# Lower Churchill Project

## Ernst & Young Cost and Schedule Forecast Review

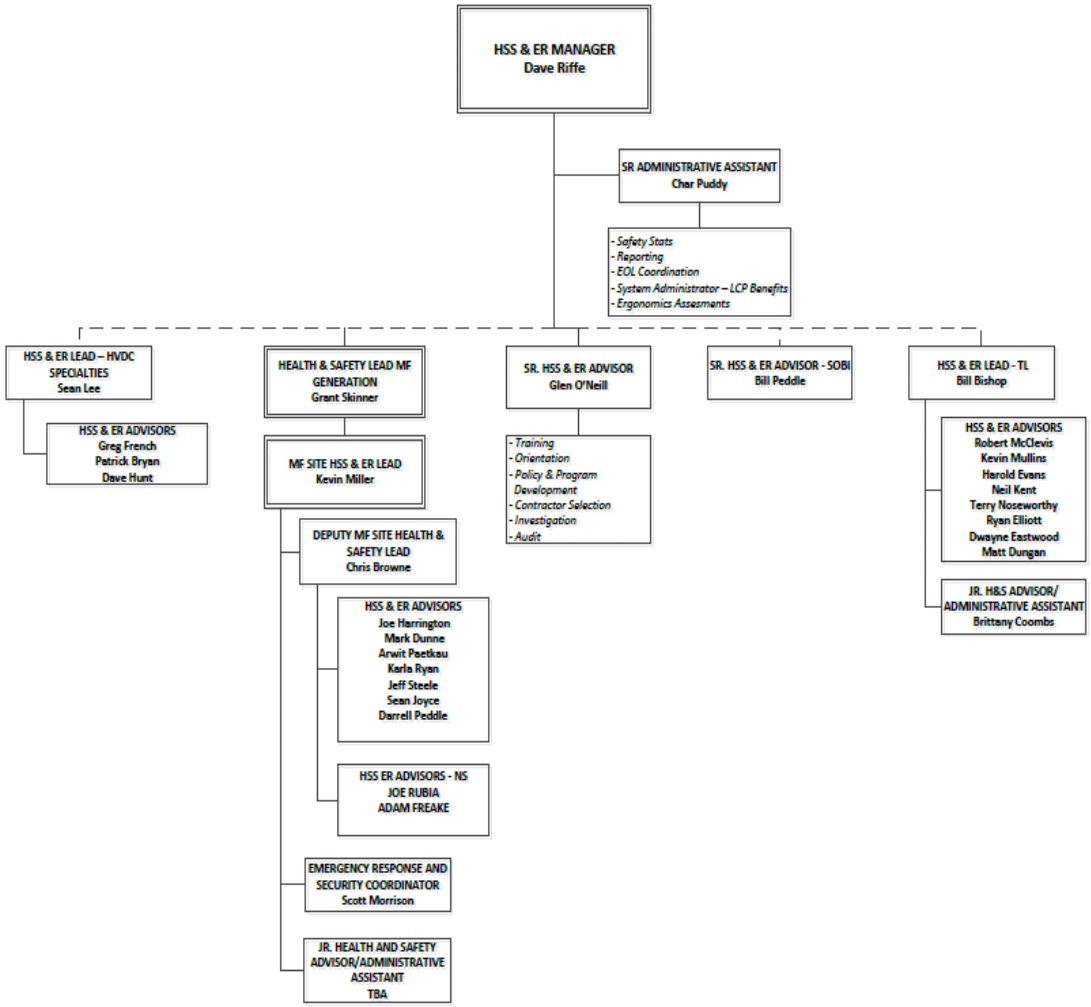
January 2016

Boundless Energy

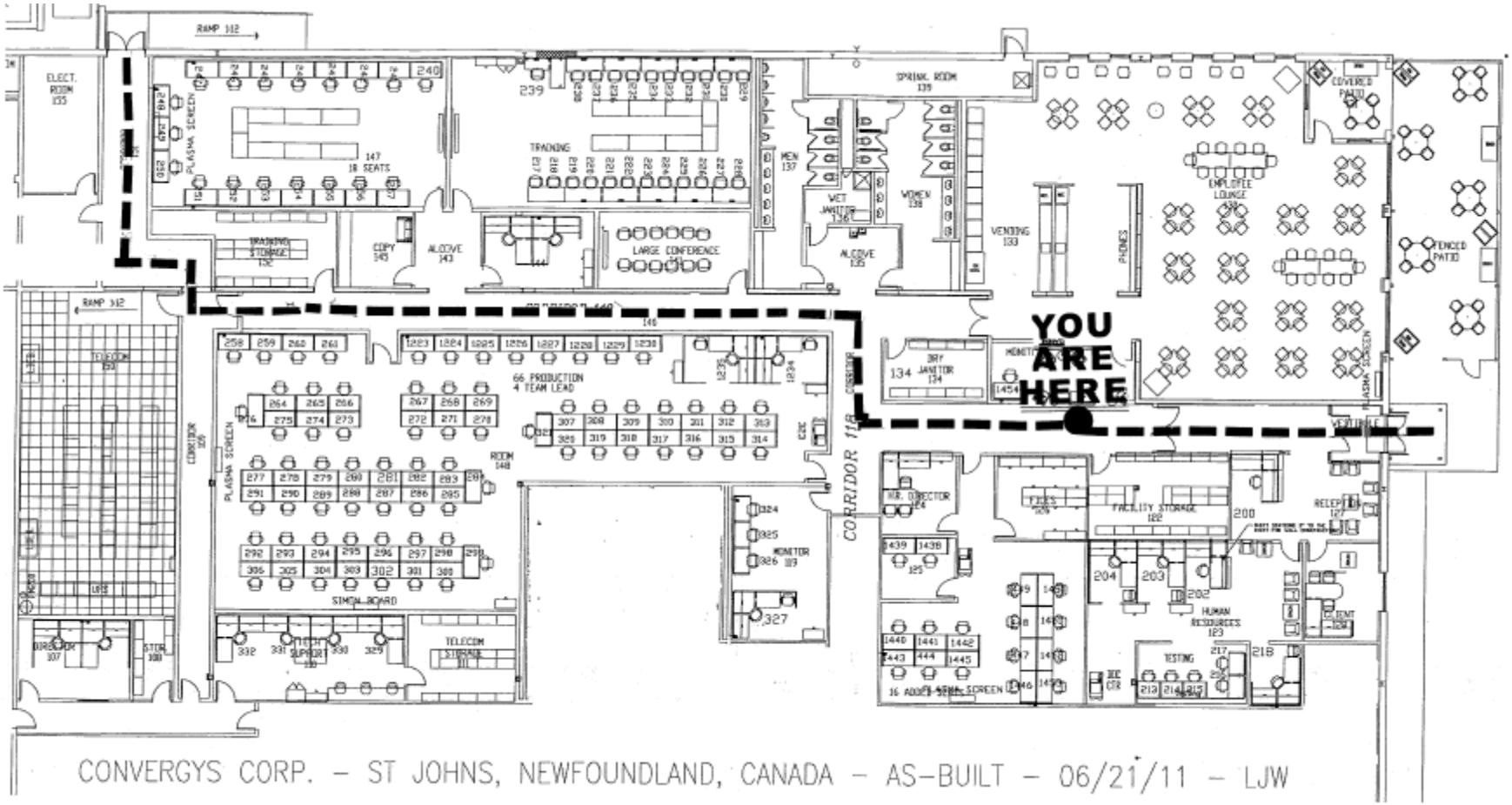
nalcor energy
LOWER CHURCHILL PROJECT

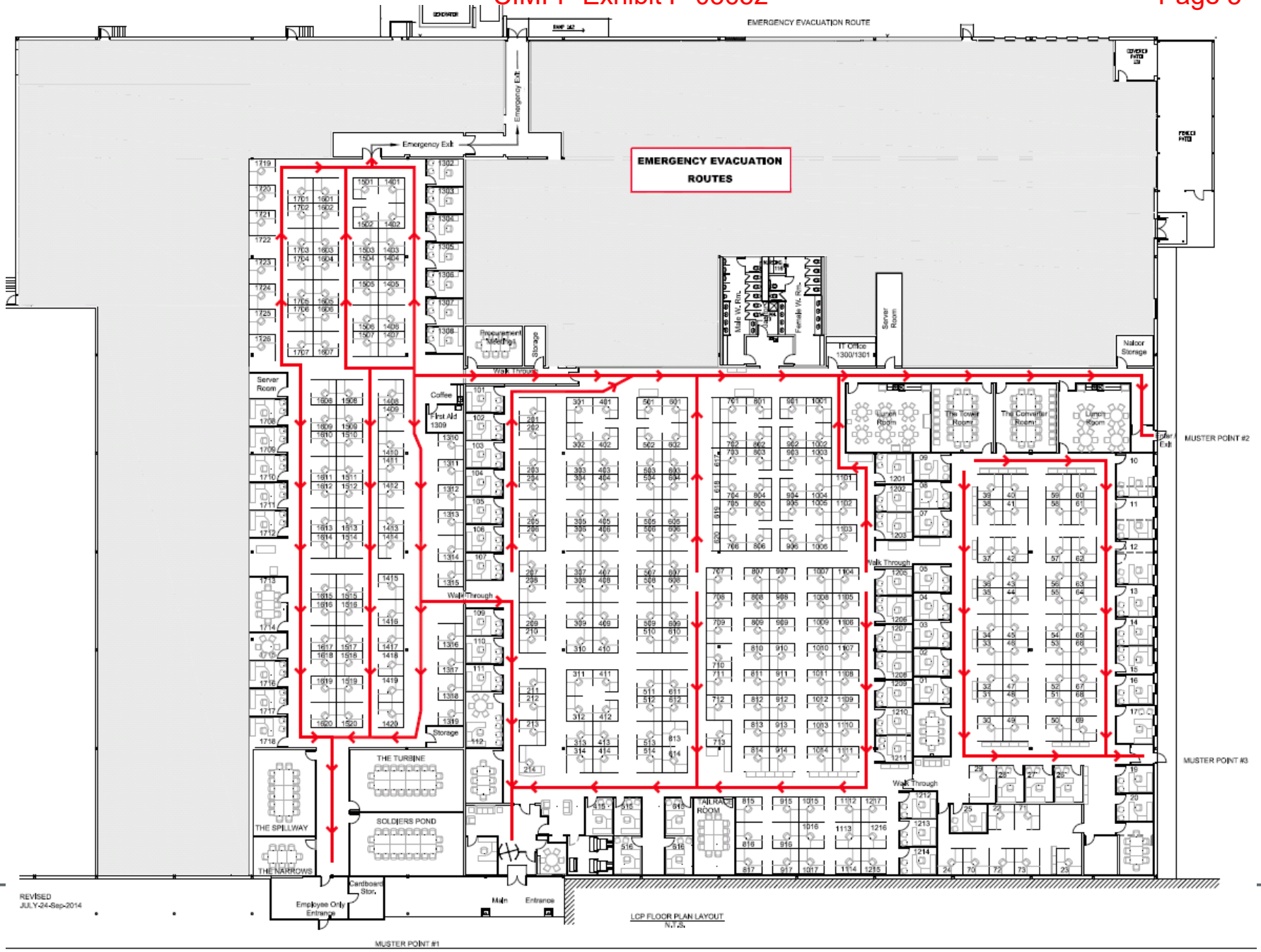
# Health and Safety at The Project Office

## Chart LCP9: Health, Safety, Security and Emergency Response (HSS & ER) Functional Organization



# Office location/configuration




EMERGENCY EVACUATION ROUTE
EMERGENCY EVACUATION ROUTES
Emergency Exit
Emergency Exit
Server Room
Coffee
First Aid 1309
Procurement Meeting
Storage
Walk Through
Male W. Rm.
Female W. Rm.
IT Office 1300/1301
Server Room
Nalcor Storage
Walk Through
Walk Through
Walk Through
Storage
THE TURBINE
SOLDIERS POND
THE SPILLWAY
THE NARROWS
TAILRACE ROOM
Cardboard Stor.
Employee Only Entrance
Main Entrance
MUSTER POINT #1
MUSTER POINT #2
MUSTER POINT #3
REVISED JULY-24-Sep-2014
LCP FLOOR PLAN LAYOUT N.T.S.

# Emergency Notes

- At your location, if an emergency arises, dial 9-911.
- Fire Alarm system at your location is a continuous alarm.

# LCP office fire and first aid

- Several employees trained and certified in First Aid
- Ample supply of first aid equipment including AED devices and personnel trained on these devices
- Fire wardens assigned to floor locations
- Recognize locations by colored batons.

# Traffic Safety

- Parking lot is fairly congested, be aware of vehicular traffic around the parking lots and especially at the read section of the building, some narrow travel areas
- Exiting onto Torbay Road. Highly recommend travel to Highland Drive to lights and then left/right onto Torbay Road.
- Nalcor has a back-in parking policy.

# Presentation Outline

# Project Orientation - Outline

- LCP Approach to Safety
- Overview of the Review
- Project Organization
- Project Scope Overview
- Project Timeline
- Independent and Technical Reviews
- Governance
- Project Global Reach
- 2015 Progress and 2016 Look Ahead
  - Muskrat Falls Generation
  - Transmission
  - SOBI
  - Switchyards and HVdc Facilities
- DG3 Cost Estimate Process
- Cost Summary
- Schedule Summary
- Risk Management

# LCP Approach to Safety Management

# Vision and Values reflect our commitment to Health and Safety

## Our Vision

- *Our Vision is to build a strong economic future for successive generations of Newfoundlanders and Labradorians*

## Our Values

- Our employees share a set of values that shape how we do business every day

# We believe ….

- All incidents are preventable
- An incident free workplace is both achievable and sustainable
- Health and Safety Performance is both strategic and fundamental to the achievement of project success, as well its overall business and project objectives.
- Employee and contractor engagement and commitment to this ideology is critical for success
- That to achieve at this level of safety performance requires each and every one of us to ***Take Ownership***

# Our Promise

- Genuine Commitment to an Injury-Free Workplace – No One Gets Hurt
- Provide the safest workplace environment
- Work towards developing an exceptional safety culture
- Relentless pursuit of safety excellence and sustained safety performance through Authentic Leadership Engagement
- Demonstrated personal safety leadership that is *FELT* at all levels of the organization
- Safety Culture WILL NOT be compromised by what Managers say versus what they actually believe

# Background

- As a construction project, Nalcor relies upon contractors to execute the physical work
  - i.e. we do not any of our own skilled craft labor, rather have ~400 FTE of engineering, construction / project management resources
  - This differentiates LCP from NLH or CF(L)Co. wherein they employ skilled craft labor
- Greatest safety exposure resides with those craft labor, who are employed by many contractors and come from varying backgrounds
  - Very difficult to create a safety culture in a non-captive or “transient” workforce

# Contractor Safety Management

- LCMC works closely with contractors to ensure they are fully implementing their approved H&S Plans.
  - Detailed reporting and auditing of safety performance completed
  - All field staff complete daily inspections of contractor's activities to ensure compliance
  - LCMC have ~25 FTE H&S professionals assigned to the various elements of the Project
- Ongoing reporting and feedback to facility opportunities for continuous improvement
  - All incidents (including First Aids) investigated, regardless of nature
- LCMC continues to role-out new programs pan-project to address identified trends

# Our Performance To-Date

- LCP has a reputation of being a safe place to work
- LCP Safety Culture is getting a foothold
- LCP Safety Toolbox implemented consistently pan-Project
- Worker engagement is increasing
  - Tremendous uptake on Step Back Field Level Risk Assessment process
- Collaborative working relationship with OHS
  - We leverage their knowledge and consider them a valued resource
  - All OHS Inspection Directives addressed, with action tracking process in-place for continual learning.
- SWOP or equivalents, Inspections and Orientations have increased dramatically in 2014

# Our Performance To-Date (cont'd)

- Making steady progress or our safety journey
  - Positive indicators project wide (Behaviors, Attitudes & Involvement)
  - Worker engagement appears to be growing steadily (e.g., Step Back)
  - Continual improvement mindset had taken hold
  - Leveraging insight with leading indicators and trends
  - Implementation of behavioral-based programs underway (Be-Safe)
  - Some areas and contractors require significant coaching and oversight
- Still seeing an significant number of incidents including Hi-Po Near Misses
- Ownership, Engagement and Alignment by Everyone is Key
  - Be relentless in doing whatever is required

# HSE STAT REPORT – YTD 2015

CIMFP Exhibit P-03652



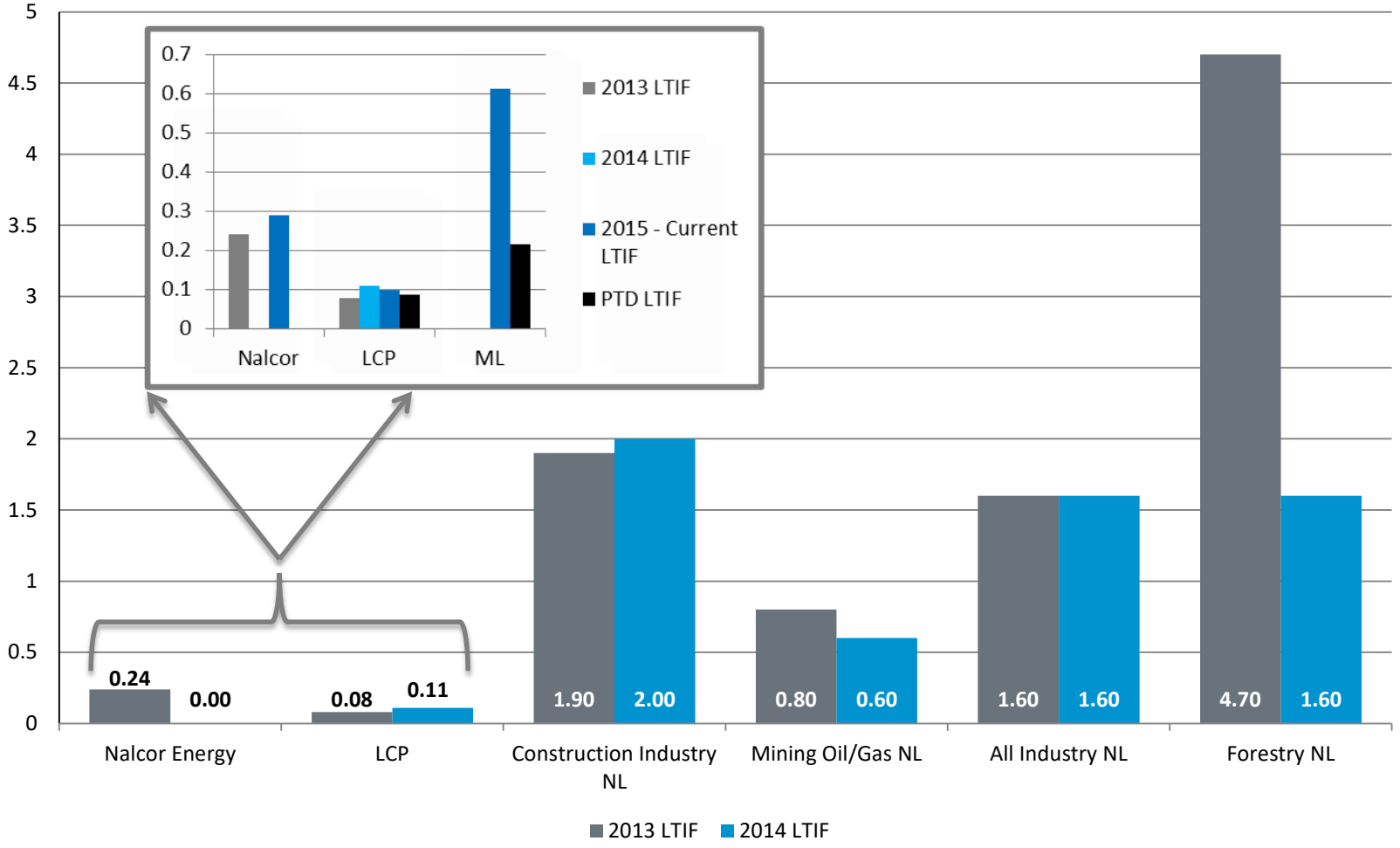
## HSE Report

For period 01-Jan-2015 to 28-Nov-2015

| | Current Period | | | Year to Date | | | Project to Date | | |
|---|---|---|---|---|---|---|---|---|---|
| | Project Delivery Organization | Contractors | Total | Project Delivery Organization | Contractors | Total | Project Delivery Organization | Contractors | Total |
| Exposure Hours | 809,177 | 7,237,012 | 8,046,189 | 809,177 | 7,237,012 | 8,046,189 | 4,115,919 | 14,085,612 | 18,201,531 |
| **Leading Indicators** | | | | | | | | | |
| High Potential Near Misses | 0 | 48 | 48 | 0 | 48 | 48 | 2 | 180 | 182 |
| Near Misses | 5 | 169 | 174 | 5 | 169 | 174 | 40 | 365 | 405 |
| First Aid | 3 | 243 | 246 | 3 | 243 | 246 | 18 | 564 | 582 |
| Conditions/Hazards, Practices, & Commendations | 2,309 | 2 | 2,311 | 2,309 | 2 | 2,311 | 5,284 | 454 | 5,738 |
| Orientations Completed | 2,994 | 6,948 | 9,942 | 2,994 | 6,948 | 9,942 | 10,647 | 12,999 | 23,646 |
| TSA's Completed | 0 | 8,472 | 8,472 | 0 | 8,472 | 8,472 | 24 | 10,330 | 10,354 |
| StepBacks Completed | 10,322 | 362,801 | 373,123 | 10,322 | 362,801 | 373,123 | 20,175 | 617,769 | 637,944 |
| Worksite Inspections | 4,506 | 10,272 | 14,778 | 4,506 | 10,272 | 14,778 | 7,399 | 16,558 | 23,957 |
| **Lagging Indicators** | | | | | | | | | |
| Lost Time Injuries | 0 | 5 | 5 | 0 | 5 | 5 | 0 | 9 | 9 |
| Medical Aids | 0 | 35 | 35 | 0 | 35 | 35 | 0 | 60 | 60 |
| Occupational Illnesses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Modified Work Cases | 1 | 119 | 120 | 1 | 119 | 120 | 1 | 130 | 131 |
| Vehicle Incidents | 15 | 31 | 46 | 15 | 31 | 46 | 15 | 44 | 59 |
| Modified Work Days | 0 | 2,311 | 2,311 | 0 | 2,311 | 2,311 | 0 | 2,454 | 2,454 |
| Lost Time Days | 0 | 272 | 272 | 0 | 272 | 272 | 0 | 274 | 274 |
| Property & Equipment Damage | 14 | 259 | 273 | 14 | 259 | 273 | 25 | 471 | 496 |
| Security Incidents | 4 | 17 | 21 | 4 | 17 | 21 | 5 | 30 | 35 |
| **Lagging Frequencies** | | | | | | | | | |
| Total Recordable Incident Frequency Rate | 0.247 | 4.394 | 3.977 | 0.247 | 4.394 | 3.977 | 0.049 | 2.826 | 2.198 |
| Lost Time Incidents Frequency Rate | 0.000 | 0.138 | 0.124 | 0.000 | 0.138 | 0.124 | 0.000 | 0.128 | 0.099 |
| All Injury Frequency Rate | 0.000 | 1.105 | 0.994 | 0.000 | 1.105 | 0.994 | 0.000 | 0.980 | 0.758 |

