

**From:** [David Steele](#)  
**To:** [Damian Joy](#)  
**Cc:** [Paul Hickey](#)  
**Subject:** FW: Notes from Ministerial Briefing  
**Date:** Monday, August 28, 2017 10:03:45 AM  
**Attachments:** [image001.jpg](#)  
[Muskrat Falls Update Report - 27 August 2017 FINAL DRAFT v3.docx](#)

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Damian,

It would be great if you could wrestle Point # 1 to the ground and come up with suggested wording. This should be reviewed in conjunction with recommendation 1 and 4 as noted in the executive summary. Please see the attached version for most current language.

See below Tim's thoughts on the matter. Michael also weighed in in his last email.

Query: Isn't the Province inherently holding contingency (at a higher level of governance) given that they have been informed of the risks? Albeit they are not included in the current cost and schedule forecast.

Regards,

David

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**From:** Tim Calver  
**Sent:** Monday, August 28, 2017 6:28 AM  
**To:** David Steele  
**Subject:** RE: Notes from Ministerial Briefing

Hi David,

Comments below as best I can without having been part of the work this time around:

1. Our recommendation was for a fully risk adjusted cost and schedule forecast at an appropriate confidence level (e.g. P80). I would expect these risks to be included in the QRA and hence they would be reflected in the probability distribution curve on which the forecast is based. If these are low probability events with a high impact then likely you wouldn't see them unless you're at a very high confidence level of say P95. So I could understand that the project calls out to the govt that there are still high impact events, outside of project control, which could blow the forecast but then I would not describe them as excluded. Maybe you have more insight behind these risks – soil and vegetation sounds

relatively predictable – the unforeseen govt thing sounds like a catch all.

2. This seems like a fair comment and a reasonable challenge for us to be more specific here, the current sentence doesn't give the reader a clear view of our conclusion. Can't comment on the use of substantial other than to observe that we don't use this for 5 or 6 which are different sorts of recommendations than 1-4.
3. Again, this is fair comment, these statements are rather non-committal and don't give a view to the reader that we have a clear position.
4. I would see 2 reasons to standardize reporting. One is efficiency of effort, the other is consistency of information so you don't waste time with confusion and reconciliation. Difficult to comment on the specific points raised, but if I was government I would want to know that source data was consistent (with independent oversight where necessary) but may want a different lens to come from OC versus the project and hence wouldn't worry too much about standardization of reporting. I may have got the wrong end of the stick here.
5. These are pretty detailed charts, not easy to see the wood for the trees. So the request to be specific about the proposed governance model seems reasonable (and I would think we can do that with a simpler diagram)
6. I think the issue here is that the other parties report to the project organisation, so can we differentiate as being the only 3<sup>rd</sup> party who is not contracted directly by the project?
7. I read the quarterly process as just documenting what is being done so shouldn't be onerous. I don't have an evidenced view of standard or best practice here. The QRA process should be repeatable and based on the risk info generated in the normal process – when I saw this it was an expensive one off process and our view was to make this more routine. Given the significant moves in forecast cost and schedule despite improved processes, high inherent risk and position of the project to exclude strategic risk I would see 6 monthly as an appropriate recommendation.

As for stochastic schedule risk modelling, this is a level of technical language we don't use anywhere else in the report. Stochastic risk analysis is the process behind QRA. So here I assume we are just talking about Schedule QRA, which was one of our original recommendations (not sure why we would use this terminology here and QRA for the cost side). In terms of plain English, it's about representing each risk as a probability distribution and then simulating lots of possible outcomes to understand how the uncertainty behind the project can influence overall outcomes. This is a good thing when you have lots of risks with very different likelihoods and interactions. Basically the technique is a better way to describe and represent uncertainty in outcomes.

Give me a call if it helps to discuss any of the above.

Thanks

Tim

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**From:** David Steele  
**Sent:** Sunday, August 27, 2017 8:46 PM  
**To:** Tim Calver <[tcalver@uk.ey.com](mailto:tcalver@uk.ey.com)>  
**Subject:** FW: Notes from Ministerial Briefing  
**Importance:** High

Hi Tim,

I could really use your perspective on these couple of points of feedback we received from the Minister. I understand that for some of these you may not have the proper context (having not been in the discussions and that's fine if you pass on a some). Mike is on holiday in Ireland and I am having difficulty in getting his input. I need to turn a draft tomorrow by noon NL time. I'm working on this tonight... so if you find 20 mins to put a few notes on the end of each of these, that would be so appreciated. Thank you in advance (if you can find time).

Overall, she is very happy with the work completed.

A few areas of input/comment for our consideration:

1. Where we identify that certain strategic risks have been excluded from the forecast, the Minister would like us to indicate if we feel this is an appropriate treatment of such risks. She believes the report as currently written indicates that we are not in agreement (i.e. our wording is negative or can be perceived as such).
2. Our status on implementation of Recommendation 5.
  - a. She feels that the "however" statement is too broad and completely nulls the fact that there has been true positive progress. She would prefer that we be specific to the point where we believe progress can be made. In this case, she'd prefer something like "..however, an opportunity exists to implement a full independent assurance function that would support the OC and the Nalcor Board."
  - b. She wondered why decided to not use the word "substantial" in recommendation 5 as we did in other Recommendation 1, 2 and 4. She feels there have been substantial improvements made and would like to see the word used.
3. Our status on implementation of Recommendation 6. She feels that the "however" statement is too broad and completely nulls the fact that there has been true positive progress. She would prefer that we be specific to the point where we believe progress can be made. In this case, she'd prefer something like "..however, opportunities exist to standardize project reporting to the OC and the Nalcor Board."
4. Additional Recommendation 4 – there was discussion and agreement that it's important that standardizing the reporting from the Project to the OC and Board is important, however disagreement that there needs to be standardization of reporting from the OC and Board to Government. Reasons:
  - a. A point was made that the OC is Government so the sentence doesn't make sense.
  - b. The OC has reps that report to appropriate Department heads and Ministers and the Premiers Office.

- c. Feels the risk of timing and nature of what's being reported is around syncing up reporting to the OC and the Board.
5. The section of the report with the Governance model charts. She has a problems with it:
  - a. Thinks the charts may not be useful. Are words enough?
  - b. Can we not provide a "suggested governance model"? Feels its not necessary to describe it as a wholesale model change to governance. Really we are just recommending an enhancement to the existing model by supplementing the OC (and Board) with a strong independent assurance function.
6. We have included a statement in the report declaring that EY is the only source of independent assurance activities (and the IE to the Feds). The Minister said that she thinks other service providers (Westney, Hatch) could take offence that we are saying they are not independent on how they do their work. She gets what we are saying, but suggested we look at the wording to remove the risk she suggested.
7. The minister was concerned about our recommendation to implement a quarterly risk assessment (formal) process with the bi-annual requirement with Westney. She asked:
  - a. Is this standard practice or best practice
  - b. Is this overkill for the project given it appears they have bettered their processes to this point.

