From: gbennett@nalcorenergy.com
To: piwilson@mhi.ca
Cc: briancrawley@nalcorenergy.com
Subject: Fw: LCP Estimate Accuracy Analysis
Date: Tuesday, August 14, 2012 7:35:05 PM
Attachments: _.png
LCP Estimate Accuracy Analysis - June2012.pdf

Paul,

As discussed, attached is a copy of our risk review. Please note the document is proprietary and confidential.

Regards,

Gilbert

----- Forwarded by Gilbert Bennett/NLHydro on 2012-08-14 05:03 PM -----

From: Paul Harrington/NLHydro

To: Gilbert Bennett/NLHydro@NLHydro

Cc: Brian Crawley/NLHydro@NLHYDRO, Jason Kean/NLHydro@NLHydro

Date: 2012-08-06 03:01 PM

Subject: Fw: LCP Estimate Accuracy Analysis

Paul Harrington
Project Director
LC Mgmt & Support
Nalcor Energy - Lower Churchill Project
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f. **709 737-1985**
e. **PHarrington@nalcorenergy.com**
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----- Forwarded by Paul Harrington/NLHydro on 08/06/2012 05:30 PM -----

From: Jason Kean/NLHydro

To: Paul Harrington/NLHydro@NLHydro

Date: 06/25/2012 01:03 PM

Subject: Fw: LCP Estimate Accuracy Analysis

Jason R. Kean, P. Eng., MBA, PMP
Deputy Project Manager, Muskrat Falls & Labrador - Island Transmission Link (Consultant to Nalcor Energy)
Nalcor Energy - Lower Churchill Project
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You owe it to yourself, and your family, to make it home safely every day. What have you done today so that nobody gets hurt?

----- Forwarded by Jason Kean/NLHydro on 06/25/2012 01:03 PM -----

From: Jason Kean/NLHydro

To: Paul Harrington/NLHydro@NLHydro

Date: 06/19/2012 03:53 PM

Subject: Fw: LCP Estimate Accuracy Analysis

Paul,

This is the final report for the Estimate Accuracy review.

JK

Jason R. Kean, P. Eng., MBA, PMP
Deputy Project Manager, Muskrat Falls & Labrador - Island Transmission Link (Consultant to Nalcor Energy)
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You owe it to yourself, and your family, to make it home safely every day. What have you done today so that nobody gets hurt?

----- Forwarded by Jason Kean/NLHydro on 06/19/2012 03:52 PM -----

From: Jack Evans <j_evans@westney.com>

To: "JasonKean@nalcorenergy.com" <JasonKean@nalcorenergy.com>

Cc: Keith Dodson SBC <keith.dodson@[redacted]>, "mike@[redacted] <mike@[redacted]>, Eric Briel <e_briel@westney.com>, Justin Dahl <j_Dahl@westney.com>, Kelly Clifton <k_clifton@westney.com>

Date: 06/15/2012 10:45 AM

Subject: LCP Estimate Accuracy Analysis

Jason,

Attached, please find the Estimate Accuracy Analysis for the Lower Churchill Project; it is provided as both a PowerPoint and a pdf. Please let me know if you have any questions.

Thank you,

Jack

.....

Jack Evans
Westney Consulting Group
(713) 861-0800

LCP Estimate Accuracy Analysis - June2012.pdf

Westney Consulting Group, Inc.

Nalcor Energy

Estimate Accuracy Analysis for Lower Churchill Project

May 23 to June 4, 2012

Summary

An estimate accuracy analysis was performed for the Lower Churchill Project. This involved select interviews with knowledgeable project team personnel, a review of the estimate, and a Tactical Risk Assessment on the estimate. For the Tactical Risk Assessment, project team members developed Best and Worst cases for each of the estimate items considering all identified risks around the estimate. The Best and Worst case values were used to develop probability distributions consistent with each item's risk profile. A Monte Carlo simulation was then performed using the PRIMS™ model and Crystal Ball software.

The Tactical Risk evaluation was based on the current adjusted estimate of $5,473 million (excluding the contingency). This "Base Estimate" is stated in January 2012 Canadian dollars.

The scope for the project is well defined and represents design development consistent with project sanction. Considerations, such as likely geotechnical conditions and quantity variations due to further design development, were quantified based on the experience of the project team and used as a basis for assessing the possible outcomes.