| | LCMC PDT | Contractors |
|---|---|---|
| Days since Last LTI | 1,061 | 21 |

# LTIF Comparison – Lower Churchill



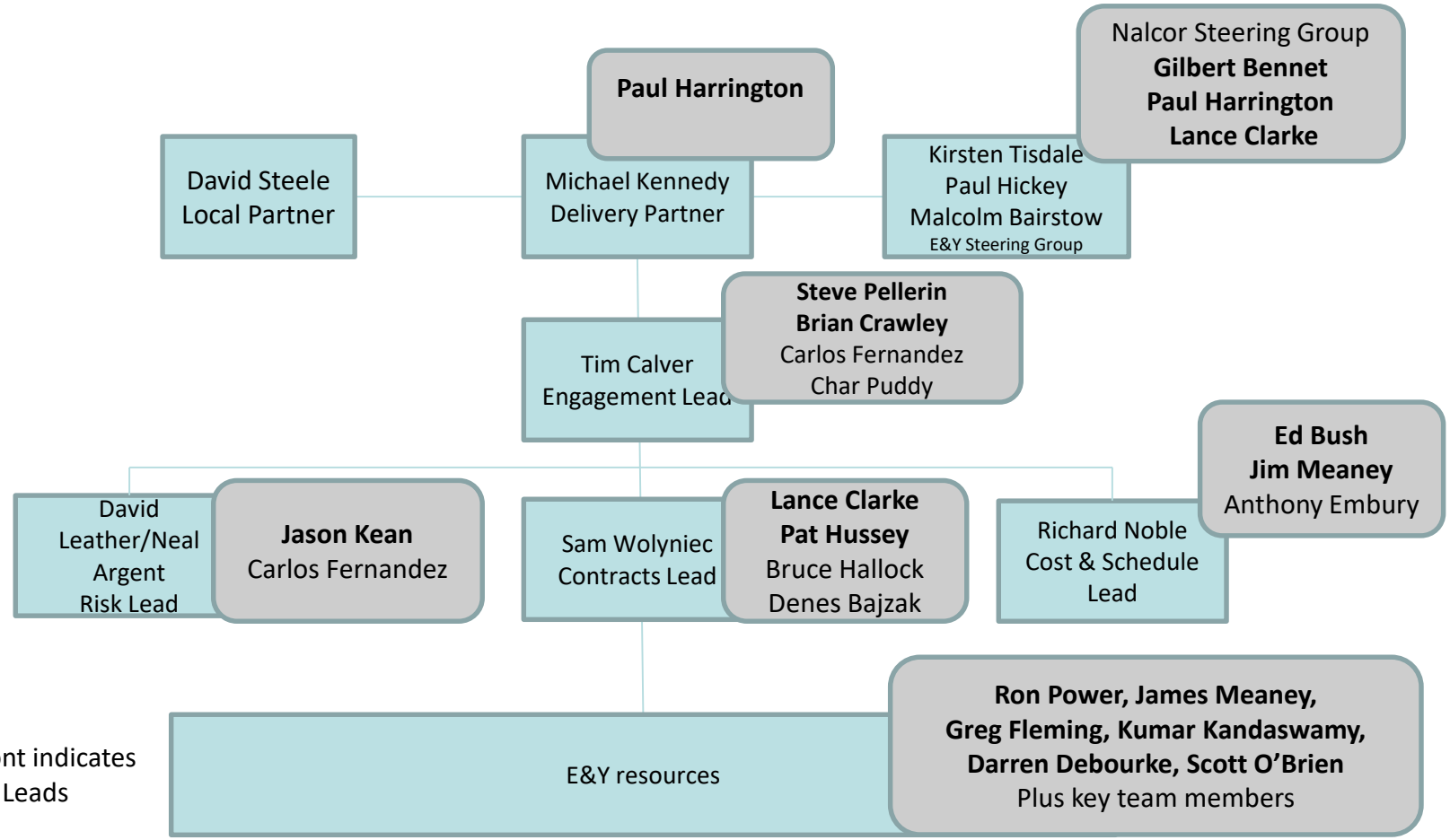
# Steps to Achieving World-Class Safety Performance

# Overview of the Review

# General – as articulated by the Premier, Ed Martin and Malcolm Bairstow

- GNL has decided to engage EY to carryout a Project cost and schedule review.
- The objective of the review is to assess the reasonableness of the Project for its cost and schedule forecast to look for material/significant risks so as to provide an independent perspective on the cost and schedule forecasts presented by Nalcor.
- EY will not develop its own cost, schedule and risk forecast but will assess the reasonableness of that prepared by Nalcor, with a focus on risks and issues that have the potential to materially impact the Project.
- The review does not include an engineering design review, physical inspection or validation of construction process and quality management.
- A Scope of Work has been developed and will guide both Nalcor and EY in this important task.
- The timelines are aggressive – with a start date of January 11th 2016 and a Final Report early March 2016.
- The Project team will cooperate fully with this important review and shall work together to achieve the objectives of the review.
- The EY Team will co-locate with the Project Team for much of the review.

# Proposed E&Y Organization and Project Counterparts




Bold font indicates Nalcor Leads

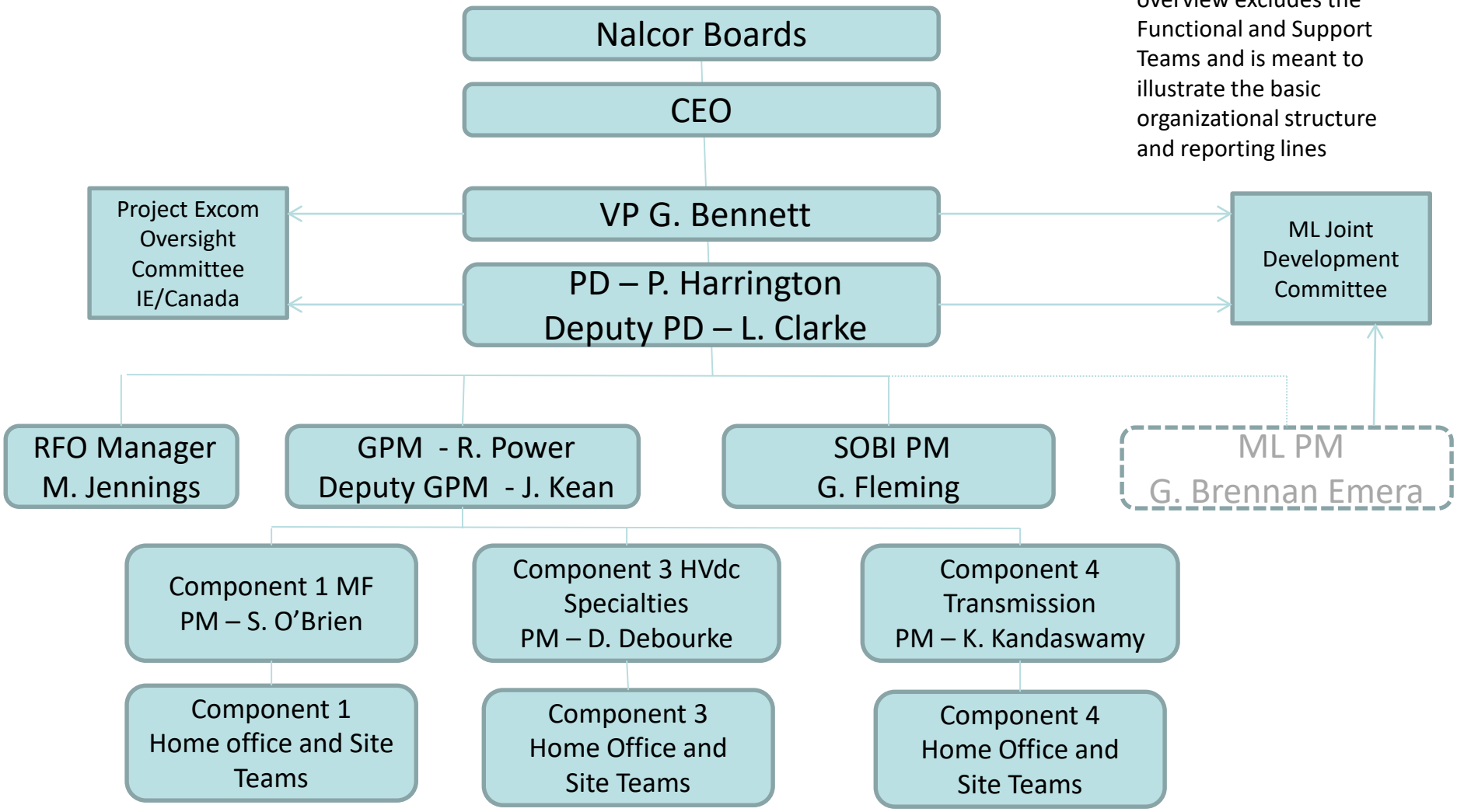
# Work Place Policies and Procedures

- The following Policies are in effect for all personnel working in our offices
  - Drug and Alcohol Policy
  - Safety and Security Policy
  - No Scent Policy
  - Respectful Workplace Policy
- Stephen Pellerin is your contact person for any information requests, data room access, meeting requests
- Sign-in/sign-out procedures are in place for work place security and safety

# Project Organization

# High Level LCMC Overview

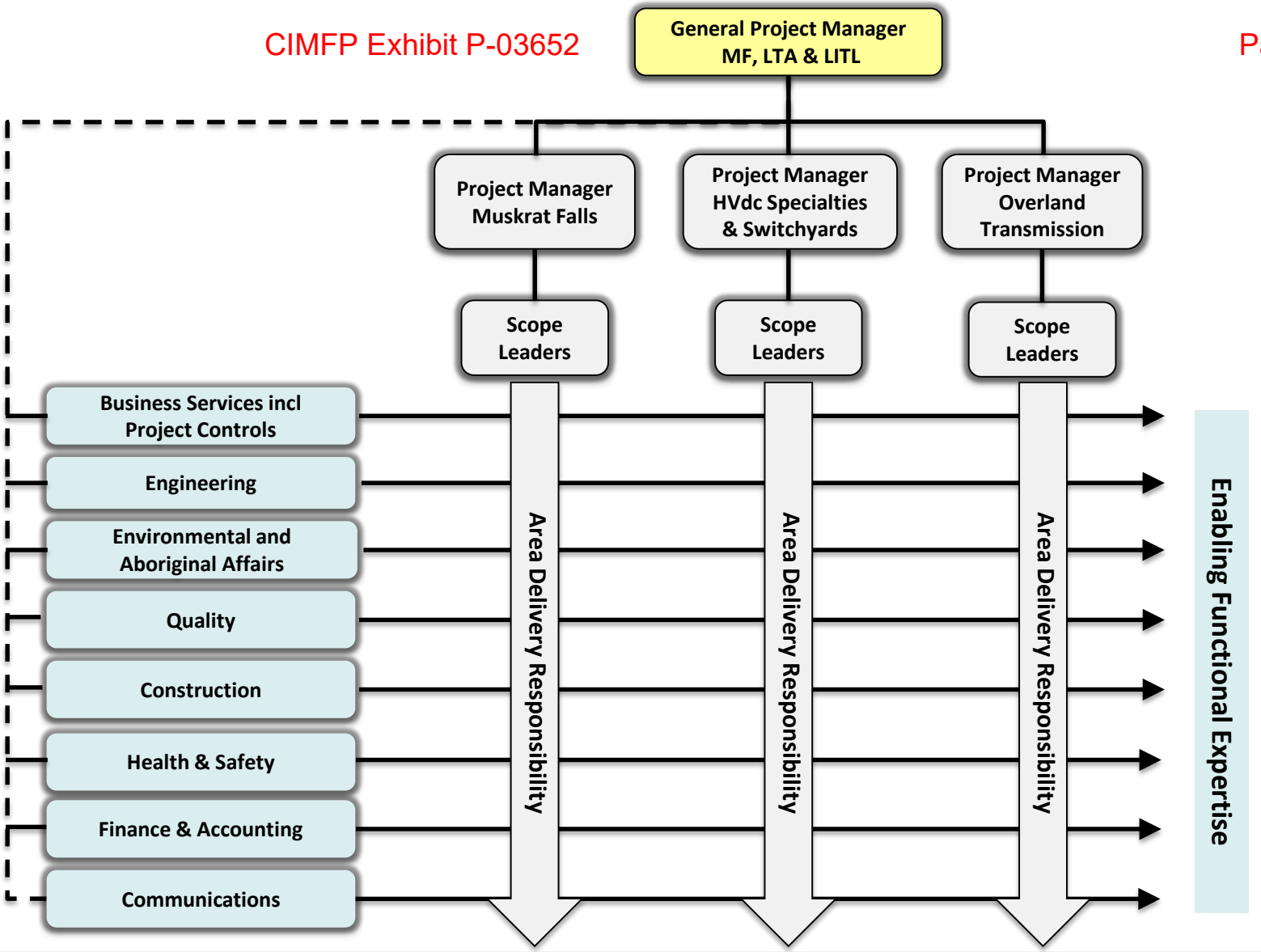
Note- This simplified overview excludes the Functional and Support Teams and is meant to illustrate the basic organizational structure and reporting lines



# Matrix Organization of Functions and Support teams

CIMFP Exhibit P-03652





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# Independent Project Analysis Inc. *(IPA Global)*

***Mid-execution Assessment – December 2015***

- *"LCP has characteristics that are compatible to those of successful mega-projects;*
- *To succeed, LCP should continue strengthening its organization and planning;*
- *Organization is well staffed and teams are well developed;*
- *LCP Project has achieved significant progress in execution and is organizing to complete construction and to start operation;*
- *….LCP strategies are consistent with the focus on achieving successful LCP execution to Completion."*

# Independent Project Analysis Inc. *(IPA Global)*

*Mid-execution Assessment – December 2015*

## Key Drivers of Megaproject Performance

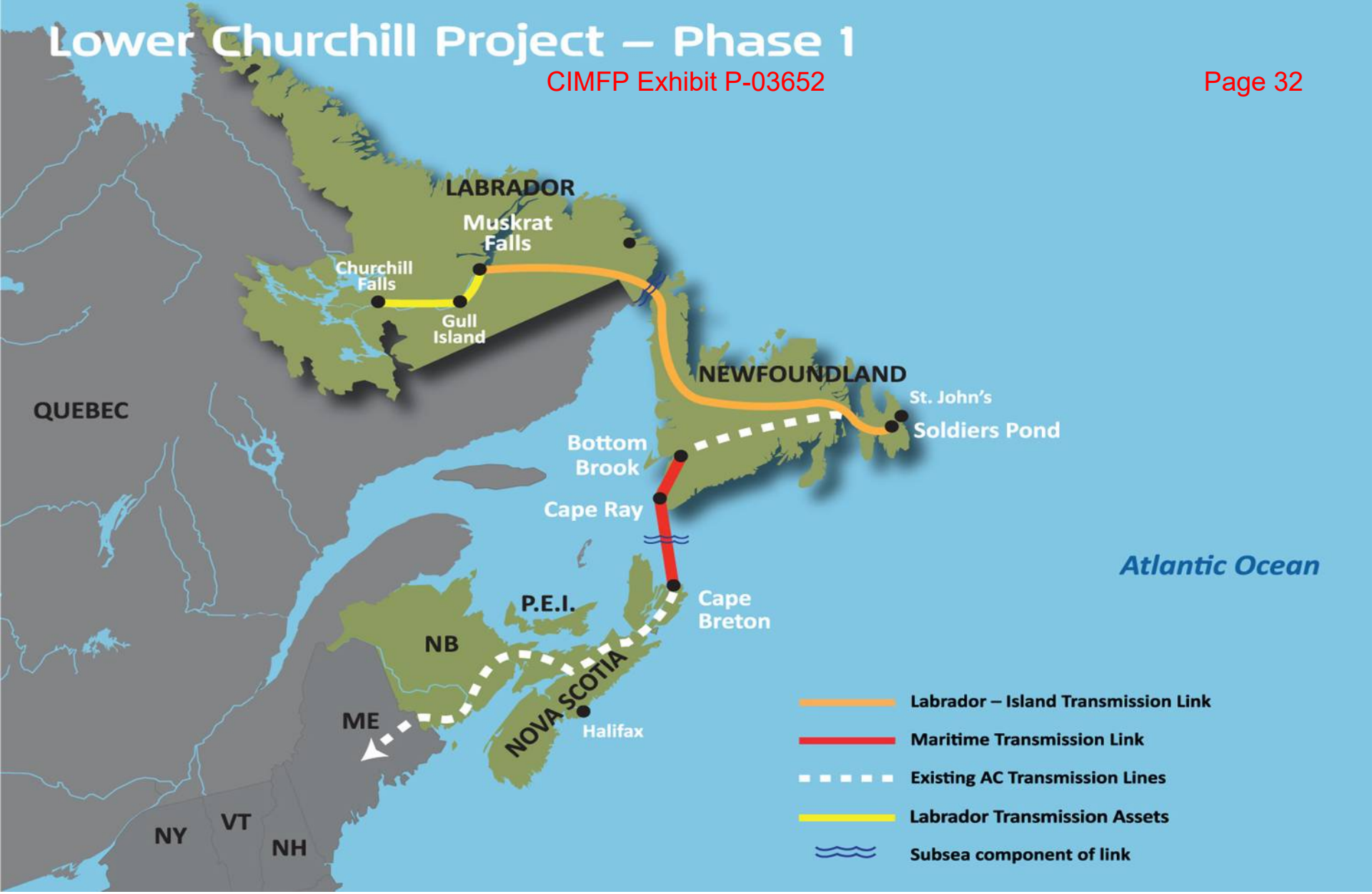
### *LCP Team Established Drivers of Team Effectiveness*

| Key Project Characteristics of Successful Megaprojects | LCP Status |
|---|---|
| Clear Defined Objectives | Yes |
| Critical Owner Team Members* | Yes |
| Team Development Index | *Good* |
| Integrated Team | Yes |
| Project Director/Manager Continuity | Yes |

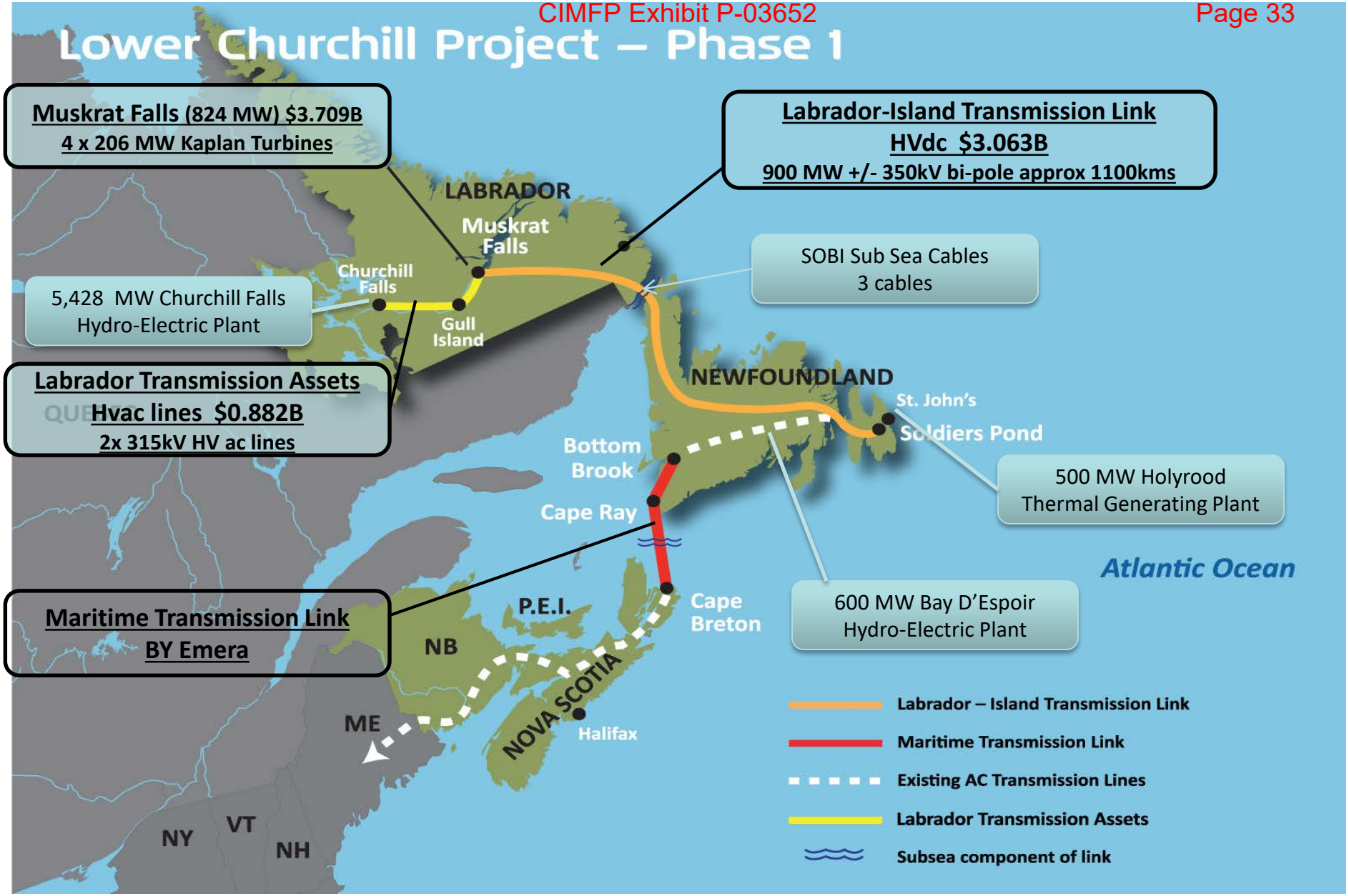
* Critical functions include Project Controls, Scheduling, Estimating, Operations, and Construction Management

CONFIDENTIAL 22 INDEPENDENT PROJECT ANALYSIS

# Project Scope Overview


Lower Churchill Project – Phase 1
LABRADOR
Muskrat Falls
Churchill Falls
Gull Island
QUEBEC
NEWFOUNDLAND
St. John's
Soldiers Pond
Bottom Brook
Cape Ray
Atlantic Ocean
P.E.I.
Cape Breton
NB
NOVA SCOTIA
Halifax
ME
NY
VT
NH
Labrador – Island Transmission Link
Maritime Transmission Link
Existing AC Transmission Lines
Labrador Transmission Assets
Subsea component of link