The Minister would like EY to provide her with formal definitions of the following for her communications purposes:

- Stochastic schedule risk modelling and why it's a good thing for the project (in plain English)

Regards,

David

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# Muskrat Falls Project

Assessment of implementation of  
EY Interim Report recommendations

DRAFT FOR DISCUSSION PURPOSES ONLY

XX August 2017



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XX August 2017

**Muskrat Falls Project - Assessment of Implementation of EY Interim Report recommendations**

Mr. Bown,

EY conducted a review of the Muskrat Falls Project's (the Project) cost, schedule and related risks, and issued an interim report (the Interim Report) dated 8 April 2016. In accordance with a statement of work dated 15 June 2017 between EY and Her Majesty in Right of Newfoundland and Labrador (the Provincial Government), EY was retained to assist the Provincial Government's Oversight Committee (the OC) for the Project in assessing the status of the implementation of the Interim Report's recommendations (the Recommendations).

The field work for this report was completed in July 2017 and consisted of reviewing project data and documentation as well as conducting enquiries and discussions with senior management and representatives of Nalcor Energy (Nalcor), Nalcor's Board of Directors, and the Provincial Government.

We would like to express our appreciation for the cooperation and assistance provided to us by representatives of Nalcor, Nalcor's Board and the OC.

Yours sincerely,

**DRAFT - INSERT EY SIGNATURE UPON FINAL**

Ernst & Young LLP



## Disclaimer

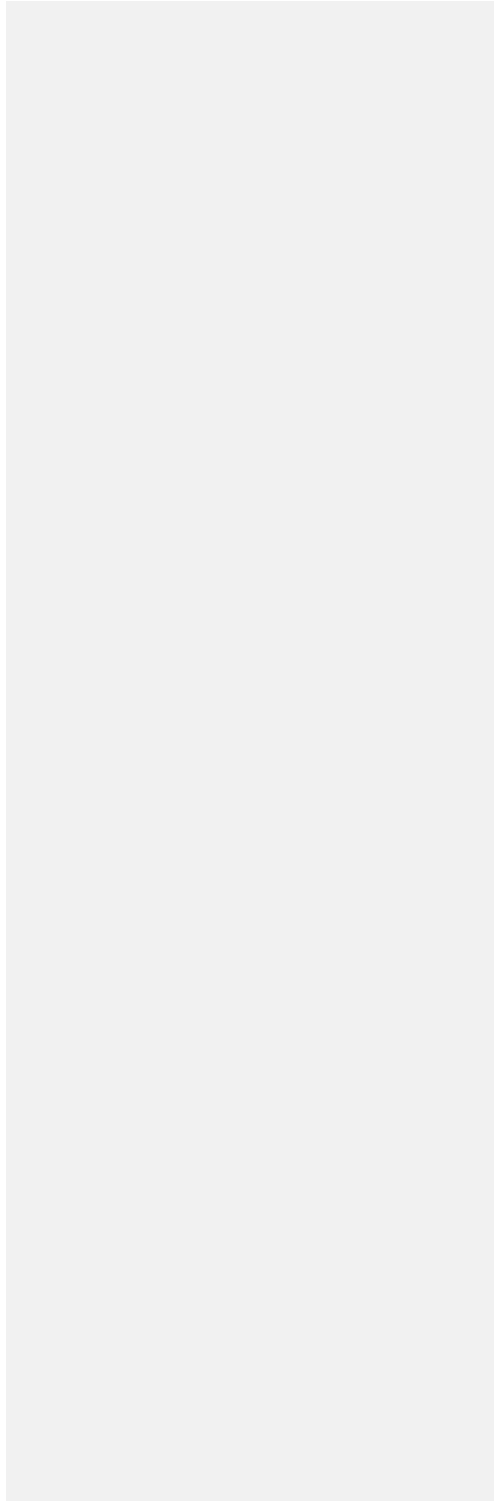
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This report is intended solely for the information and use of Her Majesty in Right of Newfoundland and Labrador as represented by the Executive Council and is not intended to be and should not be used by any other parties. In preparing this report, EY relied on information provided by its client and by Nalcor. EY has not audited, reviewed or otherwise attempted to verify the accuracy or completeness of such information. This report has not considered issues relevant to third parties and is subject to certain limitations. We shall have no responsibility whatsoever to any third party that obtains a copy of this report. Any use such a third party may choose to make of this report is entirely at its own risk. We disclaim all responsibility for loss or damage, if any, suffered by any third party as a result of reliance on, decisions made or actions taken based on this report.

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## Muskrat Falls Project

### Assessment of Implementation of recommendations

## 1 Executive summary

- 1.1 In April 2016, EY issued a report to Her Majesty in Right of Newfoundland and Labrador (the Provincial Government) containing its assessment of the reasonableness of the Muskrat Falls Project's (the Project) cost and schedule forecast and identifying opportunities to address any material/critical risks (the Interim Report).
- 1.2 The recommendations in the Interim Report (the Recommendations) included four related to planning and forecasting, contingency and risk management and two related to overall project governance and project reporting.
- 1.3 In accordance with a statement of work dated 2 June 2017 between EY and the Provincial Government, EY was retained to assist the Provincial Government's Oversight Committee (the OC) for the Project in assessing the status of the implementation of the Recommendations (the Engagement).
- 1.4 The Project's most recent cost and schedule forecasts of May 2017 and the draft June 2017 (the June 2017 Forecast) were given due consideration by EY in conducting the Engagement; however, the scope of the Engagement and this Report do not include an assessment of the reasonableness of those or any other forecasts.
- 1.5 EY's assessment of the status of implementation of the Recommendations is as follows:

Recommendation 1: *"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"*

- ▶ EY observed substantial progress against this recommendation.
- ▶ Risks managed by the Project Team are quantified in terms of contingency allowances and are incorporated into the June 2017 Forecast. The Project Team does not systematically perform monthly stochastic modelling of the construction schedule.
- ▶ Nalcor Energy (Nalcor) has identified three strategic risks for which it does not hold contingency (Additional Strategic Risks). The Additional Strategic Risks are not included in the June 2017 Forecast, but have been identified and communicated to the Provincial Government, and are as follows:
  1. Significant protest unrest
  2. Vegetation and soil removal
  3. Other unforeseen directives from government

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Recommendation 2: *"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"*

- ▶ EY observed substantial progress against this recommendation.
- ▶ The Project has changed its confidence level for cost estimates from P(50) to a more conservative P(75).



## Muskat Falls Project

### Assessment of Implementation of recommendations

- ▶ The Project Team identifies and quantifies risks, including strategic risks (other than Excluded Strategic Risks), and communicates them to the OC.

