

Island Energy Supply and Lower Churchill

Option Evaluation and Recommendation

September 23, 2010

Boundless Energy



Final v9

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Purpose

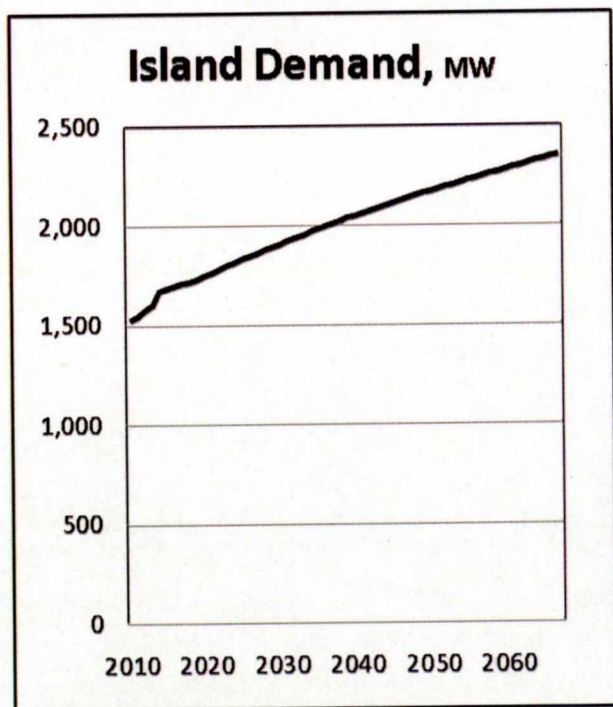
Present an evaluation of Lower Churchill – Muskrat Falls as a preferred means of meeting the electricity needs of the Island, compared to other available options

Presentation Overview

- Island demand analysis for capacity and energy
- Supply alternatives analysis
- Recommendation

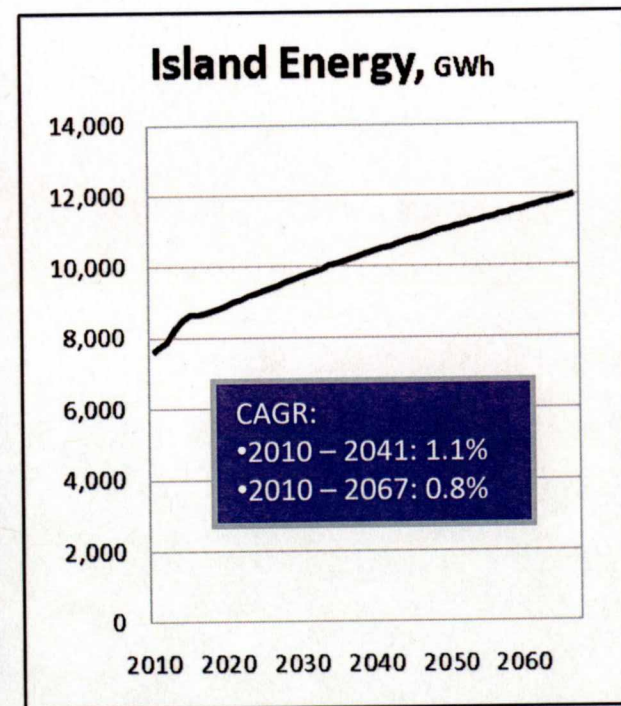
Island Requirements Analysis – Capacity and Energy

Island electricity requirements are projected to grow to over 2,300 MW and 12,000 GWh by 2067, in line with current NL economic growth projections



Assumptions:

- Single newsprint mill
- Single oil refinery
- Nickel processing facility startup late 2011, reaching full production in 2014
- Duck Pond Mine continues in operation until 2013
- Hebron developed
- Economic forecasts provided by Department of Finance (Population, housing starts, GDP, etc.)
- Loss of Load Hours no more than 2.8 hours annually



Island Demand Analysis – Capacity and Energy

Based on these assumptions there will a capacity deficit in 2015, against utility reliability standards

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	0.15	1,368	1,368
2011	1,538	7,709	1,958	8,953	0.22	0.22	1,244	1,244
2012	1,571	7,849	1,958	8,953	0.41	0.41	1,104	1,104
2013	1,601	8,211	1,958	8,953	0.84	0.84	742	742
2014	1,666	8,485	1,958	8,953	2.52	2.52	468	468
2015	1,683	8,606	1,958	8,953	3.41	3.41	347	347
2016	1,695	8,623	1,958	8,953	3.91	3.91	330	330
2017	1,704	8,663	1,958	8,953	4.55	4.55	290	290
2018	1,714	8,732	1,958	8,953	5.38	5.38	221	221
2019	1,729	8,803	1,958	8,953	6.70	6.70	150	150

Island Demand Analysis – Capacity and Energy

Implications: Excerpt from Nalcor presentation
“Generation Planning Issues, July 2010 Update”

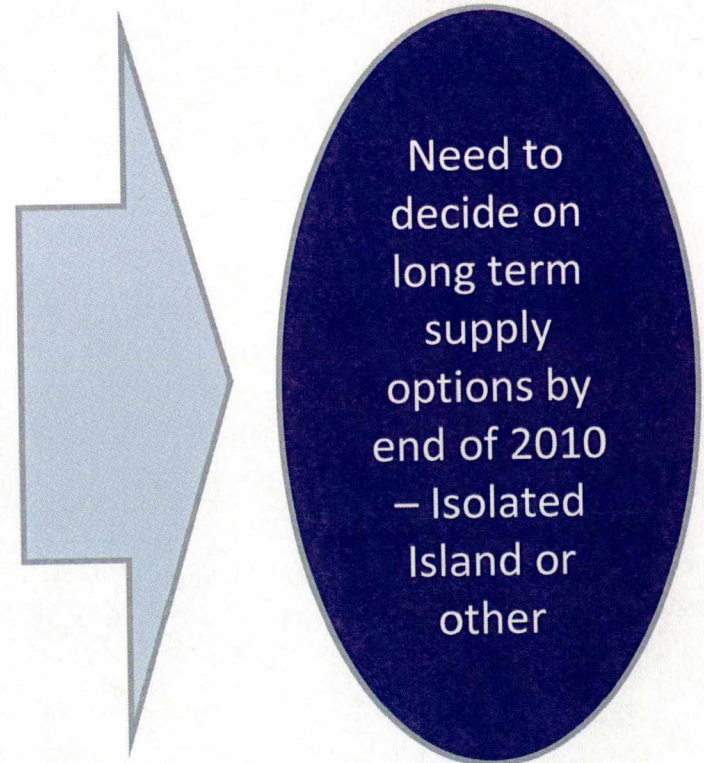
- If we do not sanction LCP by end of 2010, PUB will expect that an RFP process will be started to have the next source of generation in place by late 2015.

- 12 month RFP process

- 6 month public hearing process

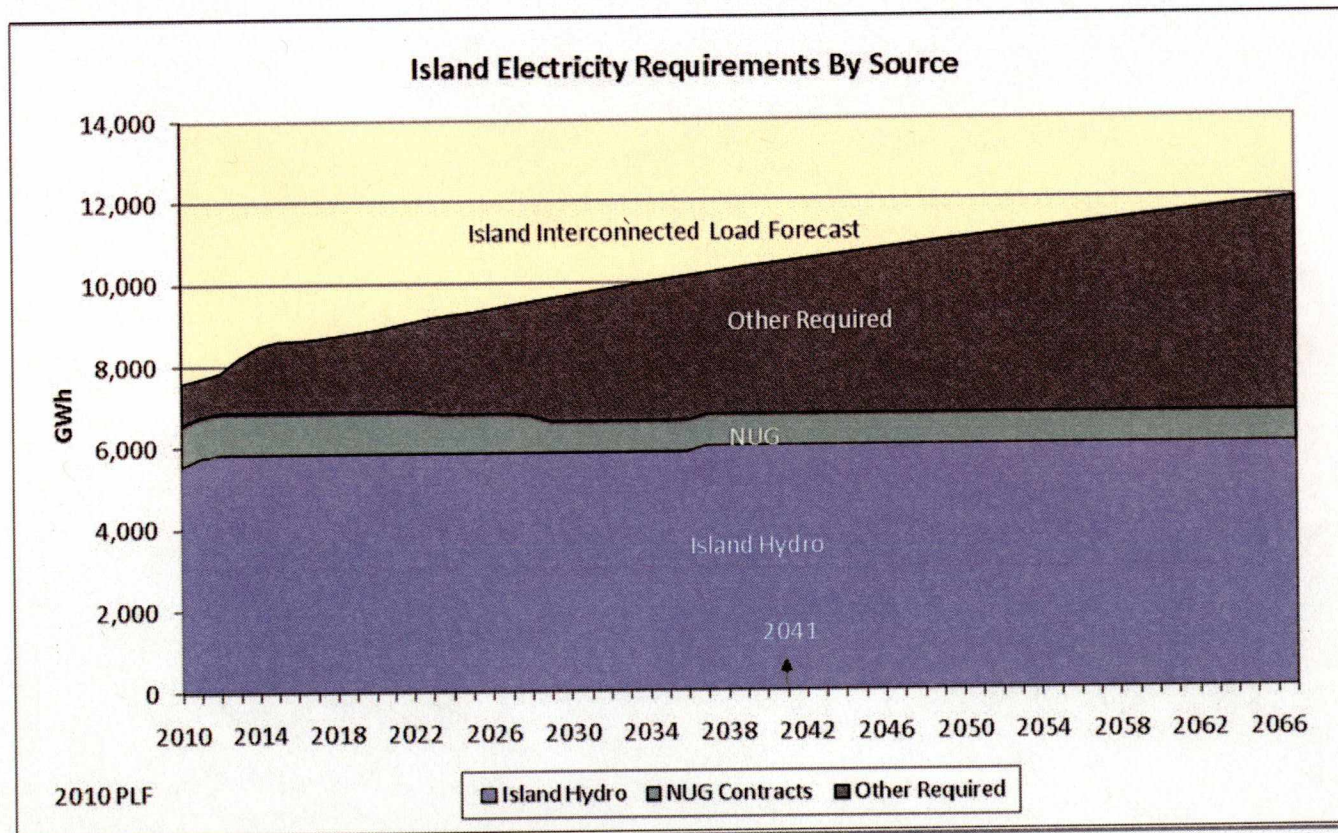
- 42 months to build Island Pond, or another proponent's development

- If we do not sanction LCP by end of 2010 and do not start the RFP process, the only way to achieve a 2015 on power date will be by OIC.



