

## Revised Capital Cost – Cost Growth

Project Summary

JK8

June 2014:	\$6,990M
Growth since AFE Rev 1:	<u>\$ 663M</u>
<b>Total Facilities Capital Cost Aug 2015:</b>	<b>\$ 7,653M</b>

	MF	LTA	LIL	Total
Market Conditions & Market Pressures	254	(2)	210	462
Reliability Improvements & Design Enhancements	9	18	93	120
Contractor Performance & Project Management Execution	51	30	0	81
<b>Total</b>	<b>314</b>	<b>46</b>	<b>303</b>	<b>663</b>

## Changes from DG3, June 2014 and AFE 2

Project Component	DG3 Cost Estimate	June 2014 Cost Estimate	AFE2 (August 2015) Cost Estimate
Muskrat Falls Hydroelectric Generating Facility	\$2,901,158	\$3,371,989	3,686
Labrador Transmission Assets	\$691,582	\$831,945	878
Labrador-Island Transmission Link	\$2,609,749	\$2,786,480	3,089
<b>Total</b>	<b>\$6,202,489</b>	<b>\$6,990,414</b>	<b>\$7,653</b>

**1. Market Conditions and Market Pressures:**

***Increase of \$523M with realized savings of \$61M for total increase of \$462M***

**1.1 Muskrat Falls Generation – \$254M***i. Contractor Bid/Work Cost Increases:*

Similar to other construction projects in NL, across the country and around the world, we are also experiencing changing market conditions in the extremely active construction industry and this is driving the capital costs of the project. We are experiencing a very competitive market and market pressures are increasing the price of the work and the contracts we require for the Muskrat Falls Project.

**Background Note:** The reason for the increase in the budget is that bidders perceived increased risk due to labour productivity and geotechnical conditions. Bidders foresee difficulty to work with the unions and to be able to manage their labour in a productive manner. As a result they increased their price to protect themselves. In addition to the

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labour productivity issue, sensitive geotechnical conditions due to the nature of the soil are of a concern especially for the North Spur contract. Bidders must be very careful as to how the work is executed and the bidders were aware of this and three out of five refused to bid; those that did bid accounted for the increased risk in their price.

The contracts expected to show budget shortfall are the following for \$237M:

- North Spur: \$55M
- North and South Dams: \$112M
- Mechanical and Electrical Auxiliaries: \$70M

### *ii. Contractor Productivity Costs:*

The productivity of the main concrete contractor at Muskrat Falls (Astaldi) indicates that it will be difficult to maintain the target price for this contract, hence it is expected that the contract price will increase to reach the LMAX contractual value: \$64M.

### *iii. Savings Realized:*

Reduction of the Contingency due to lower risk on the awarded contracts and decrease in the asset FTC value: (\$47M)

## **1.2 Labrador Transmission Assets – (\$2M)**

### *i. Contractor Bid/Work Cost Increases:*

**Background Note:** As a reaction to increased risks related to labour productivity in Labrador and concerns related to difficulties to work with the unions, contractors are increasing their manpower loading on site and their prices. There is an expected budget shortfall for the construction of the 735 kV line and the site services of the Alstom team for the construction of the MF & CF Switchyards for \$12M:

- 735 kV line: \$2M
- MF & CF Switchyards site services: \$10M

### *ii. Savings Realized:*

Reduction of the Contingency due to lower risk on the awarded contracts and decrease in the asset FTC value: (\$14M)

## **1.3 Labrador Island Transmission Link - \$210M**

### *i. Contractor Bid/Work Cost Increases:*

As a reaction to increased risks related to labour productivity in Labrador and concerns related to difficulties to work with the unions, Contractors are increasing their

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manpower loading on site. There is an expected budget shortfall for the site services of the Alstom team for the construction of the MF Converter station: \$8M.

Higher than estimated cost of the construction of the ac line on the Island: \$8M

Increase in Contingency mostly related to the remaining risk on the dc line: \$24M

*ii. Contractor Productivity Costs:*

The difficult and the unknown topography of the terrain forced to adopt a T&M type of contracts for the clearing and accesses of the dc line, creating substantial risks on the Owner. Severe weather conditions and contractors poor productivity due to unknown geotechnical constraints contributed to cost escalation. In the interior section of Labrador, and to offset schedule delays, Valard access building equipment and crews were required into the work fronts of blocks 4, 5 and 6 to help in the execution of the clearing and accesses scope. Winter roads were also added in addition to all season roads to advance clearing work fronts and installation of bridges. The cost increase is expected to reach: \$150 M.