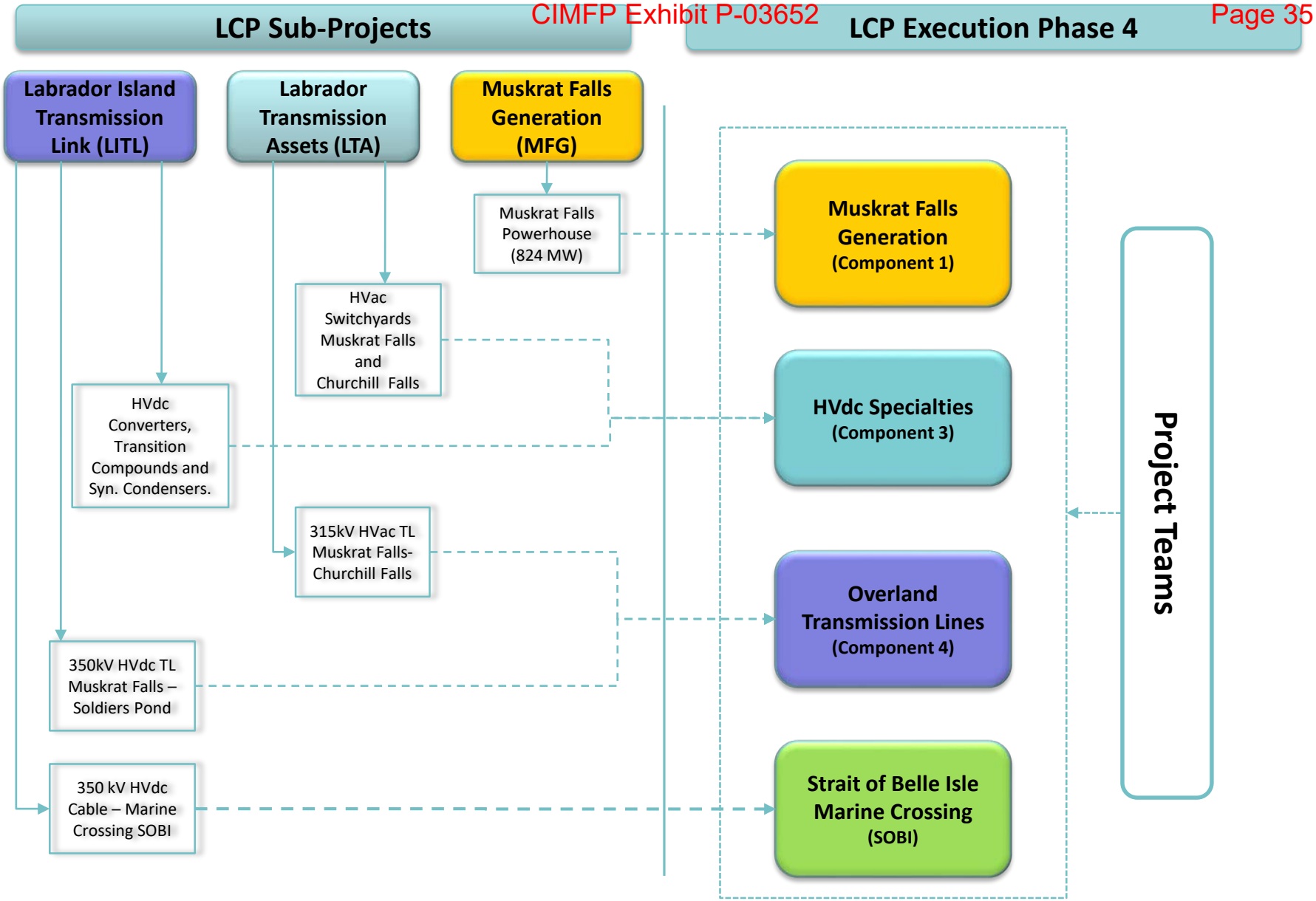
# Lower Churchill Project – Phase 1



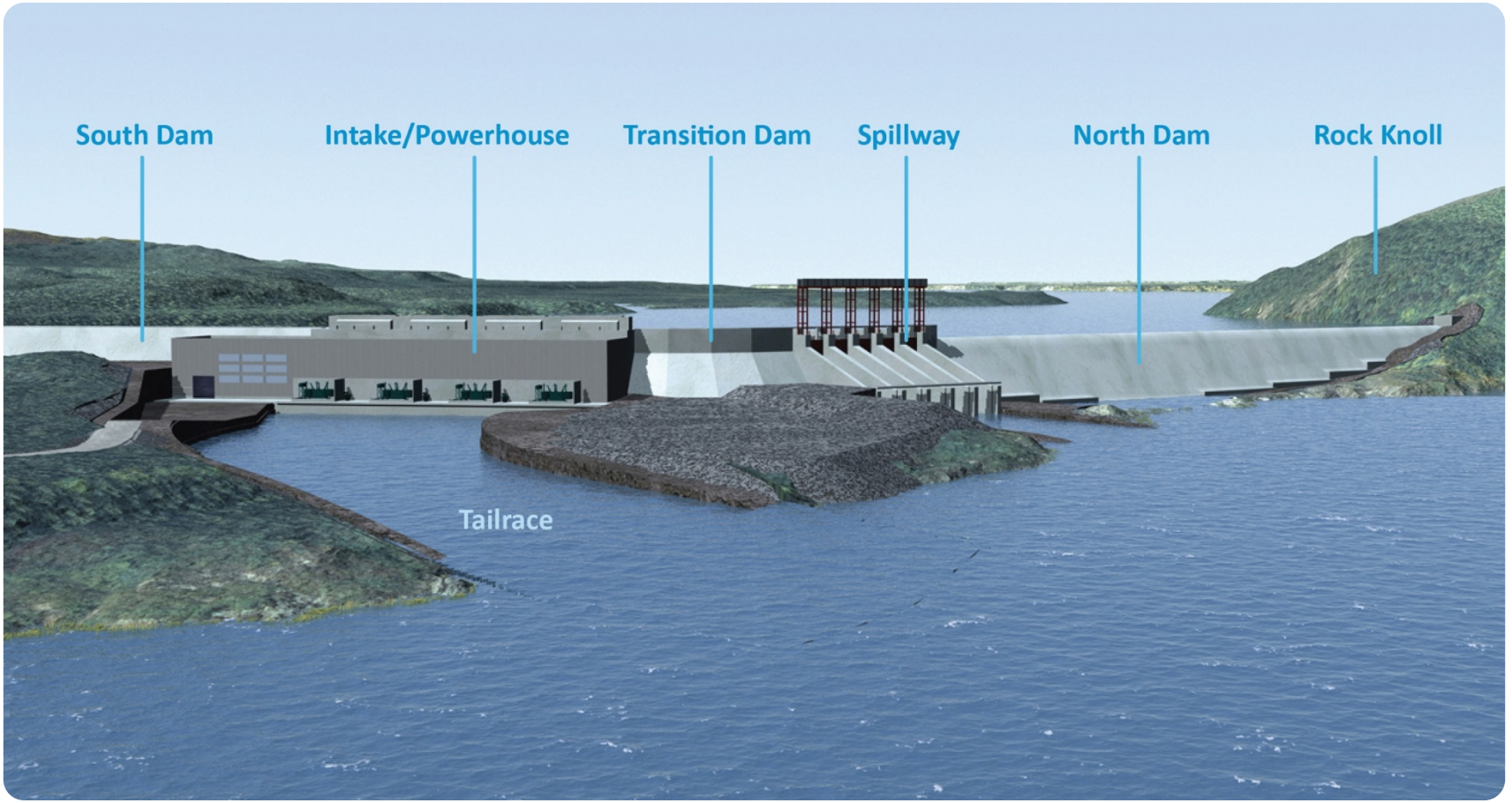
# Proven Technology

Proven technology, no serial #1's and no scale-ups ensure operational integrity

| MF | LTA | LIL |
|---|---|---|
| • Low-head, no penstocks concrete powerhouse founded on Canadian Shield<br>• Proven, model tested Kaplan turbines well within flow and head range<br>• Design philosophies based on over 40 years of hydro-electric and transmission engineering, construction and operations<br>• Conservative efficiency targets supported by equipment redundancy<br>• Core Nalcor technology | • Conventional AC technology<br>• Extension of existing Labrador transmission system<br>• Core Nalcor capability – existing lines up to 735 kv | • LCC HVDC technology used in Canada for 40+ years<br>• Mass impregnated submarine cables<br>• SOBI cable protection methods proven offshore east coast<br>• Typical HVdc overland transmission<br>• Standard HDD technology well with the boundary of design for size and distance |


LCP Sub-Projects
LCP Execution Phase 4
Labrador Island Transmission Link (LITL)
Labrador Transmission Assets (LTA)
Muskrat Falls Generation (MFG)
Muskrat Falls Powerhouse (824 MW)
HVac Switchyards Muskrat Falls and Churchill Falls
HVdc Converters, Transition Compounds and Syn. Condensers.
315kV HVac TL Muskrat Falls-Churchill Falls
350kV HVdc TL Muskrat Falls – Soldiers Pond
350 kV HVdc Cable – Marine Crossing SOBI
Muskrat Falls Generation (Component 1)
HVdc Specialties (Component 3)
Overland Transmission Lines (Component 4)
Strait of Belle Isle Marine Crossing (SOBI)
Project Teams

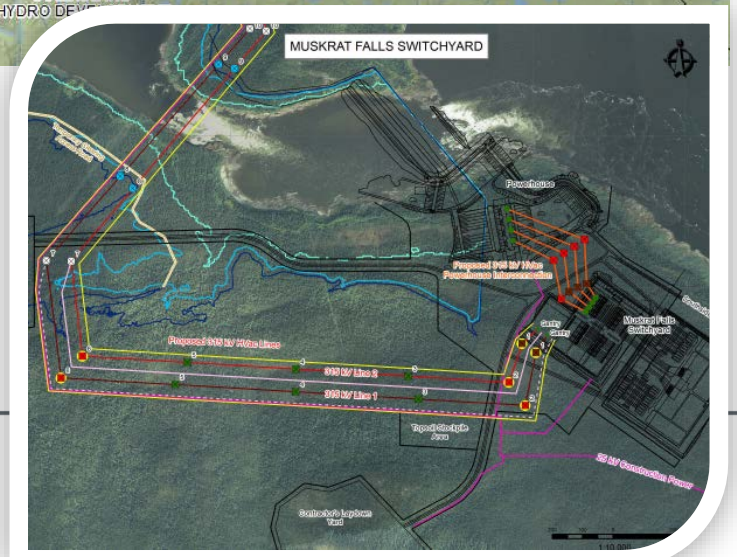
# Muskrat Falls Generation



# Labrador Transmission Assets (LTA)





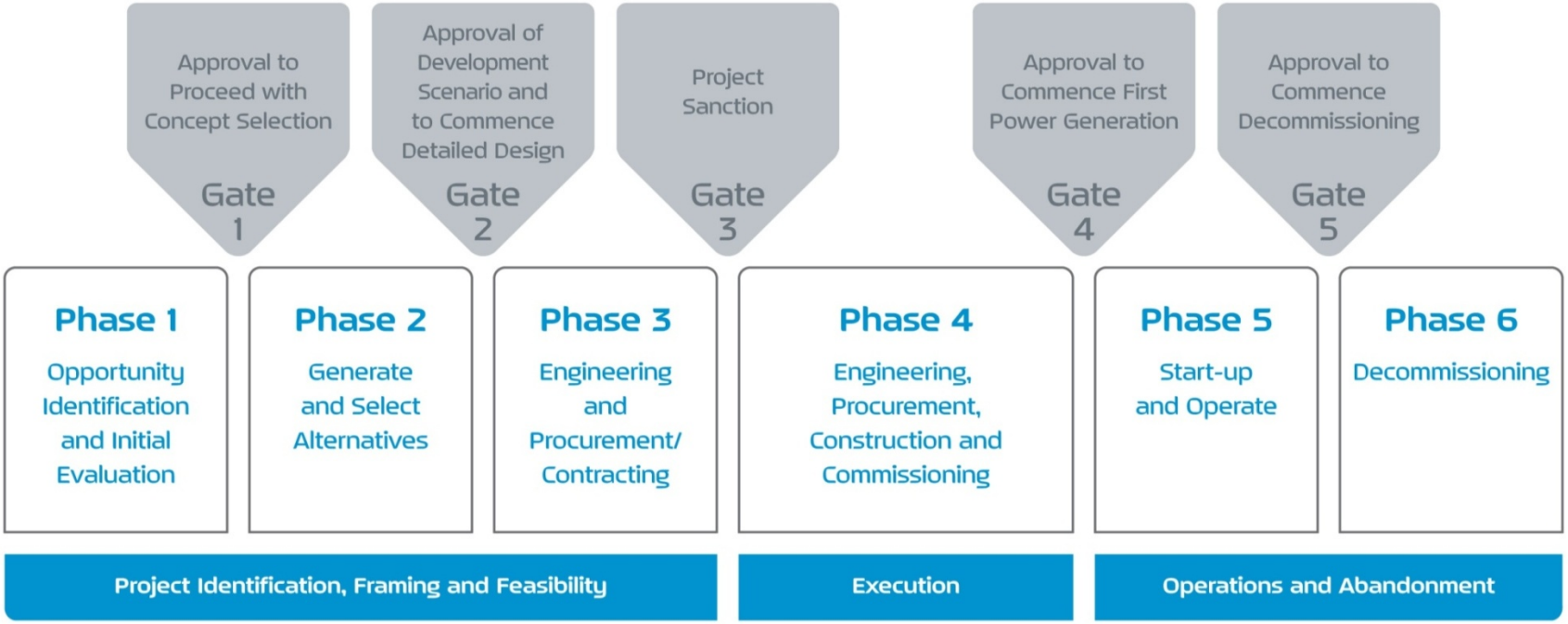


# Labrador-Island Link (LIL)

# Project Timeline

# Stage-Gate Process

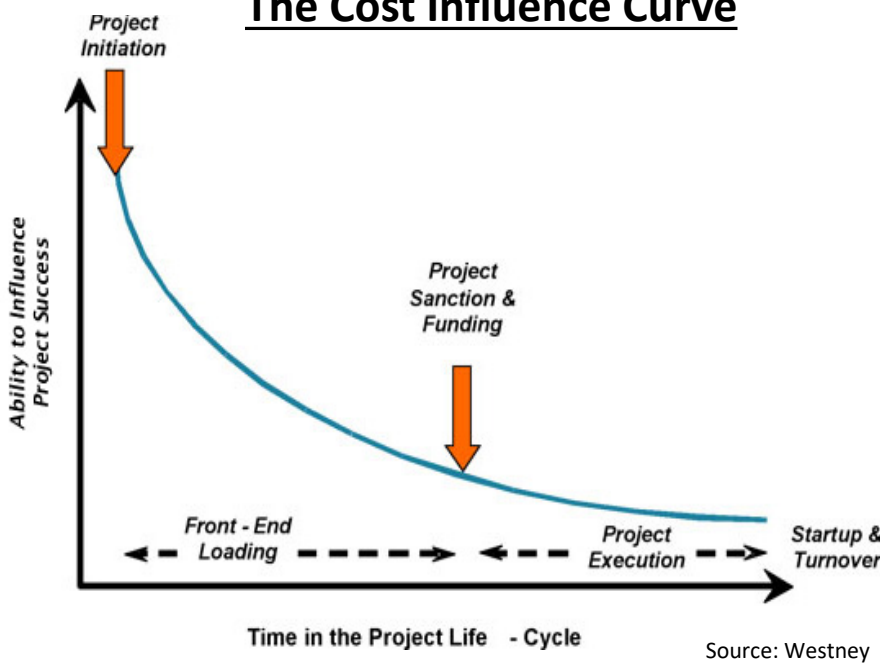
- Nalcor is implementing the Projects using a disciplined Stage-Gate Process
- DG2 was achieved in November 2010 and DG3 was achieved in December 2012
- Gatekeeper is Nalcor CEO in consultation with Nalcor Board of Directors and agreement with Shareholder



# Application of Industry Best Practice

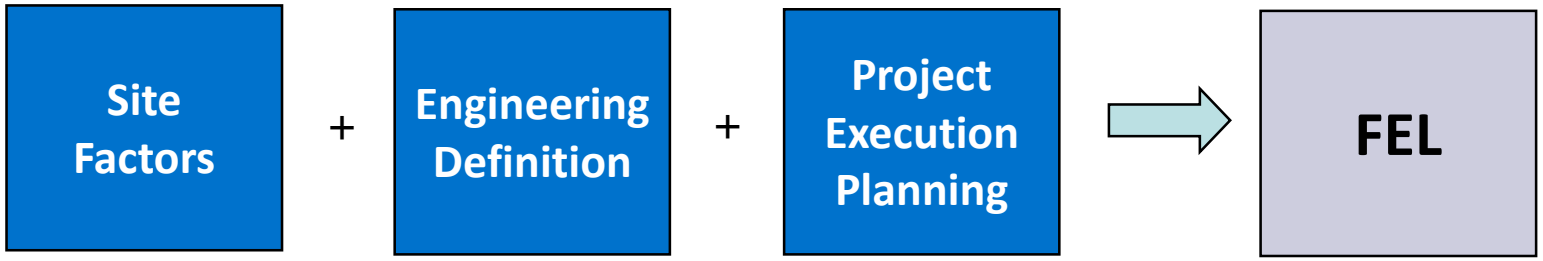
- Front-End Loading to confirm project scope and align with business objectives
  - Advanced Project Definition through completion of substantial engineering
  - Target engineering completion prior to start of construction
  - Extensive execution and construction planning
  - Adopt contracting strategies that minimizes and optimally allocates risk
  - Firming key prices through bidding before Sanction
- Early and continued focus on de-risking the projects
  - Shaped engineering, execution planning, contracting strategies, and decision to commence Early Infrastructure Works

**The Cost Influence Curve**




Source: Westney

# Front-End Loading: *#1 Predictor of Performance*




- Gateway Phase 3 focus directed towards completing the level of Front-End Loading to confirm the project definition and a “Sanction-quality” Class 3 cost estimate.

# Westney's Risk Resolution Process

## *Early Implementation in LCP's Lifecycle (pre-DG2)*


- *Risk Discovery identifies the major drivers of strategic risks and the Scenarios for Risk Framing.*
- *Risk Framing produces a Heat Map to provide understanding of risks and impacts.*
- *Risk Assessment & Analysis uses the Project Indicative Risk Model System (PRIMS™) to calculate the Risk Exposure and Risk-Conditioned Estimate Value.*

- *Risk Mitigation Planning drives decisions and strategies in such areas as:*
  - *Project Organization*
  - *Contracting & Procurement*
  - *Project Development*
  - *Financial & Commercial*
- *Risk Mitigation Analysis indicates the reduction in Risk Exposure from effective Risk Mitigation.*

- *Independent Honest Broker role allows Westney to facilitate constructive dialogue with partners, lenders, contractors and suppliers to create a shared understanding of project risks and their optimal allocation and monetization.*
- *Risk Collar defines unallocated Risk Exposure and potential sources of acceptance and funding.*

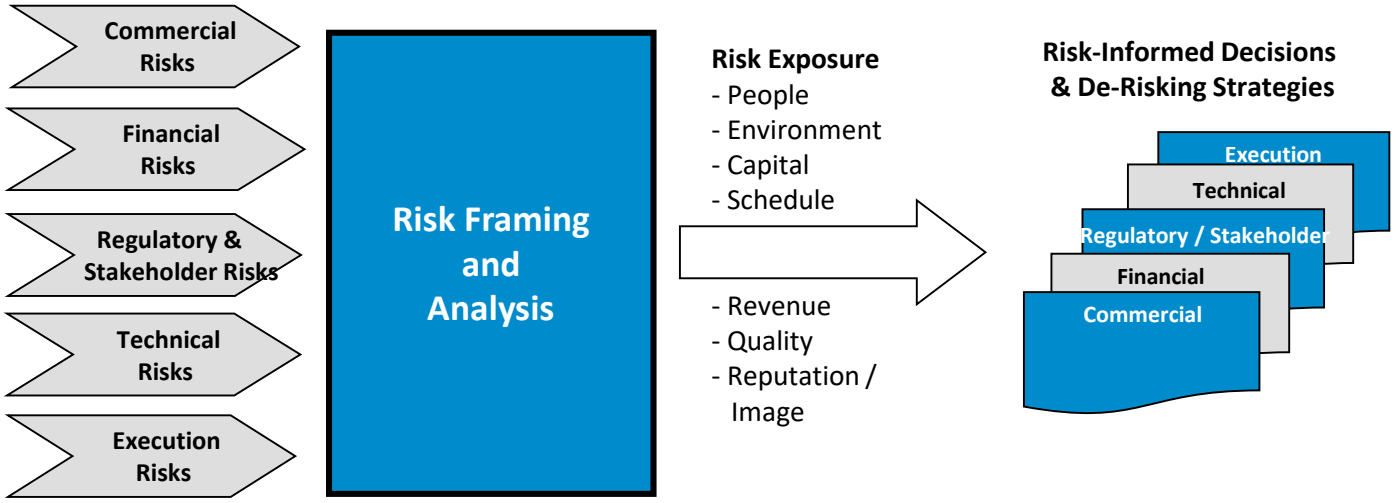
- *Risk Monitoring scans the project environment for key indicators and trends in background risks to signal the need for immediate mitigation or changes in strategy.*
- *Risk Surveillance looks for new threats and risks to the project.*
- *Risk Updates refresh the Risk Framing, Planning and Brokering processes to reflect developments.*
- *Risk Consulting supports program and project teams in ensuring the required competencies are in place and performing effectively.*