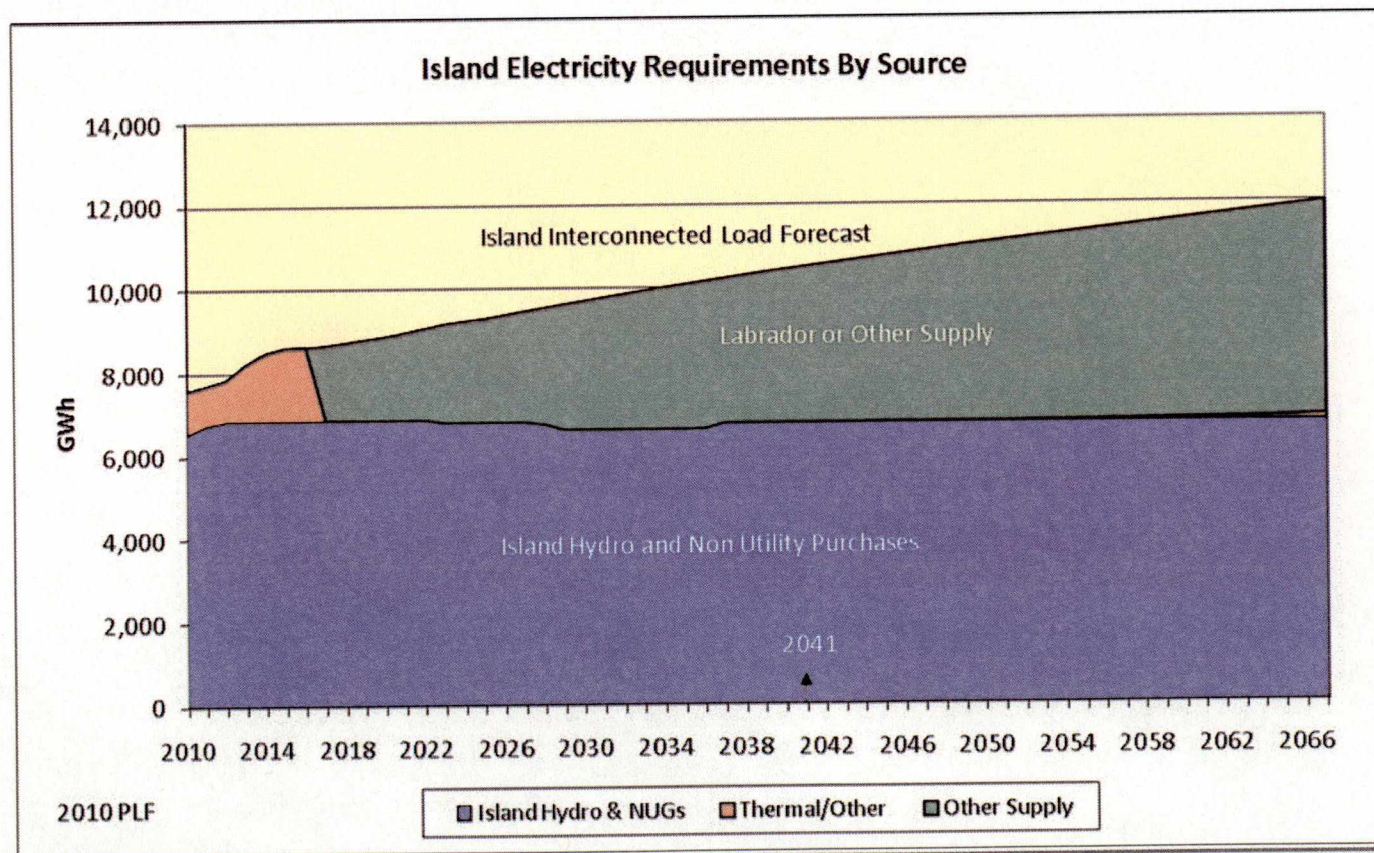
Island Supply Requirements 2010 – 2067

Island existing generation sources – excluding fossil fuel
– only supply a portion of the Island requirements