Recommendation 3: *“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”*

- ▶ EY observed a greater degree of diligence in the Project Team’s assessment of risk and the inclusion of risk contingencies in monthly forecasts.
- ▶ The Project does not formally review Project contingency on a quarterly basis.

Recommendation 4: *“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”*

- ▶ EY observed substantial progress against this recommendation.
- ▶ Risks managed by the Project Team are quantified in terms of contingency allowances and are incorporated into the June 2017 Forecast.
- ▶ Nalcor has identified certain [Additional Strategic Risks](#), which are not included in the June 2017 Forecast, but have been identified and communicated to the [Provincial Government](#).

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Recommendation 5: *“Project governance and independent oversight should be re-evaluated by the Provincial Government and strengthened at the Project, Nalcor Board and Provincial Government levels”*

- ▶ EY observed strengthening of Project governance and independent oversight at the Project, Nalcor Board and Provincial Government levels however, opportunities exist to further strengthen Project governance [by fully implementing an Independent Assurance function](#).

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Recommendation 6: *“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”*

- ▶ EY observed improvements in the quality of project reporting at the Project Team, Nalcor Board and OC levels; however, opportunities exist to further enhance Project reporting [by standardizing reporting provided by the Project to the OC and the Nalcor Board](#). [\[NTD: I have not included the OC and Board reporting to the Prov Gov\]](#)

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1.6 EY observed the following material changes in the Project since the issuance of the Interim Report. These changes have reduced the Project’s risk profile and provide the opportunity for the Project to achieve an improved level of certainty regarding cost and schedule to complete:

- ▶ New appointments to the OC in April 2017 and revised methods of reporting in the public domain. This has improved the effectiveness of the OC;
- ▶ New Nalcor Board of Directors appointed in January 2017 following an interim Board of Directors from June 2016 to January 2017;



## Muskrat Falls Project

### Assessment of Implementation of recommendations

- ▶ New Nalcor Chief Executive Officer appointed in June 2016 implemented the following changes at the Project Team level:
  - ▶ June 2016 bifurcation of the Project into separate and distinct work streams, i.e., Generation and Transmission, each of which has its own dedicated leadership and project resources. This has had a positive impact on the management of the Project; however, it requires close day-to-day coordination and dialogue between respective teams and their executive sponsors.
  - ▶ Additional staff have been added to the Project Controls group. This has improved the quality, format and content of management reporting.
  - ▶ The Project Team provides a new suite of monthly/quarterly reports to the Nalcor executive team, Nalcor Board and the OC.
- ▶ June 2017 re-baselining of cost and schedule forecasts through an updated QRA process. This has re-quantified the Project risk universe and identified Excluded Strategic Risks. This has informed the risk management process and decision making framework within the Project Team; and
- ▶ Progress has been made resolving commercial disputes with major contractors.

#### 1.7 The Project retains a high level of inherent risk for the following reasons:

- ▶ The Project is currently in a period with an expected high planned spend rate;
- ▶ The Project is approaching a period of intensive activity involving many contractors and interfaces between them;
- ▶ The Project is initiating a series of complex and significant activities, e.g., Roller Compacted Concrete North Dam, Balance of Plant installation, Turbine and Generator installation, and HVdc commissioning; and
- ▶ The winter season is approaching.

#### 1.8 In addition to the matters described above, EY observed the following:

##### Project controls

- ▶ Once a specific risk is completely eliminated, any associated unused contingency is assumed to form part of a general contingency for the use of the Project, rather than being retired. This may result in an overstatement of forecasted costs for the Project.

##### Governance and oversight

- ▶ The OC and the Nalcor Board each have their own terms of reference, receive bespoke reporting directly from the Project and have their own meeting schedule with the Project Team and Provincial Government. This is inefficient and could result in inconsistent or untimely communications to/from the Provincial Government.
- ▶ Independent assurance activities and related reporting to the Provincial Government related to cost, schedule and risks of the Project require strengthening.



## Muskat Falls Project

### Assessment of Implementation of recommendations

- 1.9 The Project, Nalcor Board and Provincial Government should maintain a relentless focus on risk management given the Project's high level of inherent risk. In that regard, EY recommends the following:

#### Project controls

- 1) The Provincial Government and Nalcor should define a process for when and how the Project Team will retire unneeded contingency from cost forecasts.
- 2) The Project Team should include stochastic schedule risk modelling in the monthly IPS report to better inform decisions regarding schedule float management.
- 3) The Project Team should formally document the results of its monthly internal risk modelling analyses on a quarterly basis. In addition, a QRA process involving Westney and other resources should be implemented on a biannual basis and following any event that materially changes the risk profile for the Project.

#### Governance and oversight

- 4) The Provincial Government and Nalcor should review and standardize reporting from the Project to the OC and the Nalcor Board, as well as from the OC and the Nalcor Board to the Provincial Government.
- 5) The Provincial Government, through the OC, should implement a full independent assurance function that will conduct regular additional project assurance activities related to cost, schedule and associated risks.



## Muskrat Falls Project

### Assessment of Implementation of recommendations

## 2 Objective and scope

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- 2.1** The objective of this Engagement is to assist the Province's OC for the Project in assessing the status of the implementation of the Recommendations.
- 2.2** The scope of the Engagement is limited to an assessment of the status of the implementation of the Recommendations. This Engagement does not provide an opinion on the reasonableness of the most recent cost and schedule forecasts for the Project, any cost and schedule baseline contained in AFEs issued by Nalcor, or any previous cost and schedule updates.
- 2.3** The Recommendations contained in paragraph 1.6 of 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;
  - 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;
  - 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.



## Muskat Falls Project

### Assessment of Implementation of recommendations

- 2.4** At the commencement of the Engagement, the Project Team advised EY that it was in the process of preparing Project reporting materials for the June 2017 reporting period. These materials contain the Generation AFE5 and Transmission AFE4 re-baselines. Draft versions of the June 2017 Project status report were made available to EY and were given due consideration by EY in conducting the Engagement; however, the scope of the Engagement and this Report do not include an assessment of the reasonableness of those or any other forecasts.
- 2.5** The Project Team and the OC informed EY that changes were being made in the risk analysis and reporting processes used by both Nalcor and the OC. As a result, the Engagement assessed processes and practices as they were being implemented up to the end of the Engagement fieldwork on 20 July 2017.