**Risk Resolution™**

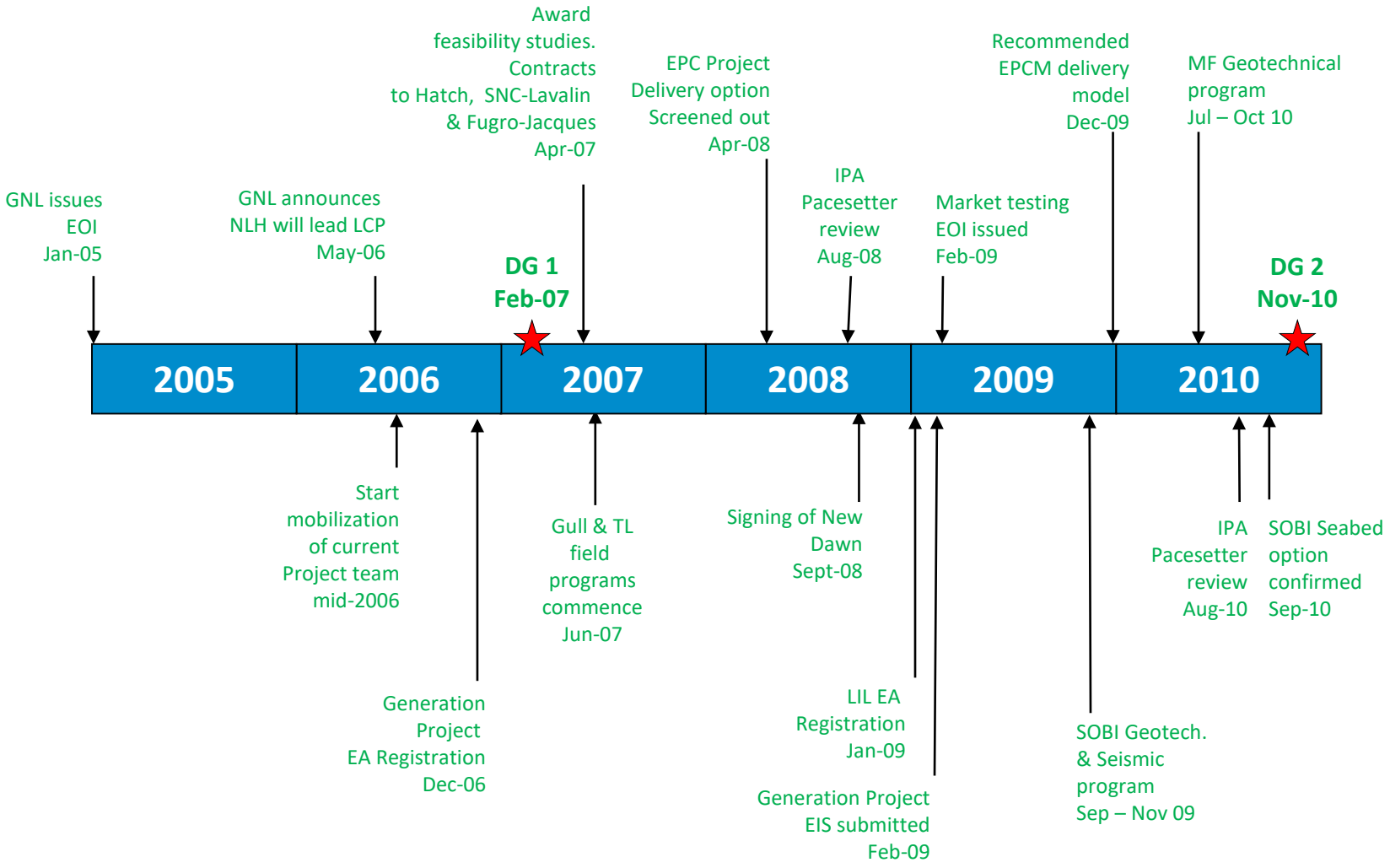
# Risk-Informed Decision Making

## *A Key Component of Our Front-End Loading Program*

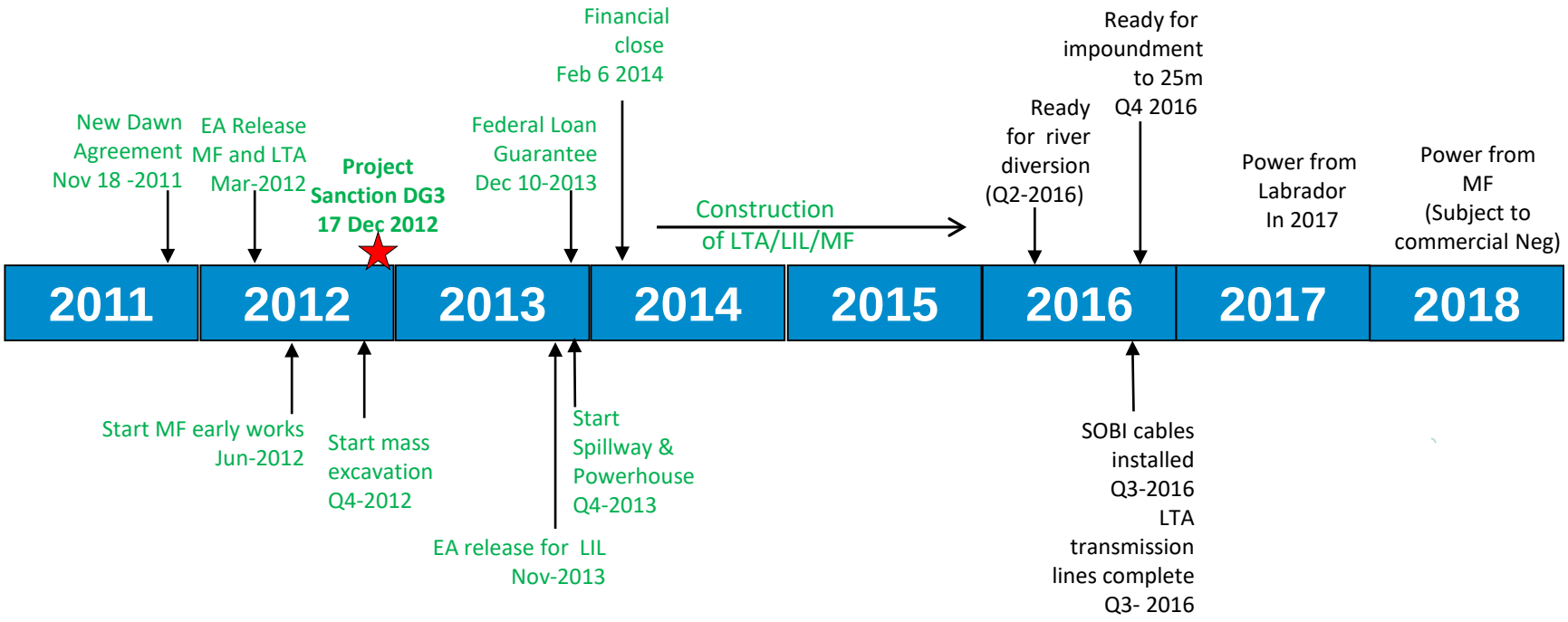
- Quality decision making will be facilitated through a comprehensive understanding of project risks and how they can be managed with least impact on the Project
  - Such risk-informed decision making will be a standard for the Project



# Key Project Achievements 2005 to 2010



# Key Project Achievements 2011 to 2016



# Independent and Technical Reviews

# Project Reviews

- At or just after DG2 an
  - IPR was conducted,
  - IPA did an assessment,
  - Navigant did a check of the business model,
  - MHI did a report for the PUB and
  - The PUB did a public review.
- At DG3
  - MHI completing a second assessment
  - Federal government did a review with Blair Franklin
  - Emera due diligence
  - IPR completed with members of Manitoba Hydro, Westney, Retired Mobil PM
  - Author of AAECI recommended practices reviewed controls processes

# Project Reviews

- Since DG3
  - Continuous internal audits by Nalcor full time auditors
  - Continuous internal audits by project quality group
  - Independent Engineer – MWH full review
  - Independent Engineer ongoing monthly monitoring and review including multiple site visits
  - Multiple independent risk overviews by the projects underwriters done semi annually
  - IPA assessment on organization capability and process,
  - Powerhouse progress reviews by Westney, Retired CEO of Bechtel, Retired Army Corp of Engineers Lieutenant Colonel and Founder of CII
  - Design Review Boards
  - Oversight Committee- EY

# Global Organizations Involved-Sample

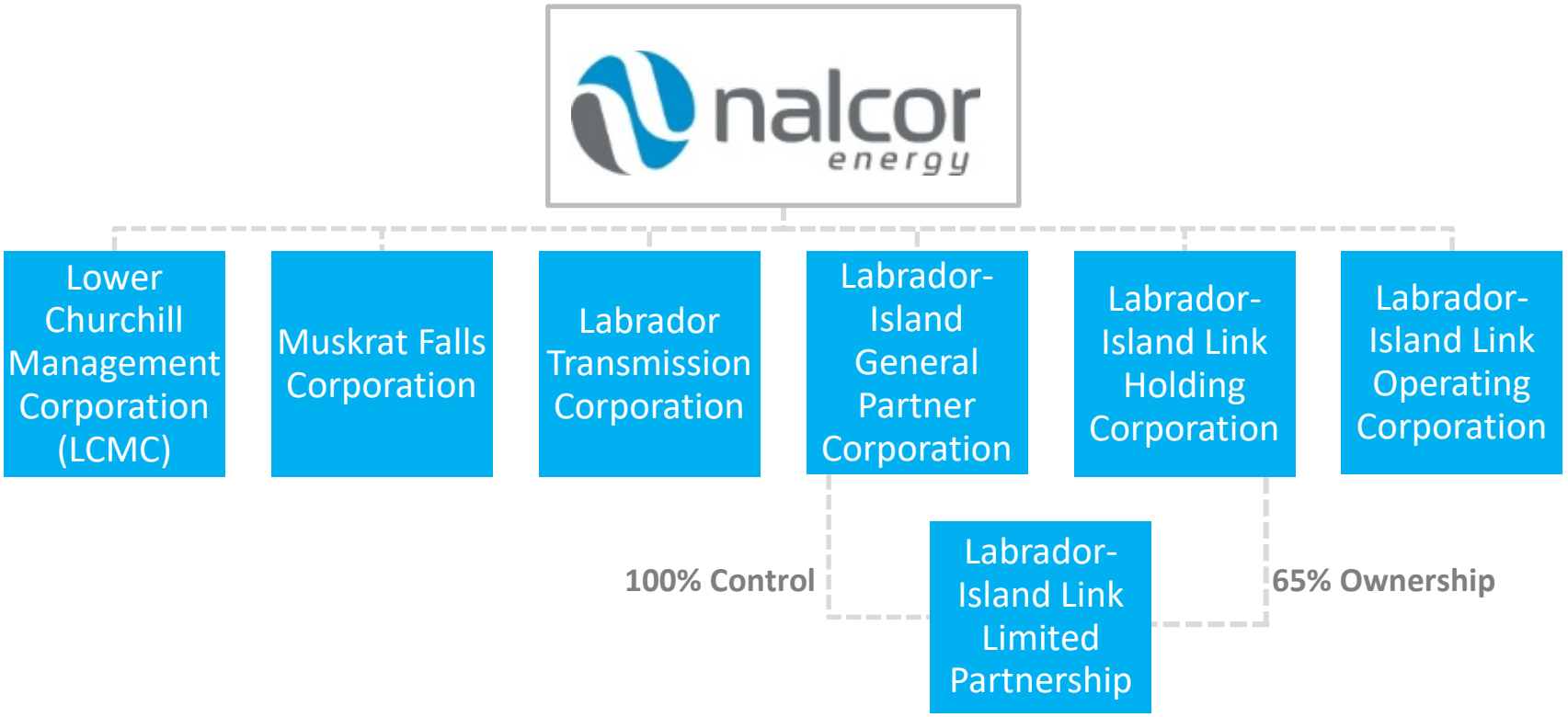
| Design and PM | PM/Risk and Finance | Construction and Manufacturing |
|---|---|---|
| SNC Lavalin | Westney | Alstom |
| Stattnett | IPA | Astaldi |
| Landsvirkijn | Navigant | Andritz |
| Manitoba Hydro | MWH | Barnard |
| BC Hydro | Blair Franklin | Quanta |
| US Meteorlogical Service | PWC | Nexans |
| AMEC Foster Wheeler | Government of Canada | Jyoti |
| Hatch | Etc. | ABB |
| OPG | | Etc. |
| Teshmont | | |
| Etc. | | |

# Governance

# Transparency and Accountability

- Part of each and every line of business throughout Nalcor Energy
- Nalcor reports to the public, government and stakeholders through various means such as:
  - Formal reports
  - Public Annual General Meeting
  - Access to Information and Privacy Protection
  - Responses to Regulatory and public requests for information
  - Public information sessions and meetings
  - Open houses and presentations

# LCP Corporate Structure



# Background

- Nalcor Energy Board of Directors is accountable to the Province of NL as Shareholder
  - Government of NL (GNL), on behalf of the people of the province, holds Nalcor accountable for project management and establishing oversight practices and procedures
- As required by legislation, the Boards of Nalcor's LCP subsidiaries must include at least 2 independent directors
  - Includes 1 "super" independent director for the LCP entities involved in the financing arrangements
- Within Nalcor and LCP there are various levels of financial oversight from groups that have different accountabilities
  - LCP Project Controls, LCP Finance & Administration and Nalcor Corporate Finance

# Background (cont'd)

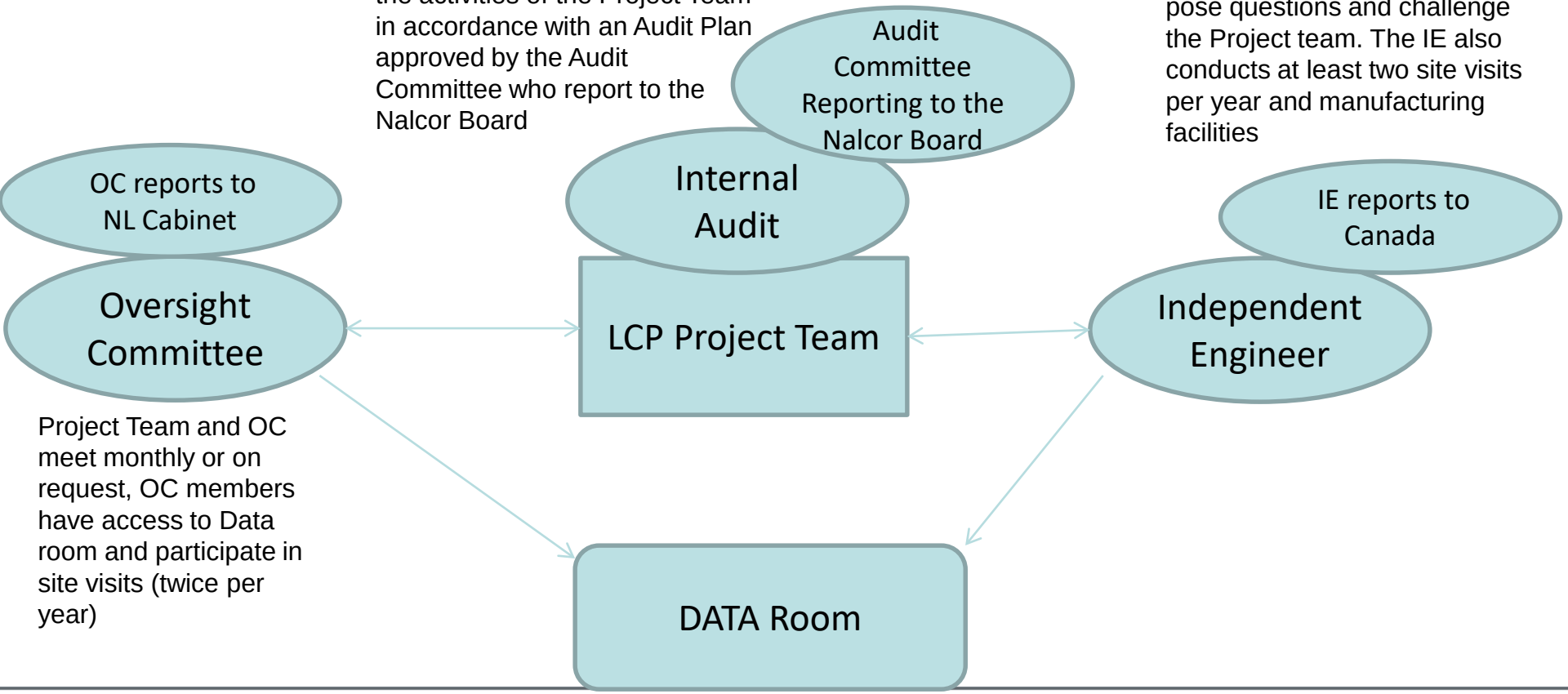
- LCP is a key focus of the Audit Committee of the Board
  - Both Internal Audit and the External Auditors support this mandate
- Oversight also provided by a number of key stakeholders external to Nalcor and LCP
  - GNL Muskrat Falls Oversight Committee
    - Purpose is to strengthen and formalize the existing oversight for the construction phase of the project
    - First report published in July 2014
  - Government of Canada, Collateral Agent and Independent Engineer ("IE") through the Federal Loan Guarantee ("FLG") arrangements and Project Finance Agreements ("PFA")

# Independent Engineer, Oversight Committee and Internal Audit



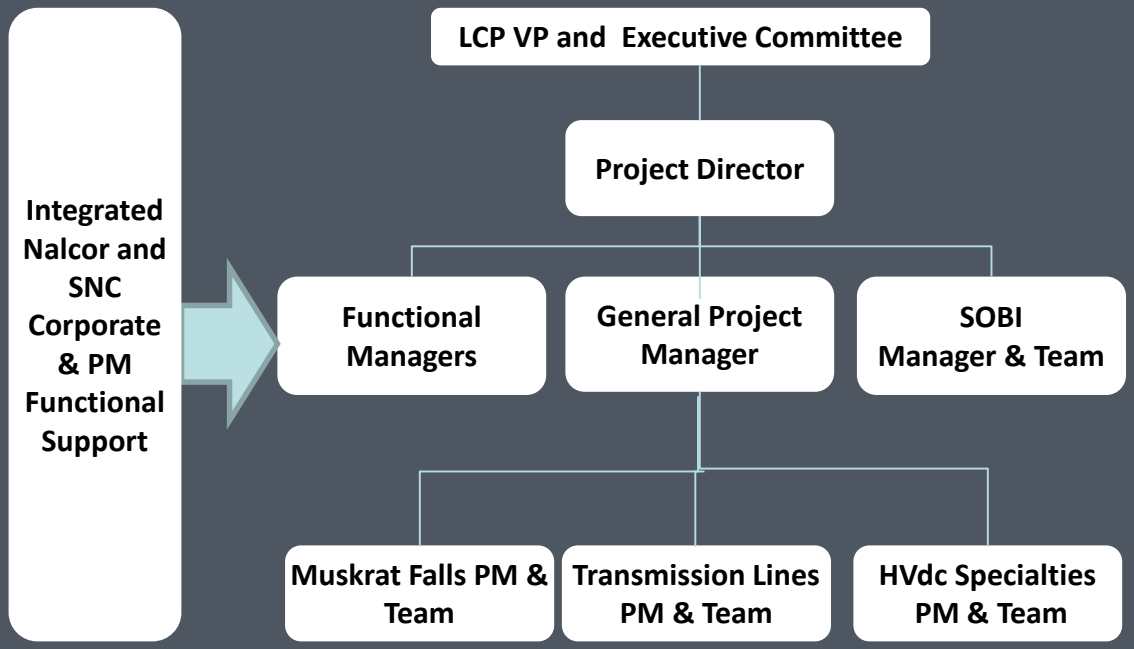
Internal Audit perform Audits on the activities of the Project Team in accordance with an Audit Plan approved by the Audit Committee who report to the Nalcor Board

The IE and expert consultants receive the Monthly Construction Reports, have continuous access to the Project team to pose questions and challenge the Project team. The IE also conducts at least two site visits per year and manufacturing facilities




Project Team and OC meet monthly or on request, OC members have access to Data room and participate in site visits (twice per year)

# LCP Governance & Org Structure

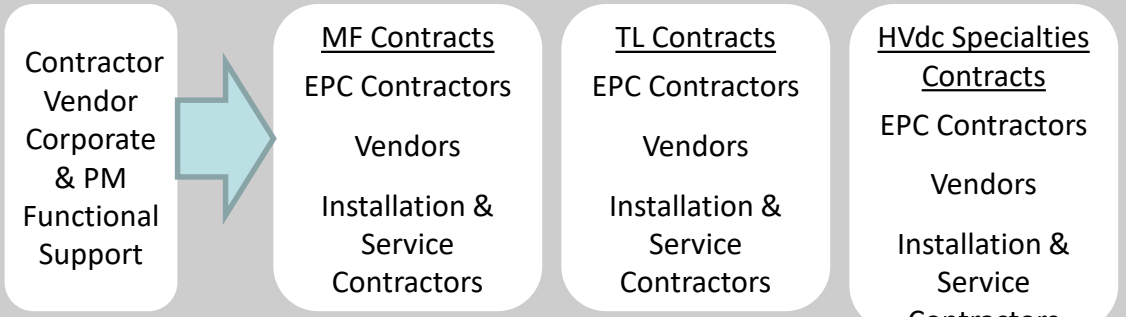



## Nalcor provides:

+ Strong Owner direction, guidance & leadership
+ Experienced PM team
+ 35 years operational experience
+ 30 years front end loading, PM best practices
+ Responsibility for finance, aboriginal, regulatory, insurance, environmental approvals, Shareholder, governance and decision making

## SNC provides:

+ World class track record of hydro-electric and transmission project execution
+ Extensive corporate resources to call on
+ Strong corporate support for Projects
+ Commitment to Project Excellence




## Contractors & Vendors provide:

+ Only top quality, reputable Tier 1's will be selected to bid
+ Only those with sound financial basis will be chosen
+ Compliance with contract format, terms and conditions

# Key Messages
# Internal Audit Assurance Framework

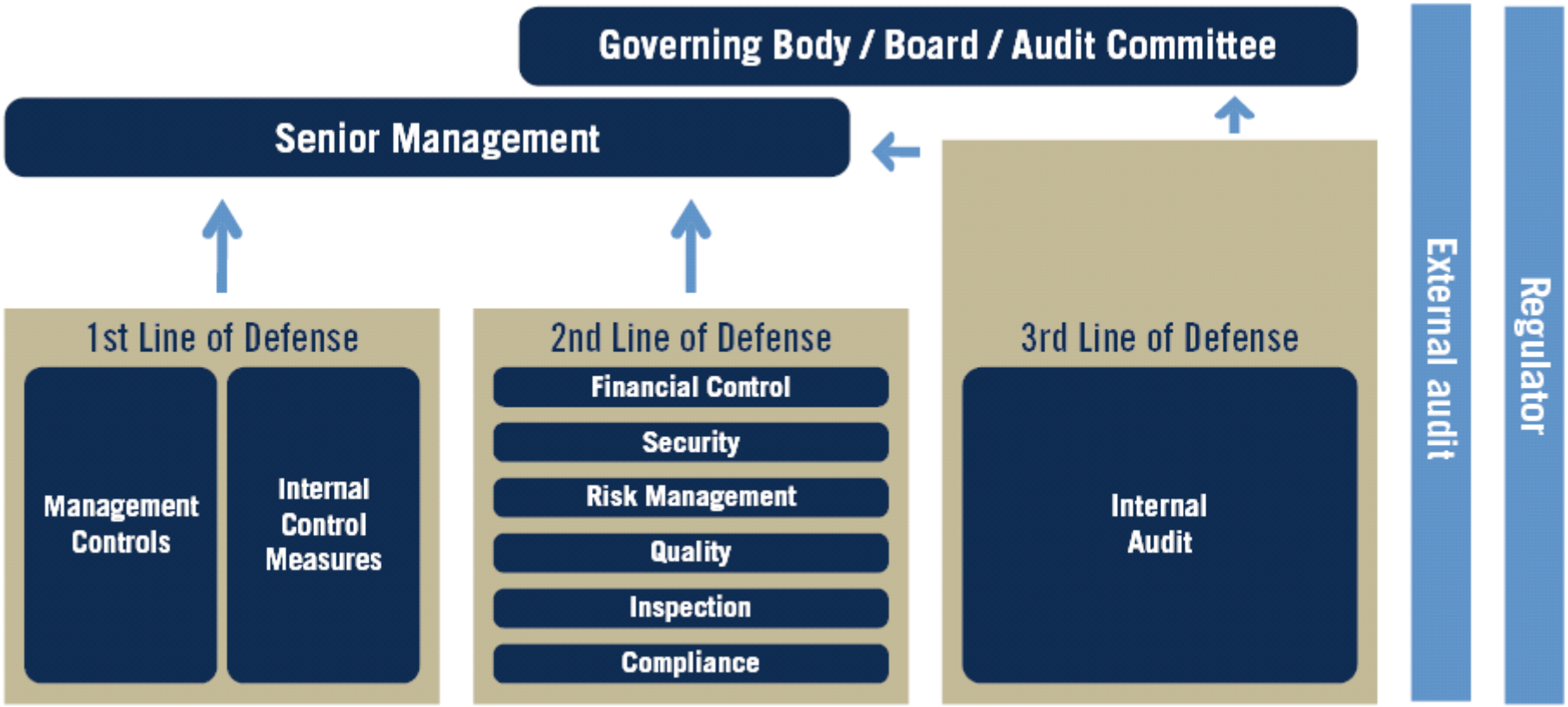
- Internal Audit has accountability for determining whether the organization's network of risk management, control, and governance processes is adequate and functioning as intended

