Muskrat Falls Development

Presentation to the PUB – July, 2011

Boundless Energy

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Presentation Outline

1. Purpose of Presentation
2. Provincial Energy Plan
3. Meeting Domestic Power Needs
4. Analyzing the Alternatives
5. Electricity Rates
6. Selecting the Development Alternative
7. Current Project
8. Going Forward/Project Implementation
9. Summary

Purpose

- To describe the process used by Nalcor Energy to arrive at the decision to develop the Muskrat Falls (MF) and Labrador-Island Link (LIL) projects
- To present an evaluation of Muskrat Falls as a preferred means of meeting the electricity needs of the Island, compared to other available options
- To provide an overview of the analysis undertaken in support of the decision
- To provide an overview of the MF and LIL projects
- To demonstrate the readiness of the Nalcor Energy – Lower Churchill Project (NE-LCP) team to execute the project

Provincial Energy Plan

Provincial Energy Plan

- Outlines long-term vision for developing NL's Energy Warehouse
- Creation of Nalcor to implement
- Relevant Energy Plan Objectives:
  - Meeting provincial electricity needs
  - Re-investing wealth from non-renewable oil resources into renewable projects
  - Replacing Holyrood Thermal generating Station (HTGS) with non-emitting alternative, or installing scrubbers and electrostatic precipitators .

Meeting Domestic Power Needs

Forecasting Electricity Supply and Demand

- NL Hydro Systems Planning group continually assesses supply and demand for electricity
- Makes recommendations on how to ensure system is able to meet demand
- Long lead times involved with developing new generation and associated transmission infrastructure necessitates long term planning
- Culminates in an annual PUB-filed report on Generation Planning Issues

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Forecasting Electricity Supply and Demand

- Rigourous demand forecast completed annually by Hydro to determine requirements so there is electricity available when people need it
- Domestic
  - Driven by economic growth and electric heated homes.
  - 86% of new homes have electric space heating: conversions from oil as oil prices rise
  - On average, 50% of home electricity costs and usage are from electric heat
  - Domestic demand has grown steadily over time and will continue
- Industrial
  - Vale Inco smelter, average 92MW (0.73 TWh annually) at full production
- Mills in Stephenville (2006) and GFW (2009) closing meant a 5-6 year delay in needing new generation

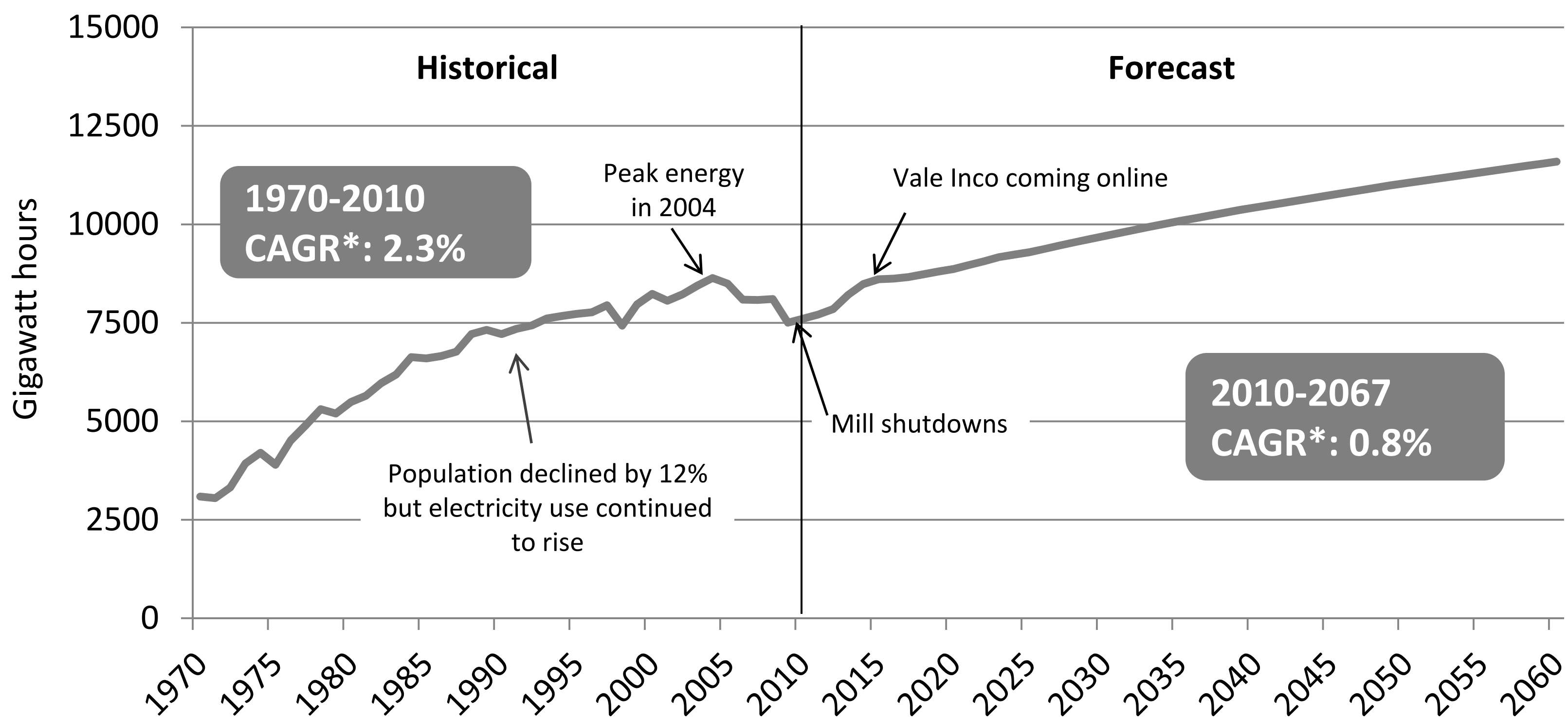
Forecasting Electricity Supply and Demand - Methodology

- Econometric demand model for Island interconnected utility load (NP + Hydro Rural)
- Historical data modeled from 1967 to present with econometric forecast for 20 year period
- Main drivers are Provincial economic forecast and energy prices (Provincial Gov't, PIRA and Hydro)
- Hydro's Industrial load requirements through direct customer contact
- Post 2029 forecast by trend with growth rate adjustments for electric heat saturation

Historical & Forecast Electricity Needs

Load forecast is realistic and reflective of the expected provincial demand

* CAGR: Compound Annual Growth Rate



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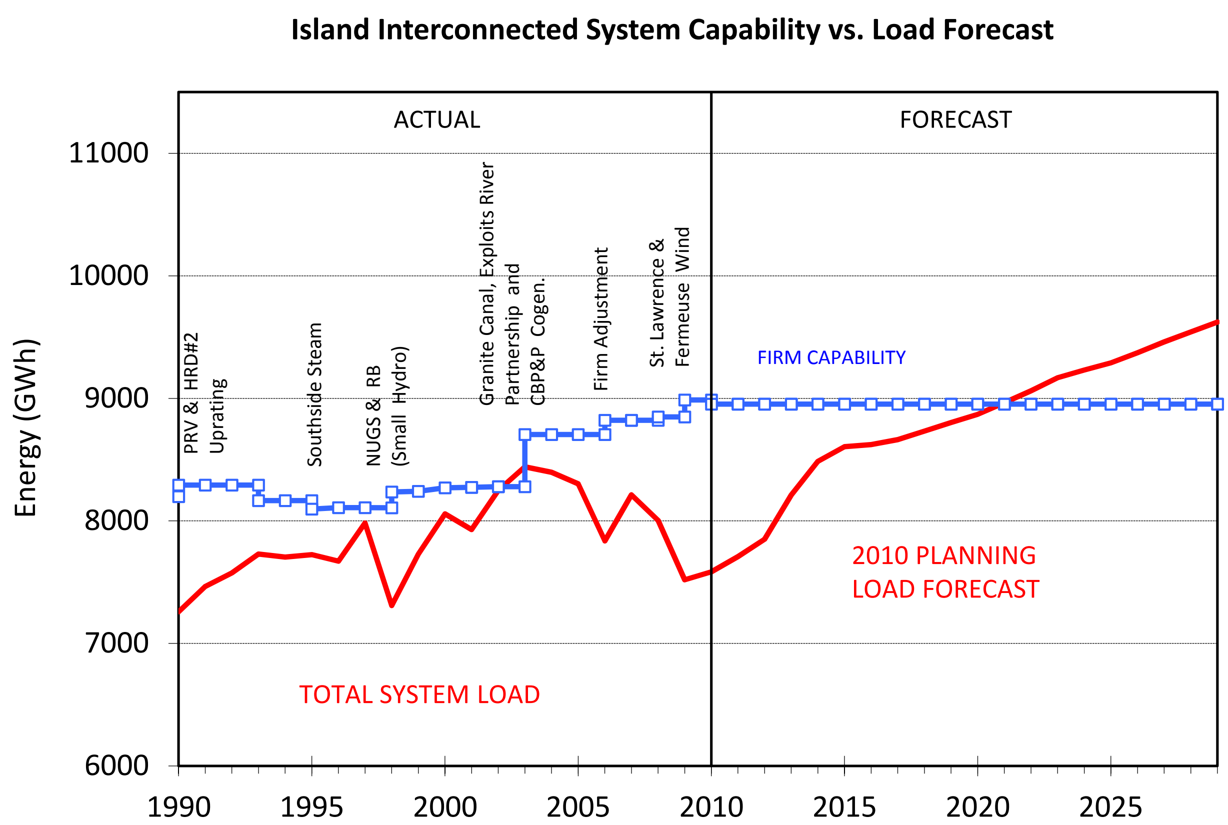
Island Requirements