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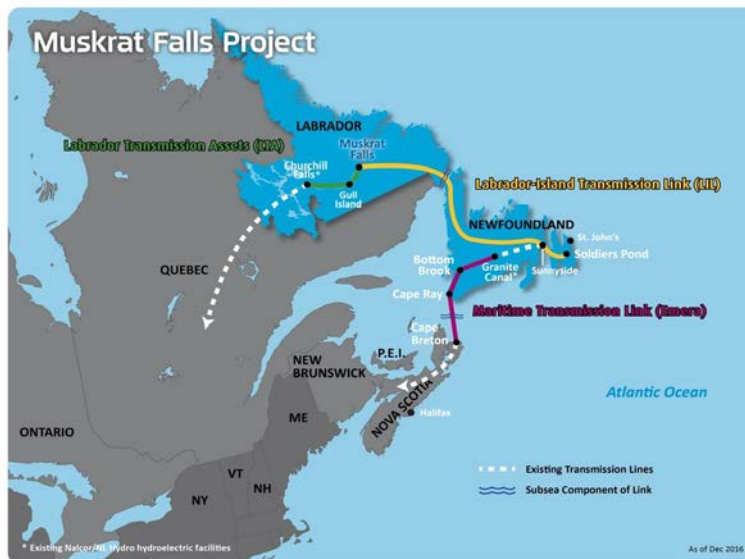
## Muskrat Falls Project

### Assessment of Implementation of recommendations

## 3 Project status

### Scope

- 3.1 The Project is intended to help meet the Province of Newfoundland and Labrador’s long-term energy needs by providing clean, renewable energy for future generations. The Project covers the design, procurement, manufacture and construction of the following three scopes of work:
- ▶ Labrador Transmission Assets (LTA): a 315-kV High-Voltage Alternating Current (HVac) transmission interconnection from Muskrat Falls to Churchill Falls and HVac switchyards;
  - ▶ Labrador Island Transmission Link (LITL): includes a ±350-kV High-Voltage Direct Current (HVdc) transmission connection from Muskrat Falls to Soldiers Pond (over 1,050 km of transmission line), HVac to HVdc converter stations, shore electrodes, and 30 km of 350-kV HVdc cable crossing at the Strait of Belle Isle; and
  - ▶ Muskrat Falls Generation (MFG) Facility: includes 4 x 206-MW (totalling 824-MW) turbine/generators, dams/spillways, river diversion, North Spur stabilization, reservoir, access roads and buildings.



- 3.2 The scope of the Project has remained consistent throughout the delivery phase. There have been no major changes in scope since the issuance of the Interim Report in April 2016.

### Progress to date



## Muskrat Falls Project

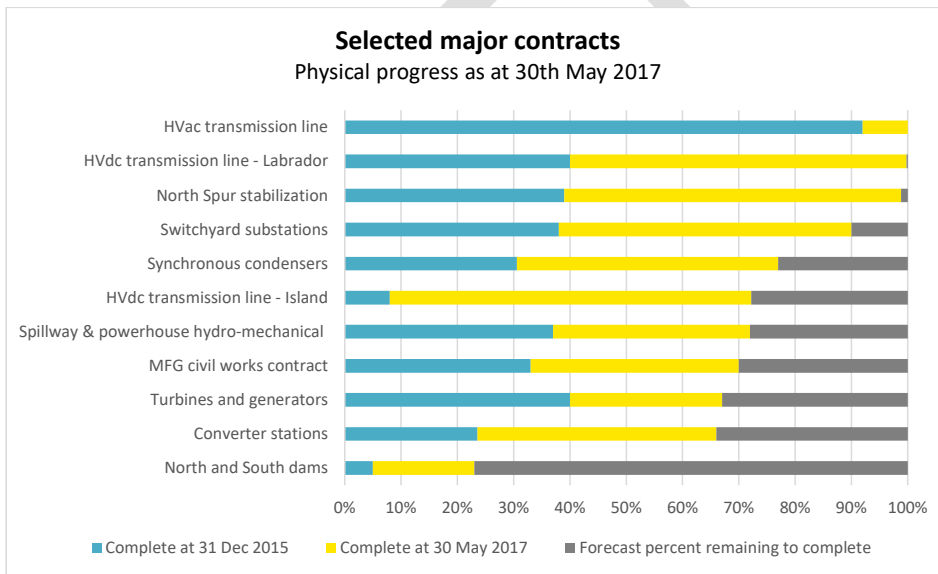
### Assessment of Implementation of recommendations

3.3 The Project Team does not report an overall progress percentage encompassing engineering/procurement/construction and commissioning. The main progress metric used is “overall construction/commissioning progress” which the Project Team reported as 78% for the June 2017 reporting cycle as set out in the table below.

	MFG AFE5	LITL AFE4	LTA AFE4	Muskrat Falls Project
Planned Progress	68.1%	87.1%	99.8%	79.5%
Earned Progress	68.7%	83.8%	95.8%	78.0%

*As at June 2017 Reporting Period*

3.4 The Project Team reports that the Project is currently progressing at a rate of approximately 2.5% – 3.0% per month and expects this to taper off slightly after December 2017, when the bulk of the powerhouse and intake structure scopes are forecast to be largely completed.



#### Current forecast to complete – cost

3.5 In June 2017, the Project adjusted the approved budget for both the Generation (AFE5) and Transmission (AFE4) sub-projects and increased the final forecast cost (FFC) upwards to \$10,117m. This is an increase of \$720m from the previous planned costs issued in December 2016, i.e., Generation AFE4 and Transmission AFE3. These figures exclude financing costs.



## Muskrat Falls Project

### Assessment of Implementation of recommendations

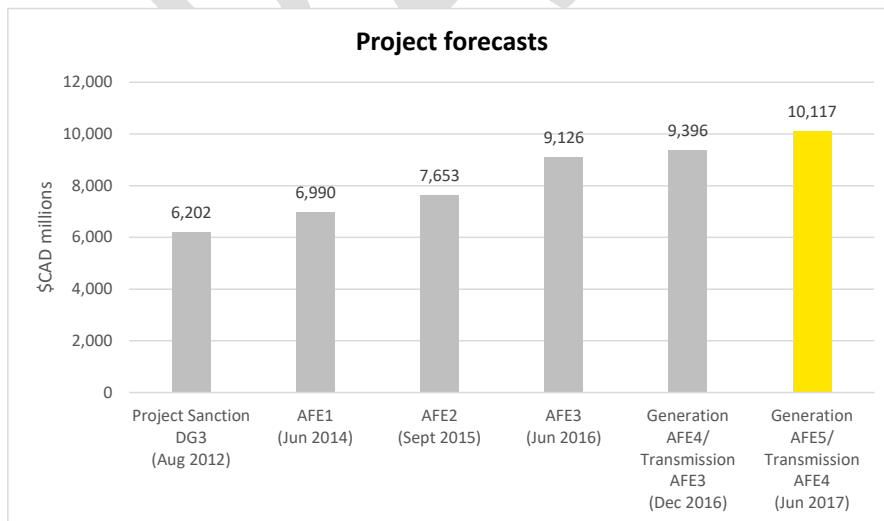
Bifurcated Projects	Generation AFE5	Transmission AFE4	Muskrat Falls Project
June 17 FFC	5,500m	4,617m	10,117m

Component	MFG AFE5	LITL AFE4	LTA AFE4	Muskrat Falls Project
June 17 FFC	5,500m	3,723m	893m	10,117m

*As at June 2017 Reporting Period*

- 3.6 Nalcor reports that the Generation AFE5 and Transmission AFE4 costs increased for the following reasons:
- Inclusion of the remaining value to settle commercial issues with Astaldi resulting from the signing of the completion agreement in February 2017;
  - Settlement of claims with the overland transmission contractor due to site access issues and geotechnical conditions in Labrador being more challenging than planned;
  - The financial consequences arising from protests and site shutdown during October and November 2016;
  - The revised estimate for the Balance of Plant contract; and
  - Additional and unplanned work largely related to camp expansion and cofferdam and transmission conductor issues.