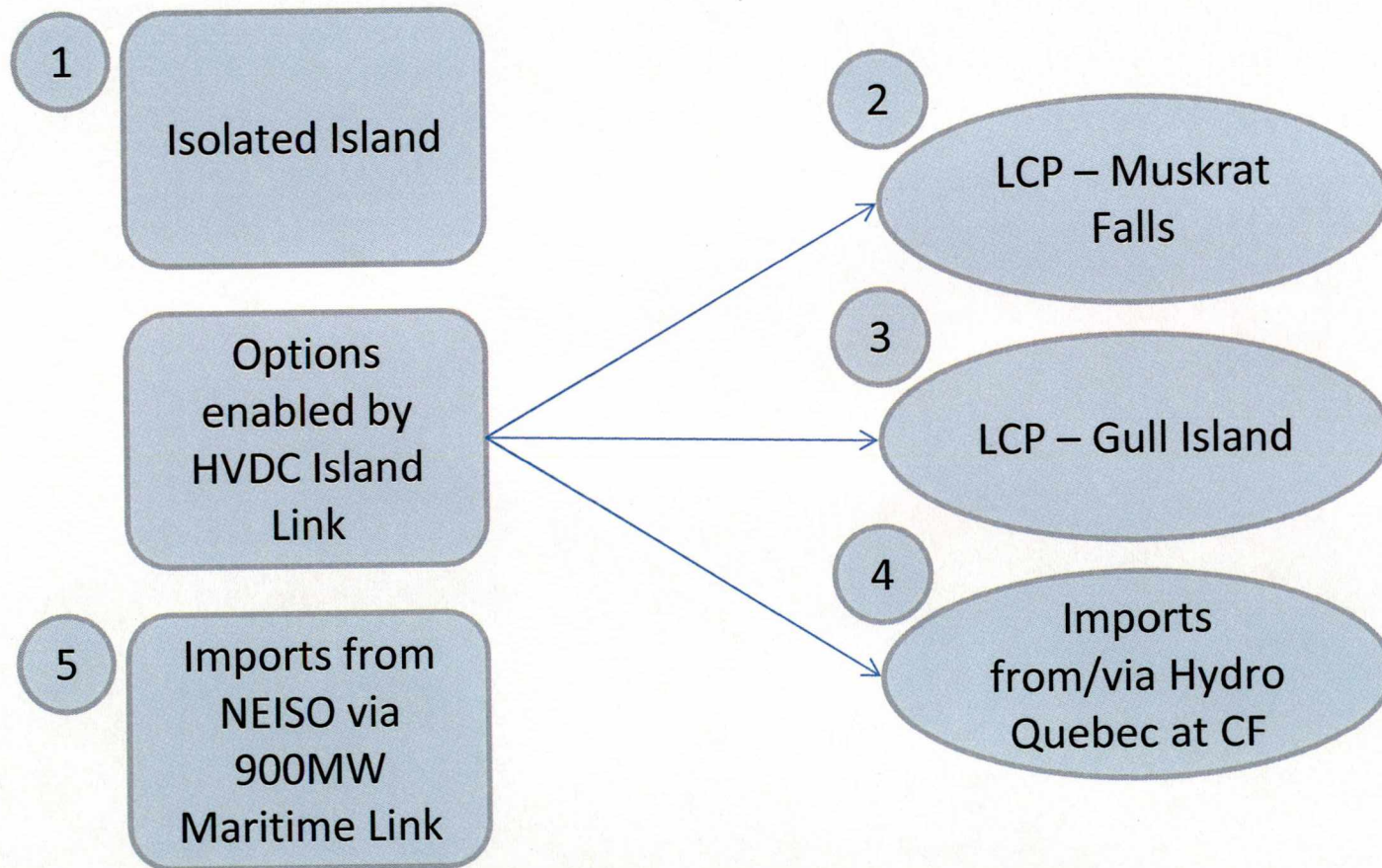
Island Supply Requirements 2010 - 2067

Focus of this presentation is on Island supply starting in the 2017 timeframe

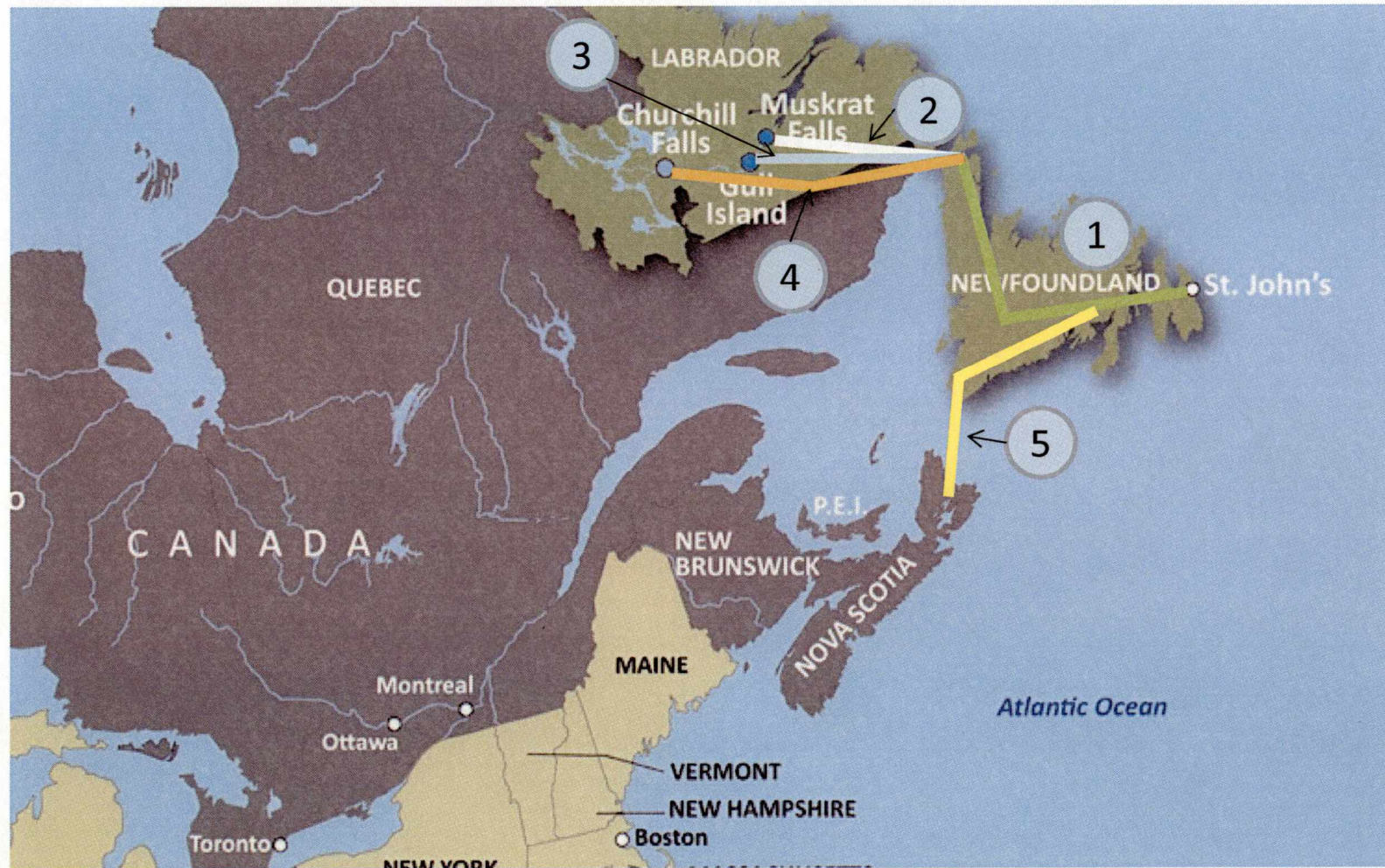


Options for Meeting Island Supply Requirements

Five options for evaluation



Options for Meeting Island Supply Requirements



Supply Alternatives Analysis: Criteria

Criteria used in evaluating options

Criterion	Isolated Island	LCP – Muskrat Falls	LCP – Gull Island	Imports from/via HQ	Imports from NEISO via ML
Reliability					
Cost to Ratepayers					
Environment					
Risk and uncertainty					
Financial viability of non-regulated elements					

Supply Alternatives Analysis: Assumptions

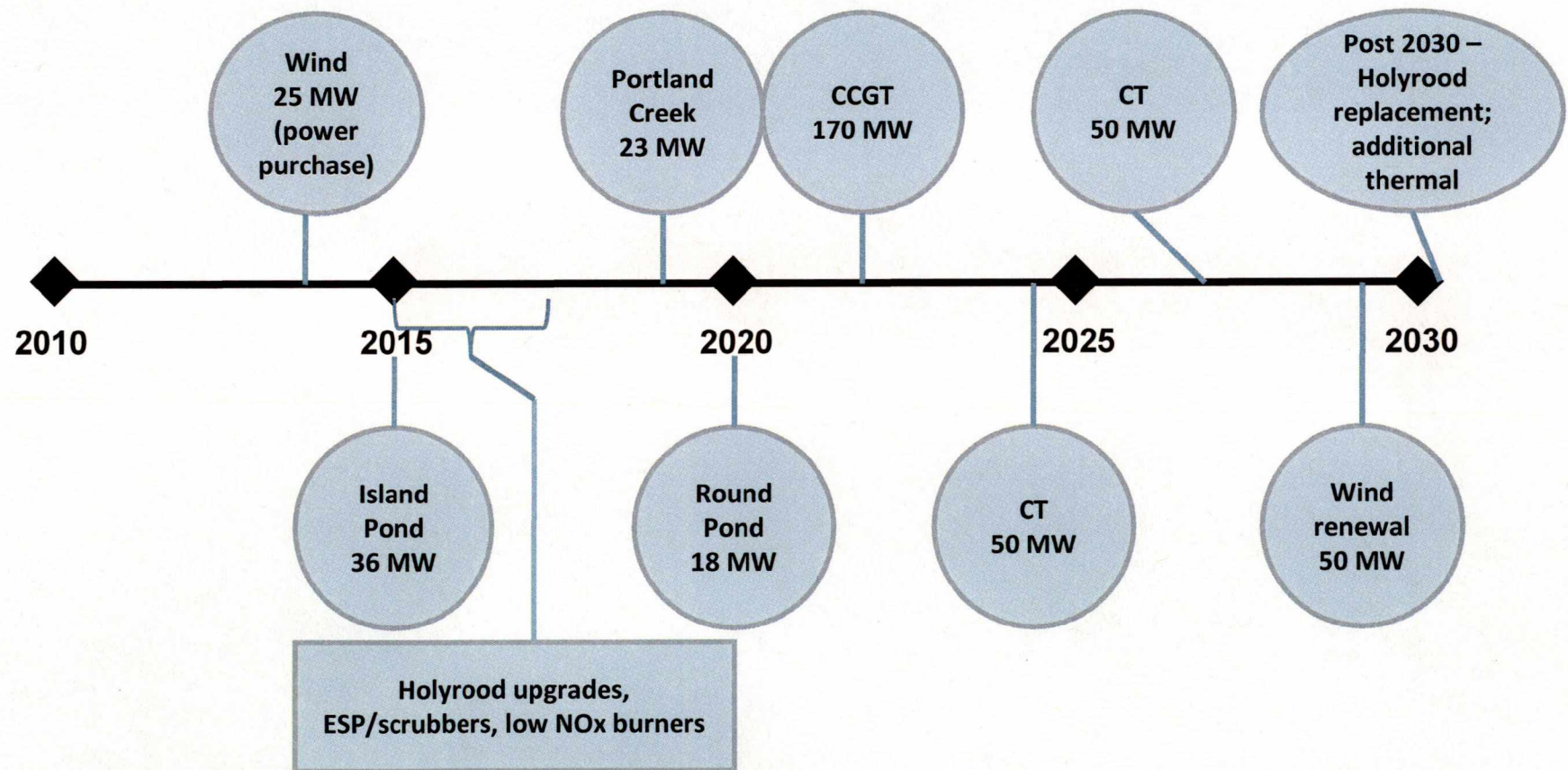
Nalcor corporate assumptions used in the evaluation

Parameter	Assumption
Regional North American Electricity prices	<ul style="list-style-type: none"> PIRA Energy Group for Ontario, New York, New England
World Oil prices	<ul style="list-style-type: none"> PIRA Energy Group
Environmental costs	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 2% CPI Generation and transmission O&M 2.5% Capital costs 2% - 3%
Long run regulated financial assumptions	<ul style="list-style-type: none"> Debt cost 7.4% Equity cost 10.0% Debt:Equity ratio: 75:25 WACC/discount rate: 8%