The estimate and quantification are consistent with the requirements of project sanction. In many cases, pricing was based on actual bids and budgetary quotes. "Check" estimates were developed by industry experts for key areas, including the Muskrat Falls powerhouse and dam works. Other pricing was benchmarked against representative projects. The effects of weather, labour/skills availability, and supervision were also considered and/or benchmarked. Overall, this project's degree of design development, definition, and methodology is consistent with an AACEI Class 2 estimate.

The estimate, plus an amount to reach the P50 on the results curve, should represent the cost at which the project can be executed according to the plan exclusive of external uncertainties.

A P50 contingency is $368 million which equates to 7% of the estimate.

Objective of the Assessment

The objective of the assessment was to determine the probabilistic accuracy associated with the base estimate for:

1. Muskrat Falls Generation Facility (MF)
2. Labrador - Island Transmission Link (LITL)
3. Labrador Transmission Assets (LTA)

Estimate accuracy is an indication of the degree to which the final cost outcome may vary from the estimated cost. These determinations are made through the application of risk analysis techniques.

Basis of Assessment

Project Components

1. Muskrat Falls 824 MW Generation Facility
2. LITL – 350 kV HVdc Transmission (Muskrat Falls to Soldier's Pond)
3. LTA – 315 kV HVac Transmission (Muskrat Falls to Churchill Falls)

Cost Estimates*

1. Muskrat Falls Generation Facility: $2,512 million
2. Labrador - Island Transmission Link: $2,360 million
3. Labrador Transmission Assets: $601 million

*Cost estimates are in January 2012 Canadian dollars and do not include any contingency.

Current Project Schedule

1. LTA Ready for Power Delivery: May-2016
2. LITL Ready for Power Delivery: Jun-2017
3. First Power: Jul-2017
4. Full Commercial Power: Dec-2017

Westney Risk Resolution® Process - Tactical Risk Assessment

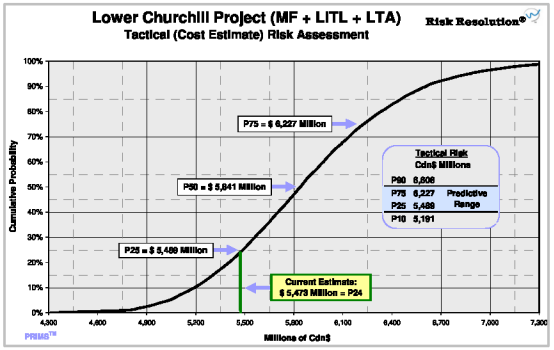
Discovery

- Review project documents
- Interview key knowledge holders
- Analyze current cost forecast
- Analyze current schedule
- Analyze current progress system
- Use heuristic metrics to identify gaps in current measures
- Analyze gaps and confirm
- Determine key dependencies in schedule
- Develop Time Risk Model
- Determine and quantify work remaining
- Sarbanes-Oxley Compliant

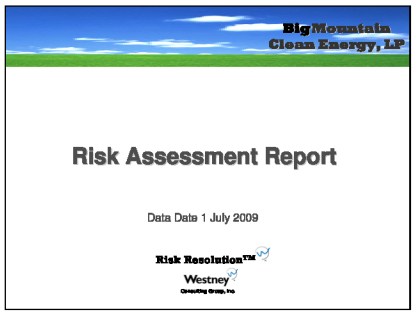
Assessment

- Assess risks around current forecast
  - Tactical risks are typically related to project definition and contractor performance, and managed by the project team
  - Excludes exposure from strategic risks (outside the control of the project team)
- Calculate realistic level of cost contingency, consistent with project-level/ tactical risks