3.7 Nalcor has advised that the evolution of the Project's FFC is as follows:





**Muskrat Falls Project**

**Assessment of Implementation of recommendations**

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## Muskrat Falls Project

### Assessment of Implementation of recommendations

#### Current forecast to complete – schedule

3.8 The Project Team is currently reporting the following key milestones for the Project:

Milestone description	Date at project sanction (DG3)	Re-baseline planned June 2016 (Generation AFE4/ Transmission AFE3)	Re-baseline planned June 2017 (Generation AFE5/ Transmission AFE4)	Forecast June 2017
Project sanction	17 Dec 2012	17 Dec 2012	17 Dec 2012	17 Dec 2012
<i>Major transmission milestones</i>				
Ready for power transmission (LTA)	31 May 2017	31 Oct 2017	31 Dec 2018	11 Dec 2018
1 <sup>st</sup> power transfer (Pole 1)	N/A	N/A	01 Jul 2018	21 Mar 2018
<i>Major generation milestones</i>				
First power from Muskrat Falls	30 Dec 2017	02 Aug 2019	02 Nov 2019	To be confirmed
Full power from Muskrat Falls	22 May 2018	14 May 2020	14 Aug 2020	To be confirmed

From Project Controls Monthly Review Package, June 2017, "Schedule F" Report

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## 4 Approach

- 4.1 EY sought written and oral information from Nalcor and other stakeholders to inform our assessment of the status of the implementation of the Recommendations. Primary sources of information were as follows:
- ▶ The suite of documents provided by Nalcor and used by EY to prepare the Interim Report;
  - ▶ An updated suite of documents provided by Nalcor, current as at the June 2017 reporting cycle;
  - ▶ Interviews with the Project's senior project personnel and delivery team representatives; and
  - ▶ Interviews with Nalcor executives, members of the Nalcor Board, members of the OC and representatives of the Provincial Government.
- 4.2 The Engagement has been based on data and information provided by Nalcor, members of the Nalcor Board, members of the OC and representatives of the Provincial Government. EY has not sought to independently verify the data and information received. EY had direct access to the Project Team; EY did not have direct access to contractors.
- 4.3 EY toured the Project site at Muskrat Falls during the course of the Engagement; however, EY did not conduct any engineering review, physical inspection or validation of construction process.





## 5 General observations

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- 5.1 EY noted improvement in project controls and processes since the issuance of the Interim Report largely as a result of the bifurcation, the change and increase in management personnel, the updated QRA and the outcomes of certain commercial renegotiations.
- 5.2 The Project retains an expected high level of inherent risk for the following reasons:
- ▶ The Project is currently in a period with an expected high planned spend rate;
  - ▶ The Project is approaching a period of intensive activity involving many contractors and interfaces between them;
  - ▶ The Project is initiating a series of complex and significant activities, e.g., Roller Compacted Concrete North Dam, Balance of Plant installation, Turbine and Generator installation, and HVdc commissioning; and
  - ▶ The winter season is approaching.
- 5.3 The Nalcor Board and the Provincial Government should maintain a relentless focus on risk management given the Project's high level of inherent risk.



## Muskrat Falls Project

### Assessment of Implementation of recommendations

## 6 Implementation of Recommendations 1, 2, 3 & 4

### 6.1 Recommendations 1, 2, 3 & 4 address forecasting, risk and contingency management:

- ▶ Recommendation 1: *“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”*
- ▶ Recommendation 2: *“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”*
- ▶ Recommendation 3: *“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”*
- ▶ Recommendation 4: *“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”*

6.2 Prior to conducting its June 2017 reporting cycle, the Project Team undertook an exercise to capture all project risks, including strategic risk, to support a fully risk-adjusted cost and schedule forecast. This exercise addressed identification, measurement and mitigation and has informed cost contingency and float values used in the current cost and schedule forecast, with some defined exclusions.

6.3 The Project’s current cost and schedule forecast is measured against the re-baseline completed in June 2017 (Generation AFE5 and Transmission AFE4) and forms the basis of the revised plan and forecast figures published in the June 2017 reporting cycle. The Project Team advised that this re-baseline included a complete bottom-up QRA by work package, which was facilitated by Nalcor’s specialist risk consultant (Westney).

6.4 The Project now forecasts the impact of risks using Monte Carlo analysis at a P(75) confidence level. This level has been adopted since the issuance of the Interim Report, taking a more conservative view than the P(50) confidence level used in risk modelling for previous AFE updates.



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6.5 The Project Team identified the categories of cost contingency shown in the table below:

Nalcor/Westney Risk Categorization	EY Risk Categorization	Description
<b>Tactical</b>	Tactical (Package Level)	Specific risks identified at the work package level; specific contingency held against a risk within a work package
	Tactical (Project Level)	Specific risks applicable to the whole project; specific contingency held against a risk at project level
<b>Strategic</b>	Strategic (Project Funded)	Risks that are largely out of the control of the project; general contingency held against risk at project level
	Excluded Strategic Risks (Not Project Funded)	Risks that Nalcor has no ability to influence; and no contingency is held at project level: <ul style="list-style-type: none"> <li>▶ Significant protest unrest</li> <li>▶ Vegetation and soil removal</li> <li>▶ Other unforeseen directives from government</li> </ul>

6.6 The Project Team advised that the sufficiency of the Project’s cost and schedule contingency is reviewed at different levels:

- ▶ The QRA model for each sub-project covering cost and schedule contingency is re-run annually, or where there is a major change to the risk profile;
- ▶ The Transmission Project team uses an abbreviated version of the QRA model in its monthly reviews to support its determination of appropriateness of cost contingency and to support monthly forecasting;
- ▶ The Generation Project team supports its determination of appropriateness of cost contingency via internal control reporting and discussion and evaluation at monthly project controls meetings of the cost impact of risks. It uses the output of that discussion to inform its monthly forecasting process; and
- ▶ Both the Generation Project team and the Transmission Project team determine the appropriateness of schedule float via internal control reporting and discussion and evaluation at their monthly project controls meetings.

6.7 Excluded Strategic Risks, which are not included in the \$10,117m FFC, are as follows:

- ▶ Significant project unrest (e.g., further protests);
- ▶ Vegetation and soil removal from the reservoir (to mitigate the perceived risk of methyl mercury); and
- ▶ Other unknown government directives.