Additional generation required by 2015 for capacity deficits



Capacity/Energy Deficit – Forecast

Year	Island Load Forecast		Existing System		LOLH (hr/year) (limit: 2.8)	Energy Balance (GWh)
	Maximum Demand (MW)	Firm Energy (GWh)	Installed Net Capacity (MW)	Firm Capability (GWh)	HVdc Link/Isolated Island	HVdc Link/Isolated Island
2010	1,519	7,585	1,958	8,953	0.15	1,368
2011	1,538	7,709	1,958	8,953	0.22	1,244
2012	1,571	7,849	1,958	8,953	0.41	1,104
2013	1,601	8,211	1,958	8,953	0.84	74[illegible]
2014	1,666	8,485	1,958	8,953	2.52	468
2015	1,683	8,606	1,958	8,953	3.41	347
2016	1,695	8,623	1,958	8,953	3.91	330
2017	1,704	8,663	1,958	8,953	4.55	290
2018	1,714	8,732	1,958	8,953	5.38	221
2019	1,729	8,803	1,958	8,953	6.70	150

Capacity deficit forecasted and new generation required

Energy deficit forecasted and new generation required

LOLH is a statistical assessment of the risk that the System will be incapable of serving the System's firm load for all hours of the year. For Hydro, an LOLH target of not more than 2.8 hr/year represents the inability to serve all firm load for no more than 2.8 hours in a given year.

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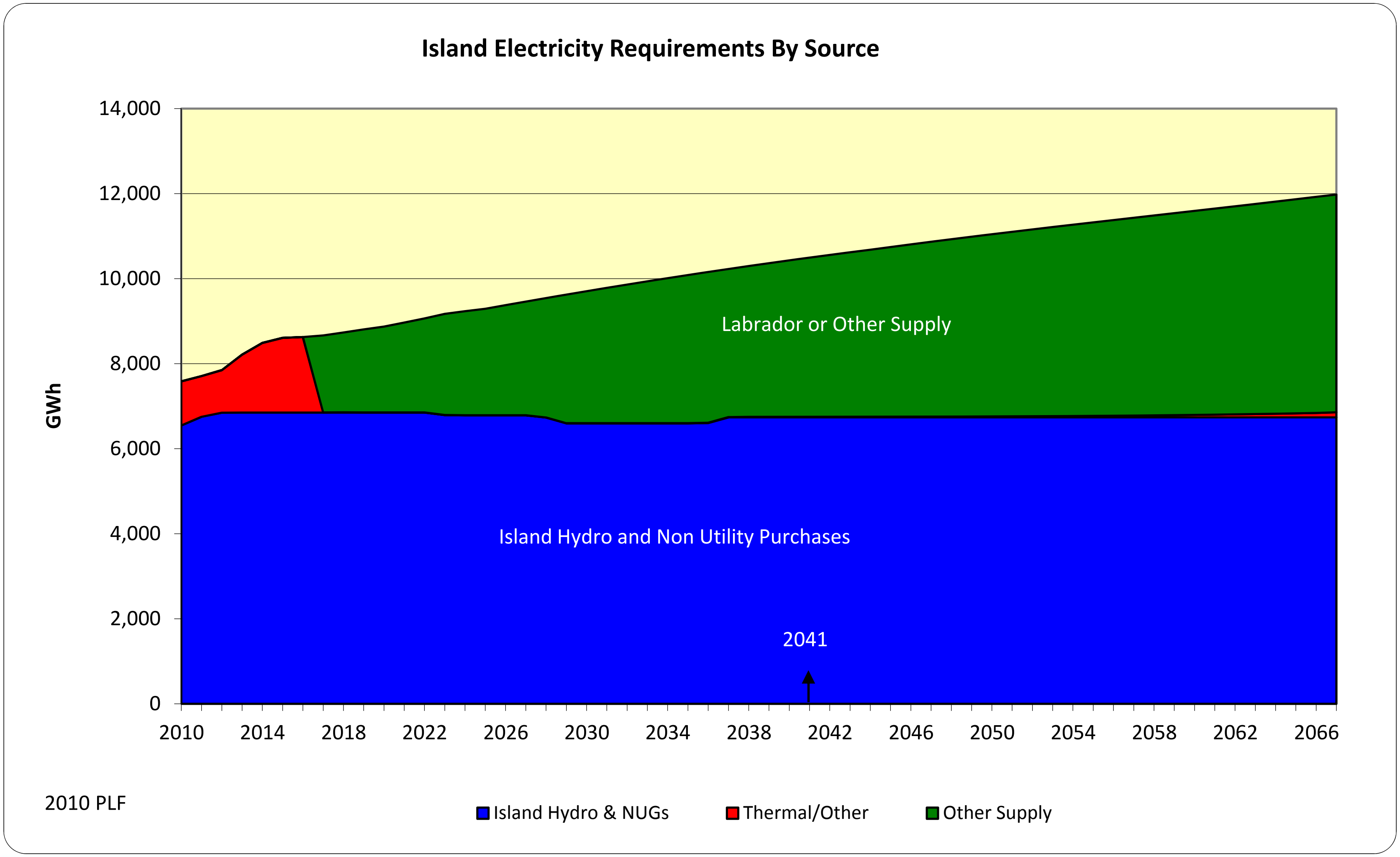
Island Supply Requirements (2010 – 2067)

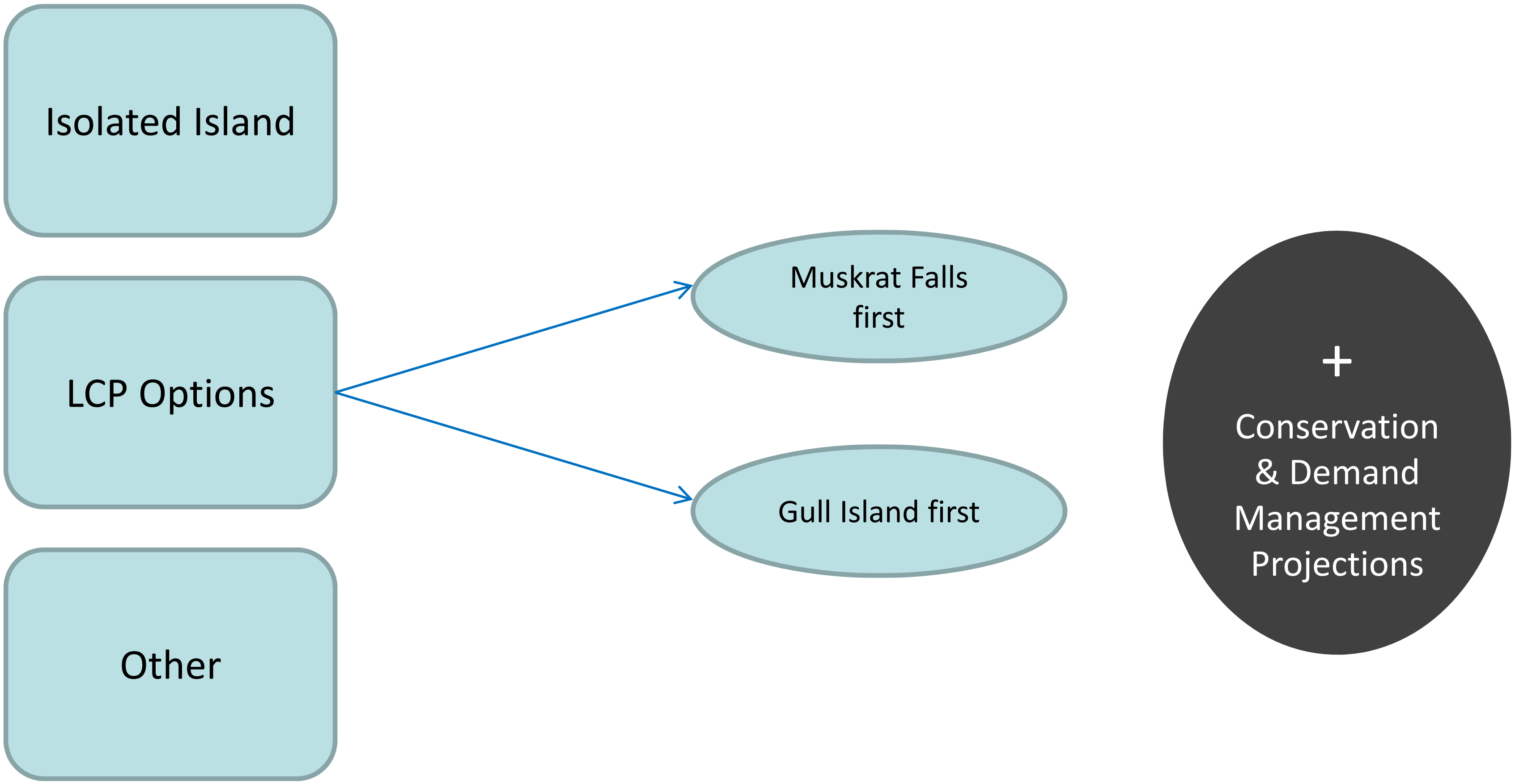


Analyzing the Alternatives

Supply Option Evaluation Criteria

- Five key criteria were used when evaluating the alternatives for supplying load growth:
  - Security of supply and reliability
  - Least cost option for ratepayers (measured as the cumulative present value (CPW) of alternative electricity supply futures)
  - Environment
  - Risk and uncertainty
  - Financial viability of non-regulated elements