Supply Alternatives Analysis

Option: Isolated Island

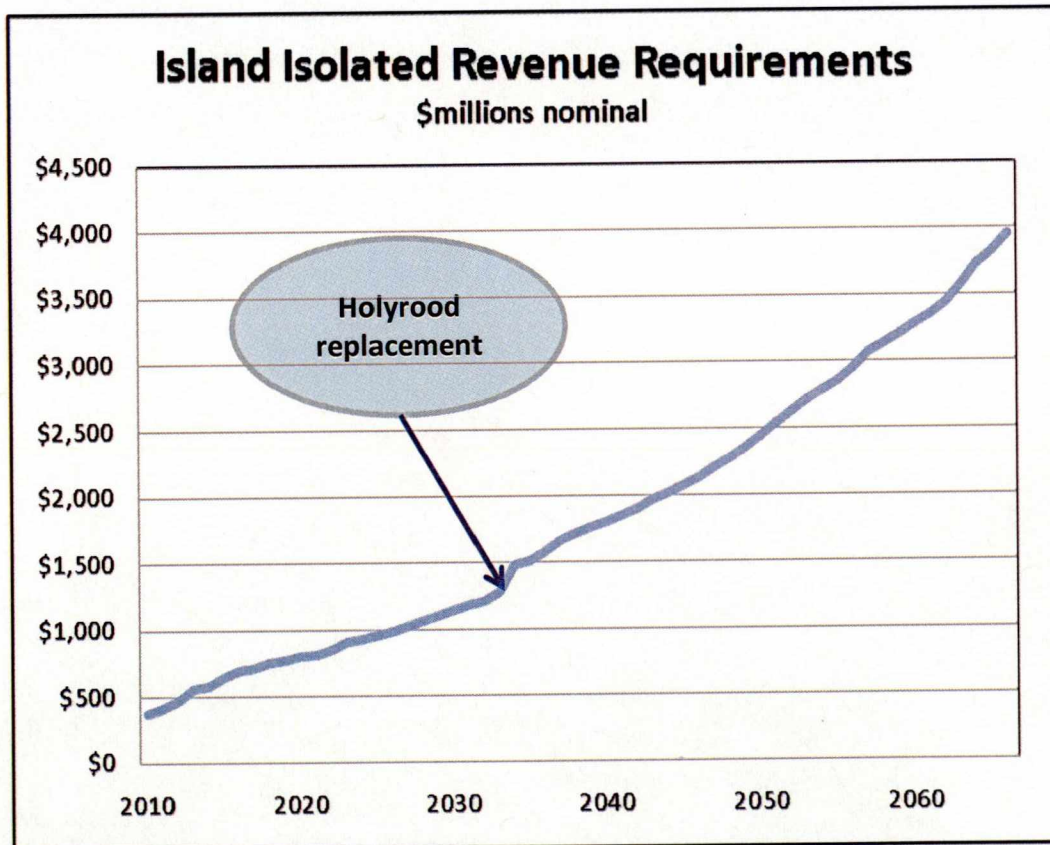
Build program involves numerous projects



Supply Alternatives Analysis

Option: Isolated Island

Isolated Island Case: 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

Supply Alternatives Analysis

Option: Isolated Island

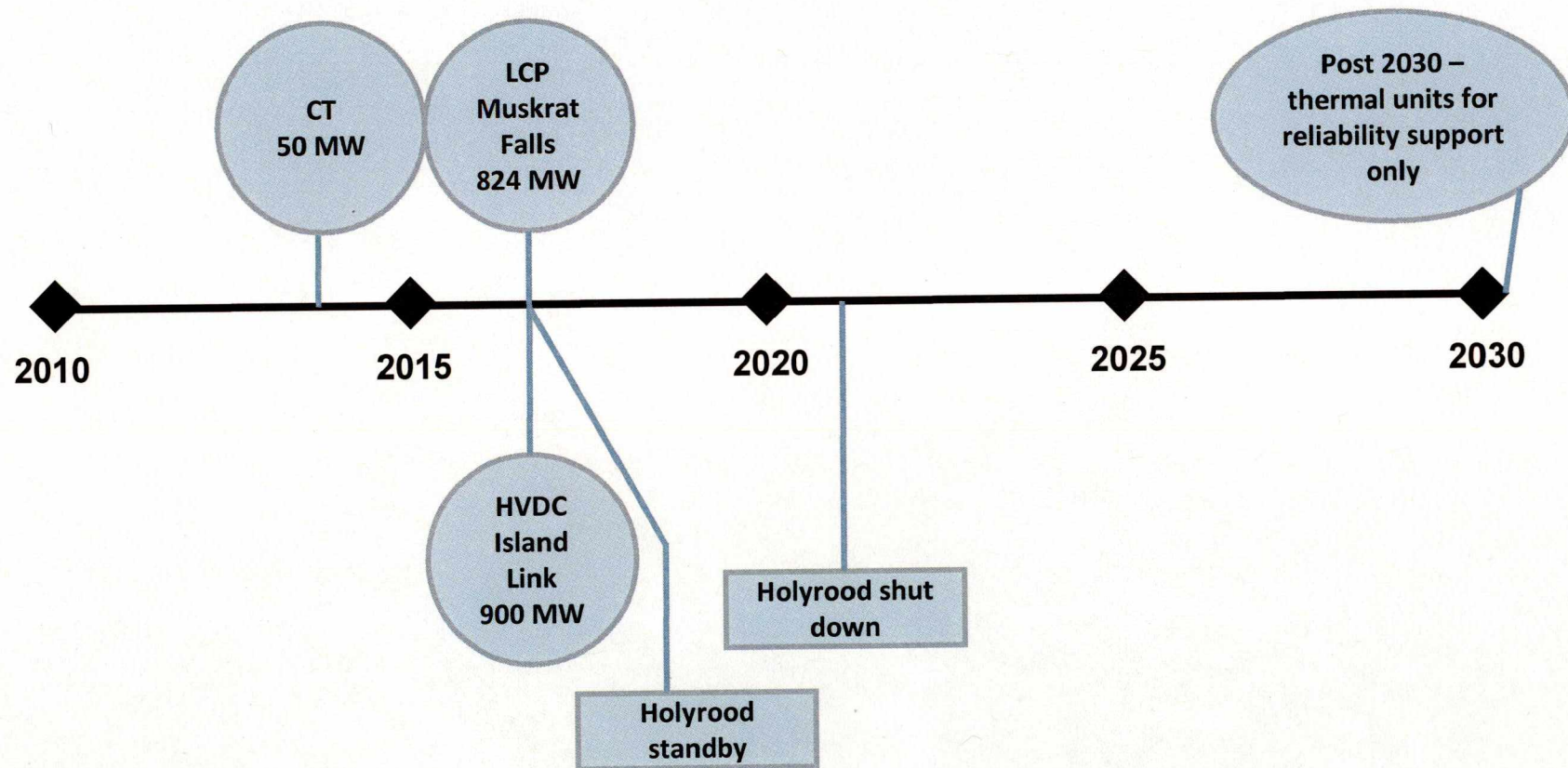
Isolated island is the reference case, and features environmental and world oil price risks

Criterion	Isolated Island	LCP – Muskrat Falls	LCP – Gull Island	Imports from/via HQ	Imports from NEISO via ML
Reliability	No interconnection to NA grid				
Cost to Ratepayers	Reference Case				
Environment	Petroleum Based				
Risk and uncertainty	World oil price Enviro costs				
Financial viability of non-regulated elements	N/A				

Supply Alternatives Analysis

Option: LCP – Muskrat Falls

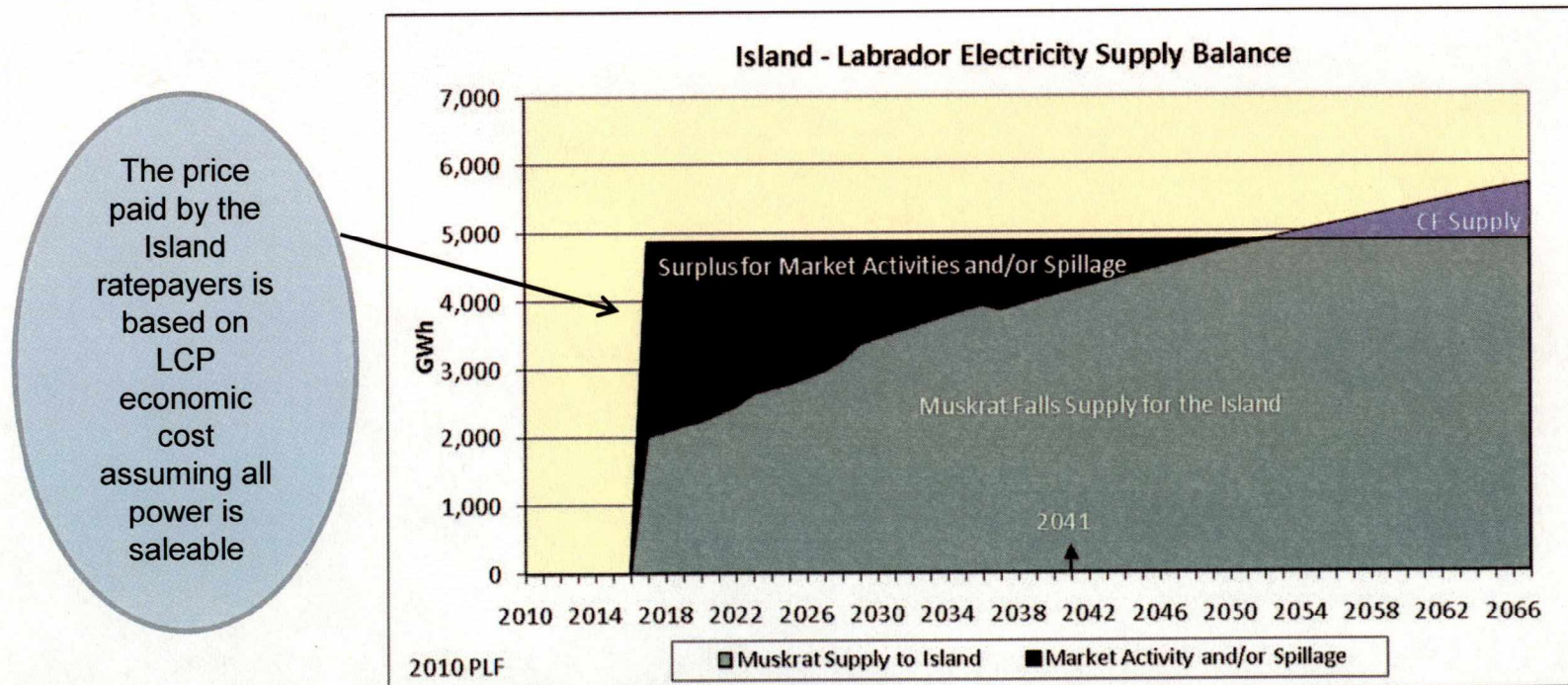
Build program revolves around LCP and related HVDC