- A proper assurance framework contemplates multiple layers of control and providers of assurance

- Internal Audit acts as a coordinator to ensure effectiveness of the assurance function and to avoid duplication of effort

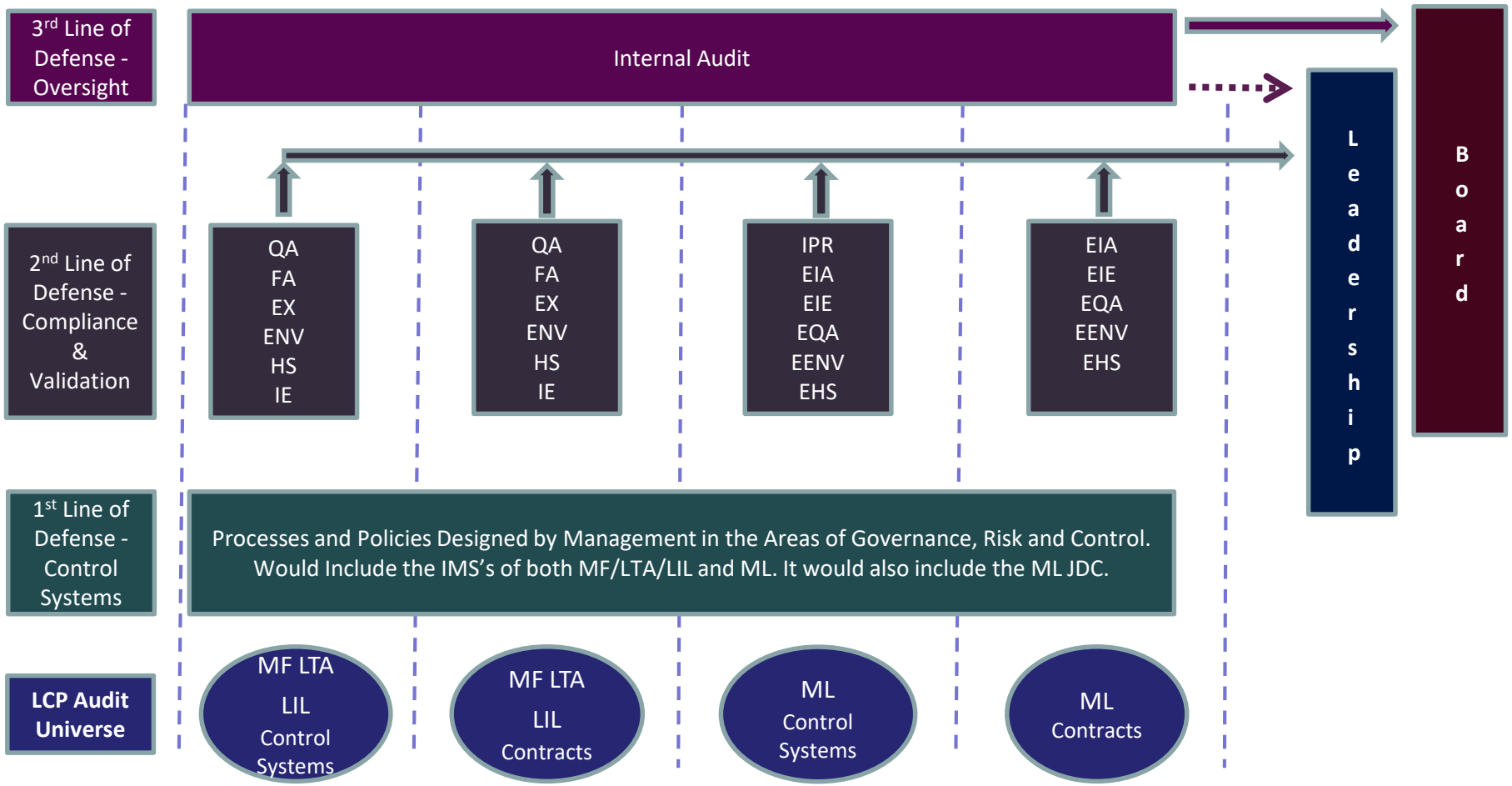
- Nalcor's assurance framework is consistent with best practices for ensuring an independent assessment of governance, risk management, and control processes for the Project

# Generic Assurance Framework Per the IIA




Reprinted from the Institute of Internal Auditors Position Paper dated January 2013 entitled; “The Three Lines of Defense in Effective Risk Management and Control”.

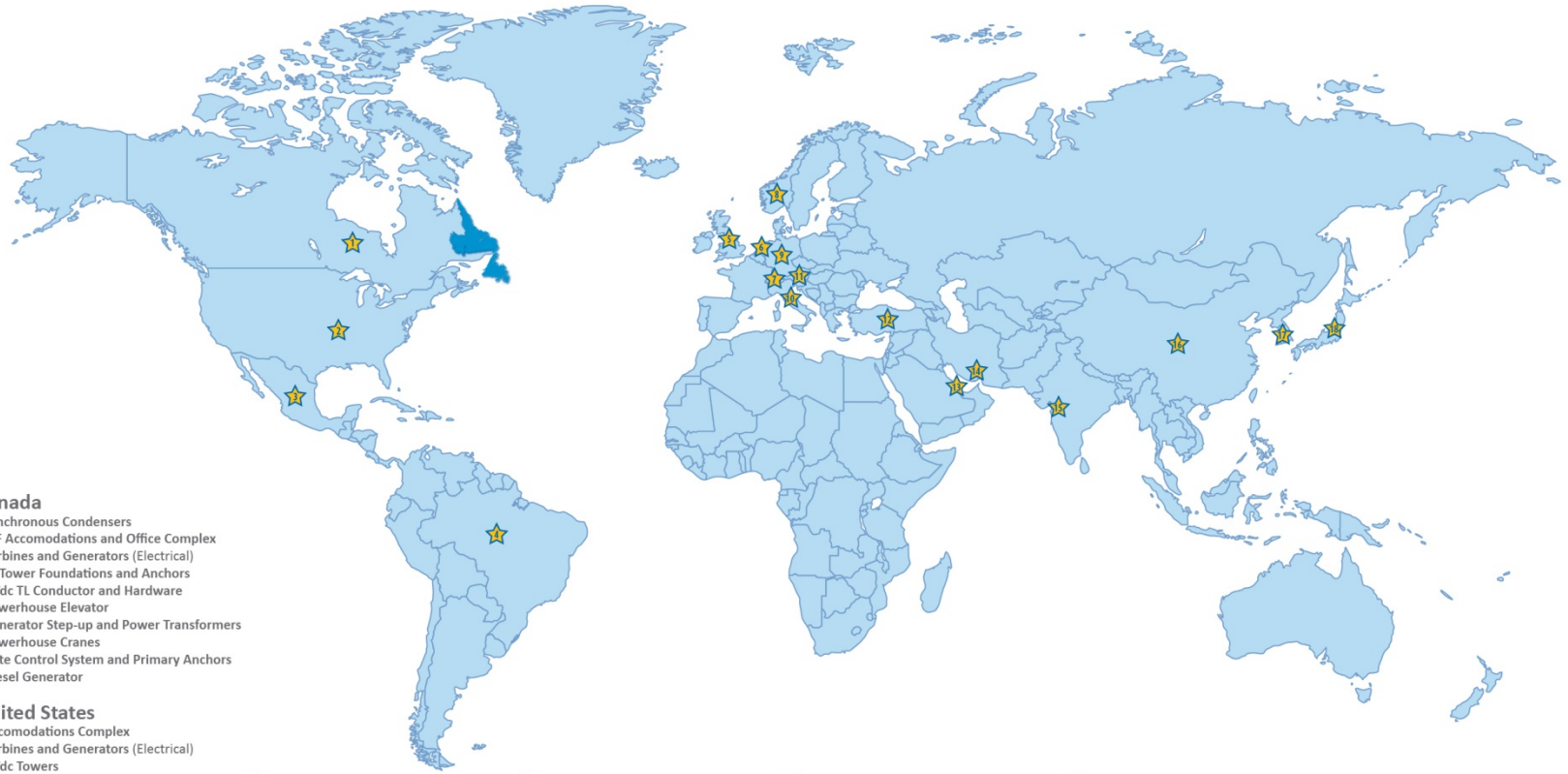
# LCP Assurance Framework - In Summary



# Project Global Reach

# Lower Churchill Project Global Reach

Locations around the world where components for the Muskrat Falls Project are being manufactured and fabricated



**Canada**
- Synchronous Condensers
- MF Accomodations and Office Complex
- Turbines and Generators (Electrical)
- TL Tower Foundations and Anchors
- HVdc TL Conductor and Hardware
- Powerhouse Elevator
- Generator Step-up and Power Transformers
- Powerhouse Cranes
- Gate Control System and Primary Anchors
- Diesel Generator

**United States**
- Accomodations Complex
- Turbines and Generators (Electrical)
- HVdc Towers
- Power Transformers

**Mexico**
- Construction Transformers

**Brazil**
- HDD Casing
- HVdc Converter Transformers

**England**
- Gas Insulated Switchgear
- HVdc Converter Transformers
- HVdc Thyristor Valves

**Netherlands**
- Rock Installation

**Switzerland**
- Generator Circuit Breakers

**Norway**
- Fibre Optics
- Cable Engineering

**Germany**
- Trash Rack Cleaning Machine

**Italy**
- TL Insulators
- Isolated Phase Bus

**Austria**
- HVac Tower Hardware
- Govern High Pressure Unit

**Turkey**
- HVac Towers

**Bahrain**
- HVac Conductors
- HVdc Electrode Conductors

**United Arab Emirates (Dubai)**
- HVdc Towers

**India**
- HVdc Towers
- Generator Rotor Poles

**China**
- Turbines and Generators (Mechanical)
- Optical Ground Wires
- Gates (major structural components)

**Korea**
- Synchronous Condenser (Flywheel/Shaft) Forging and Machining

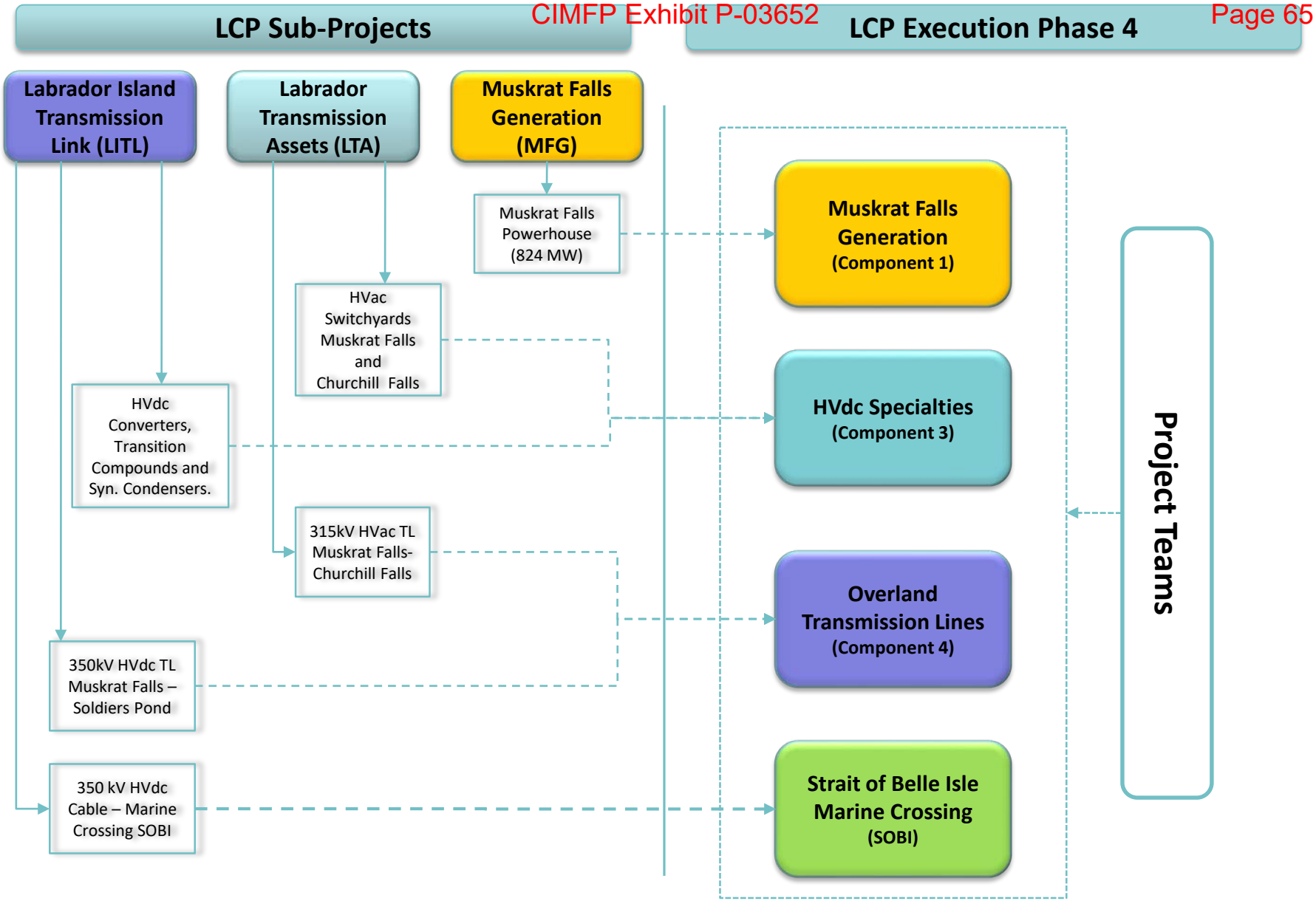
**Japan**
- Marine Cables

nalcor energy
LOWER CHURCHILL PROJECT

# Project Delivery Model

# Optimizing Project Delivery

| Strategic Objectives | Decision 1: Delivery Model = E+Integrated Team | Decision 2: Packaging Strategy |
|---|---|---|
| Balancing absolute cost against cost certainty, while…<br>• Achieving the required project quality<br>• Optimizing the project schedule<br>• Minimizing overall cost and schedule risk<br>• Achieving optimum and appropriate risk allocation<br>• Meeting benefits and First Nations obligations | • Market not amenable to single EPC, but to smaller EPC<br>• Skillsets required vary across the 3 SPVs<br>• Offers enhanced Design Integrity & Performance<br>• 3 separate SPV's need individual, distinct delivery representation,<br>• Overarching system design and management needed across the SPV's to ensure total system delivery | • Each SPV requires varied skill sets – need to align to bidder resources and capacities<br>• Market desires are clear for most major packages<br>• Optimize risk allocation<br>• Maximizes market competition<br>• Heavily focusing on EPC, lump sums, and fixed unit price with known quantity<br>• Reflect IBA Obligations |


LCP Sub-Projects
LCP Execution Phase 4
Labrador Island Transmission Link (LITL)
Labrador Transmission Assets (LTA)
Muskrat Falls Generation (MFG)
Muskrat Falls Powerhouse (824 MW)
HVac Switchyards Muskrat Falls and Churchill Falls
HVdc Converters, Transition Compounds and Syn. Condensers.
315kV HVac TL Muskrat Falls-Churchill Falls
350kV HVdc TL Muskrat Falls – Soldiers Pond
350 kV HVdc Cable – Marine Crossing SOBI
Muskrat Falls Generation (Component 1)
HVdc Specialties (Component 3)
Overland Transmission Lines (Component 4)
Strait of Belle Isle Marine Crossing (SOBI)
Project Teams

# Material Contract Strategy Summary

| Muskrat Falls Generation Facility | | | | | |
|---|---|---|---|---|---|
| **Contract #** | **Description** | **Contractor** | **Status** | **Type** | **Strategy** |
| CH0002-001 | Accommodations Complex | Liannu Limited Partnership | **Complete** | S&I | LS/UR |
| CH0006-001 | Bulk Excavation | IKC-ONE Earthworks Constructors | **Complete** | Civil | Unit Rate |
| CH0007-001 | Powerhouse/Intake/Spillway | Astaldi Canada Inc. | Active | Civil | LS/UR |
| CH0008-001 | North Spur Stabilization | Gilbert Newfoundland and Labrador | Active | Civil | T&M |
| CH0009-001 | North & South Dams | Barnard Pennecon Limited Partnership | Active | Civil | LS/UR |
| CH0024-001 | Reservoir Clearing | Johnson's Construction Ltd. | Active | Civil | Lump Sum |
| CH0030-001 | Turbines & Generators | Andritz Hydro Canada Inc. | Active | S&I | Lump Sum |
| CH0031-001 | Balance of Plant | **TBD** | **RFP** | S&I | Unit Rate |
| CH0032-001 | Hydro-Mechanical (Gates) | Andritz Hydro Canada Inc. | Active | S&I | Lump Sum |
| SH0018-001 | Camp Catering & Janitorial | Labrador Catering Limited Partnership | Active | Services | Unit Rate |

| Labrador Transmission Assets | | | | | |
|---|---|---|---|---|---|
| **Contract #** | **Description** | **Contractor** | **Status** | **Type** | **Strategy** |
| CD0502-001 | AC Substations | Alstom Grid Canada Inc. | Active | Civil | Lump Sum |
| CT0319-001 | AC Transmission Line | Valard Construction LP | Active | Civil | LS/UR |

| Labrador Island Transmission Link | | | | | |
|---|---|---|---|---|---|
| **Contract #** | **Description** | **Contractor** | **Status** | **Type** | **Strategy** |
| CD0501-001 | Converters & Transition Compounds | Alstom Grid Canada Inc. | Active | S&I | Lump Sum |
| CD0502-001 | AC Substations | Alstom Grid Canada Inc. | Active | Civil | Lump Sum |
| CD0508-001 | Electrode Sites | H.J. O'Connell Construction Limited | **Complete** | Civil | LS/UR |
| CD0534-001 | Synchronous Condensers | Alstom Renewable Power Canada Inc. | Active | S&I | Lump Sum |
| CT0327-001 | DC Transmission Line | Valard Construction LP | Active | Civil | LS/UR |
| CT0327-013 | ROW Clearing (Blocks 4, 5 & 6) | Johnson's Construction Ltd. | Active | Civil | T&M |
| CT0327-015 | ROW Clearing (Blocks 9 to 12) | Johnson's Construction Ltd. | Active | Civil | T&M |
| PT0328-001 | DC Conductor (Wire) | General Cable Company Limited | Active | PO | Unit Rate |
| PT0330-001 | DC Tower Steel | Jyoti Americas | Active | PO | Unit Rate |
| LC-SB-002 | Submarine Cable | Nexans Norway AS | Active | S&I | Lump Sum |
| LC-SB-011 | Rock Protection for Submarine Cable | Tideway (Luxembourg) S.A. | Active | S&I | LS/UR |

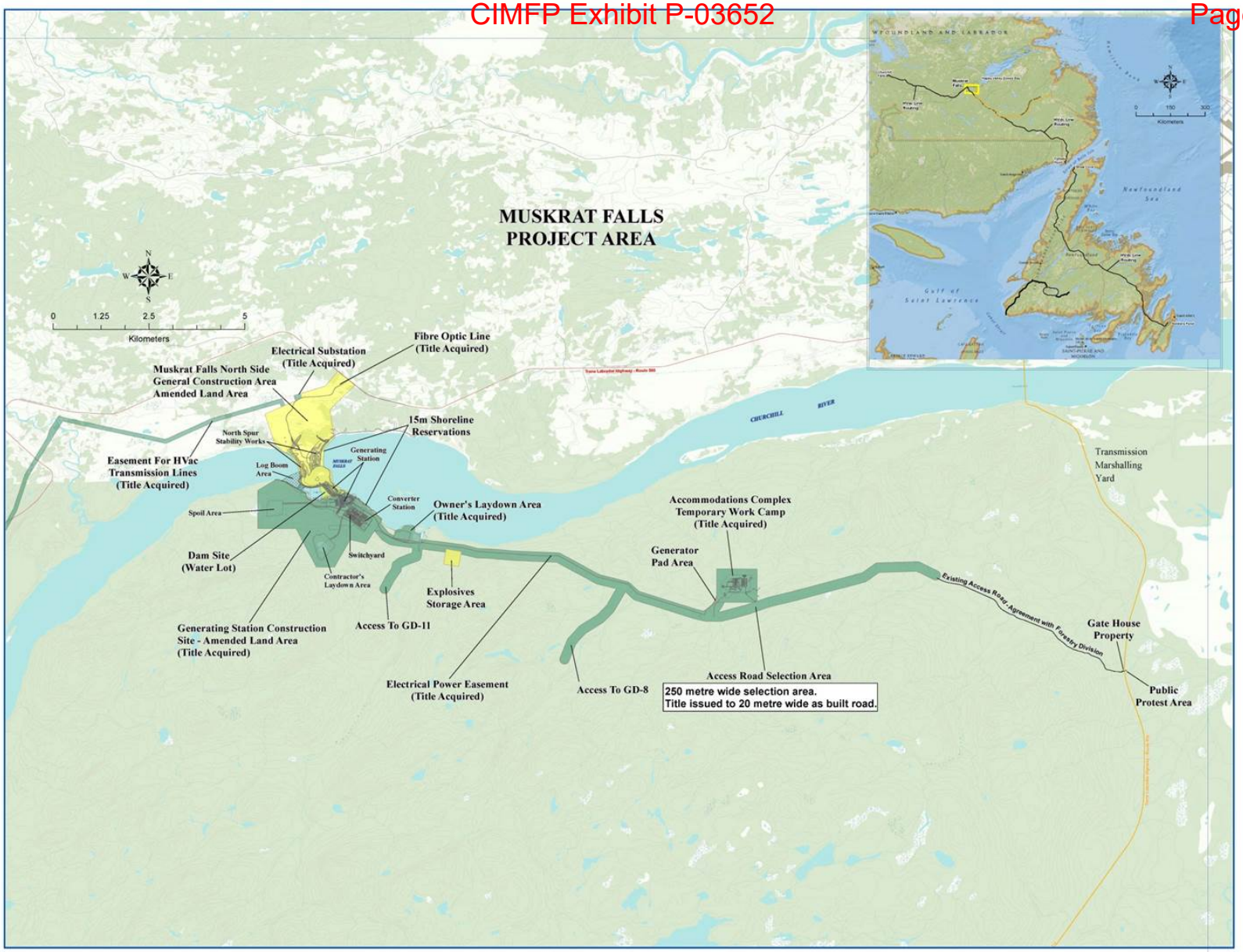
S&I = Supply and Install Agreement
UR = Unit Rate
PO = Equipment/Material Purchase
LS = Lump Sum
T&M = Time and Materials