Options for Meeting Island Supply

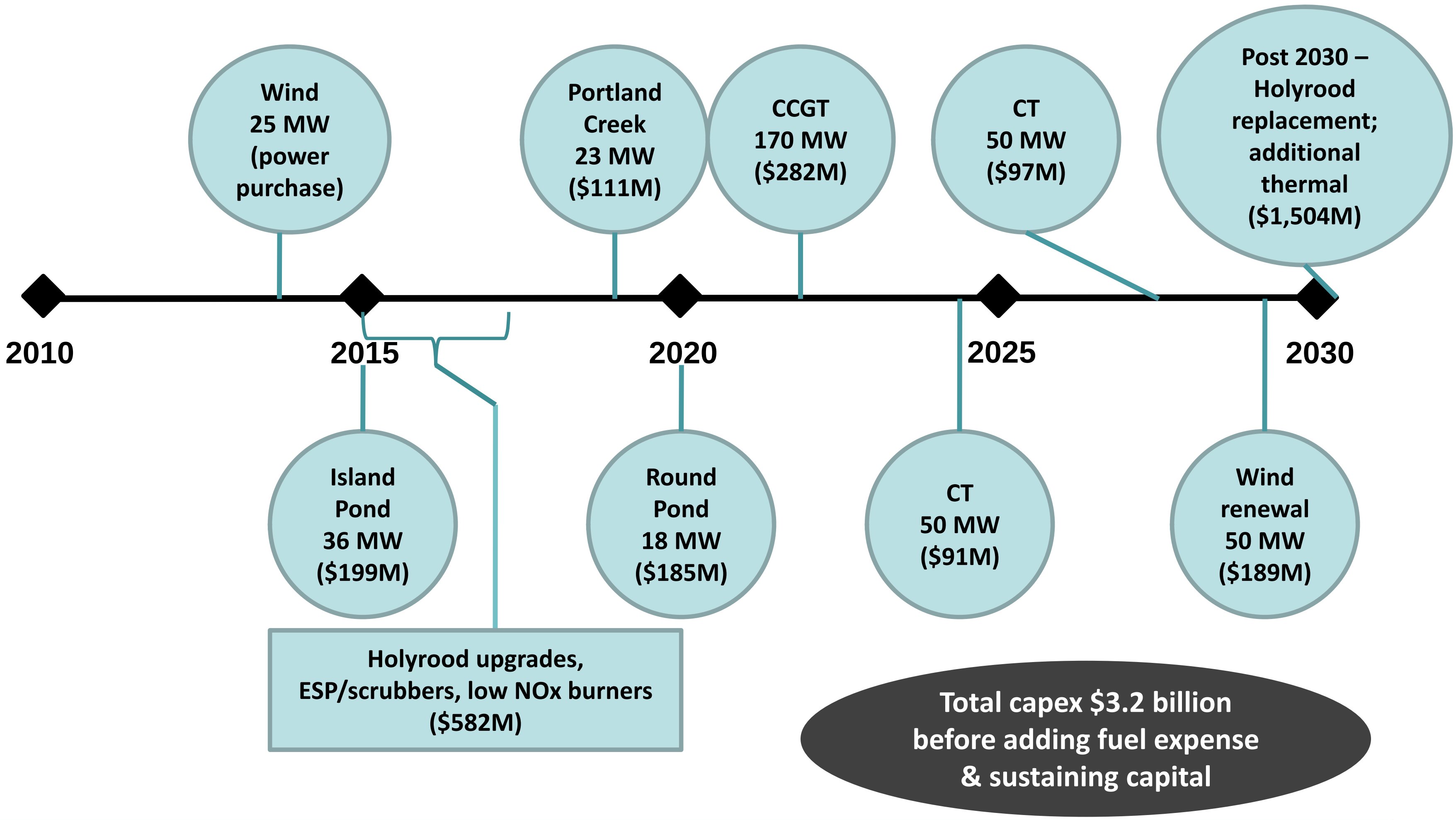


Assumptions

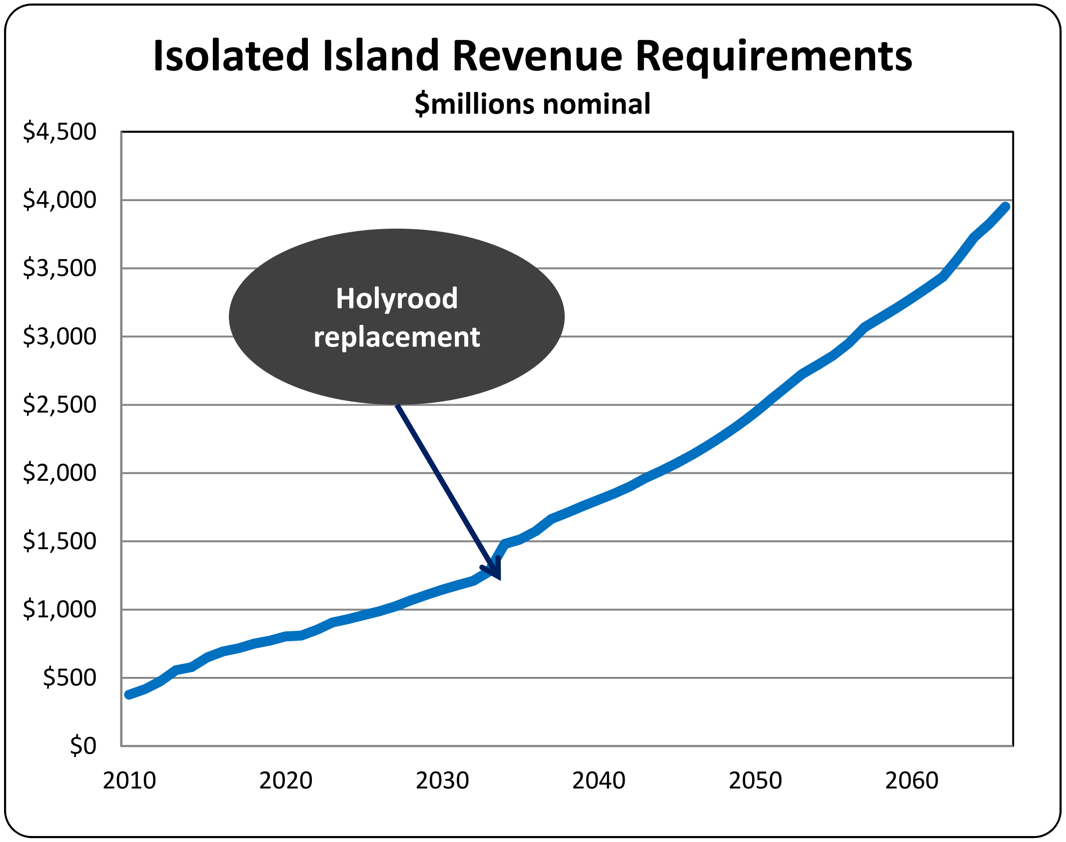
Consistent assumptions used in the evaluation of all alternatives included:

Parameter	Assumption
Regional North American Electricity prices	• PIRA Energy Group
World Oil prices	• PIRA Energy Group
Environmental costs	• Island Isolated Case: ESP and scrubbers included in capital costs • No impact assumed for uncertain costs associated with Federal Atmospheric Emission regulations or GHG; such costs would be unfavourable to the Isolated Island case
Cost escalation and inflation	• 2% CPI • Generation and transmission O&M 2.5% • Capital costs 2% - 3%
Long run regulated financial assumptions	• Debt cost 7.4% • Equity cost 10.0% • Debt:Equity ratio: 75:25 • WACC/discount rate: 8%