Supply Alternatives Analysis

Option: LCP – Muskrat Falls

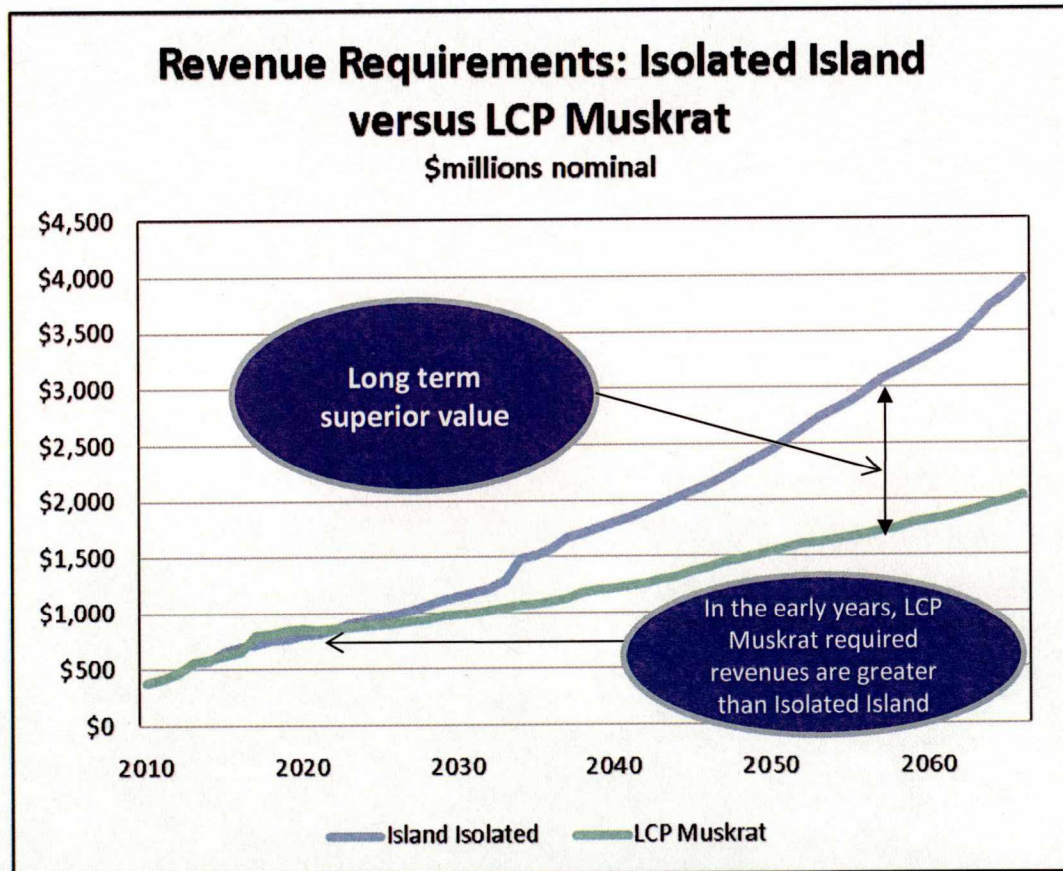
LCP may “spill” power not required by the Island; the risk associated with this is to the account of the project, not the Island ratepayers.



Supply Alternatives Analysis

Option: LCP - Muskrat Falls

LCP Muskrat Falls Case: key indicators



Economic Indicators (\$ millions)

- CPW of revenue requirement: \$10,604
- CPW versus Isolated Island: -\$1,668
- 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:

- 8.5% IRR assuming no monetization of spill

Supply Alternatives Analysis

Option: LCP – Muskrat Falls

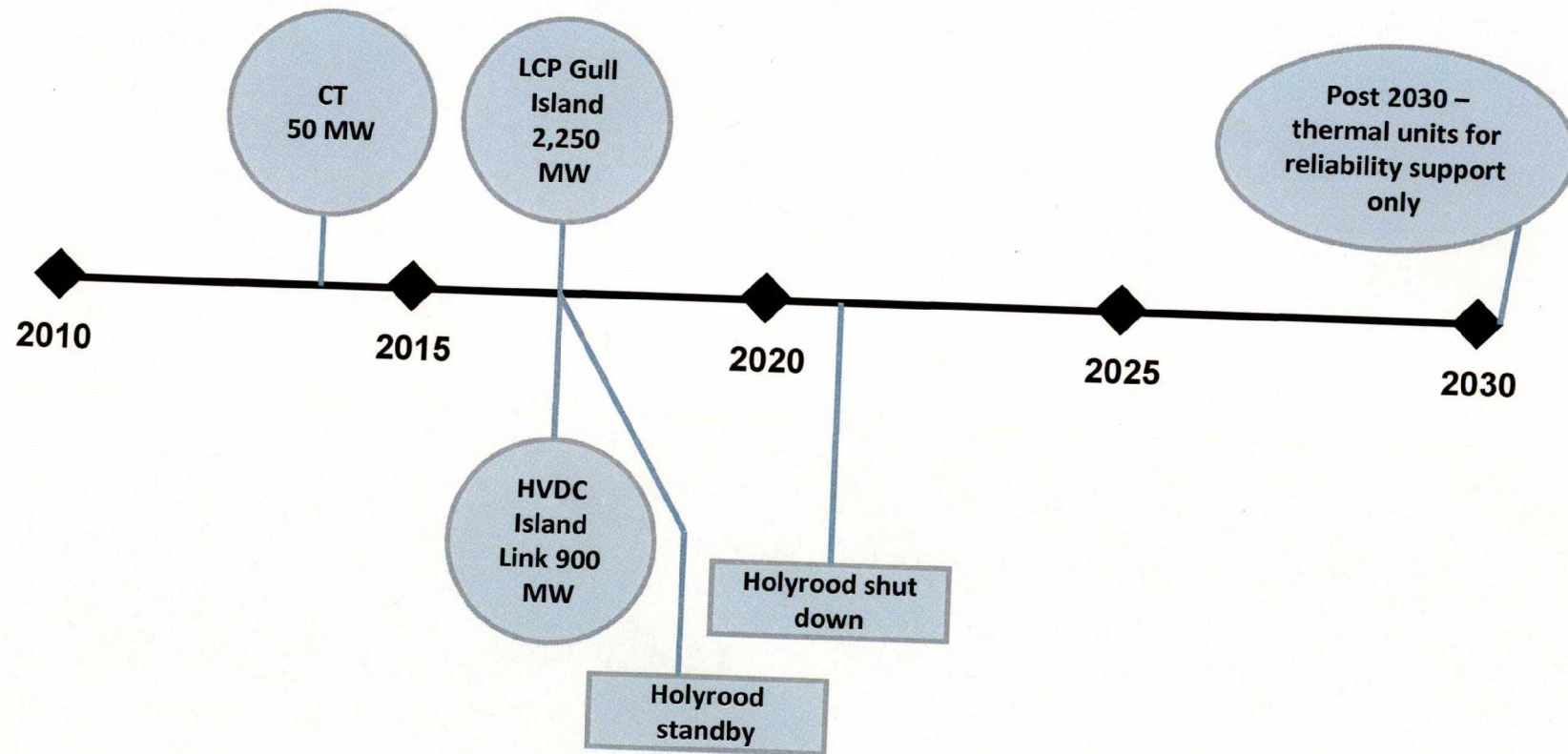
LCP Muskrat is more attractive than the Isolated Island case

Criterion	Isolated Island	LCP – Muskrat Falls	LCP – Gull Island	Imports from/via HQ	Imports from NEISO via ML
Reliability	No interconnection to NA grid	Interconnected			
Cost to Ratepayers	Reference Case	Better than reference case long term; similar short term			
Environment	Petroleum Based	Renewable to maximum extent			
Risk and uncertainty	World oil price Enviro costs	Schedule and approvals; capital cost control			
Financial viability of non-regulated elements	N/A	IRR exceeds cost of shareholder's associated borrowing			