# Contract Interface Management

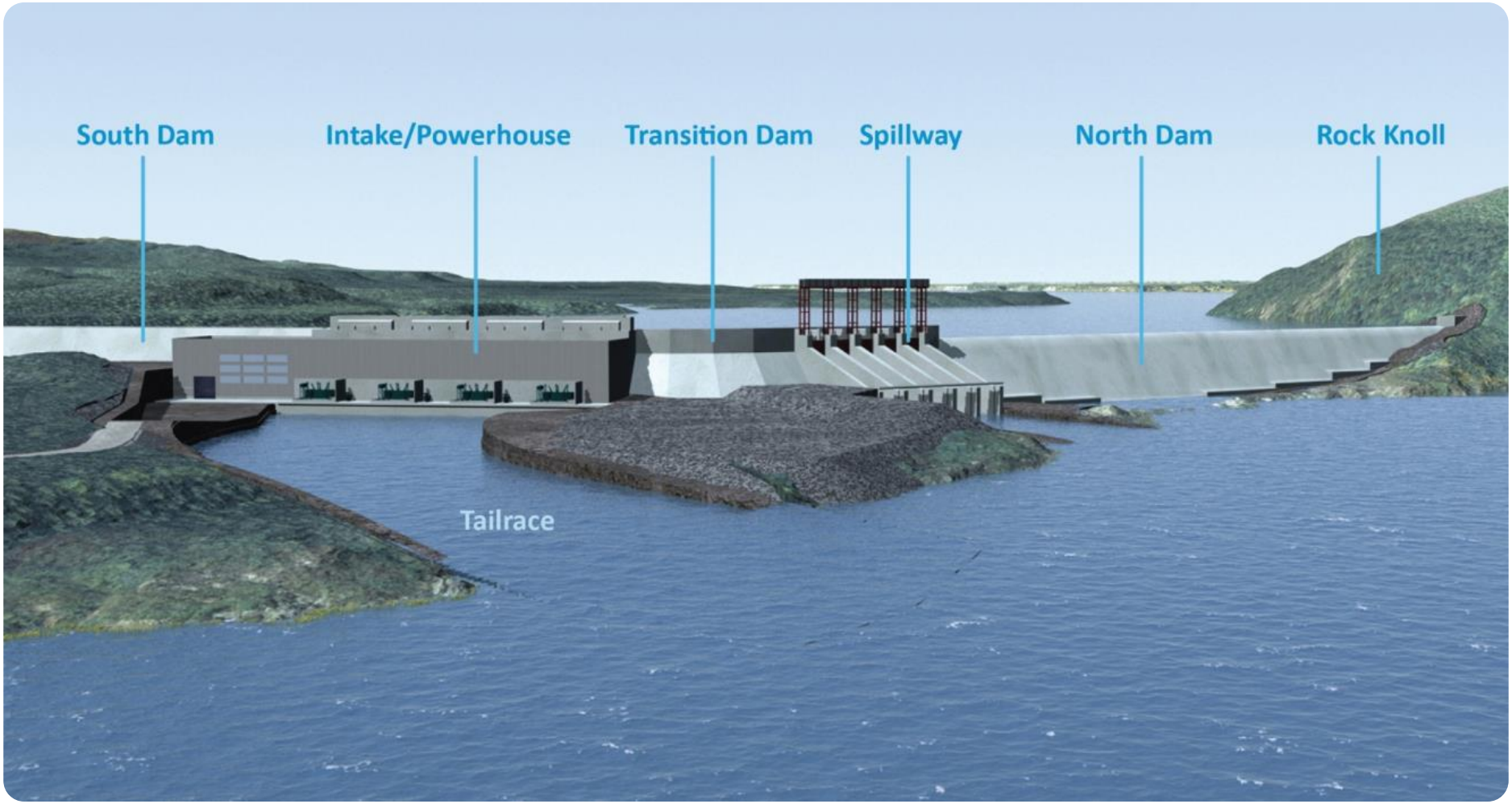
In addition to assuring the correct contracting strategy, Nalcor owners team is well resourced to manage contract interfaces to find the optimal balance between cost, execution risk and execution certainty through actions such as:

- Keeping interfaces to single points where practical
- Incorporating interface responsibility into contract language
- Ensuring appropriately sized and skilled owner team
- Using fixed price or Unit rate agreements where practical to allow appropriate passage of risk within a specific area of expertise
- Assigning resources to and implementing project wide interface management processes

# 2015 Progress and 2016 Look Ahead - Muskrat Falls Generation Site


MUSKRAT FALLS
PROJECT AREA
N
W
E
S
0
1.25
2.5
5
Kilometers
Electrical Substation
(Title Acquired)
Fibre Optic Line
(Title Acquired)
Muskrat Falls North Side
General Construction Area
Amended Land Area
15m Shoreline
Reservations
North Spur
Stability Works
Generating
Station
Easement For HVac
Transmission Lines
(Title Acquired)
Log Boom
Area
Converter
Station
Owner's Laydown Area
(Title Acquired)
Spoil Area
Dam Site
(Water Lot)
Switchyard
Contractor's
Laydown Area
Explosives
Storage Area
Generating Station Construction
Site - Amended Land Area
(Title Acquired)
Access To GD-11
Electrical Power Easement
(Title Acquired)
Access To GD-8
Accommodations Complex
Temporary Work Camp
(Title Acquired)
Generator
Pad Area
Access Road Selection Area
250 metre wide selection area.
Title issued to 20 metre wide as built road.
Existing Access Road Agreement with Forestry Division
Transmission
Marshalling
Yard
Gate House
Property
Public
Protest Area
CHURCHILL
RIVER
Newfoundland
Sea
Gulf of
Saint Lawrence
0
150
300
Kilometers

# Muskrat Falls Generating Facility



# Spillway

**November 2014**
The spillway concrete works were at the stage when the base slabs were poured and the concrete piers were being started


**November 2015**
The spillway concrete works, transition dams and separation wall are complete. Astaldi have handed over to Andritz for the installation of the guides and gates

# Separation Wall

**November 2014**
The separation wall had just been started



**November 2015**
The separation wall is complete

# Centre Transition Dam

**November 2014**
The centre transition dam base slab was poured and formwork was being erected



**November 2015**
The centre transition dam is complete

# Powerhouse and Intake

**November 2014**
The powerhouse and intake concrete works were just started Unit 1 and 2



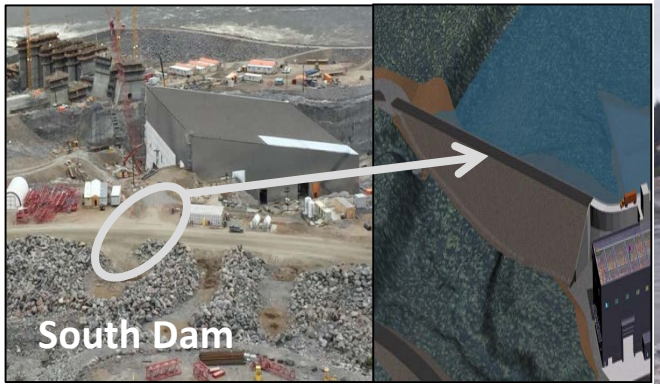
**November 2015**
The powerhouse and intake base slabs are poured, the semi-spiral case formwork is erected and concrete works proceeding on all units

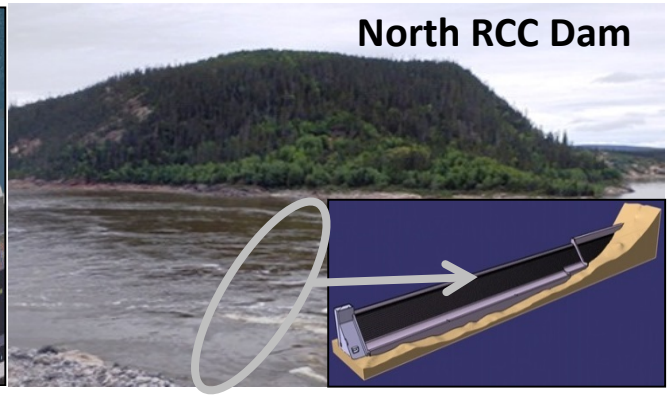
# North Spur

**November 2014**
The North Spur stabilization contract not yet awarded and no work had started on stabilization

**November 2015**
The contract was awarded Q1 2015. The contractor has made good progress with the upstream cut-off wall complete and upstream slope stabilization well advanced; downstream slope stabilization is also well advanced

# North and South Dams



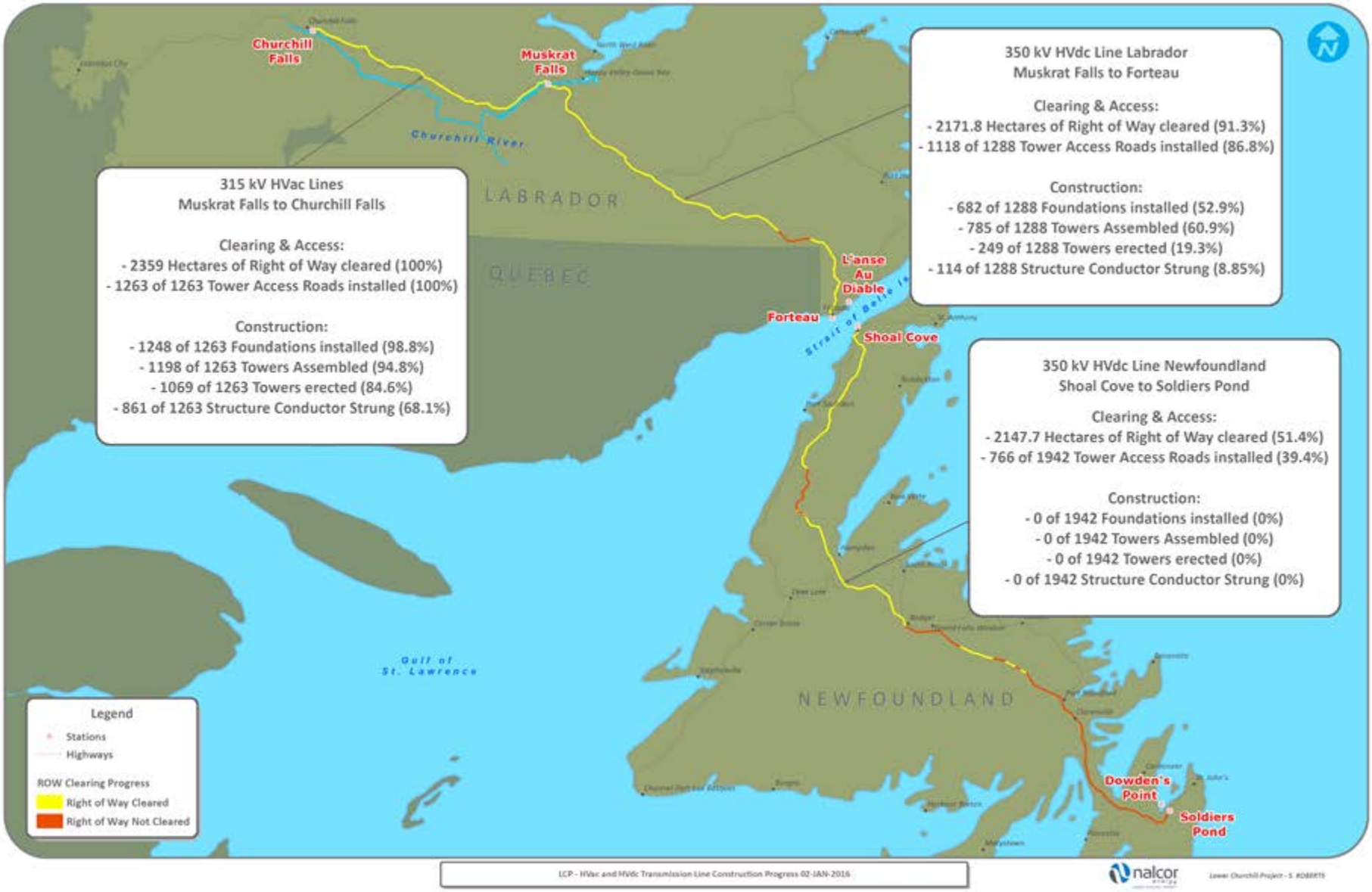

**November 2014**
The basic design was complete. Contracts were out for bid but not awarded


**November 2015**
The contract for north and south dams was awarded Q3 2015, the cofferdam that will close and divert the river in 2016 has started and the cofferdam to protect the powerhouse intakes is also well advanced

# 2016 Look Ahead

- Key targets
  - Substantial completion of spillway gates, guides and hoists to meet river diversion mid year
  - Close upstream cofferdam and river diversion mid 2016
  - Completion of North Spur stabilization work to allow impoundment to 25m by November
  - Impound reservoir to 25m
  - Powerhouse and intake concrete works on all units

# 2015 Progress and 2016 Look Ahead - Transmission


Churchill Falls
Muskrat Falls
Churchill River
LABRADOR
QUEBEC
L'anse Au Diable
Forteau
Strait of Belle Isle
Shoal Cove
Gulf of St. Lawrence
NEWFOUNDLAND
Dowden's Point
Soldiers Pond
315 kV HVac Lines
Muskrat Falls to Churchill Falls
Clearing & Access:
- 2359 Hectares of Right of Way cleared (100%)
- 1263 of 1263 Tower Access Roads installed (100%)
Construction:
- 1248 of 1263 Foundations installed (98.8%)
- 1198 of 1263 Towers Assembled (94.8%)
- 1069 of 1263 Towers erected (84.6%)
- 861 of 1263 Structure Conductor Strung (68.1%)
350 kV HVdc Line Labrador
Muskrat Falls to Forteau
Clearing & Access:
- 2171.8 Hectares of Right of Way cleared (91.3%)
- 1118 of 1288 Tower Access Roads installed (86.8%)
Construction:
- 682 of 1288 Foundations installed (52.9%)
- 785 of 1288 Towers Assembled (60.9%)
- 249 of 1288 Towers erected (19.3%)
- 114 of 1288 Structure Conductor Strung (8.85%)
350 kV HVdc Line Newfoundland
Shoal Cove to Soldiers Pond
Clearing & Access:
- 2147.7 Hectares of Right of Way cleared (51.4%)
- 766 of 1942 Tower Access Roads installed (39.4%)
Construction:
- 0 of 1942 Foundations installed (0%)
- 0 of 1942 Towers Assembled (0%)
- 0 of 1942 Towers erected (0%)
- 0 of 1942 Structure Conductor Strung (0%)
Legend
Stations
Highways
ROW Clearing Progress
Right of Way Cleared
Right of Way Not Cleared
LCP - HVac and HVdc Transmission Line Construction Progress 02-JAN-2016
nalcor energy

# 2016 Look Ahead

- Muskrat Falls to Churchill Falls transmission lines complete
- Muskrat Falls to Forteau line substantially complete
- Shoal Cove to Soldiers Pond ROW cleared and access roads installed
- Shoal Cove to Soldiers Pond tower erection and line stringing over 30% complete

# 2015 Progress and 2016 Look Ahead - SOBI

# Cables in Japan and Labrador Sites


Cable factory in Japan


Final Sub sea cable manufactured


Land cable terminations at Forteau


Quarry and Quay near Forteau

# Overview of SOBI Progress

## Status as of November 2014

- Horizontal Directional Drilling - 100%
- Cable type testing and manufacturing 53%
- Civil works 85%
- Land cable installation 0%
- Rock supply and Quay 47%

## Status as of November 2015

- Horizontal Directional Drilling - 100%
- Cable type testing and manufacturing 100%
- Civil works 95%
- Land cable installation 83%
- Rock supply and Quay 100%

# 2016 Look Ahead

- Transport cable to SOBI
- Install three sub sea cables
- Terminate and test installed cables
- Sub sea rock protection complete
- SOBI scope substantially complete

# 2015 Progress and 2016 Look Ahead - Switchyards and HVdc Facilities

# Overview of Switchyards and HVdc Facilities

## Status as of November 2014

- EPC contracts for switchyards, converters and synchronous condensers in progress
- Power transformer manufacturing started
- Site preparation complete at Muskrat Falls, Churchill Falls and Soldiers Pond, Forteau and Shoal Cove sites, civil works not started
- Grounding sites contract for island and Labrador not yet awarded

## Status as of November 2015

- EPC contracts progressing with focus on civil design and major equipment manufacturing underway
- Power transformers received at Muskrat Falls(2) Churchill Falls (7) and Soldiers Pond (4)
- Civil works and building construction well advanced at Muskrat Falls, Churchill Falls and Soldiers Pond
- Work for grounding sites substantially complete for island and Labrador

# Switchyards and HVdc facilities



**2014**
Site preparation work was nearing completion at all sites



**November 2015**
Civil works well advanced at all sites and grounding stations substantially complete

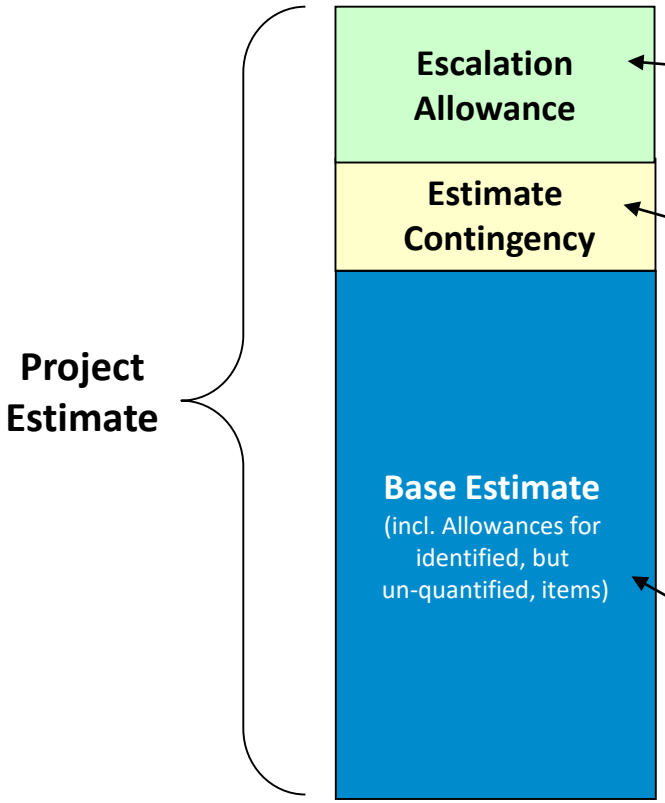
# 2016 Look Ahead

- Civil works and buildings nearing completion at all sites
- Synchronous condensers delivered
- Gas insulated switchgear, converter transformers and station equipment delivered to sites
- Equipment installation underway at all sites
- Factory Acceptance Testing of protection and control systems well advanced
- Substantial completion of Soldiers Pond switchyard

# DG3 Cost Estimate Process

# Cost Estimate is comprised of 3 Primary Components

## Definitions as per AACE Recommended Practice No. 10S-90




**Escalation Allowance**
Provision for changes in price levels driven by economic conditions. Includes inflation. Estimated using economic indices weighted against base estimate components.

**Estimate Contingency**
Provision made for variations to the basis of an estimate of time or cost that are likely to occur, that cannot be specifically identified at the time the estimate is prepared but, experience shows, will likely occur.

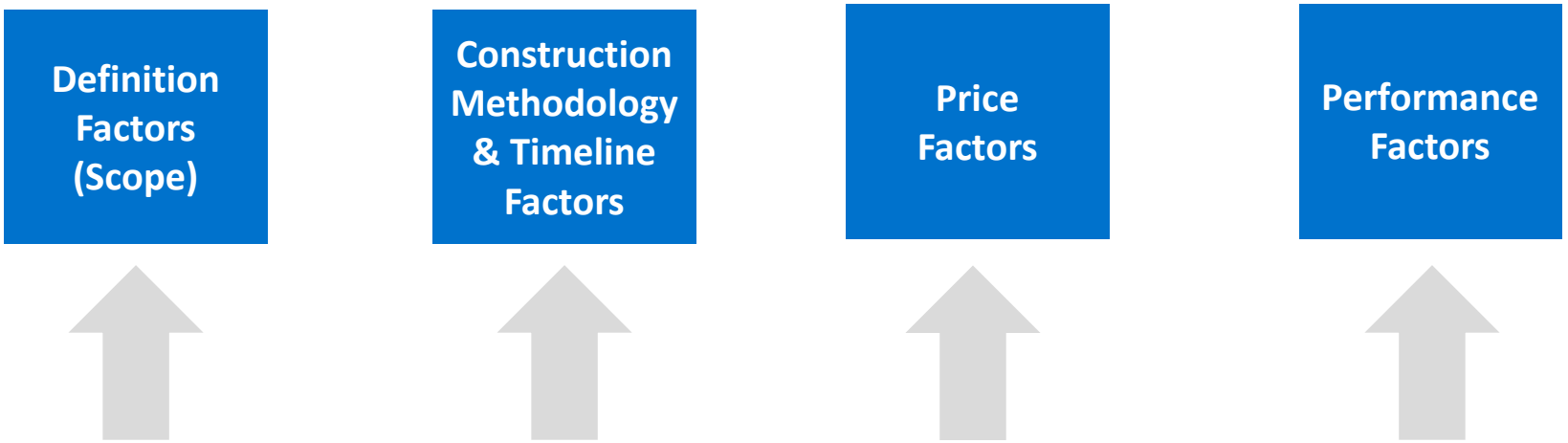
It is not meant to cover scope changes outside the Project's parameters, events such as strikes or natural disasters, escalation or foreign currency impact, or changes that alter the basis upon which the control point for management of change as been established as captured in key project documents (e.g. basis of design, project execution plan), or address strategic / external risks.

**Base Estimate**
Reflects most likely costs for known and defined scope associated with project's specifications and execution plan.