Isolated Island – Numerous Projects & a Thermal Future



Isolated Island Key Indicators



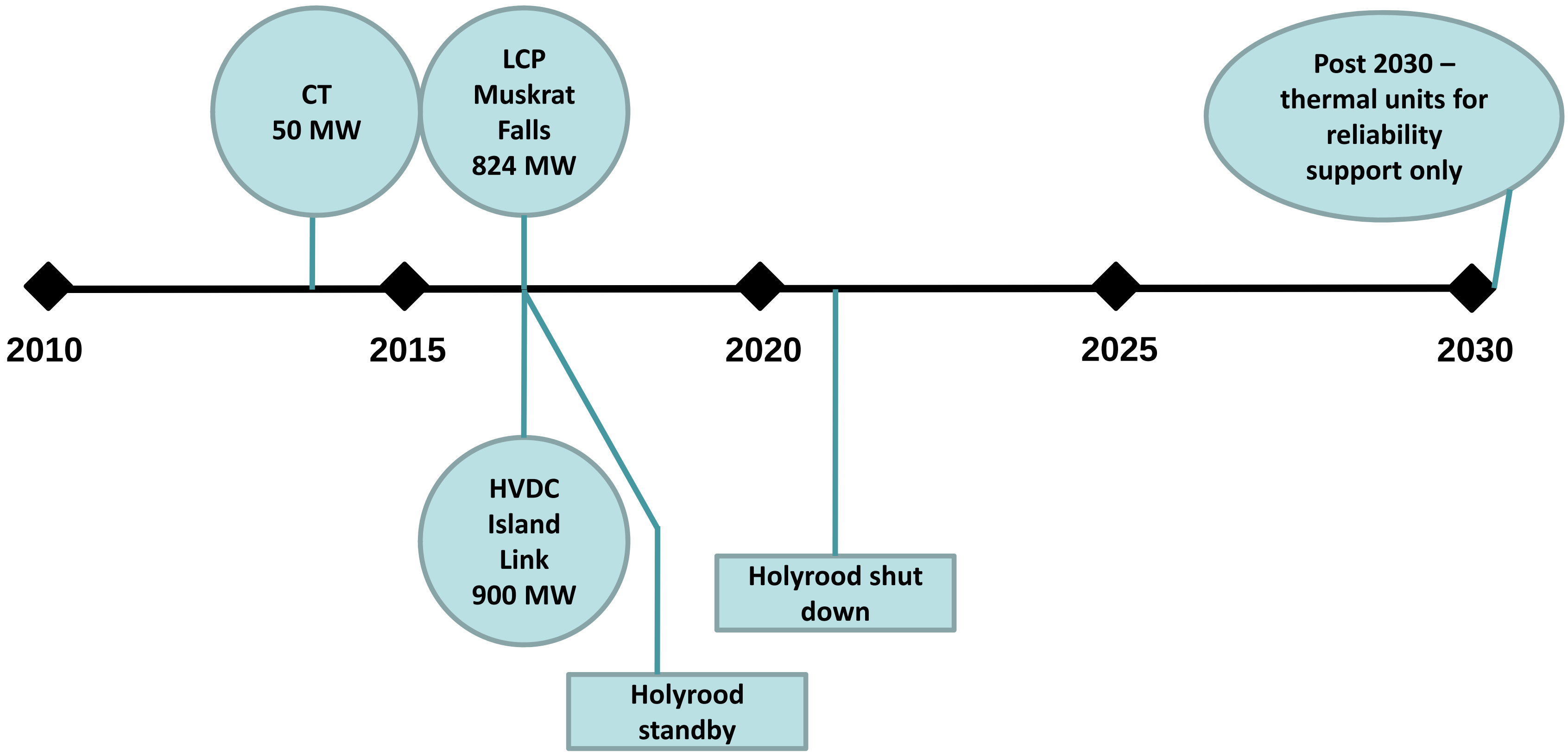
Economic Indicators ($ millions)
- CPW of revenue requirement: $12,272
- Capex de-escalated to 2010$: $8,074

Key Risks:
- Fuel cost escalation/volatility
- Environmental costs

Reliability Considerations:
- No interconnection to North American grid

Rate of return on non-regulated elements:
- N/A - all regulated assets

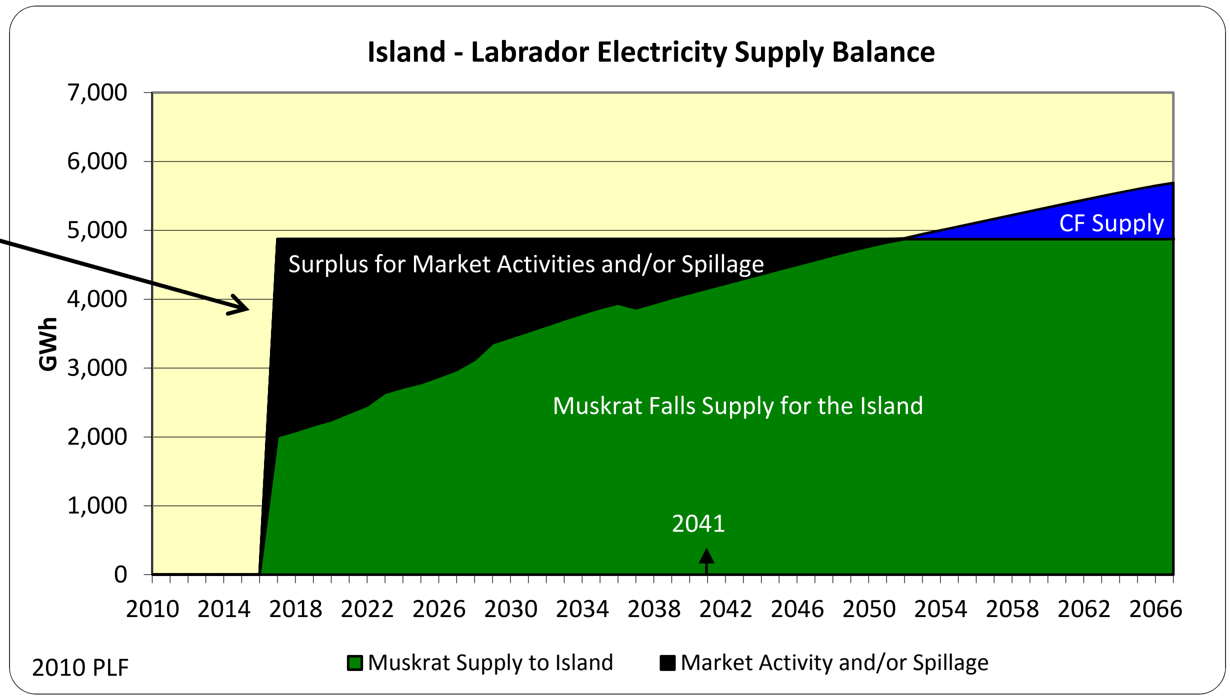
LCP – Muskrat Falls First



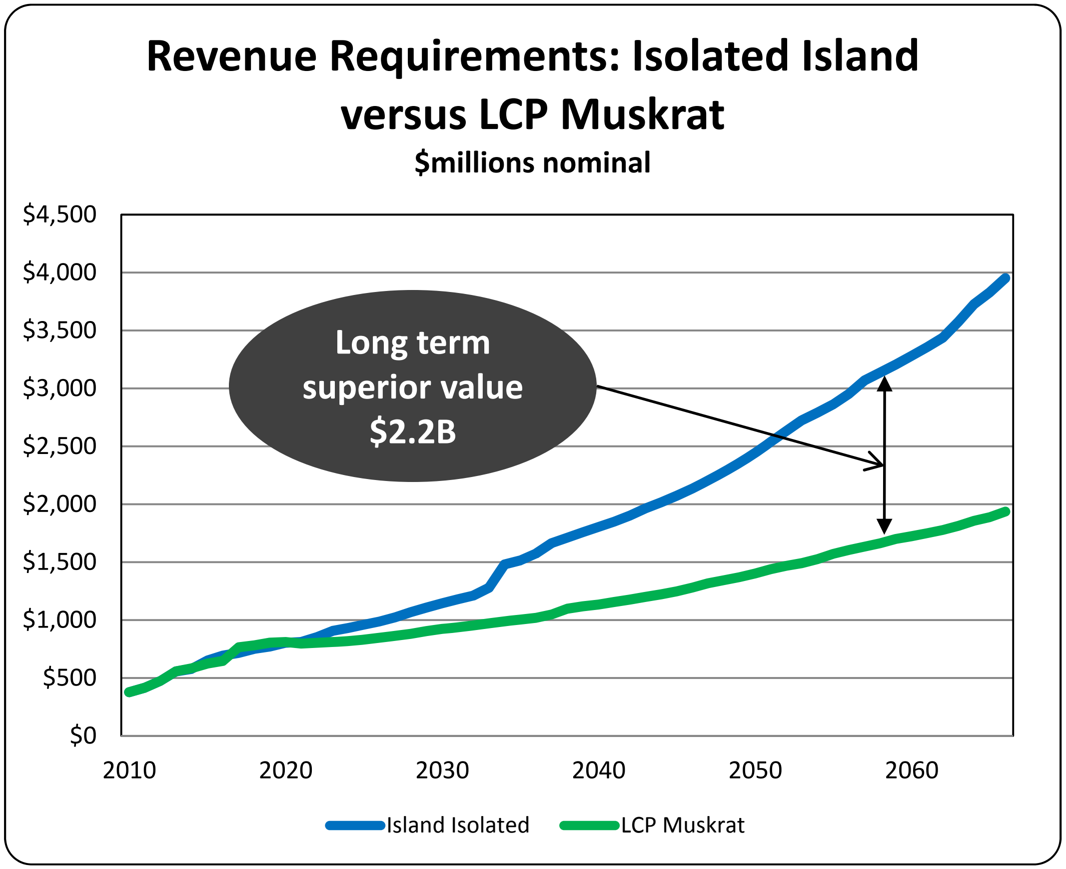
LCP – Muskrat Falls First

MF is the least cost alternative for ratepayers even if the extra water is spilled and no income is received.