Tactical Risk Assessment



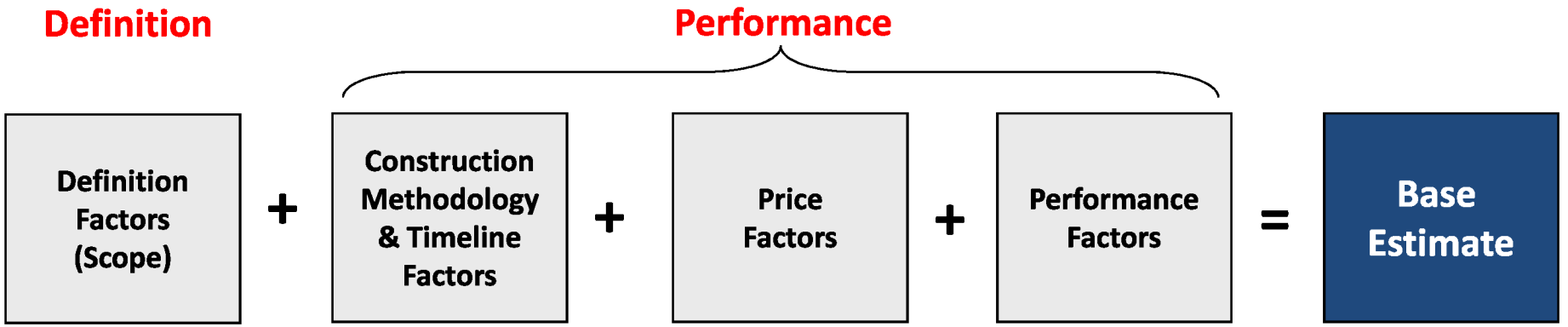
Report and Analysis



LCP Tactical Risk Assessment

- Relevant risk information was used from LCP risk registers, which are maintained as part of Nalcor's project risk management process
- Impact of key risk events was then quantified using Nalcor's Estimate Uncertainty Framework, which focuses on definition and performance risks

Estimate Uncertainty Framework*



*Detailed Estimate Uncertainty Framework shown in *Supporting Materials*

Estimate Structure

The estimate for the Lower Churchill Project was divided into three major sub-projects:

1. ***Muskrat Falls Generation Facility (MF)***
2. ***Labrador - Island Transmission Link (LITL)***
3. ***Labrador Transmission Assets (LTA)***

General Project Distributable Costs were also identified and split among the three sub-projects for analysis.

Muskrat Falls Generation Facility

Includes the design, construction, and commissioning of the Powerhouse, Spillway, Dams, Pump Well System, and Fibre Optic Lines/ Connections for the MF site.

Labrador – Island Transmission Link

Includes the design, construction, and commissioning of the MF Converter Station; Soldiers Pond Converter Station, Switchyard, and Synchronous Condensers, 350 kV HVdc Transmission Line, SOBI Crossing, Electrode sites and Holyrood modifications.

Labrador Transmission Assets

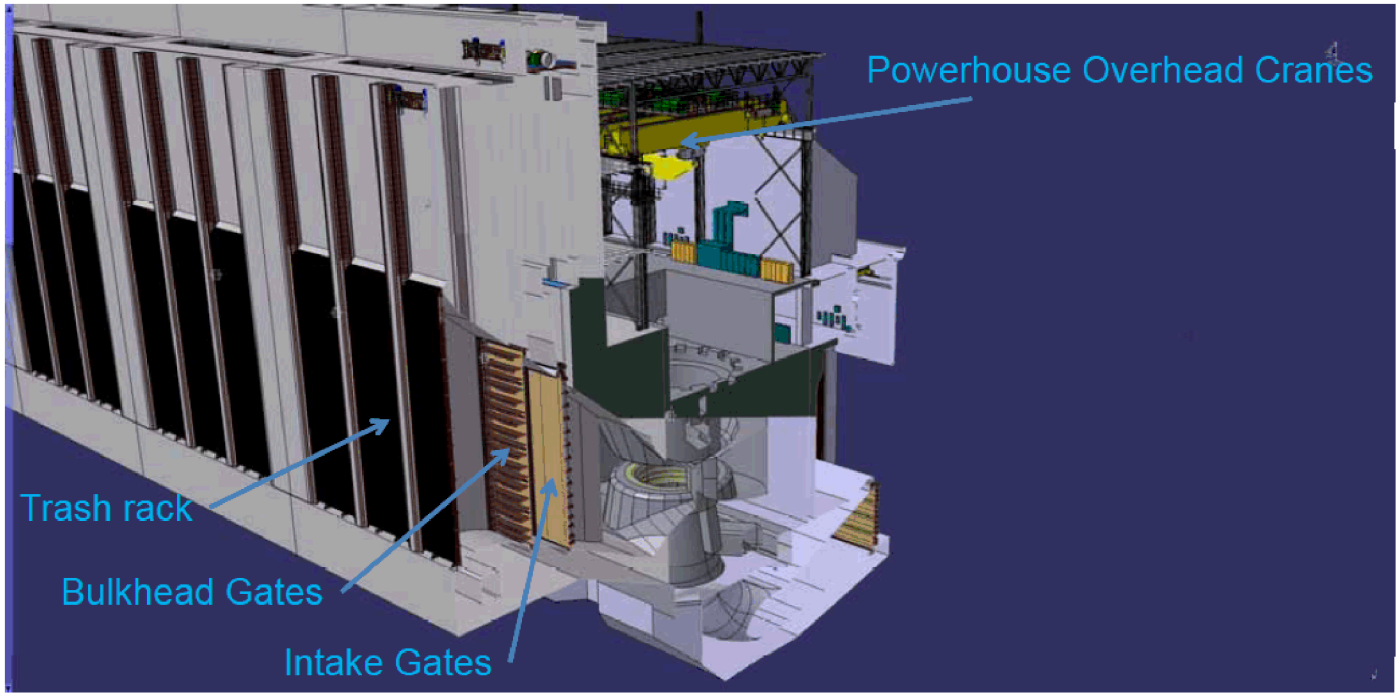
Includes the design, construction, and commissioning of the new Churchill Falls Switchyard and Extension, MF Switchyard, and 2X 315 kV Hvac Transmission Lines.