Supply Alternatives Analysis

Option: LCP – Gull Island

Build program is similar to Muskrat Falls

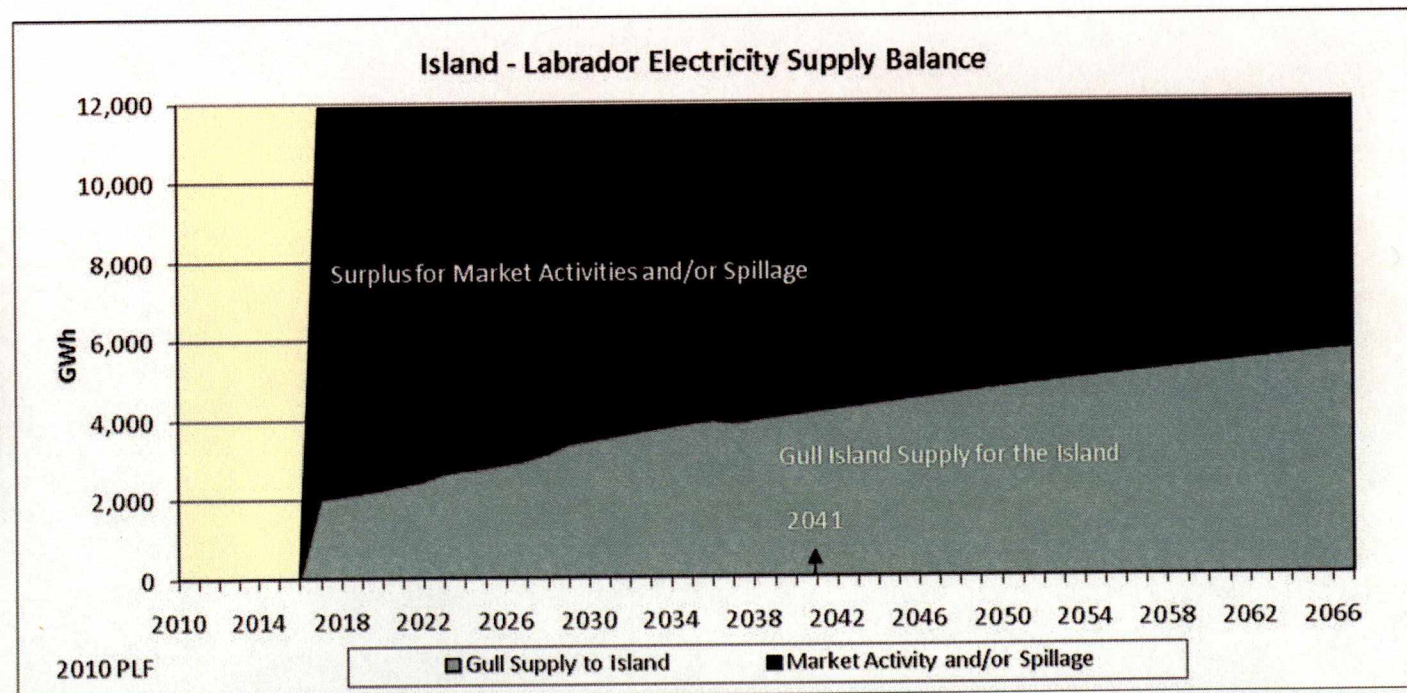


Supply Alternatives Analysis

Option: LCP – Gull Island

An important challenge with Gull Island is that relatively little of its available energy is required for the Island; the majority would need to be sold in undetermined markets, or spilled

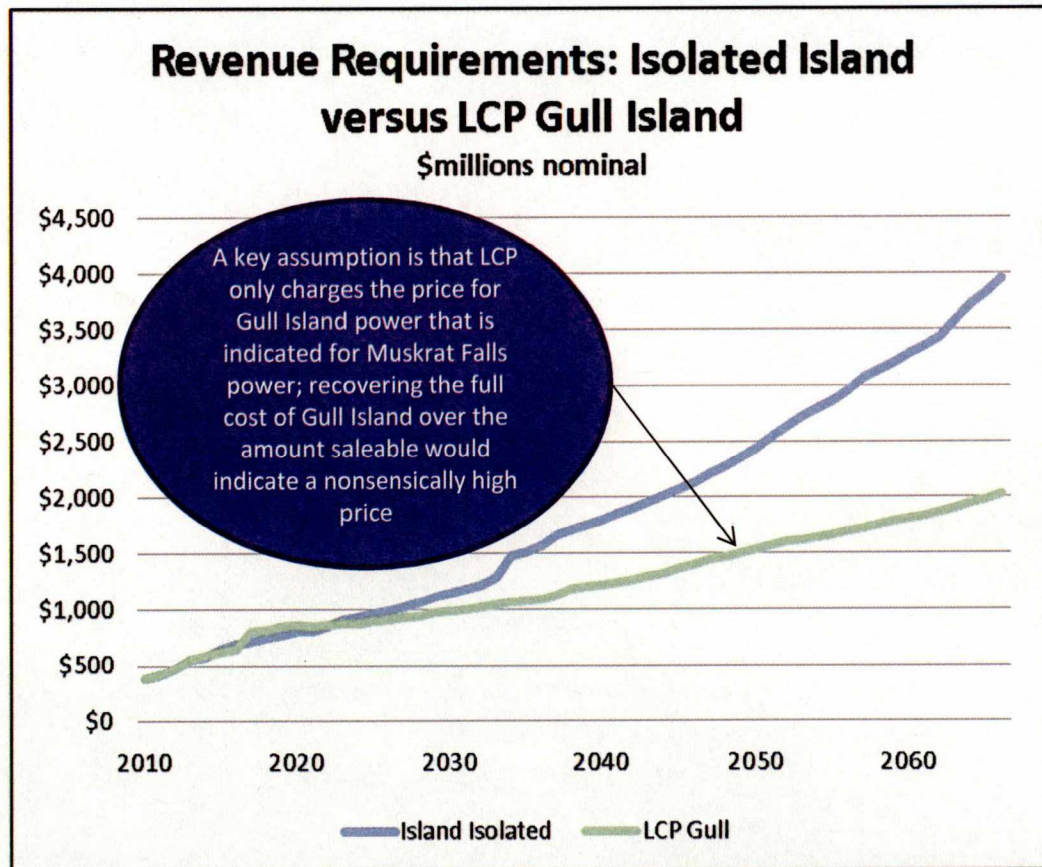
Total Gull power is 11.9 TWh; less than 6 TWh is required by the Island, and the rest may be “stranded” outright



Supply Alternatives Analysis

Option: LCP – Gull Island

LCP Gull Case: key indicators



Economic Indicators (\$ millions)

- CPW of revenue requirement: \$10,604
- CPW versus Isolated Island: -\$1,668
- Capex de-escalated to 2010\$: \$ 6,582

Key Risks:

- Environmental approval/schedule
- Capital cost control
- Heavy spill over project life

Reliability Considerations:

- Interconnected to the North American grid via Churchill Falls

Rate of return on non-regulated elements:

- 5.7% IRR assuming no spill monetization

Supply Alternatives Analysis

Option: LCP – Gull Island

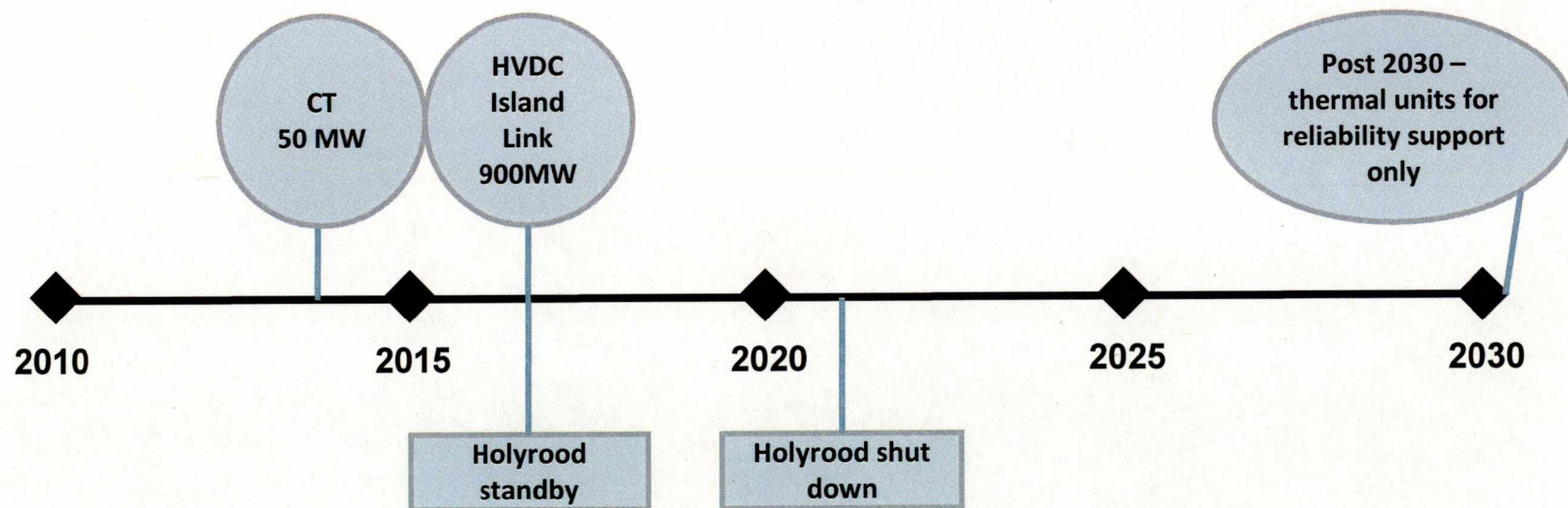
LCP Gull is not financially viable absent assured transmission via HQTE, due to heavy spill