The price paid by the Island ratepayers is based on LCP cost assuming a return similar to a regulated utility



LCP – Muskrat Falls First Key Indicators



Economic Indicators ($ millions)
- CPW of revenue requirement: $10,114
- Lower CPW vs Isolated Island: $2,158
- Capex de-escalated to 2010$: $6,582

Key Risks:
- Environmental approval/schedule
- Capital cost control

Reliability Considerations:
- Interconnected to the North American grid via Churchill Falls

Rate of return on non-regulated elements:
- 8.4% IRR assuming no monetization of spill

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Isolated Island vs. Muskrat Falls - Summary

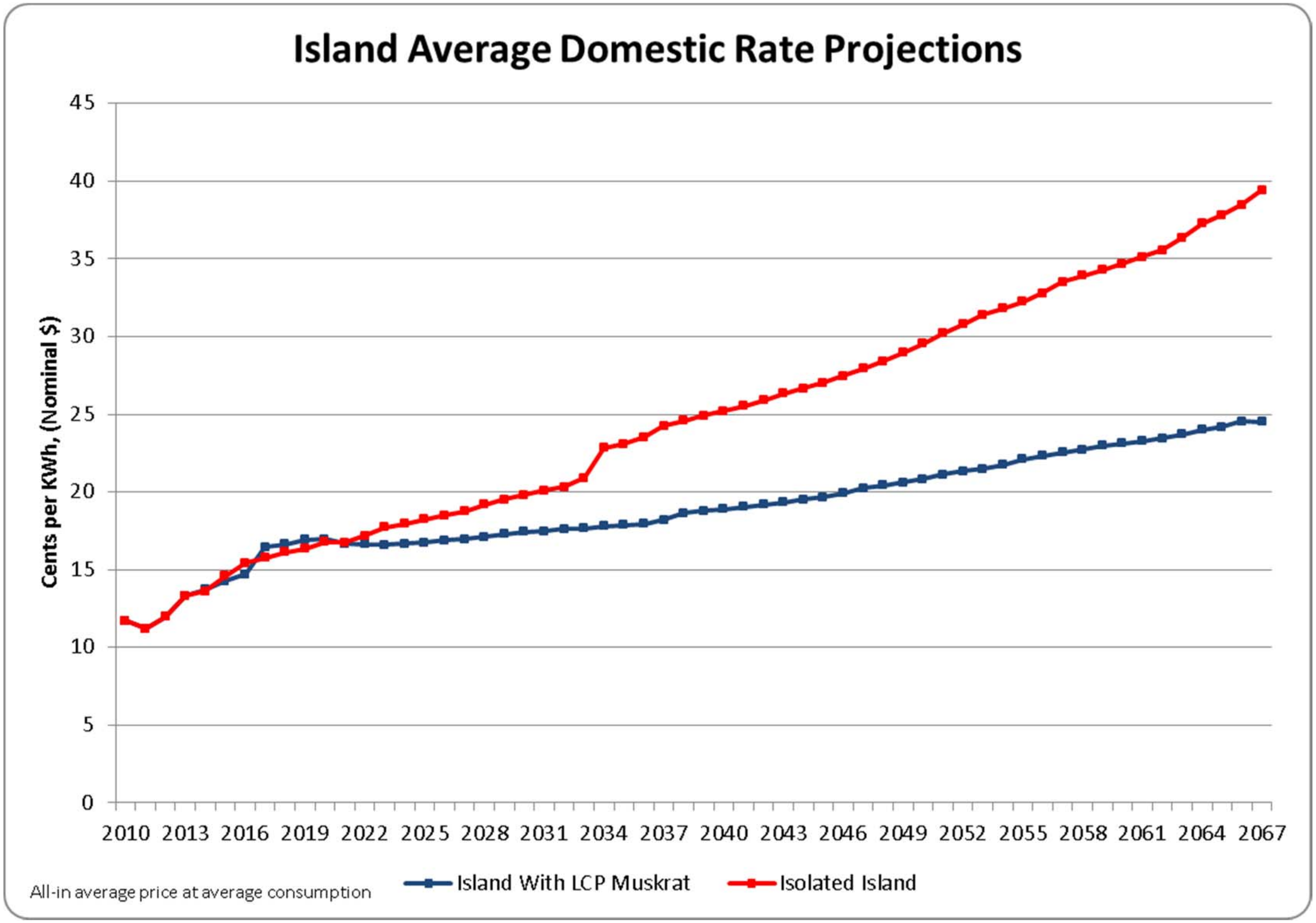
Criteria	Muskrat Falls	Isolated Island
Security of supply and reliability	- Interconnection with NA grid - Limited reliance on fossil fuel	- No interconnection with NA grid - Heavy reliance on fossil fuel
Cost to ratepayers (CPW)	- CPW of $10,114 M - Lower over long term - $2.2 B in net savings vs. Isolated island case	- CPW of $12,272 M - Higher than Muskrat Falls over long term
Environment	- EA almost completed - Environmental impacts well studied - Much lower GHG emissions	- Numerous environmental assessments will be required - Unknown environmental impacts Increased GHG emissions
Risk and uncertainty	- Significant planning and engineering work completed	- Minimal engineering work and planning completed
Financial viability of non-regulated elements	- 8.4% IRR on non-regulated elements	- NA

NL Supply Conclusions

- Domestic supply requirements need to be addressed
  - Planning decisions cannot be deferred
- Muskrat Falls (824 MW) is the least-cost option for domestic supply
  - Even assuming no value obtained for surplus MF power
- Muskrat Falls translates to lower and stable rates for customers over the long term
- Muskrat Falls surplus power available for domestic use and export sales

Electricity Rates

Muskrat Falls – Stable Electricity Rates

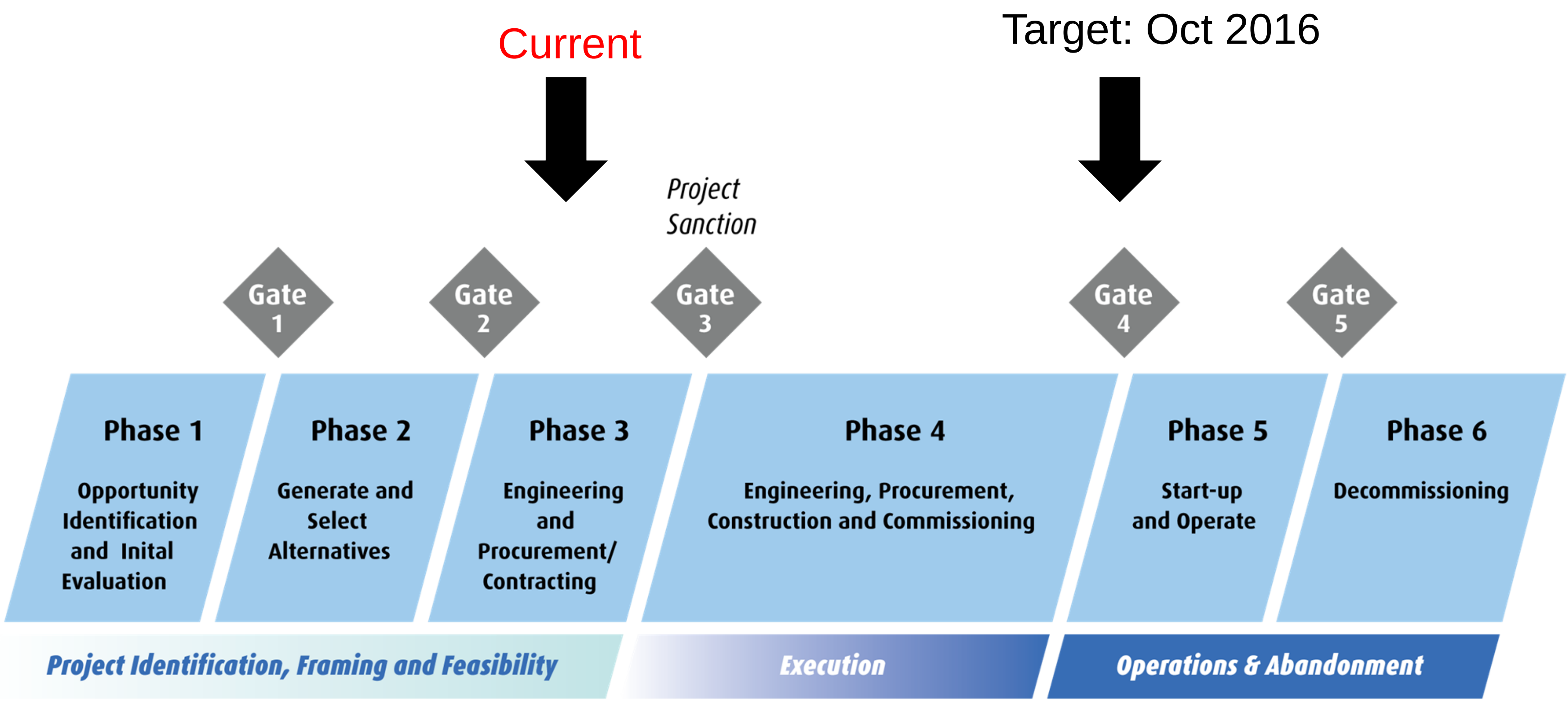


Selecting the Development Alternative

Approach

- Planning activities for LCP over the past 5 years guided by Gateway Process in parallel with analysis of island supply alternatives
- Considerable front-end loading to reduce risk
- Led by multi-functional, experienced Owner's team
- Areas of focus included:
  - Commercial
  - Project Execution
  - EA & Regulatory
  - Stakeholder Engagement
  - Engineering & Technical
  - Financing
  - Aboriginal Affairs