6.8 The Project Team advised that, following the most recent re-baseline, the QRA risk model will be updated:

- ▶ Annually after the March 2017 update; and



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- ▶ Whenever there is an event causing a major shift in the risk profile of the Project.

- 6.9** The Project Team demonstrated for EY the monthly cost and schedule float forecast review processes that are followed by the Generation Project and Transmission Project teams. EY found that the processes demonstrated are consistent with good practice around active review, management and reporting of risks.
- 6.10** The Project Team advised EY that the Project's plans and processes for project controls management and risk management have changed only minimally since issuance of the Interim Report. They also advised of substantial change in controls at a level of detail beneath project plan level, such as report structures and content and quality of inputs to meetings.
- 6.11** The Project Team advised that the Project does not have a management reserve to deal with unknown risk or risks categorized as Excluded Strategic Risks.

#### Observations specific to Recommendation 1

- 6.12** While the Project has not materially amended its project controls process documents, the performance of this function appears to have improved. The quality of project performance information gathered, reviewed and reported in the re-baseline and monthly reporting working sessions is consistent with good practice. Project performance monitoring, from a schedule perspective, would be enhanced by inclusion of stochastic schedule risk modelling in the monthly integrated project schedule.
- 6.13** EY considers the Project to be reporting risk-adjusted cost and schedule information consistent with the Project's known risk universe existing at a given point in time. EY noted certain minor exceptions related to the timing of reporting changes to forecasts resulting from on-going commercial negotiations.
- 6.14** EY observed that the additional management bandwidth available to the Project since the bifurcation appears to have improved the depth and rigour of the project controls function.



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#### Observations specific to Recommendation 2

- 6.15** The QRA process now considers 100% of the identified risk “universe” for the Project, including strategic risk, and has specifically identified the exclusions, i.e., the Excluded Strategic Risks. The confidence level has been raised from P(50) to P(75).
- 6.16** The overall risk profile of the Project has been reduced as a result of the following:
- ▶ Construction progress has narrowed the risk profile of activities or eliminated risks entirely;
  - ▶ Project bifurcation has enabled additional resources to be applied to the management of risk;
  - ▶ The completion of an updated risk review, which provided additional context against which to better quantify risks; and
  - ▶ On-going progress in settling commercial disputes with significant contractors.
- 6.17** As identified in section 6.5, there are a number of Excluded Strategic Risks, which are not included in the Project's contingency and not covered by Project funding.

#### Observations specific to Recommendation 3

- 6.18** EY has observed that contingency reporting and control documentation has improved significantly since the issuance of the Interim Report because the Project Team now takes a broader view of project risks, with only Excluded Strategic Risks not provided for in the cost forecast. The scoping, usage and forecast drawdown of cost contingency is more visible.
- 6.19** EY observed that the level of rigour around project cost risk analysis has improved, but documentation of schedule float analysis could be improved. The Project Team advised that analysis of schedule float is conducted at the subcontractor level; however, the level of analysis conducted by the Project Controls department requires further clarity.

#### Observations specific to Recommendation 4

- 6.20** Nalcor has separated the Project contingency into an amount managed within the relevant AFE by the Project Team and has clearly identified Excluded Strategic Risks, which are not covered by the AFE. This has been communicated to the Nalcor Board and the OC.



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## 7 Implementation of Recommendation 5

7.1 Recommendation 5 addresses project governance:

- ▶ Recommendation 5: *“Project governance and independent oversight should be re-evaluated by the Provincial Government and strengthened at the Project, Nalcor Board and Provincial Government levels”*

7.2 Since the issuance of the Interim Report, the Provincial Government, Nalcor and the Project Team have all implemented organizational and governance changes. Notably:

- ▶ The Provincial Government appointed a new CEO of Nalcor in June 2016;
- ▶ The Provincial Government announced a permanent 11 member Board of Directors of Nalcor in November 2016, replacing an interim Board that served Nalcor from April 2016 until that time;
- ▶ The Provincial Government appointed four additional members to the OC in April 2017, all of whom are independent of the Provincial Government;
- ▶ Nalcor bifurcated the Project in June 2016 into separate and distinct sub-projects, i.e., the Generation Project and the Transmission Project, each of which has its own dedicated leadership and project resources. This has had a positive impact on the management of the Project; however, it requires close day-to-day coordination and dialogue between respective teams and their executive sponsors;
- ▶ Nalcor has reinforced the Transmission Project team with additional project executives, subject matter experts and new management; and
- ▶ Nalcor advised it has increased the number of staff employed in the Project Controls group from approximately 44 to approximately 60 (i.e., 36%).

7.3 The Project Team advised that project processes have remained largely unchanged, with the following notable exceptions:

- ▶ The content and presentation of performance reporting has improved significantly;
- ▶ The quality of engagement and accountability by project management personnel and project controls personnel with respect to monthly forecast reviews has improved; and
- ▶ More robust adherence to some areas of project controls processes because additional resources are available within the project controls function.

7.4 Nalcor has a complicated corporate governance structure due to the breadth of its operations. Nalcor has six lines of business, including the Project, which has seven wholly owned subsidiary companies governed by boards of directors with a total of 26 members. The Project comprises the following entities:

- ▶ Lower Churchill Management Corporation (LCMC), provides management services to the Project
- ▶ Muskrat Falls Corporation (MF Corp)
- ▶ Labrador Transmission Corporation (Lab Transco)





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- ▶ Labrador Island Link Limited Partnership (LIL LP), owned 75% by LIL Holdco and 25% by an Emera affiliate
  - ▶ Labrador Island Link Limited Holding Corporation (LIL Holdco)
  - ▶ Labrador Island Link General Partner Corporation (LIL GP)
  - ▶ Labrador Island Link Operating Corporation (LIL Opco)
  - ▶ LIL Construction Project Trust (Project Trust), a structured entity created for the purpose of obtaining financing and on-lending the proceeds to LIL LP
- 7.5 The subsidiary entities comprising the Project are MF Corp, Lab Transco and LIL LP. Each Project entity has its own board of directors, including independent directors, and three to four of each entity's directors also serve on the Nalcor Board.
- 7.6 Since the new CEO and new Nalcor Board have been in place, Nalcor has instituted joint meetings for the board members of all entities. Nalcor advised that approximately 80% of meeting time is allocated for collective review of common information, and the remaining 20% of the time is allocated to entity-specific business. This approach allows the interdependencies between entities to be addressed in real time and significantly reduces the demands on the Project Team related to preparing information for and attending board meetings.
- 7.7 The OC's terms of reference are to provide reliable and transparent oversight on the following key issues associated with the Project and to establish a direct and effective communication channel to Cabinet so that:
- ▶ The Project cost and schedule is well managed;
  - ▶ The Project is meeting the cost and schedule objectives; and
  - ▶ The cost and schedule risks are being reasonably anticipated and managed.
- 7.8 The independent assurance function that exists to date for the Project has been limited to EY's procedures underlying its report of 29 October 2015 titled "Review of Muskrat Falls Project Cost and Schedule Management Processes and Controls", the Interim Report and this Report (collectively, EY Reports). There has been no other independent validation and verification of reported information, other than the work completed for the Federal Government by the Independent Engineer. Independent validation and verification is a good practice for major capital projects.
- 7.9 Additional activities related to cost, schedule and associated risks would better enable the OC to fulfill its mandate. The results of any such independent assurance activities should be reported to the Provincial Government.
- 7.10 EY compared the current state of the Project's governance against leading practices for organizations conducting major capital projects. The results of this comparison and including suggested governance changes are outlined below.
- Current governance model**
- 7.11 EY identified the governance structure for the Project and conducted an analysis of the lines of reporting within that structure. The output of this analysis is the current governance model (CGM) attached hereto as Appendix A.
- 7.12 The CGM chart demonstrates the following:



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- ▶ Both the Nalcor Board and the OC are responsible for reporting Project information to the Provincial Government; and
- ▶ Sufficient and appropriate independent verification of information reported to the Provincial Government by the Project Team is not conducted on a regular periodic basis (e.g., monthly/quarterly). Such independent verification to date has consisted solely of EY's procedures underlying the EY Reports as reflected by the dotted green line in the CGM chart.

7.13 EY observed that the Project Team's approach to reporting to the OC in recent months has been more regular and consistent and provided a clearer focus on important matters. Project Team members noted a more meaningful and intensive level of questioning from the OC since the appointment of the OC's independent members.

#### Leading practice governance model

7.14 An example of a leading practice governance model (LPGM) for organizations undertaking major capital projects, as EY believes it would apply to the Provincial Government and Nalcor in relation to the Project, is attached hereto as Appendix B.

7.15 Key differences between the LPGM and the CGM structures include:

- ▶ LPGM has a dedicated Capital Projects Committee of the Board;
- ▶ LPGM independent assurance contemplates that sufficient and appropriate verification is provided on a regular basis (e.g., monthly/quarterly) by an qualified independent third party in respect of project reporting from the Project Team; and
- ▶ LPGM does not have a separate oversight committee.

7.16 Crown corporations generally operate with a CEO and a board of directors in a manner similar to private sector organizations. Typically, the CEO will lead and manage the daily operations and report to the Crown corporation's board of directors on the corporation's performance. In turn, the chair and the board of directors are accountable to a Minister as the representative of the single shareholder and are responsible for the oversight of the corporation's business activities and other affairs. They have the responsibility to act in the best interests of the Crown corporation and to exercise due care and diligence.

7.17 Many organizations undertaking major capital projects delegate oversight of the projects to a capital projects sub-committee of the board of directors. Such a sub-committee would have terms of reference focused on project risks and their potential impact on the organization, and would, as good practice, be comprised of independent directors with knowledge and experience of similar capital projects development and delivery. It is unusual for a shareholder to strike a separate project oversight body that bypasses the board of directors and reports directly to the shareholder, as is the case with the Project.

#### Suggested changes to existing governance model

7.18 Given the current stage of the Project's life cycle, further significant and/or unnecessary changes to its governance structure may have negative implications for the Project. Nevertheless, the following changes should be implemented:



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- ▶ The OC and the Nalcor Board should better align the timing, format and content of their respective information requirements to minimize disruption to the Project Team; and
- ▶ The OC should implement a full independent assurance function. The function should perform independent verification procedures conducted by a qualified independent third party on a regular basis (e.g., monthly/quarterly) to better enable the OC to fulfill its mandate and meet the expectations of stakeholders. These procedures are discussed in more detail below.

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**7.19** Independent assurance is typically provided by a third party firm independent of the owner and the builder and having the requisite experience in major infrastructure projects. The key goal of the independent assurance function is to increase confidence in the validity and accuracy of reporting provided to the project owner and to the public on project progress.

Deleted: The suggested governance model (SGM) reflecting these changes is attached hereto as Appendix C. ¶

**7.20** With respect to the Project, the independent assurance function is not to assist or strengthen Nalcor in its management of the Project, but to strengthen the OC's ability to fulfill its mandate. Key activities of the independent assurance function in the context of the Project should include:

- ▶ Assist in the coordination of standardized reporting from the Project to the OC and the Nalcor Board and from those entities to the Provincial Government;
- ▶ Regular independent reviews of project progress, status and risk reporting;
- ▶ Provide assurance of the integrity of critical project processes including ongoing implementation of the recommendations from project review reports;
- ▶ Assist with identification of key project issues, review associated action plans developed by project leadership and provide assurance of the implementation of these action plans;
- ▶ Independent reviews of critical risks and issues to provide a dependable source of information free of biases and filters;
- ▶ Independent review of the reasonableness of any significant update to the Project cost and schedule forecast; and
- ▶ Production of independent reports on a regular basis to communicate the results of the independent assurance activities to the OC, the Provincial Government and the public.



## Muskrat Falls Project

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## 8 Implementation of Recommendation 6

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- 8.1 Recommendation 6 addresses project reporting:
- ▶ Recommendation 6: *“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”*
- 8.2 The Project Team provided a selection of key project reports produced by major subcontractors and Nalcor for internal project use and for reporting to project oversight entities. There are currently ten different reports each with different iterations depending on the intended recipient.
- 8.3 The Project Team advised that an improved level of data collection and analysis of performance data is being conducted by the Project Controls team, e.g., the re-establishment of the progress baseline document and the use of schedule analytics tools and contingency drawdown curves.
- 8.4 EY identified the reports being produced by the Project Controls group and mapped the monthly timeline for delivery of these reports to intended recipients.
- 8.5 EY found improvement in the control and oversight of project performance data and related reporting by the Project Controls team.
- 8.6 EY found that risks are more clearly communicated to senior project leaders and Project stakeholders than prior to the issuance of the Interim Report. Despite the improvements in reporting, issues remain in the following areas:
- ▶ The timing of the delivery of reports can depend on the schedule upon which the stakeholder group meets. Sometimes the timing of delivery does not serve the needs of the stakeholder group. The Nalcor Board and the OC, in particular, have sometimes received information up to two months out of date;
  - ▶ The level of detail provided in some reports may be excessive for an executive level audience; and
  - ▶ The Project Team has progressively reduced the number of unique reports sourced from common data, yet a high number of unique reports remain.



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- 8.7 The Provincial Government and Nalcor each require certain information related to the Project. Coordination and rationalization of the timing and content of the required reporting would reduce the administrative burden on the Project Team and improve the consistency and usefulness of information delivered to the various Project stakeholders.