General Project Distributable Costs

Includes the EPCM Contract, Owners Project Team, Integrated Commissioning Support Services, QC Inspection Services, Land Acquisition/Permits, Environmental, Aboriginal, and other General Services.

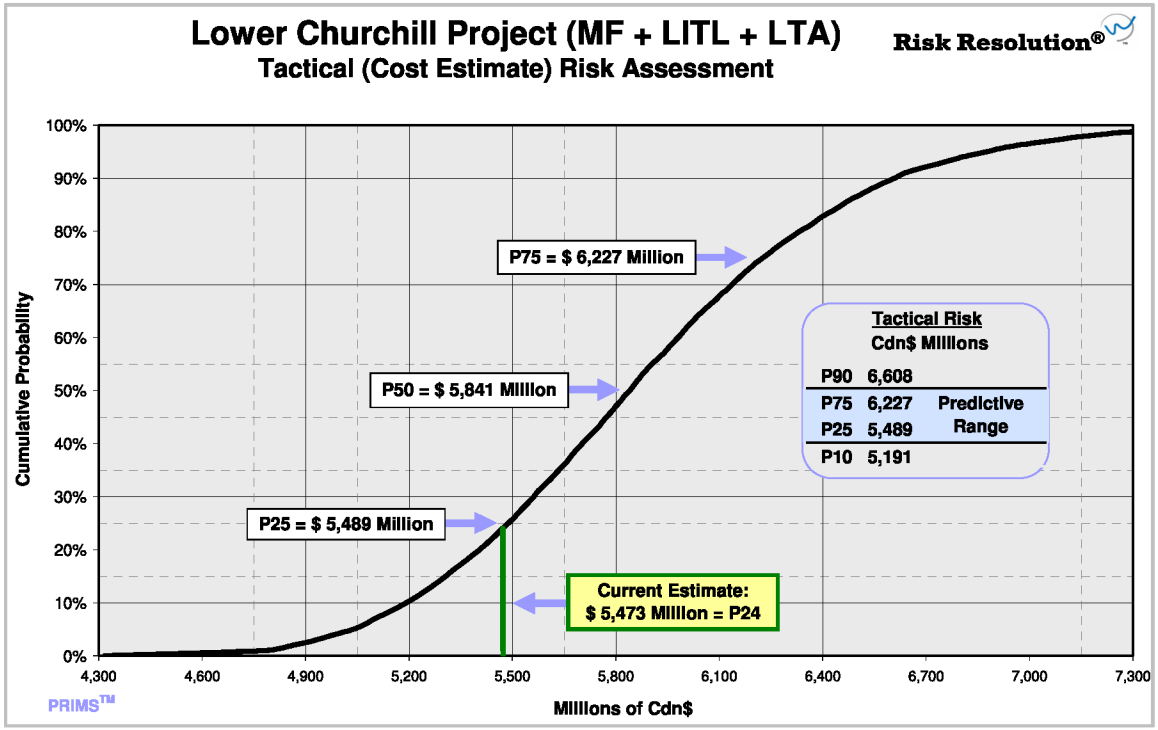
Maturity of Lower Churchill Project

- Engineering and detailed design was ~40% complete in April 2012
- Detailed project planning is well progressed
- There is a significant amount of market data to support development of the estimate, including bids for cable, turbine/generators, access roads, tower steel, and the accommodations complex



Tactical Risk Analysis Results – Lower Churchill Project

Risk Analysis for the overall Lower Churchill Project suggests, at a P50 value, the project contingency would be $368 million ($5,841 million minus $5,473 million), which equates to 7% of the estimate.