*iii. Foreign Exchange:*

Realized Impact of Foreign Currency due to the recent turmoil in the markets, mainly on the Converter and the Synchronous Condenser contracts: \$20M

**2. Reliability Improvements & Design Enhancements:**

***Increase of \$124M with realized savings of \$4M for total increase of \$120M***

**2.1 Muskrat Falls Generation – \$9M***i. Design Enhancements:*

Changes in contracts for additional quantity of materials and scope changes:

- Civil works: additional concrete (overbreak), site conditions, construction power \$6M
- T&G contract: scope changes above original contract items \$3M

**2.2 Labrador Transmission Assets – \$18M***i. Design Enhancements for Geotechnical Conditions:*

Due to potential issues relating to the soil (clay, silt soils) in the Muskrat Falls and Churchill Falls switchyard areas, the layout of the switchyards were changed. In addition, grounding quantities were increased after the recent resistivity testing results: \$3M

To adapt to geotechnical conditions of the terrain encountered on the ac line, enhancements were made to the ac line to ensure reliability: \$19M

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- Increase in anchors length
- Use of micro piles for some towers
- Additional surveys
- Additional down lead clamps
- Additional quantities of imported backfill
- Relocation of some towers due to the use of GIS in MF and CF SY
- Change in types of foundations to accommodate soil conditions

### *ii. Realized Savings:*

The Gas Insulated Switchgear (GIS) technology was used instead of conventional Air-Insulated Switchgear (AIS) in the design of the AC substations in CF and MF. In proceeding with GIS alternative, the switchgear will be enclosed within its own building resulting in a smaller yard. As a result, there will be a reduction in the civil work requirements: (\$4M)

## 2.3 Labrador Island Transmission Link - \$93M

### *i. Design Enhancements for Geotechnical Conditions:*

To adapt to geotechnical conditions of the terrain encountered on the dc line, enhancement were made to the dc line to ensure reliability: \$15M

- Increase in anchors length
- Increase in tower weight
- Additional quantities of imported backfill
- Change in types of foundations to accommodate soil conditions

Due to potential issues relating to the soil (clay, silt soils) at Muskrat Falls and size constraints in Soldiers Pond, the layout of the Converter Stations in these areas was changed. In addition to that, grounding quantities were increased after the recent resistivity testing results: \$23M

As a result of the harmonic impedance study results, it was decided that more ac filters were required in the converter filters design: \$5M

### *ii. Reliability Improvements:*

In consideration of the extensive access requirements required for construction, due to a combination of remoteness and the size of the TL towers and hardware, all bridging, culverts and roads be left in place for post operational support, while incremental effort (e.g., abutment height) be made to have a long-term infrastructure for line survey and emergency repair: \$50M

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**3. Contractor Performance and Project Management Execution:**

***Increase of \$ 96M with realized savings of \$15M for total increase of \$81M***

**3.1 Muskrat Falls Generation – \$51M***i. Additional Contractor Management:*

Some contracts have required more direct project management from our team than others and there are additional costs associated with this work.

Increase in our cost due to additional contractor management above and beyond that which was reasonable assumed: \$22M

*ii. Additional Labour Related to Contractor Performance (additional services required):*

The total anticipated camp loading at MF site is higher than what was estimated, so an increase in the scope of services at MF site is required to accommodate the additional manpower requested by contractors to perform their scope of work: \$18M

Because work on the North Spur is planned to occur seasonally over three years, there are a limited number of options available to contractors to provide the medical and security services themselves. It was therefore decided to expand the contracts of these services in the existing MF site to cover the North Spur: \$3M

*iii. Other Cost/Misc:*

Increase in disputes final value: \$5M

- South side access road : \$2M
- Bulk excavation: \$3M

Increase in environmental costs due to additional Historic resources: \$3M

**3.2 Labrador Transmission Assets – \$30M***i. Additional Contractor Management:*

Increase in our cost due to additional contractor management above and beyond that which was reasonable assumed: \$45M

*ii. Savings Realized:*

Recoupment of the bond value related to the terminated contract of GWF for the clearing of the AC line: (\$15M)