Gateway Process



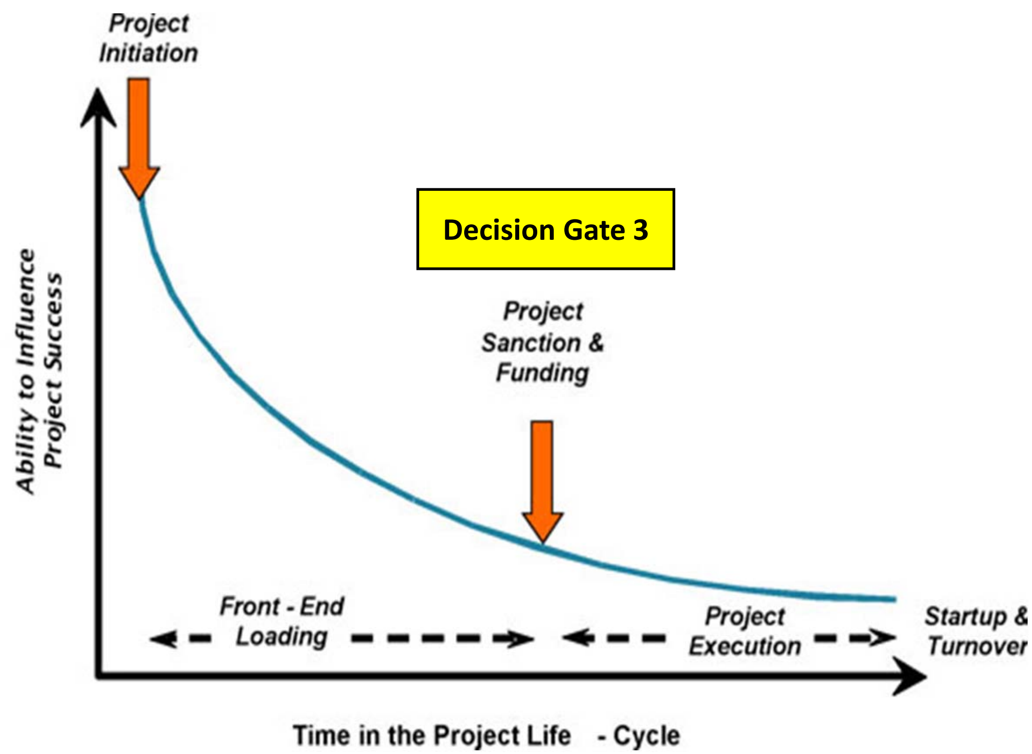
Enables Quality Decision Making

- Establish the process that will be used at major decision points to ensure optimal decision-making
  - Staged-gate project delivery models
- Determine what information (i.e. Key Deliverables) required to enable decisions to be made and communicated within the project team
- Effort leading up to the decision focused on producing decision-critical information (e.g. understanding key project risks)
- For strategic decisions, plan for independent verification of key project information

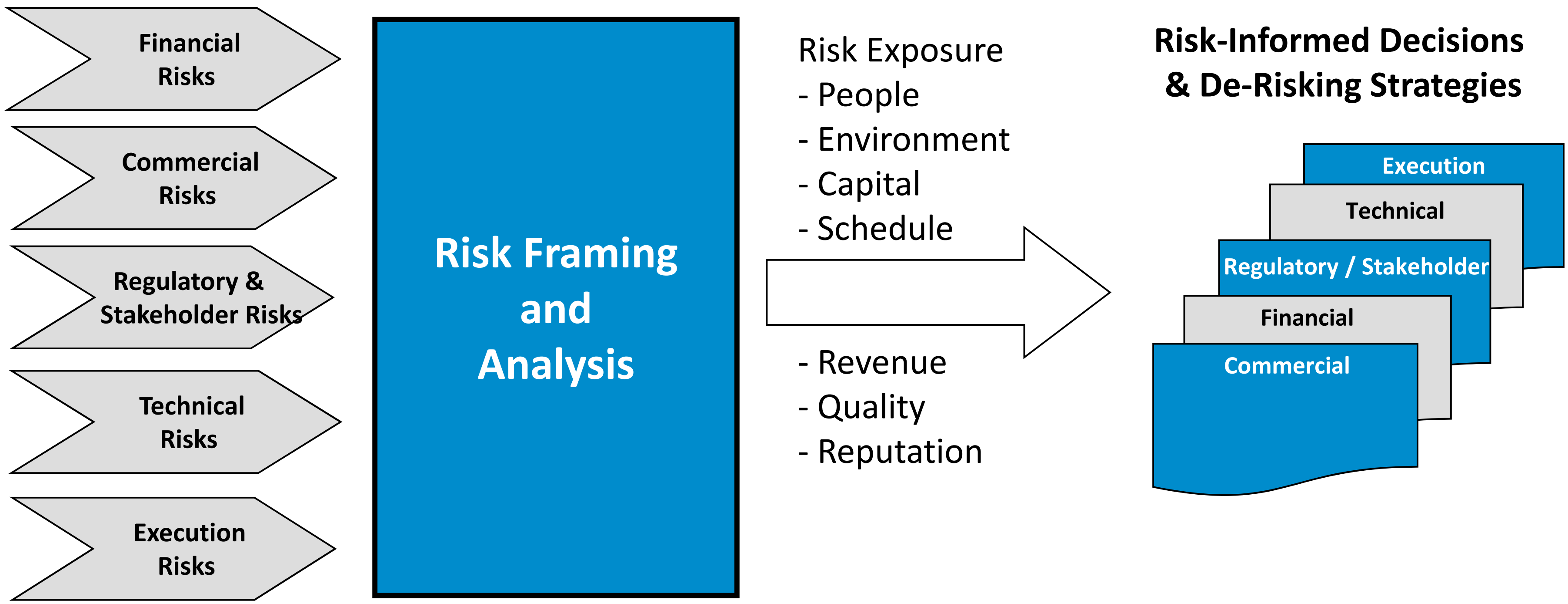
Risk-Driven Front End Loading (FEL)

- FEL is a key means to ensure capital predictability
- Work leading up to a Decision Gate is focused towards ensuring a full understanding of all Project risks
  - Driver behind Decision Gate Key Deliverables
- Based on philosophy that if we understand the risks and opportunities, we make the right choice at the Decision Gate