# DG3 Estimate – Intended Attributes

| Attribute | Key Characteristic |
|---|---|
| **Intended Purpose** | (i) Verify the Decision Gate 2 estimate<br>(ii) Provides increased level of confidence in outcome.<br>(iii) Seek Effective Project Approval or Sanction<br>(iv) Establishes the Project Budget |
| **Project Definition (i.e. level of engineering design complete)** | (i) Completed design documents including drawings and outline specifications at the end of Gateway Phase 3.<br>(ii) All project execution strategies in-place for execution.<br>(iii) Complete working drawings for early construction packages being issued for tender.<br>(iv) Expended engineering effort from 30% to 40% of total. |
| **Preparation Methodology** | (i) Deterministic based for both direct and indirect cost<br>(ii) Majority of estimate prepared from measured and priced quantities obtained from the completed design drawings and outline specifications.<br>(iii) Price and performance factors developed specifically for the Project (i.e. project labor agreement, commodity prices, productivity rates) and benchmarked against historical projects.<br>(iv) Production rates and timeline durations aligned with detailed construction schedule.<br>(v) A very minor proportion of the estimate may be in the form of allowances. |
| **Level of Precision** | Medium to High |
| **Cost Flow** | (i) Aligned with Project Control Schedule<br>(ii) Monthly cost flow available for each major commodity and for each currency and for each WBS Physical Component. |

# The Estimators Consider 4 Elements



# Base Estimate developed using 4 Main Inputs

## Nalcor's follows principles of AACE Recommend Practice No. 36R-08

**Input 1**: Definition Factors (Scope)

- ❑ 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

+

**Input 2**: Construction Methodology & Timeline Factors

- ❑ 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

+

**Input 3**: Price Factors

- ❑ 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

+

**Input 4**: Performance Factors

- ❑ 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

=

**Output**: Base Estimate

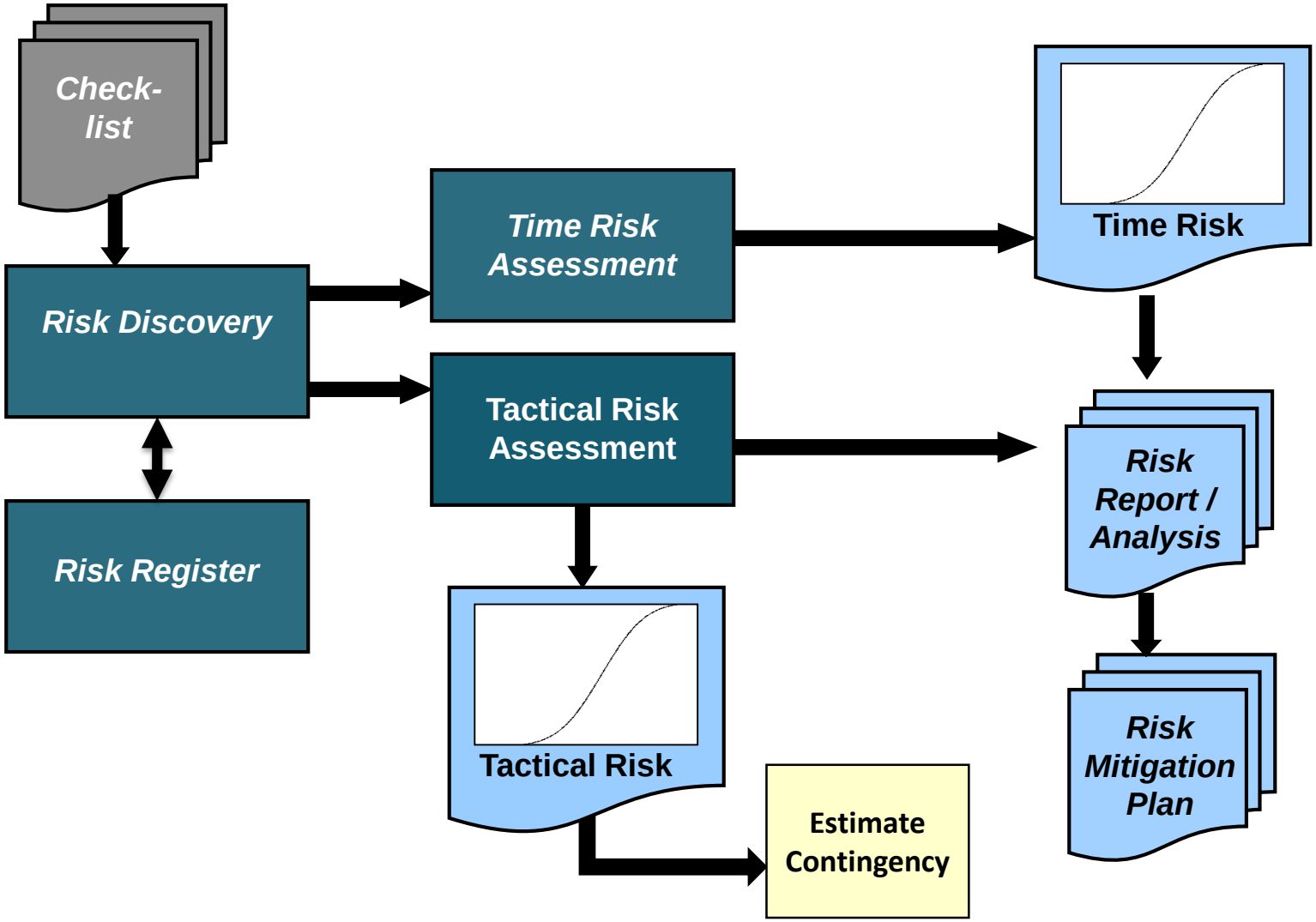
- ❑ Estimate organized by Project, Physical Component and by Contract Package
- ❑ Documented Basis of Estimate
- ❑ Foreign Currency Demand
- ❑ Person hours
- ❑ Trade demands
- ❑ Cash flows

# Approach and Methodology

- Owner-led estimate team comprised of SNC-Lavalin and various 3rd parties
- Developed over a 12-month period
- Leveraged extensive historical data for Hydro and Transmission projects developed in Canada
- Reflects what a construction contractor would need to do to evaluate project costs for which a bid is being prepared
  - This approach could be best described as a bottom-up first principle estimate as opposed to a parametric or stochastic method
- Concurrently "Check" or validation estimates and Estimate Process Check completed by expert consultants

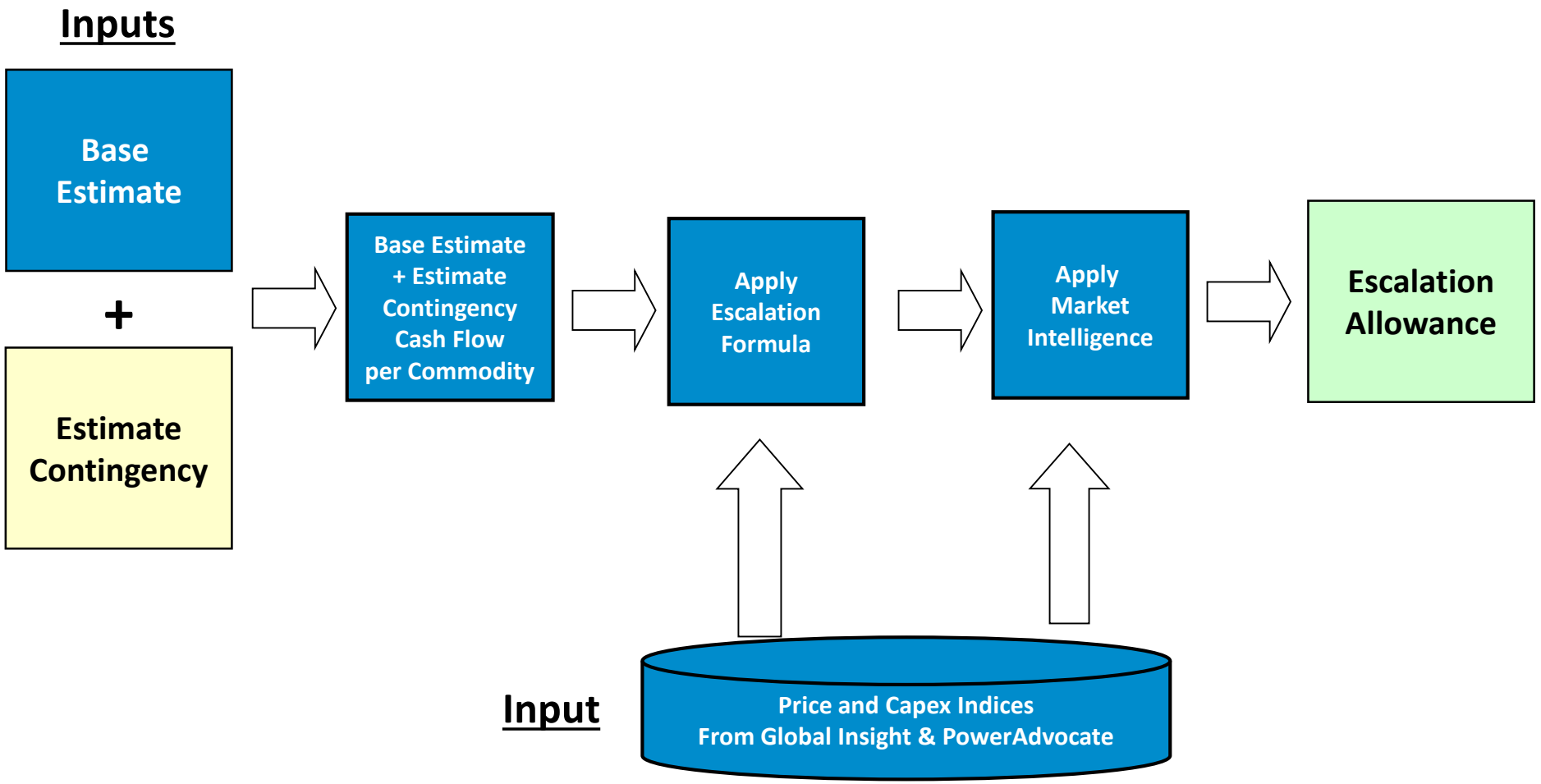
# Estimate Contingency Setting

## Nalcor's follows principles of AACE Recommend Practice No. 42R-08



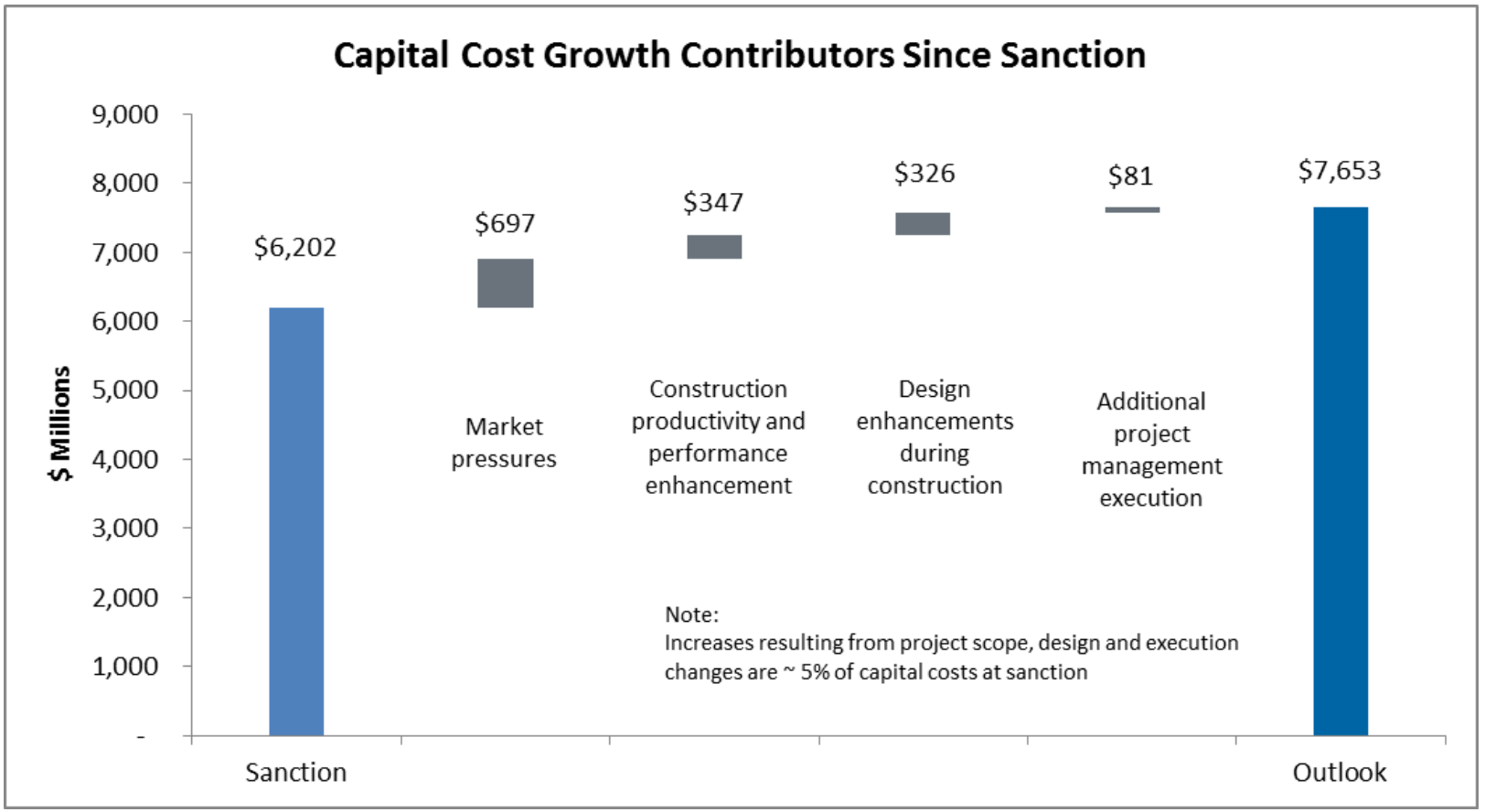
# Escalation Estimating Process

## Nalcor's follows principles of AACE Recommend Practice No. 58R-10



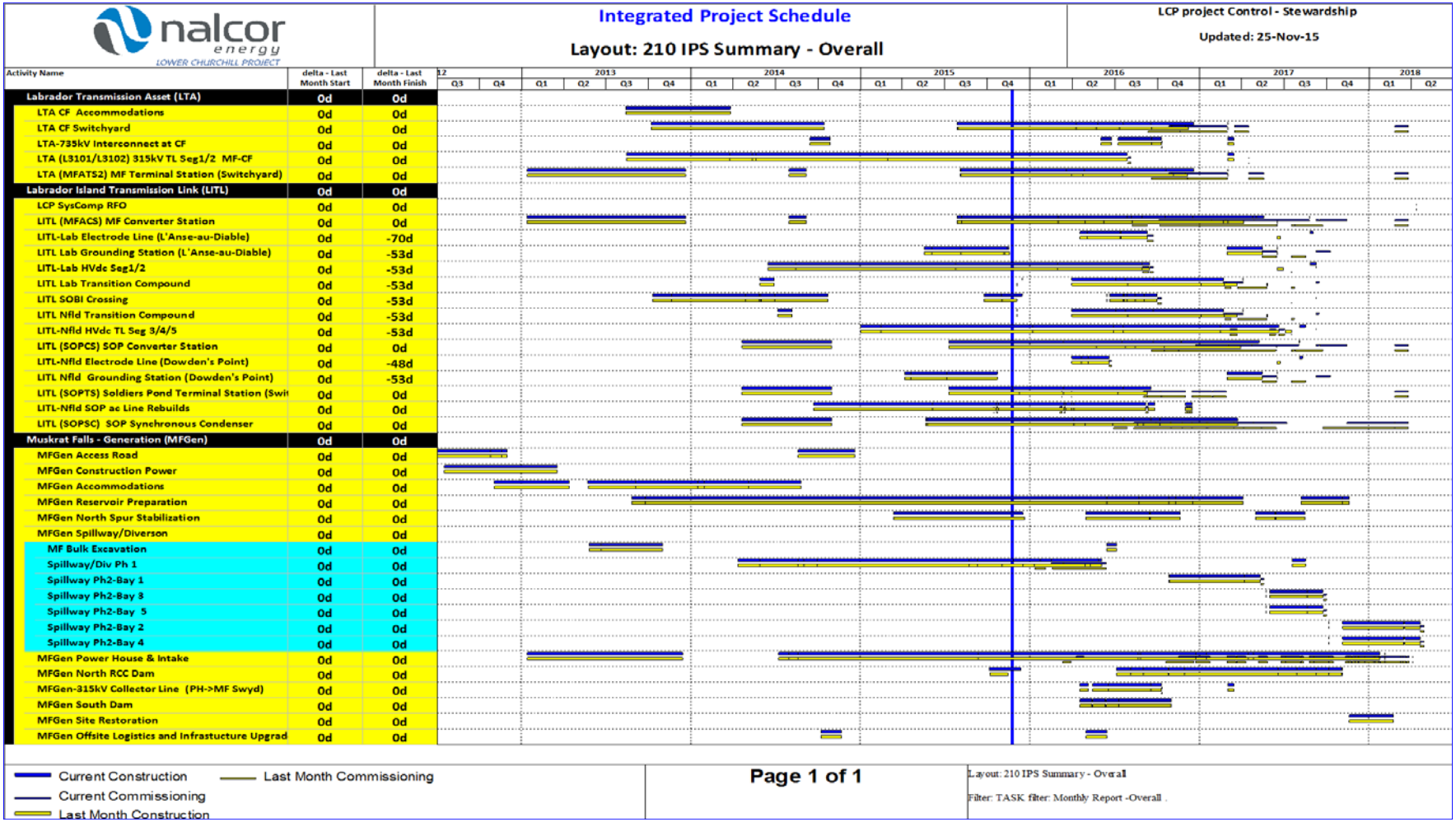
# Cost Summary

# Cost Growth Contributors Since Sanction



# Schedule Summary

# Summary Schedule-Period End Nov-15



# Summary of Progress-Period End Nov-15

## LCP - Overall 2015 Nov

### This Reporting Period

| | Weight | Period % | | | | Cumulative % *2 | | | Next Month |
|---|---|---|---|---|---|---|---|---|---|
| | Factor % | Plan *1 | Forecast | Earned | Var-Forecast | Plan | Earned | Variance | Forecast % |
| | A | B | B1 | C | C-B1 | E | F | F-E | G |
| Labrador Transmission Asset (LTA) | 11.1% | 3.2% | 3.2% | 6.2% | 3.0% | 60.9% | 66.5% | 5.6% | 4.4% |
| Labrador Island Transmission Link (LITL) | 42.2% | 3.4% | 3.4% | 1.7% | -1.7% | 35.2% | 32.5% | -2.7% | 3.0% |
| Muskrat Falls Generation (MFGen) | 46.7% | 1.9% | 1.9% | 1.1% | -0.8% | 54.7% | 39.6% | -15.1% | 0.2% |
| LCP-Overall | 100.0% | 2.7% | 2.7% | 1.9% | -0.8% | 47.2% | 39.6% | -7.6% | 1.8% |

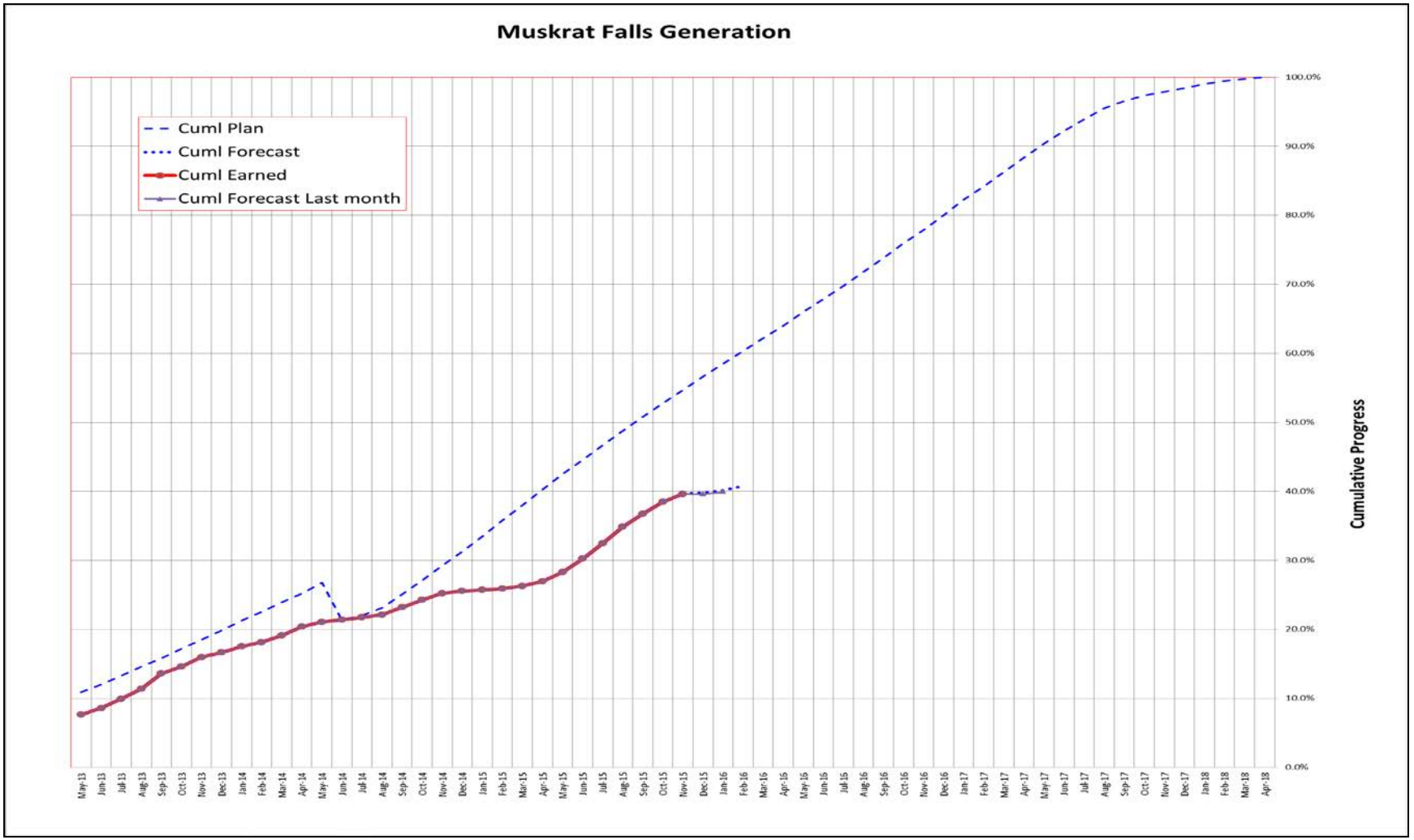
### Last Reporting Period

| | Weight | Period % | | Cumulative % | |
|---|---|---|---|---|---|
| | Factor % | Plan | Earned | Plan | Earned |
| | A | B | C | E | F |
| Labrador Transmission Asset (LTA) | 11.1% | 3.3% | 5.2% | 57.6% | 60.3% |
| Labrador Island Transmission Link (LITL) | 42.2% | 2.8% | 2.0% | 31.9% | 30.8% |
| Muskrat Falls Generation (MFGen) | 46.7% | 2.0% | 1.8% | 52.7% | 38.5% |
| LCP-Overall | 100.0% | 2.5% | 2.2% | 44.5% | 37.7% |