Project Sub-component Analysis

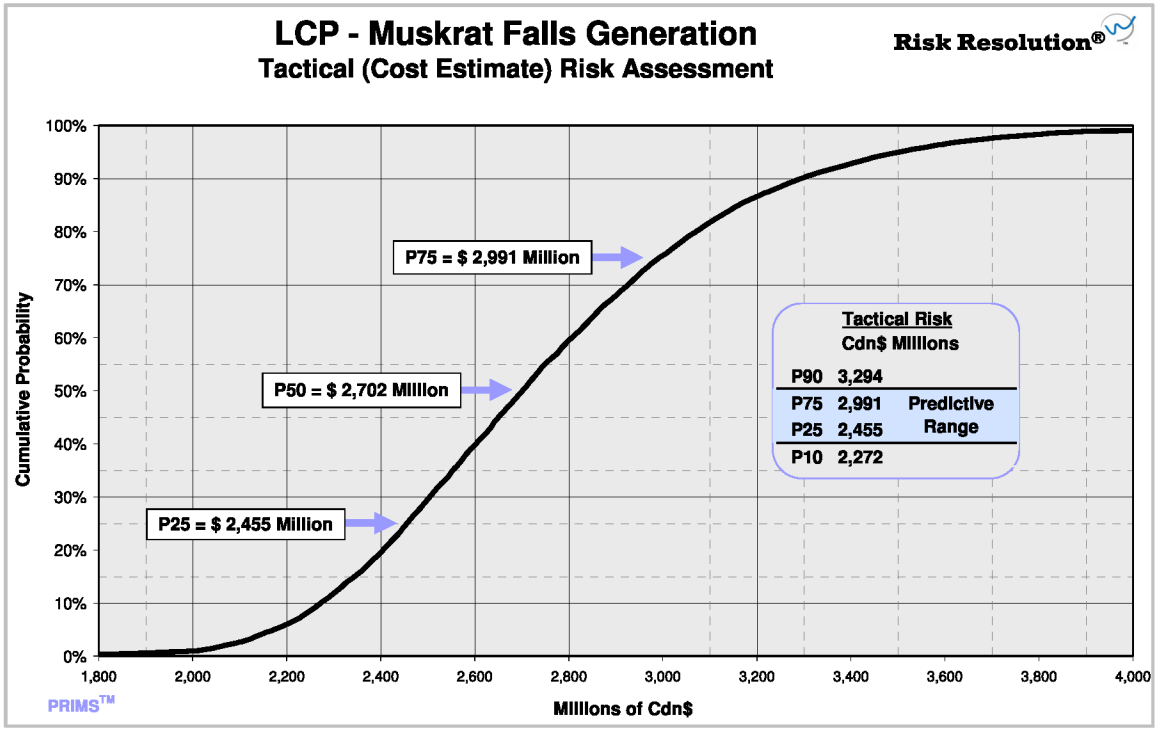
The major project scope sub-projects: Muskrat Falls Generation; Labrador – Island Transmission Link; and Labrador Transmission Assets, were analyzed separately to provide a view of the individual risk profiles. Cost elements from the General Project Distributable Cost category were distributed to each of the major project scope sub-projects as appropriate.

Please note that, due to the nature of probabilistic analyses, the individual sub-project analysis results are not directly additive to the overall project results.