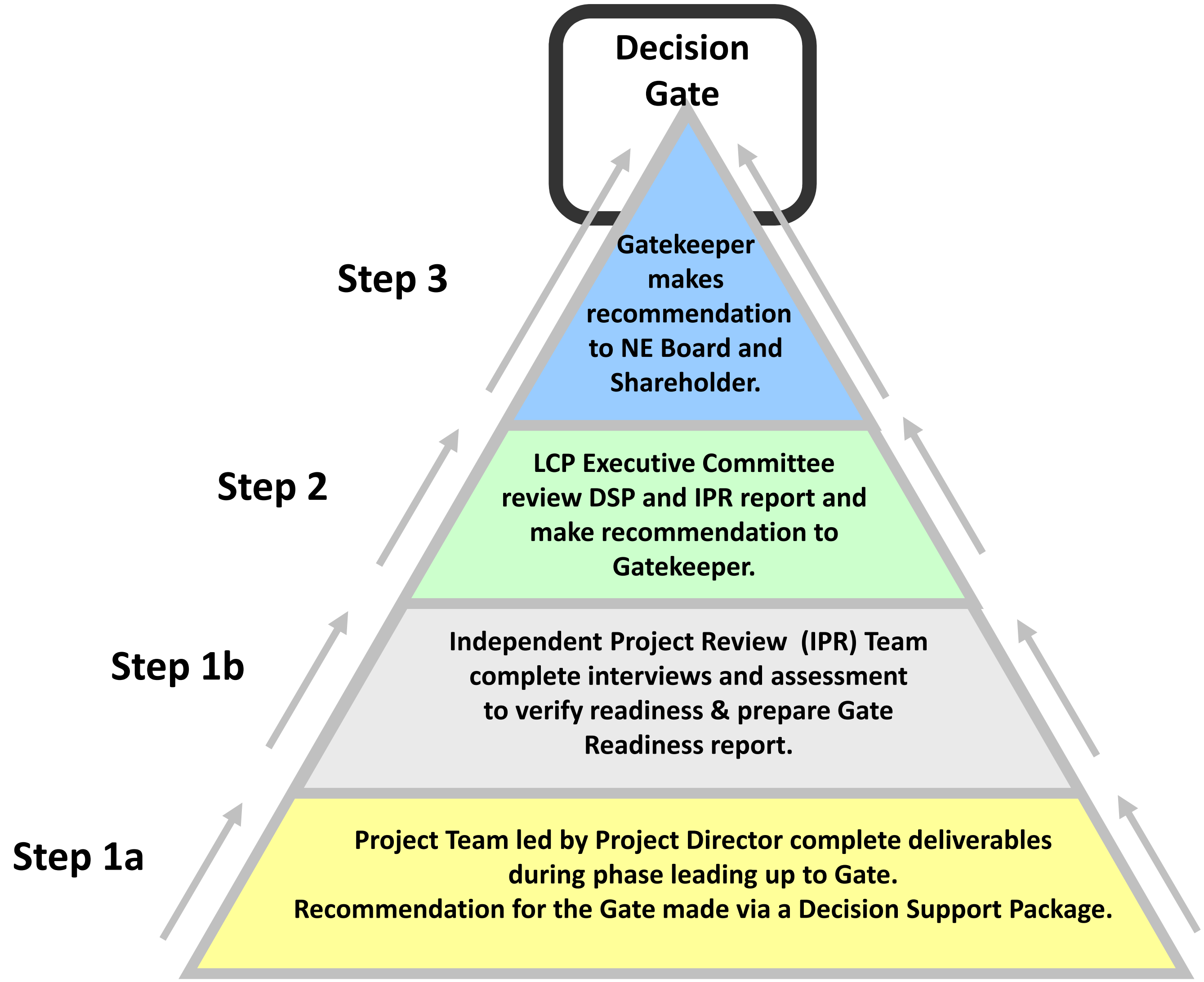
Project Influence Curve



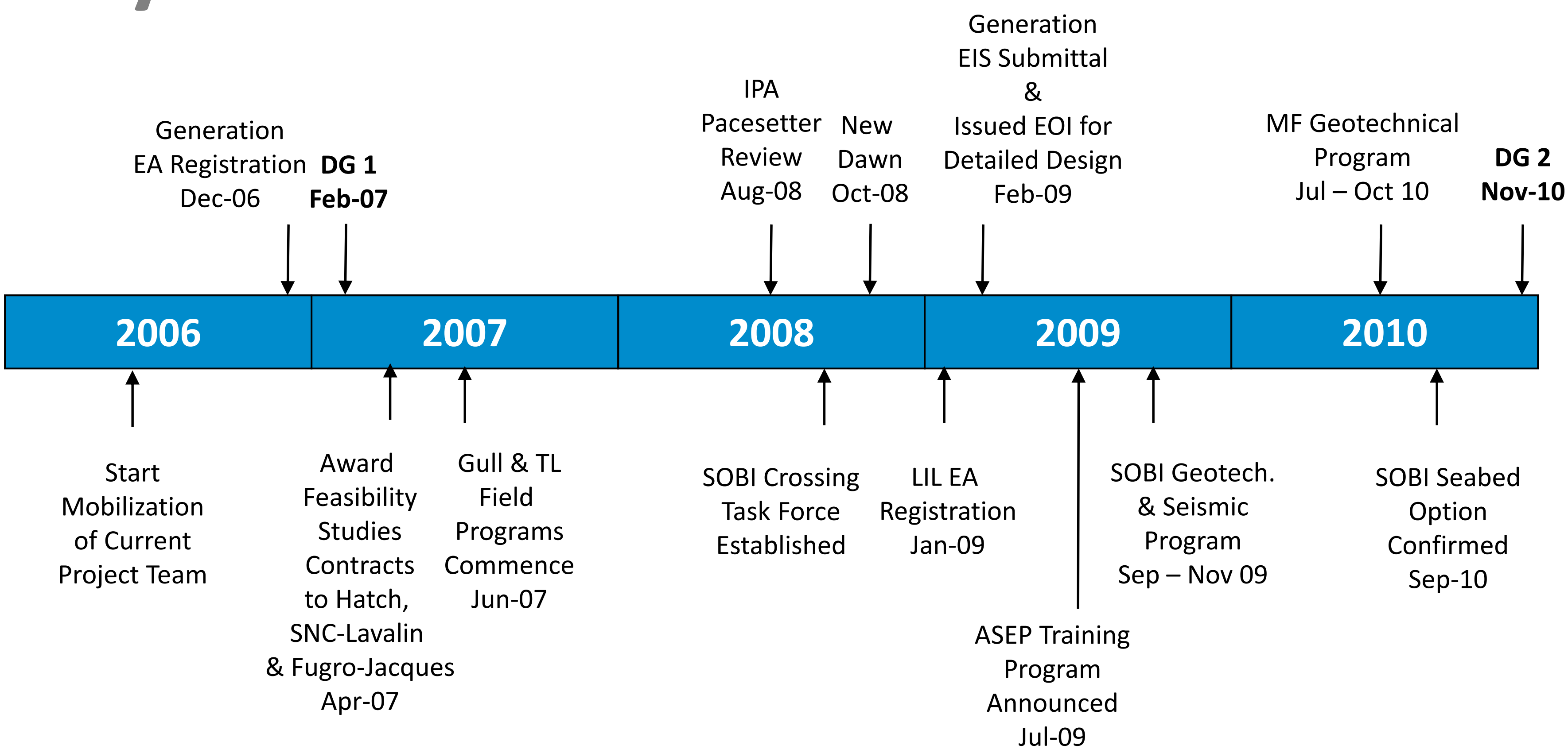
Risk-Informed Decision Making



Decision Gate Review Process



Key Events



Generation EA Registration Dec-06
DG 1 **Feb-07**
IPA Pacesetter Review Aug-08
New Dawn Oct-08
Generation EIS Submittal & Issued EOI for Detailed Design Feb-09
MF Geotechnical Program Jul – Oct 10
DG 2 **Nov-10**
2006
2007
2008
2009
2010
Start Mobilization of Current Project Team
Award Feasibility Studies Contracts to Hatch, SNC-Lavalin & Fugro-Jacques Apr-07
Gull & TL Field Programs Commence Jun-07
SOBI Crossing Task Force Established
LIL EA Registration Jan-09
ASEP Training Program Announced Jul-09
SOBI Geotech. & Seismic Program Sep – Nov 09
SOBI Seabed Option Confirmed Sep-10

Conclusions

- Significant amount of work completed to understand how to develop the lower Churchill River.
- Culminated at a recommendation to proceed with Muskrat Falls and a 900 MW HVdc link.
- Project readiness for Decision Gate 2 confirmed by Independent Project Team.
- Decision Gate 2 occurred in November 2010.

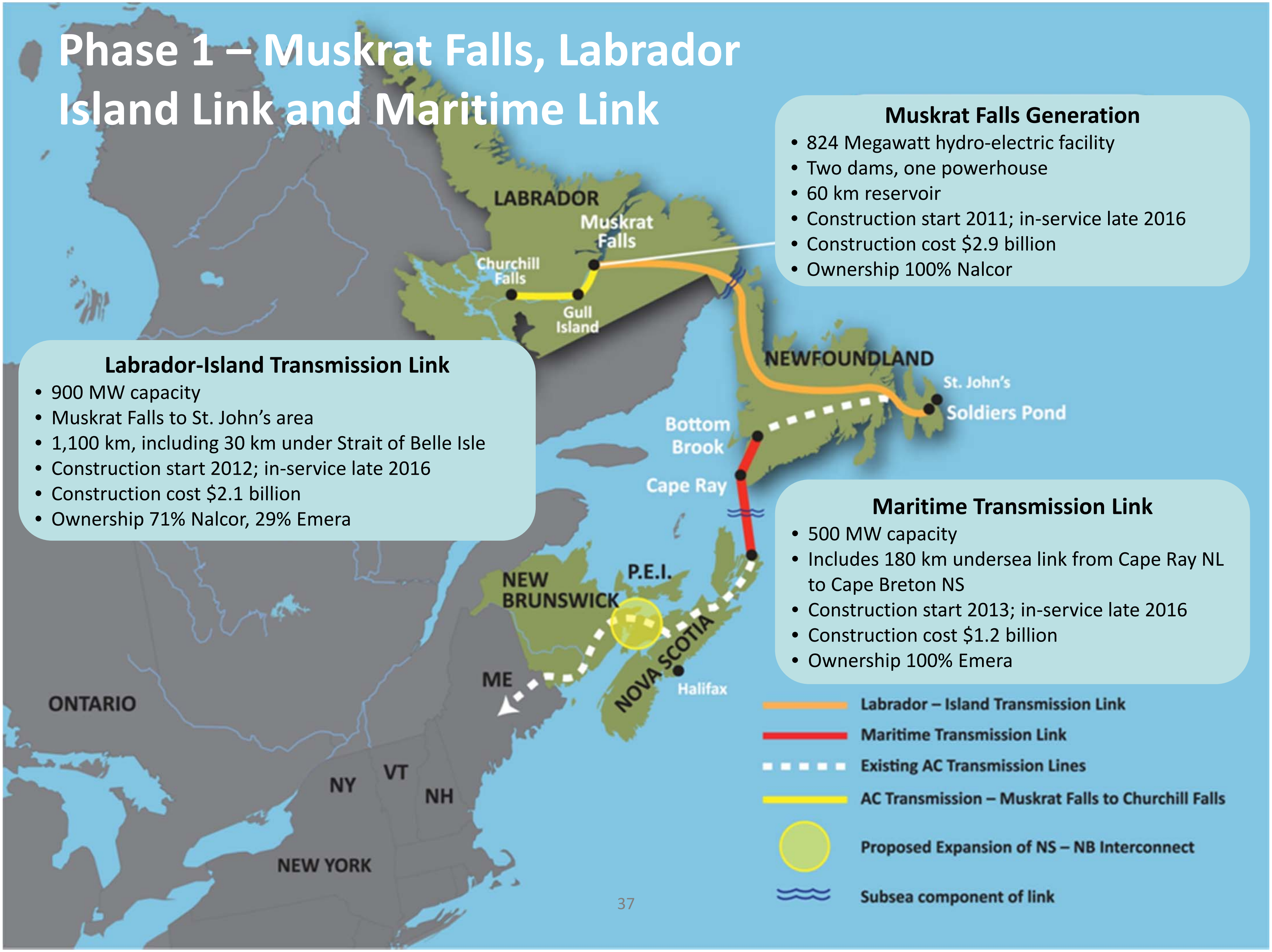
Current Project

Phase 1 – Muskrat Falls, Labrador Island Link and Maritime Link

Muskrat Falls Generation
- 824 Megawatt hydro-electric facility
- Two dams, one powerhouse
- 60 km reservoir
- Construction start 2011; in-service late 2016
- Construction cost $2.9 billion
- Ownership 100% Nalcor

Labrador-Island Transmission Link
- 900 MW capacity
- Muskrat Falls to St. John's area
- 1,100 km, including 30 km under Strait of Belle Isle
- Construction start 2012; in-service late 2016
- Construction cost $2.1 billion
- Ownership 71% Nalcor, 29% Emera

Maritime Transmission Link
- 500 MW capacity
- Includes 180 km undersea link from Cape Ray NL to Cape Breton NS
- Construction start 2013; in-service late 2016
- Construction cost $1.2 billion
- Ownership 100% Emera