Criterion	Isolated Island	LCP – Muskrat Falls	LCP – Gull Island	Imports from/via HQ	Imports from NEISO via ML
Reliability	No interconnection to NA grid Reference Case	Interconnected	Interconnected		
Cost to Ratepayers		Better than reference case long term; similar short term	Assumed same as Muskrat; would be unaffordable if full costs recovered		
Environment	Petroleum Based	Renewable to maximum extent	Renewable to maximum extent		
Risk and uncertainty	Fuel price Enviro costs	Schedule and approvals; capital cost control	Heavy spill over project life		
Financial viability of non-regulated elements	N/A	IRR exceeds cost of shareholder's associated borrowing	IRR less than cost of shareholder borrowing ; debt financing problematic		

Supply Alternatives Analysis

Option: Imports from/via HQ

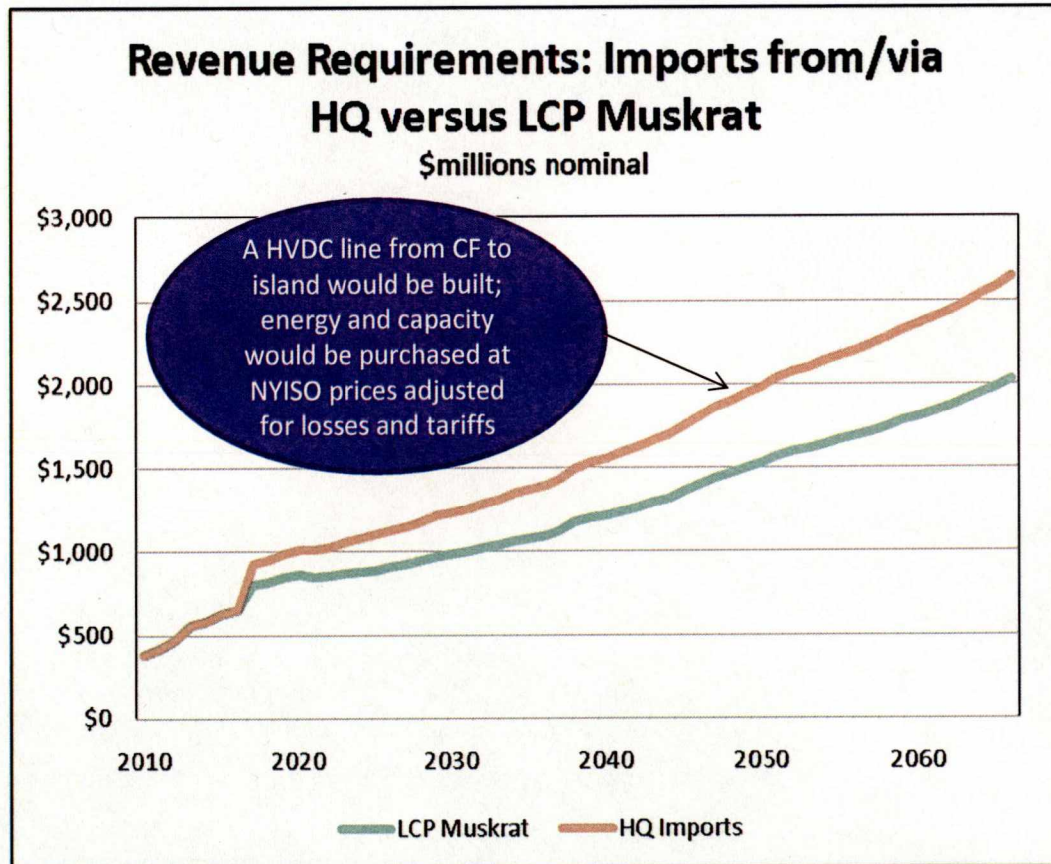
Build program is similar to LCP, but HVDC transmission only; Nalcor purchases power from or via Hydro Quebec at Churchill Falls for market prices



Supply Alternatives Analysis

Option: Imports from/via HQ

Imports via HQ at Churchill Falls Case: key indicators



Economic Indicators (\$ millions)

- CPW of revenue requirement: \$12,413
- CPW versus LCP Muskrat: +\$1,809
- Capex de-escalated to 2010\$: \$ 6,945

Key Risks:

- Ability to secure long-term firm supply
- Market price volatility

Reliability Considerations:

- Interconnected to North American grid
- However, continuity of supply not assured

Rate of return on non-regulated elements:

- N/A

Supply Alternatives Analysis

Option: Imports from/via HQ

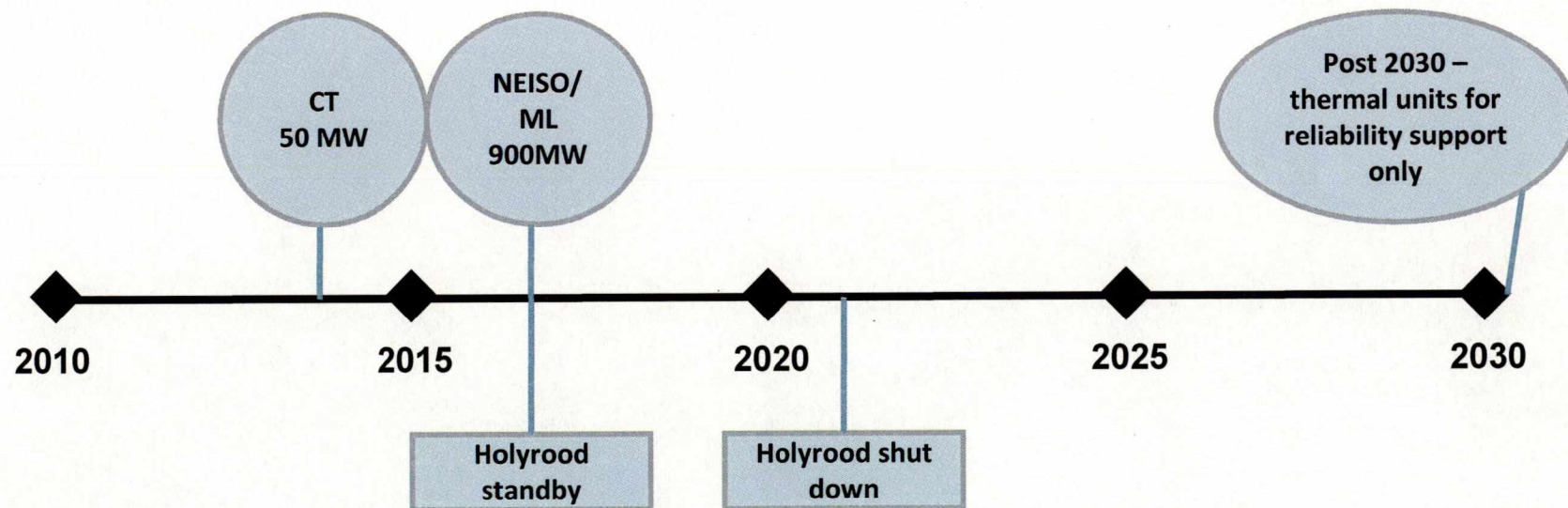
The HQ import option is inferior to LCP Muskrat, and may be infeasible for several reasons

Criterion	Isolated Island	LCP – Muskrat Falls	LCP – Gull Island	Imports from/via HQ	Imports from NEISO via ML
Reliability	No interconnection to NA grid	Interconnected	Interconnected	Assurance of long term firm supply?	
Cost to Ratepayers	Reference Case	Better than reference case long term; similar short term	Assumed same as Muskrat; would be unaffordable if full costs recovered	Higher than LCP - Muskrat	
Environment	Petroleum Based	Renewable to maximum extent	Renewable to maximum extent	Ultimate power source unknown	
Risk and uncertainty	Fuel price Enviro costs	Schedule and approvals; capital cost control	Heavy spill over project life	No assurance of firm supply; price volatility	
Financial viability of non-regulated elements	N/A	IRR exceeds cost of shareholder's associated borrowing	IRR with spill less than cost of shareholder borrowing ; debt financing problematic	N/A	