Tactical Risk Analysis Results – Muskrat Falls Generation Facility

The Predictive Range (P25 to P75) is $2,455 million to $2,991 million, largely influenced by:

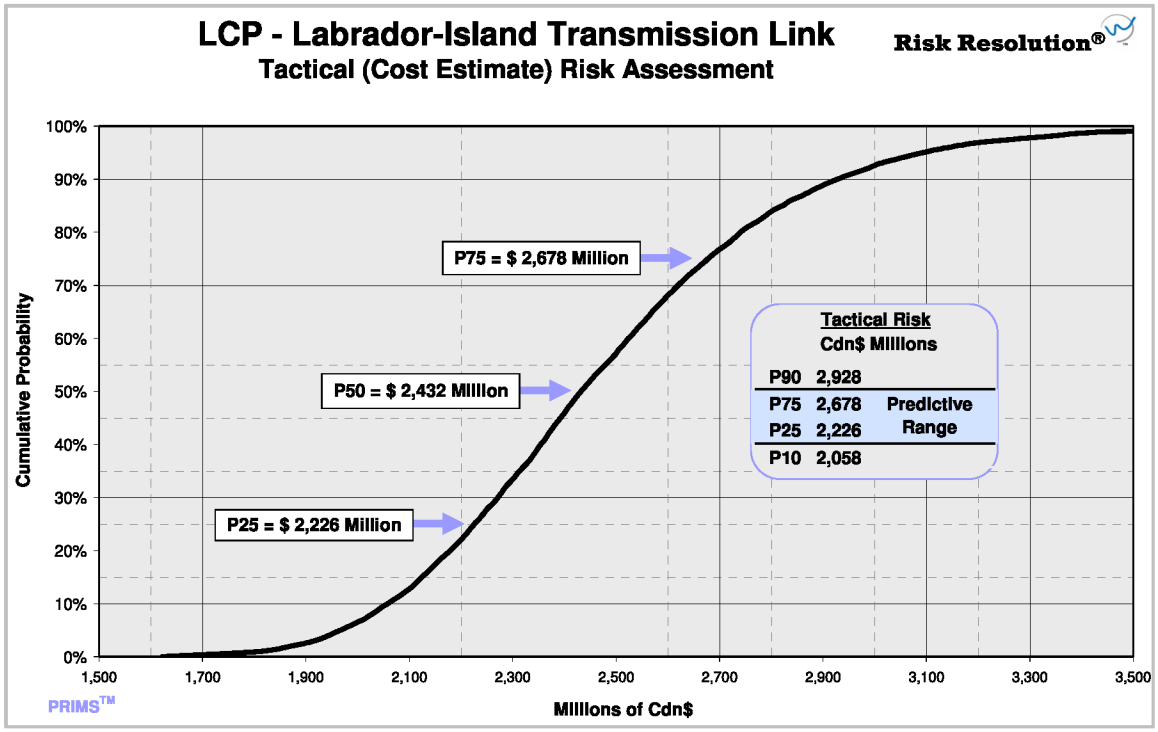
- ***Production rates for major concrete works - intake, powerhouse, spillway, and transition dams***
- ***Support services (catering, site maintenance, etc.)***
- ***Foundation conditions - North RCC Dam***
- ***Project management/ construction management activities***



Tactical Risk Analysis Results – Labrador – Island Transmission Link

The Predictive Range (P25 to P75) is $2,226 million to $2,678 million, largely influenced by:

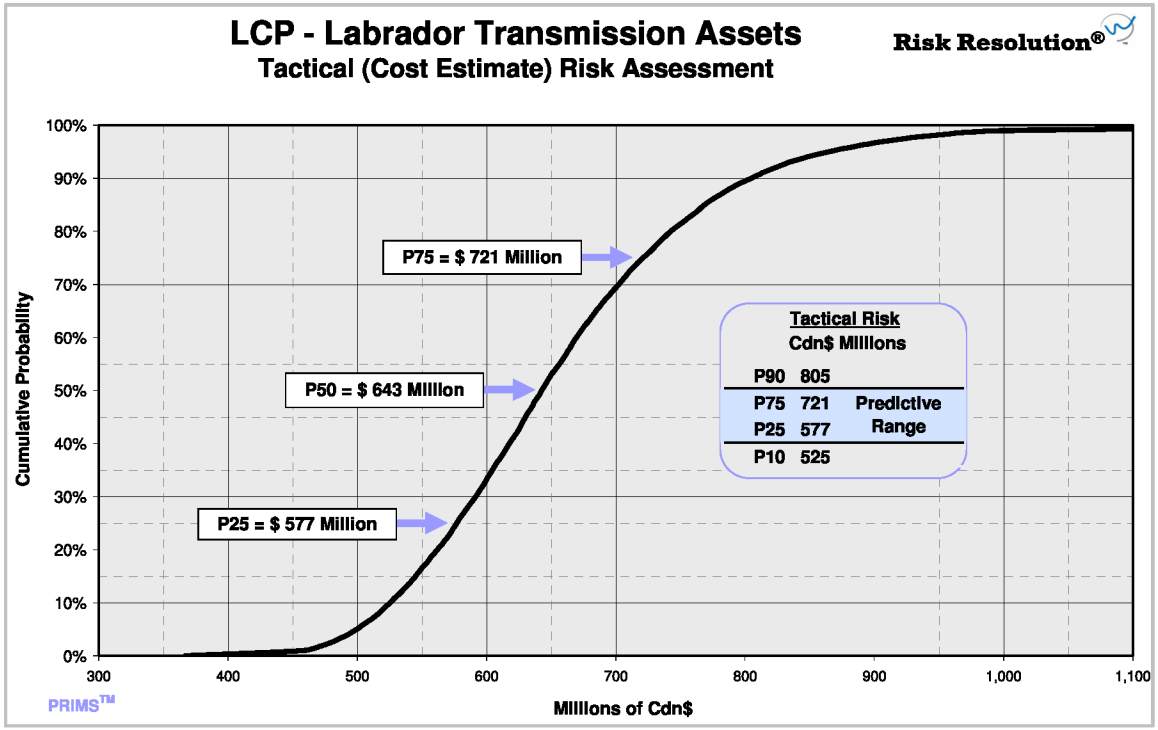
- ***Construction of 350 kV HVdc transmission line (sect. 1 & 2)***
- ***SOBI cable supply & installation***
- ***Clearing right of way for HVdc transmission line***
- ***Synchronous condensers – supply & installation***



Tactical Risk Analysis Results – Labrador Transmission Assets

The Predictive Range (P25 to P75) is $577 million to $721 million, largely influenced by:

- ***Construction of 315 kV HVac transmission line (MF to CF)***
- ***Churchill Falls switchyard***
- ***Project management/ construction management activities***



Supporting Materials

Detailed Nalcor Estimate Uncertainty Framework

Definition **Performance**

Definition Factors (Scope)	+	Construction Methodology & Timeline Factors	+	Price Factors	+	Performance Factors	=	Base Estimate

- ❑ Design Criteria & Specifications
- ❑ General Arrangements & Layouts
- ❑ Design Drawings for major components – towers and hardware
- ❑ MF rock and concrete quantities from 3D CAD
- ❑ Master Equipment List
- ❑ Cable List
- ❑ Material Take-offs for Construction Bulks
- ❑ Equipment Specifications
- ❑ Geotech surveys
- ❑ WBS & Cost Codes

- ❑ Construction Philosophies
- ❑ Construction Execution Plan
- ❑ Constructability Reviews
- ❑ Construction Schedule
- ❑ Logistics and Access, incl. freight forwarding & marshaling yards
- ❑ Contract Package Dictionary
- ❑ Org. Design and Staff Plans
- ❑ Construction Equip. Types
- ❑ Labor Demand
- ❑ Labor Demarcation
- ❑ In-directs Strategies
- ❑ Site Services
- ❑ Pre-Fabrication Plans
- ❑ Crane & Access Studies
- ❑ Support Facilities
- ❑ Material Sourcing Strategies
- ❑ Seasonality Constraints
- ❑ Permit Register

- ❑ Labor Agreement
- ❑ Construction Equip. Rates
- ❑ Bid Analysis – T/G, SOBI Cable, Tower Steel, Accommodations, Road
- ❑ Budgetary Quotes – various equipment
- ❑ Site Services Costs – catering, air transport
- ❑ Construction Bulks Prices – Rebar, Cement, Diesel, etc.
- ❑ Helicopters and Aircrane
- ❑ Contracting Market Intelligence – overhead and profit
- ❑ Foreign Exchange Rates

- ❑ Crew Make-up and Assignments
- ❑ Task durations
- ❑ Workface Restrictions
- ❑ Labor Productivity & Benchmarks
- ❑ Mobilization Constraints
- ❑ Work Front Stacking
- ❑ Seasonality Impacts
- ❑ Equipment Productivity
- ❑ In-Directs Usage
- ❑ Offsite Fabrication

- ❑ Estimate organized by Project, Physical Component and by Contract Package
- ❑ Documented Basis of Estimate
- ❑ Foreign Currency Demand
- ❑ Person hours
- ❑ Trade demands
- ❑ Cash flows