Project Overview

- Muskrat Falls Generating Facility
  - Close-coupled 824 MW powerhouse
  - 4 Kaplan turbines
  - North and South RCC dams
  - Gated Spillway
  - 263 km 345 kV ac transmission interconnect between Muskrat Falls and Churchill Falls

Project Overview

- Labrador – Island Transmission Link
  - 320 kV dc transmission connection from Labrador to Island
  - 1,050 km 320 kV Overhead Transmission Line
  - HVac to HVdc converter stations at Muskrat Falls and Soldier's Pond
  - Shore Electrodes at SOBI and Dowden's Point
  - 3 Mass Impregnated Cables crossing the SOBI protected using a combination of HDD shore approaches and rock berms
  - Island System Upgrades, including 3 off 150 MVar high inertia synchronous condensers

Project Costs

- Generation - $2.9 B
- Transmission - $2.1 B
- Cost expressed in as-spent dollars
- Include contingency and escalation
- Does not include interest during construction (IDC)

Project Implementation

MANDATE: LCP Management Team

- Deliver LCP – Phase 1:
  - Safely
  - Environmentally Acceptably
  - On Budget
  - On Schedule
  - Meeting Design Criteria

Key Dates

• EPCM Contract Award	Feb 2011
• Generation EA Release	Dec 2011
• Decision Gate 3	Dec 2011
• Commence Early Works	Jan 2012
• CF to MF Tx Ready	Aug 2014
• First Power	Nov 2016

Project Delivery Strategy

- Muskrat Falls
  - Nalcor PMT + EPCM Consultant (SNC-Lavalin)
- Labrador-Island Link Transmission
  - Nalcor PMT + EPCM Consultant (SNC-Lavalin)
- SOBI Cable Crossing
  - Nalcor PMT + EPC / EPCI Contractors (TBD)
- Maritime Link
  - Emera lead with Nalcor involvement

Nalcor Energy – Lower Churchill Project
Overall Project Management

Nalcor-led Scope

Sub-Project: Environmental Assessment & Aboriginal Affairs

Sub-Project Sections:
- EA – MF & GI Generation with MF/GI Interconnect
- EA – Island Link
- EA - Maritime Link
- Aboriginal Affairs

Sub-Project: Nalcor Other Activities

Sub-Project Sections:
- Power sales & market access
- Finance
- Existing Contracts
- Industrial Relations
- Execution Readiness
- Insurance

Sub-Project: Island Link - Strait of Belle Isle Marine Crossing

Sub-Project Sections:
- Route and Installation Strategy
- Shoreline / Landfall Protection
- Subsea Cable Procurement and installation
- Subsea Protection

EPCM-led Scope

Sub-Project: Muskrat Falls Generation (Component 1)

Sub-Project Sections:
- 824 MW powerhouse and supporting structures including:
  - Infrastructure/Temps
  - Powerhouse/Intake
  - Dams/Spillway
  - Overhead Lines
  - Reservoir
- 345 kV HVac transmission interconnect between Muskrat Falls and Churchill Falls

Sub-Project: Island Link -Land Portion (Components 3&4)

Sub-Project Sections:
- 1050 km Overhead Transmission Line
  - incl. Transition Structures
- HVac to HVdc converter stations at Muskrat Falls and Soldier's Pond
- Shore Electrodes at SOBI and Dowden's Point
  - incl. transmission line
- Switchyard on Avalon
- Island System Upgrades

Emera-led Scope

Sub-Project: Maritime Link - Land Portion

Sub-Project Sections:
- 127 km Overhead Transmission Line
- HVac to HVdc converter stations at Bottom Brook and Lingan
- Shore Electrodes in NL and NS
- Island System Upgrades

Sub-Project: Maritime Link - Cabot Strait Marine Crossing

Sub-Project Sections:
- Route and Installation Strategy
- Shoreline / Landfall Protection
- Subsea Cable Procurement and installation
- Subsea Protection

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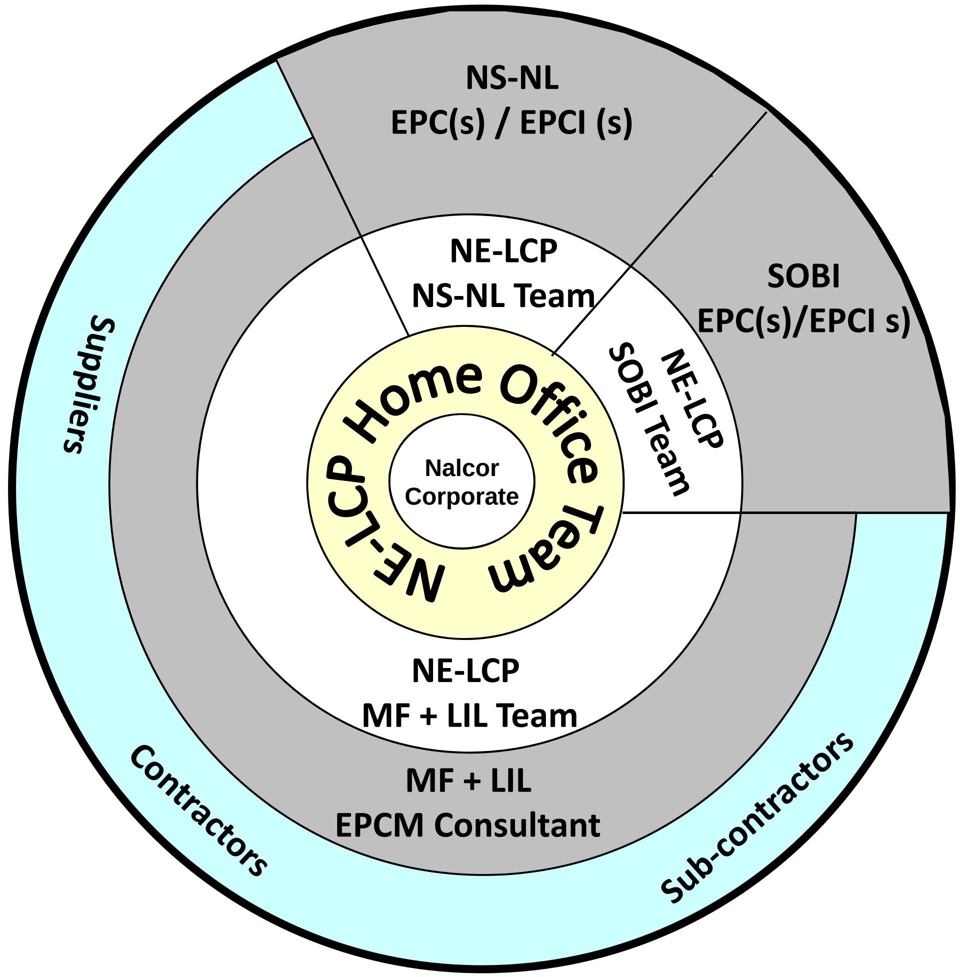
Organization Interfaces – Project Delivery

- Nalcor Project Director has overall Project Delivery accountability and interfaces with NE Corporate.
- Project Director supported by Functional Managers and expertise.
- Designated Project Managers and Project Teams for MF + LIL, SOBI, and Maritime Link.
- Project Teams contain functional expertise required for delivery.
- Designated Nalcor / SLI Site Teams manage the EPC and contractors (the builders).
- The EPC and contractors manage their vendors, contractors and sub-contractors.



Ensuring Project Delivery

Four key attributes of successful project execution are addressed in these projects:

- defined organization and governance models consistent with best practices of project management,
- experienced project management and design teams with performance measures aligned with projects success,
- thorough up front investigation of project risks and mitigation plans; and
- expert external appraisal throughout the stages of projects approval to execution (e.g. independent projects review at decision gates and expert panels).

Established Performance Baseline

- Extensive effort has already been made to define and document the projects scope, schedule and cost estimates
- Cost estimate assumptions have been benchmarked against other projects
- Cost estimates include latest market pricing data for labour, equipment and materials
- Capital cost baseline has been prepared to facilitate effective cost control during construction
- Appropriate cost and schedule contingencies to address uncertainties have been established

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Focused Project Control Resources

- Dedicated Owner teams managing a world class EPCM contractor SNC-Lavalin who are focused on controlling projects cost and schedule against baseline plans
- Implement a rigorous integrated cost, schedule and scope management approach
- Proven project control and management of change processes implemented
- Owner multidisciplinary team of experienced professionals provide both continual managerial and technical oversight of the projects

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Control During Execution

- Use of variance analysis reporting to identify emerging issues and initiate management action
- Frequent and detailed progress reports showing physical progress
- Ongoing identification and management of performance trends
- The basis of design associated Capex and schedule form the basis for management of change
- Disciplined management of change process to challenge all project changes that can affect the projects cost and schedule

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Summary

Summary

- NL requires new generation to meet load growth
- Muskrat Falls and Transmission Link to the Island is best solution
  - Most economic and least-cost option
  - Holyrood thermal plant coming off-line and thermal replacement avoided
  - Enhances system reliability and security of supply with interconnection
  - Rate stability for customers over long term
  - Generates a positive rate of return for province
- Electricity demand met up to 2036
- Generation >98% GHG free
- Robust business case –good project for Newfoundlanders and Labradorians

Summary

- Project is well defined and understood
- Risk-optimization measures in place
- Experienced management team in place to execute project
- Vigorous technical, economic and financial analysis completed