Supply Alternatives Analysis

Option: Imports from NEISO via ML

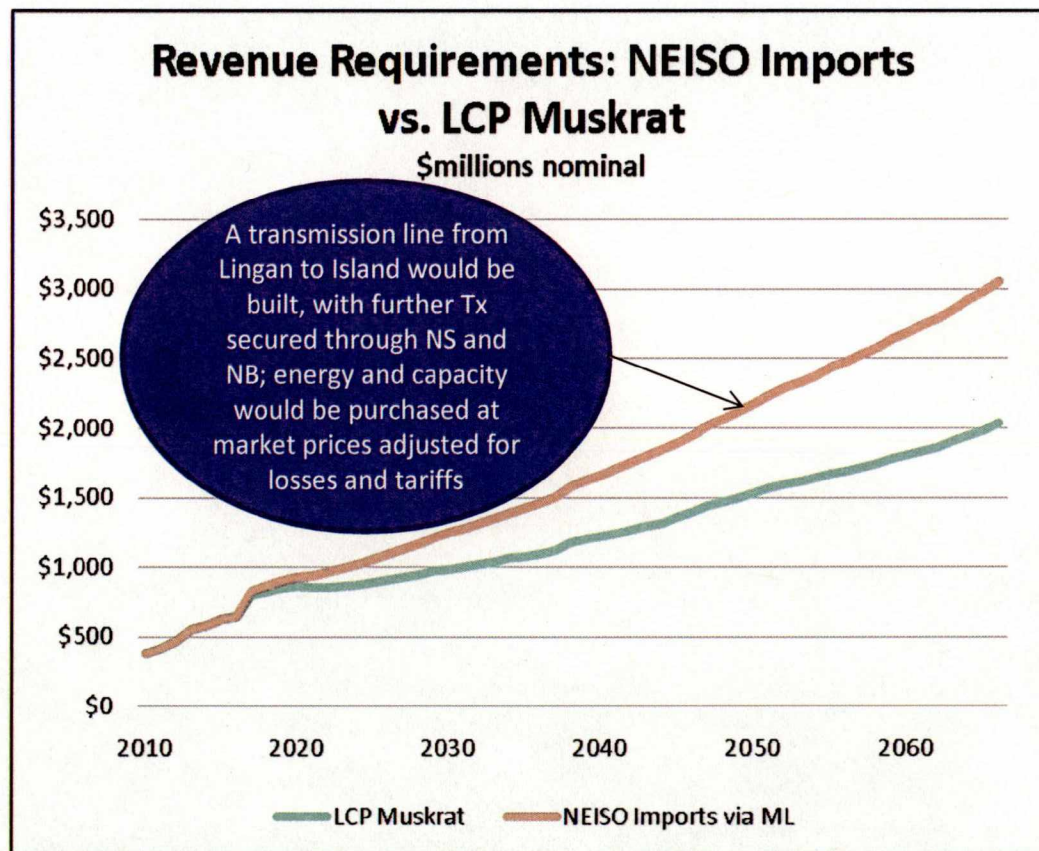
Build program is similar to HQ import case but with a 900 MW Maritime Link to Lingan, and further transmission access secured through NS and NB. Power would be purchased at the regional market price



Supply Alternatives Analysis

Option: Imports from NEISO via ML

Imports from NEISO via ML: key indicators



Economic Indicators (\$ millions)

- CPW of revenue requirement: \$12,398
- CPW versus LCP Muskrat: +\$1,795
- Capex de-escalated to 2010\$: \$ 6,748

Key Risks:

- Project execution for complex multi-jurisdictional NEISO/Maritime Link
- Market price volatility in NEISO

Reliability Considerations:

- Interconnected to North American grid
- However, continuity of supply not assured (no long-term contracts in US markets)

Rate of return on non-regulated elements:

- N/A

Supply Alternatives Analysis

Option: Imports from NEISO via ML

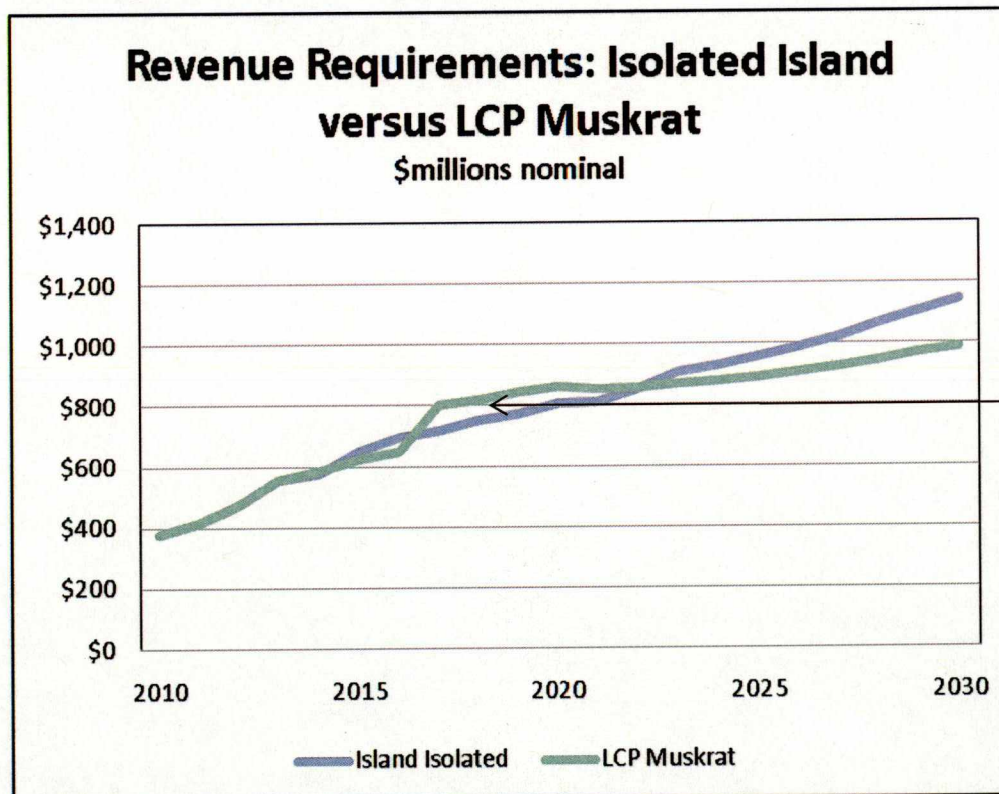
The NEISO/ML import option is also inferior to LCP Muskrat, and may also be infeasible

Criterion	Isolated Island	LCP – Muskrat Falls	LCP – Gull Island	Imports from/via HQ	Imports from NEISO via ML
Reliability	No interconnection to NA grid	Interconnected	Interconnected	Assurance of long term firm supply?	Assurance of long term firm supply?
Cost to Ratepayers	Reference Case	Better than reference case long term; similar short term	Assumed same as Muskrat; would be unaffordable if full costs recovered	Higher than LCP - Muskrat	Higher than LCP - Muskrat
Environment	Petroleum Based	Renewable to maximum extent	Renewable to maximum extent	Ultimate power source unknown	Ultimate power source unknown
Risk and uncertainty	Fuel price Enviro costs	Schedule and approvals; capital cost control	Heavy spill over project life	No assurance of firm supply; price volatility	No assurance of firm supply; price volatility
Financial viability of non-regulated elements	N/A	IRR exceeds cost of shareholder's associated borrowing	IRR with spill less than cost of shareholder borrowing ; debt financing problematic	N/A	N/A

Supply Alternatives Analysis

Implications if LCP Muskrat Selected

An early-year challenge to be met is that the required revenue is higher than isolated island, despite superior long term value



In the early years, the LCP Muskrat option has higher required revenues, in the cumulative amount of \$332 million in-service through 2022. This can be mitigated through modified financing at Muskrat Falls, modified revenue requirements for the Island Link, and rate stabilization as required

Supply Alternatives Analysis

Dealing with the Early-Year Challenge

A range of tools is available to Nalcor and the Province, which will enable the early-year required revenue challenge to be met

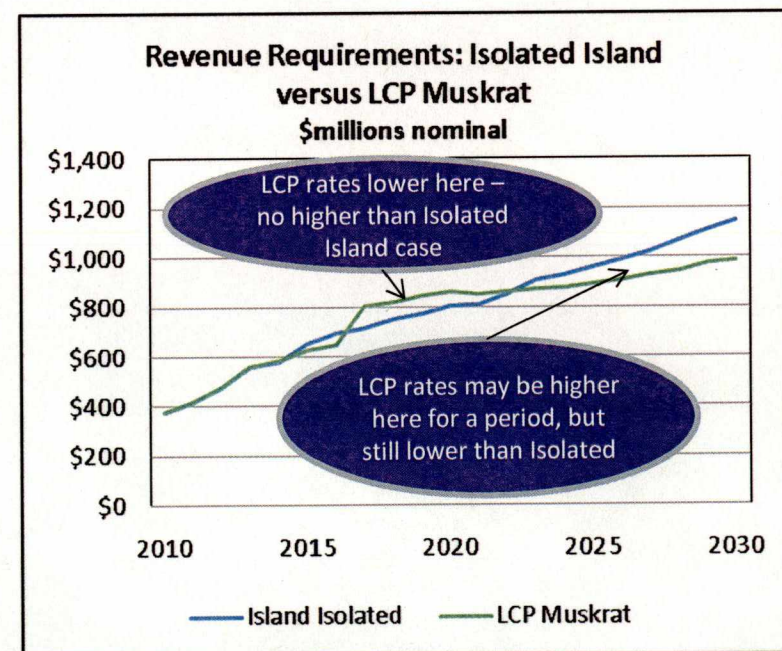
Illustrative Options

Self-funded rate stabilization fund: Create a fund during the period leading up to LCP in-service, funded by savings in LCP versus Isolated Island; draw down to mitigate rates partially in early years

Leverage in Muskrat Falls Generation – this would enable a lower economic cost to be offered to the island, even if constrained by debt-carrying capacity in spill case

Modified required revenue/tariff paid by island ratepayers for the Island Link – defer returns to equity while meeting debt service requirements and regulated return to equity

Provincially funded and administered rate stabilization fund – ratepayers would be subsidized in early years; the Province may be repaid via a levy during later years when LCP case is lower-cost



Summary and Recommendation

Based on this analysis, proceeding with LCP – Muskrat Falls is the preferred option:

- Strong reliability profile
- A solution internal to NL – no complications with external jurisdictions
- Lowest long term cost to ratepayers; “bump” can be managed
- Environmentally sound
- Lower supply and price risk than import scenarios; no exposure to fuel price volatility as Island Isolated
- Potential for attractive shareholder returns if export volume can be achieved, but viable if not
- Advances objectives of the Provincial Energy Plan