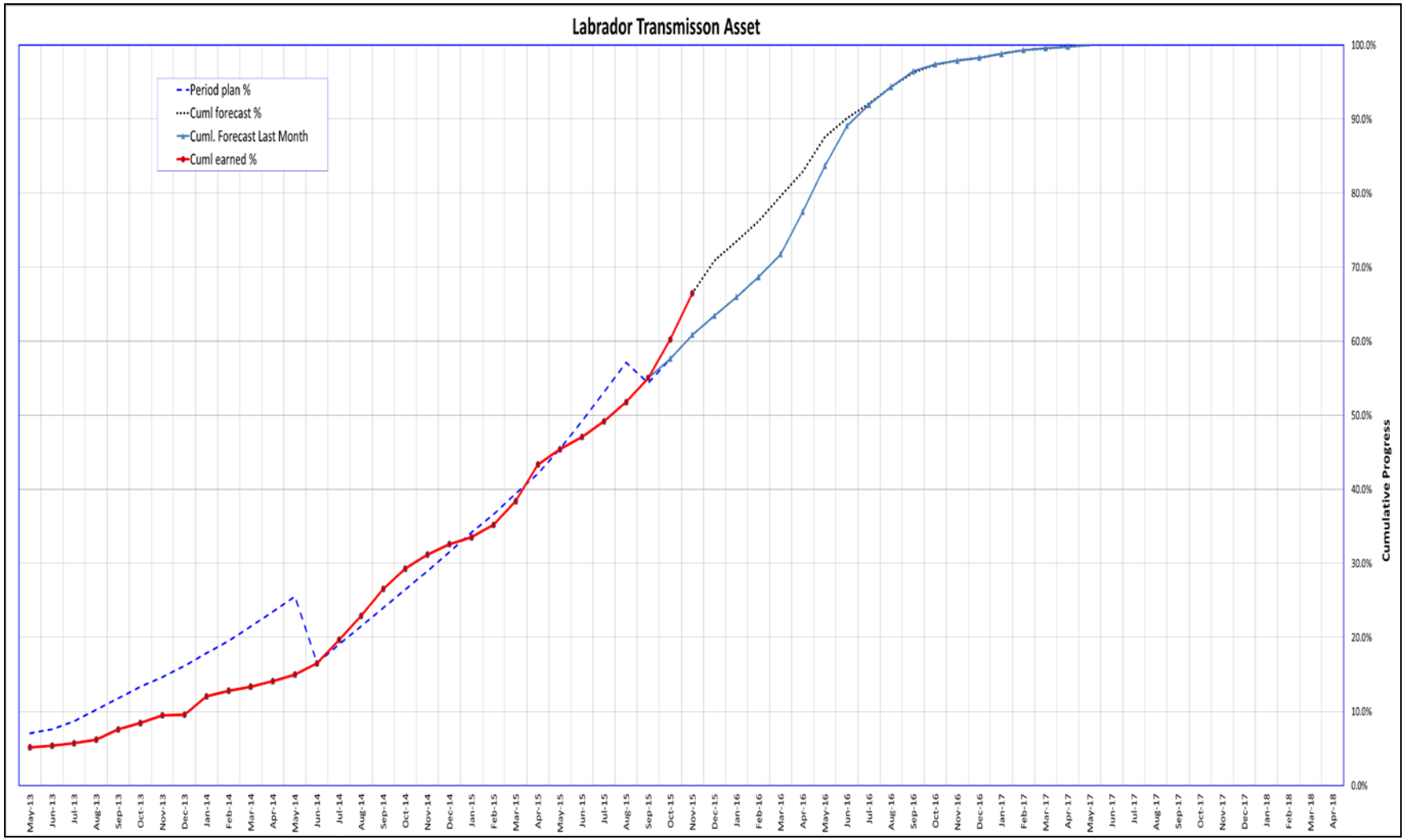
*1 Plan represents Sep 2015 rebaseline for LTA/LITL and partial MFG. Remaining MFG uses June 2014 baseline

*2 MFG cumulative planned progress uses June 2014 baseline until MFG update available

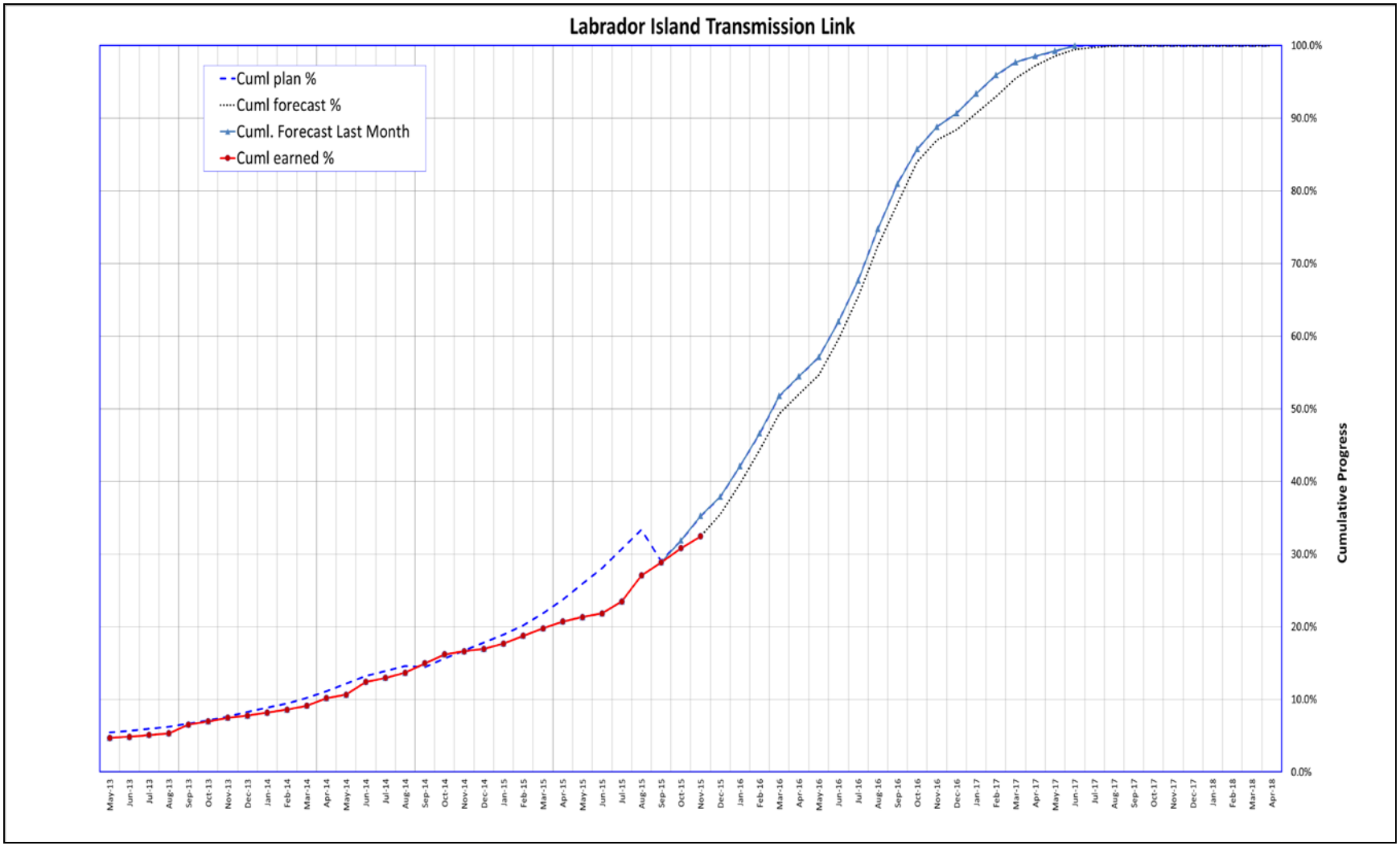
# Muskrat Falls Generation-Progress Curve
# Period End Nov-15



# Labrador Transmission Asset-Progress Curve
# Period End Nov-15

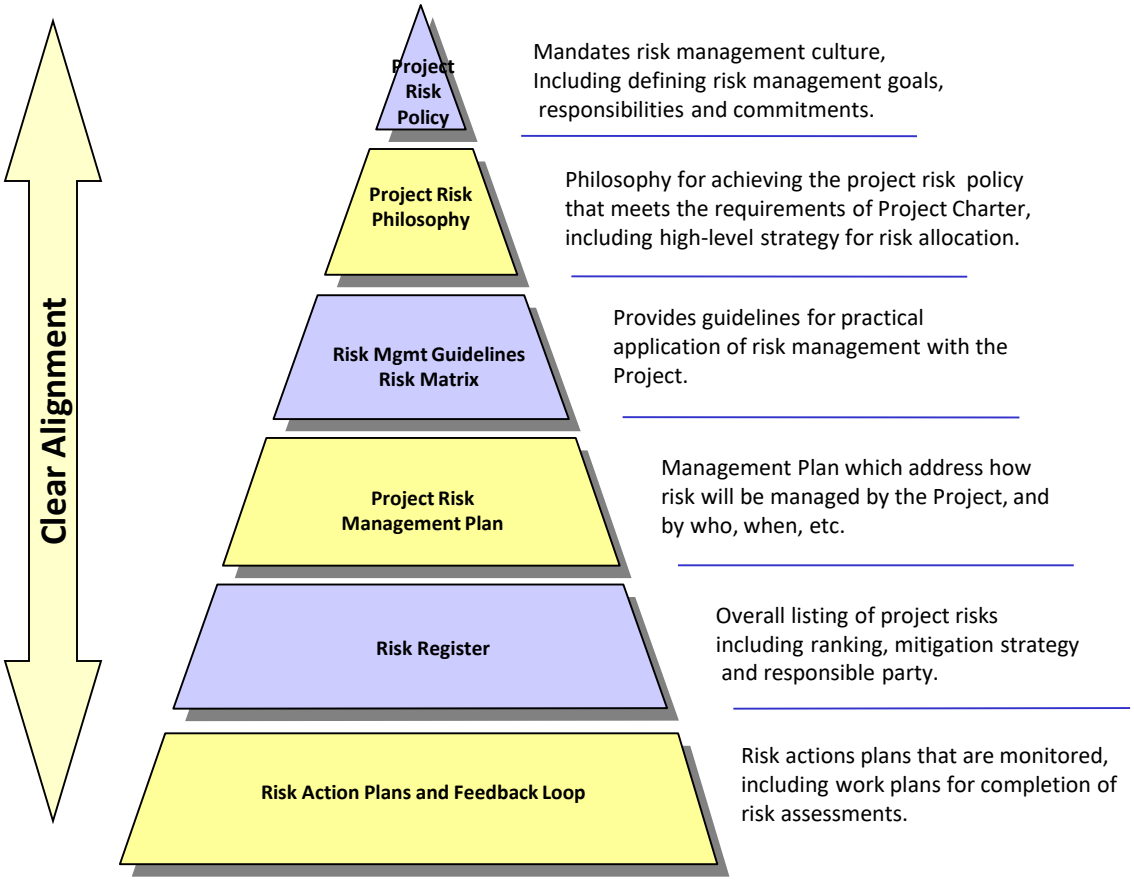


# Labrador Island Transmission Link-Progress Curve Period End Nov-15



# Risk Management

# Risk Management Framework


**Strategic**

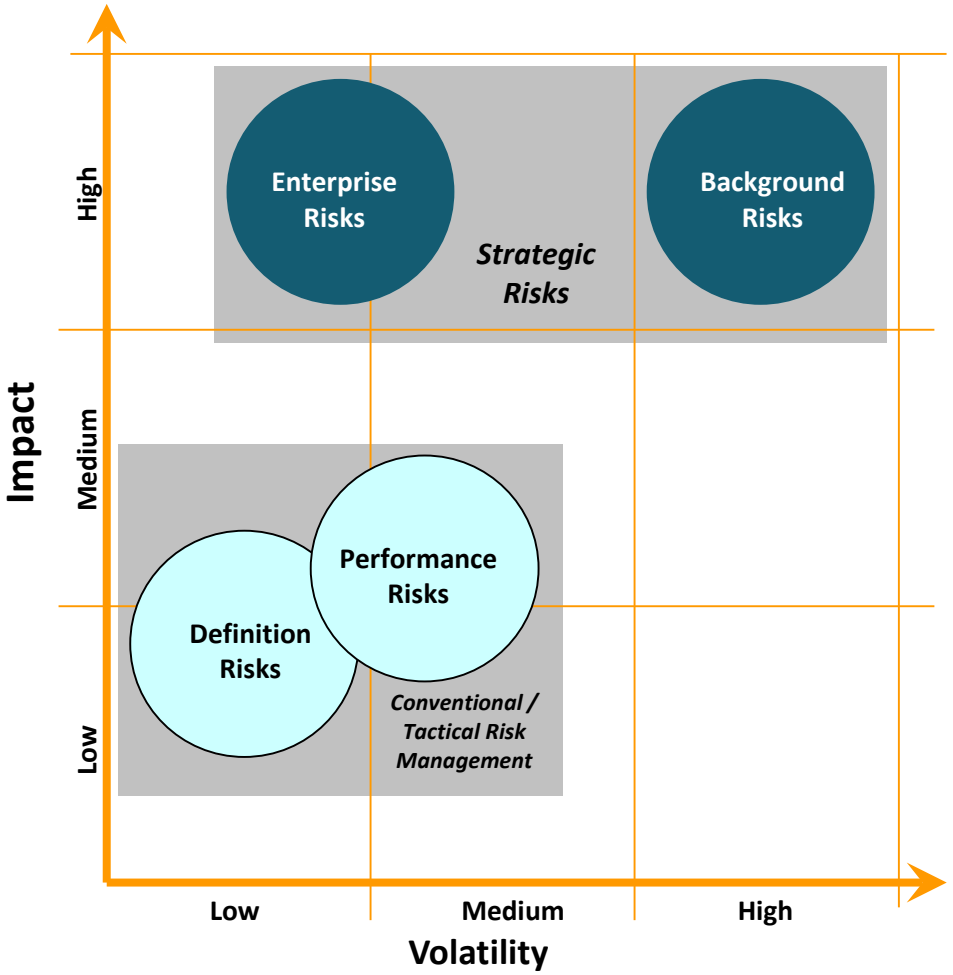
**Day-to-Day Management**

# LCP's Risk Philosophy

- Built upon framework of early identification, assessment and mitigation planning
- Many risks are multi-dimensional and complex requiring creative solutions
- Cost effectively managing risks will require risks to be allocated to various stakeholders who are best positioned to manage them through Risk Brokering
- This process of Risk Allocating will be featured significantly through the procurement process for the project's supply and construction contracts

# LCP's Risk Philosophy (cont'd)

- A few risks (8 to 10) will shape the Project
  - Referred to as Key Risks
  - Some can be considered "strategic" or background / external risks and outside direct influence of Project Team



# Project Risk Management Plan

nalcor energy
LOWER CHURCHILL PROJECT

**PROJECT RISK MANAGEMENT PLAN**

**Nalcor Doc. No. LCP-PT-MD-0000-RI-PL-0001-01**

| Comments: | Total # of Pages: (Including Cover): |
|---|---|
| General review and update throughout in order to describe Risk Management process, tool and resources for the current phase of LCP. | 59 |

| Status / Revision | Date | Reason for Issue | Prepared by | Functional Manager Approval | Quality Manager Approval | General Project Manager Approval |
|---|---|---|---|---|---|---|
| B2 | 23-Oct-2014 | Issued for Use | C. Fernandez | E. Bush | D. Green | R. Power |
| B1 | 30-Jun-2011 | Issued for Use | - | - | - | - |

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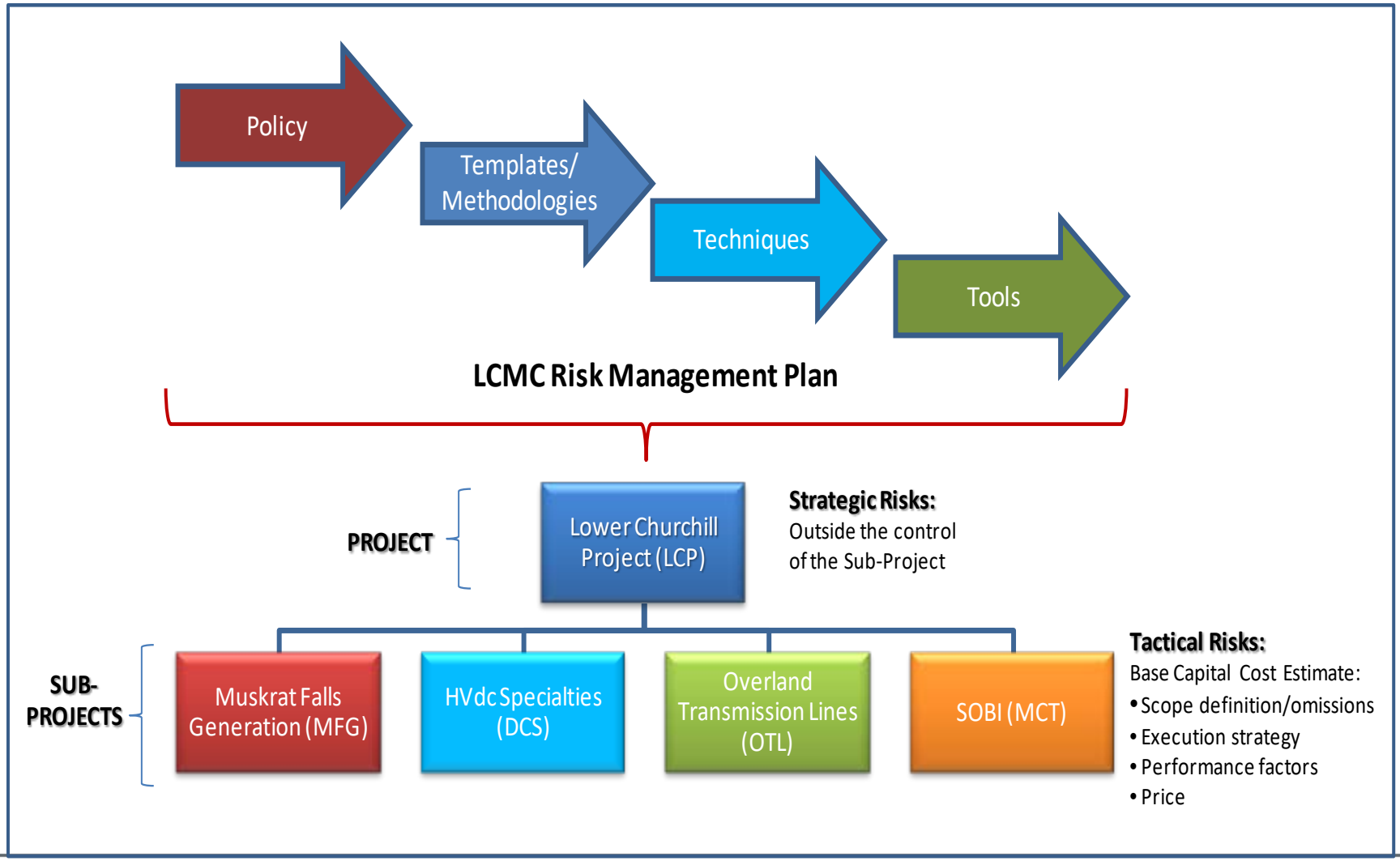
- Risk Management Plan defined "LCP's Approach" established early
- Extensive risk management efforts expended prior to Sanction/DG3, which facilitated characterization of the Project's risk spectrum and shape delivery strategies
- Framework contained in this Plan continues to be used for ongoing risk management

# The Risk Management Cycle Continues

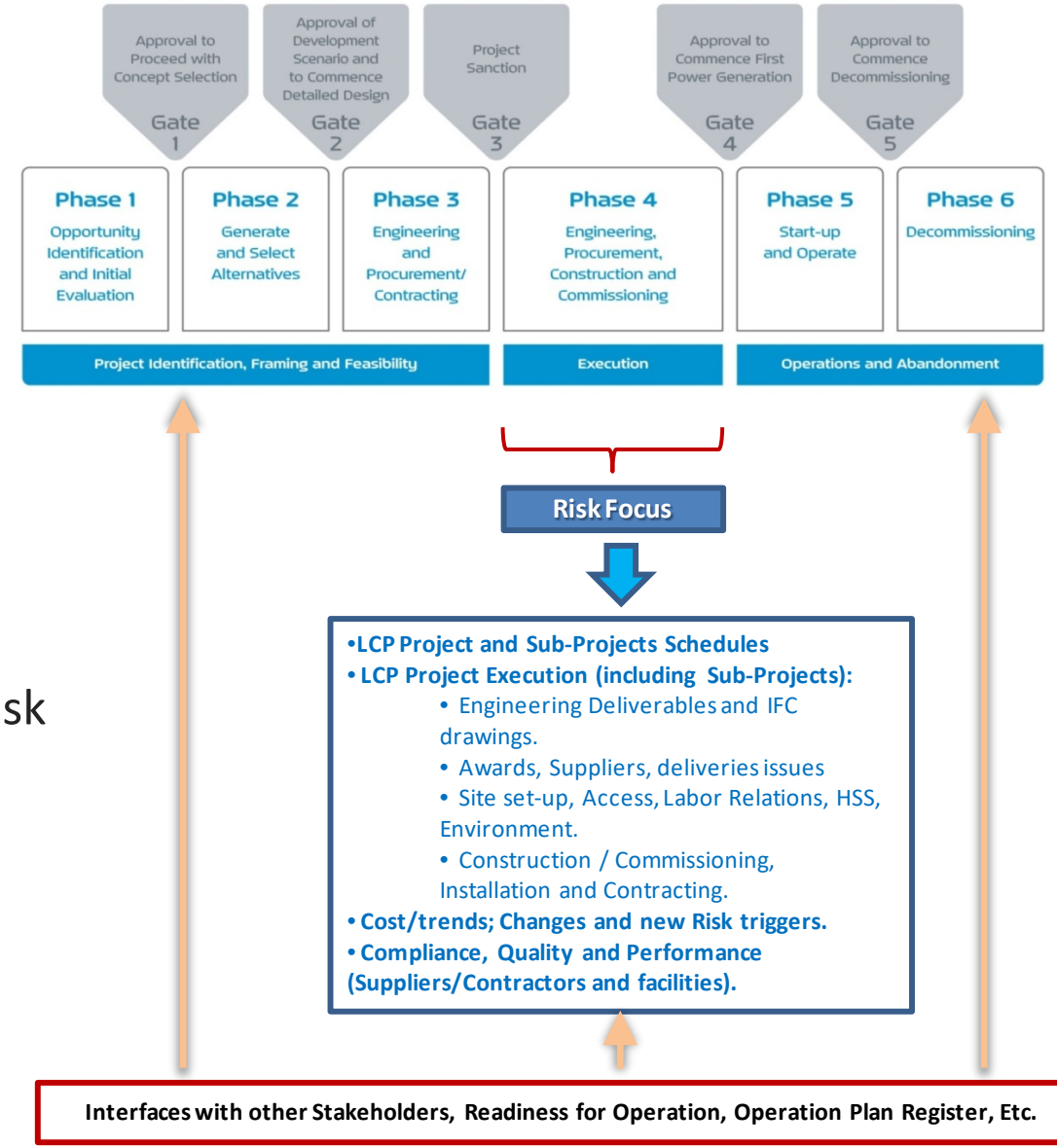
- Project Risk Management Plan is centered around the Risk Management Cycle
  - On-going Plan-Do-Check-Act

# Risk Management Process



# Current Focus

- Risk Management Cycle aligned with Gateway Model and supports the Project Controls Cycle
- Focus today is **Risk Monitoring and Control**
- With consideration of current risk profile of the Project a decision has been taken quantified the residual risk post mitigation in order to provide a risk-adjusted cost forecast



# Remaining Key Project Risks

- Contractor failure/abandonment– Nalcor check the financial stability of our contractors prior to award and monitor any contractors that are considered to have increased financial risk. Contractor failure/abandonment can result in significant cost and schedule impacts despite contract securities being in place
- Contractor Performance including production and productivity – Nalcor have the oversight of the contractors performance and are intervening where required, this can result in greater Owner costs but is essential to ensure best project outcome
- Completion, Commissioning and Startup – Nalcor is pro-active in establishing the organization, processes and procedures required and has established specific teams to manage the contractors and ensure readiness for commissioning and Startup – however this will be a challenging task

# Remaining Key Project Risks continued

- Time and Material contracts – there is a risk with these type of contracts that costs can increase as site conditions actually experienced can be more challenging than estimated and take more time than planned for
- Geotechnical risk is much reduced however still remains on the HVdc line and dam construction

Sharing our ideas in an open and supportive manner to achieve excellence.

## Teamwork

## Open Communication

Fostering an environment where information moves freely in a timely manner.

## Honesty and Trust

Being sincere in everything we say and do.

Relentless commitment to protecting ourselves, our colleagues, and our community.

## Safety

## Respect and Dignity

Appreciating the individuality of others by our words and actions.

## Leadership

Empowering individuals to help, guide and inspire others.

Holding ourselves responsible for our actions and performance.

## Accountability