversight Committee:

1. Work with Nalcor to obtain management response for each of the findings noted in this report and the detailed supplementary report with defined corrective action, responsibility and anticipated completion dates. Given the volume of Project activity, timeliness of action is critical. Therefore, the Oversight Committee should actively monitor status and verify completion of management response to its expectations.
2. Consider conducting detailed assessments of the cost and schedule status of the Project on an ongoing basis until Nalcor's corrective action addressing key risks and issues noted in this report is complete to the Oversight Committee's satisfaction. This ongoing assessment should include the basis and accuracy of the forecasts for completion at the contractor level, as well as the quantification of cost and schedule risk.

The Report and Nalcor's response are available at [www.gov.nl.ca/MFoversight/](http://www.gov.nl.ca/MFoversight/).

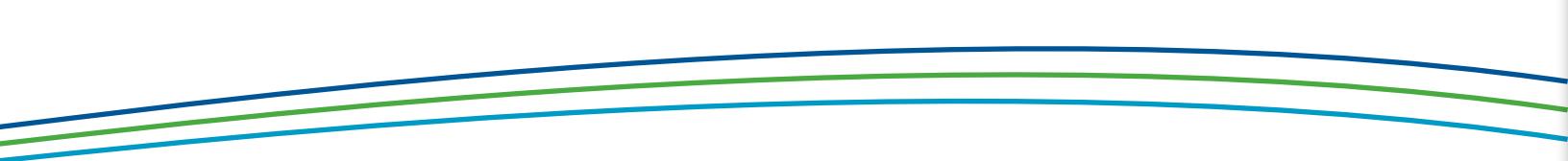
The engagement of EY in December of 2015, as discussed further below, is consistent with the recommendations above.

## 2. Project Cost, Schedule and Associated Risk

In December 2015, the Government of Newfoundland and Labrador, through the Committee, contracted with EY to conduct an independent review of the Project cost and schedule performance, the key associated risks and identification of opportunities for remediation or corrective action. Nalcor is currently undertaking a risk assessment to evaluate impacts to Project cost and schedule. As this assessment is not complete, EY was requested to issue an Interim Report. The Interim Report focuses on the reasonableness of the cost and schedule position as set in September 2015. The findings in the Interim Report have been incorporated throughout this report. A full copy of the Interim Report and Nalcor's response are available at [www.gov.nl.ca/MFoversight/](http://www.gov.nl.ca/MFoversight/).

The key recommendations from the Interim Report are as follows:

- The Project should revise its planning and forecasting processes to explicitly include the regular reporting of a fully risk-adjusted final forecast of cost and schedule;
- The Project Contingency should make appropriate allowances for all risks including strategic, at a confidence level reflecting stakeholders required cost certainty. EY recommends that consideration be given to the use of a more conservative confidence level for setting Project contingency, based on a thorough risk assessment;
- The sufficiency of the Project contingency should be reviewed quarterly to assess whether it appropriately covers all risks, taking account of the effectiveness of mitigation plans and the likelihood of risks crystallizing; and
- There should be separation of the Project Contingency into an amount to be managed by the Project team and an amount to be managed at a higher level of governance.



In the course of conducting the Review, EY has observed that certain elements of governance and reporting arrangements to date have not been effective in respect of the Project's cost and schedule forecasts. There is a need to strengthen Project governance and reporting to provide more effective oversight and constructive challenge to Project performance and execution, key decisions and forecasting. EY recommends that:

- Project governance and independent oversight should be re-evaluated by the Provincial Government and strengthened at the Project, Nalcor Board and Provincial Government levels; and
- Project reporting should be enhanced to support senior management focus on key risks and issues, to communicate more clearly how key risks are reflected in the forecast and to enable more effective Provincial Government oversight.

# Next Report

The Committee will continue its oversight of the construction of the Project in accordance with its mandate and the Oversight Framework. The next report will be for the quarter ended March 2016.

# Appendix A

## Project Budget Summary Expenditure Categories

The summary expenditure categories are described as follows:

**NE-LCP Owners Team, Admin and EPCM Services:** includes the labour, facilities and overhead costs of the LCP Project team as well as costs of SNC Lavalin.

**Feasibility Engineering:** includes the cost of early-stage engineering activities, which are now complete.

**Environmental & Regulatory Compliance:** includes costs associated with environmental assessment, permits, licenses and similar such costs.

**Aboriginal Affairs:** includes costs associated with activities in the aboriginal communities along with obligations under the Impact and Benefits Agreement.

**Procurement & Construction:** includes costs associated with the major construction activities and the awarding of contracts.

**Commercial & Legal:** includes costs associated with insurance, legal and other commercial activities.

**Contingency:** provision for additional expenditure, if required.

# Appendix B

## Contingency Changes, Period September – December 2015

The reasons for the changes to the Project Forecast Contingency budget and the net decrease of \$14.0 million from September to the end of December 2015 were reported as follows:

### **Muskrat Falls Generating Facility**

The \$6.2 million contingency drawn for the Muskrat Falls Generating Facility related primarily to:

- increased costs associated with professional concrete services being conducted under the contract for construction of the Intake, Powerhouse, Spillway and Transition Dams;
- schedule acceleration costs related to contract for supply and installation of hydro-mechanical equipment; and
- additional costs associated with construction of bulk excavation works within the Muskrat Falls Generating Facility sub-project.

### **Labrador-Island Transmission Link**

The \$7.7 million contingency drawn for the Labrador-Island Transmission Link related primarily to:

- a requirement for extra anchors and foundations;
- an increase in costs associated with geotechnical field investigations and micropile foundation studies related to construction;
- markup costs associated with the transfer of scope from the civil contractor for HVdc Specialties to the contractor for construction of AC Substations; and,
- additional third-party quality inspection costs for foundations.

### **Labrador Transmission Assets**

The \$137,000 contingency drawn for the Labrador Transmission Assets related primarily to:

- markup costs associated with the transfer of scope from the civil contractor for HVdc Specialties to the contractor for construction of AC Substations;
- an increase in costs associated with Churchill Falls camp usage by staff and contractors;
- an increase in costs associated with the Muskrat Falls Switchyard due to layout changes;
- an increase in costs associated with electrical installation and the construction of temporary pads for the Churchill Falls autotransformer;
- requirement for additional anchors; and
- savings associated with the contract for clearing of the HVac Transmission Line.

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