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## Muskat Falls Project

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## 9 Further Recommendations

- 9.1 The Project, Nalcor Board and the Provincial Government should maintain a relentless focus on risk management given the Project's high level of inherent risk. In that regard, EY recommends the following:

### Project controls

1. The Provincial Government and Nalcor should define a process for when and how the Project Team will retire unneeded contingency from cost forecasts.
2. The Project Team should include stochastic schedule risk modelling in the monthly IPS report to better inform decisions regarding schedule float management.
3. The Project Team should formally document its monthly internal risk modelling analyses on a quarterly basis. In addition, a QRA process involving Westney and other resources should be implemented on a biannual basis and following any event that materially changes the risk profile for the Project.

### Governance and oversight

4. The Provincial Government and Nalcor should review and standardize reporting from the Project to the OC and the Nalcor Board, as well as from the OC and the Nalcor Board to the Provincial Government.
5. The Provincial Government, through the OC, should implement a full independent assurance function that will conduct regular additional project assurance activities related to cost, schedule and associated risks.





## Muskrat Falls Project

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## Glossary of terms

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AFE – Authorization for Expenditure

Balance of Plant – supporting components and auxiliary systems required to deliver energy, other than the generating units

Bifurcation – a separation into two parts – the term used to describe the establishment by Nalcor of distinct management teams for the Generation and Transmission sub-projects, which was implemented in June 2016

Excluded Strategic Risks – specifically identified strategic risks that the Project does not manage and for which it does not hold contingency

FFC – Final Forecast Cost

HVac – High-Voltage Alternating Current

HVdc – High-Voltage Direct Current

kV – Kilovolt

LITL – Labrador Island Transmission Link

LTA – Labrador Transmission Assets

MFG – Muskrat Falls Generation

MW – Megawatt

P(50) and P(75) – Statistical confidence level of achieving cost and schedule forecasting

Project – Muskrat Falls Project

Project Team – the Nalcor project management team for the Project

QRA – Quantitative Risk Analysis

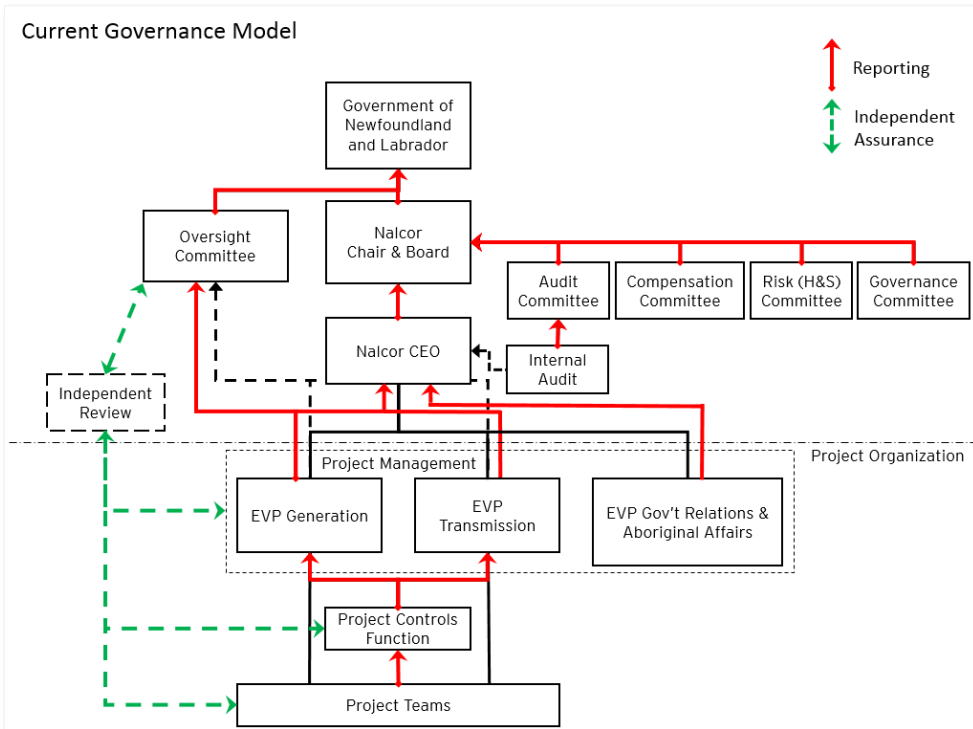
Westney – Westney Consulting Group, a third party hired by Nalcor to conduct project risk analysis



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## Appendix A

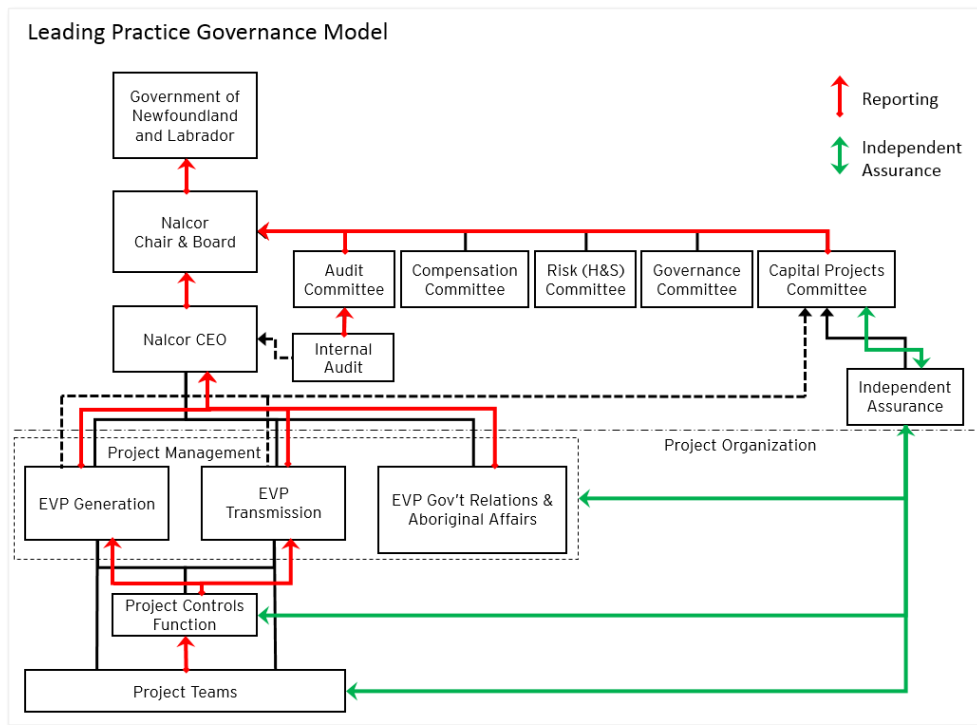




### Muskat Falls Project

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## Appendix B



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## Muskrat Falls Project

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EY | Assurance | Tax | Transactions | Advisory

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