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Technical Briefing

October 30, 2012

Boundless Energy



Cost Update

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Maritime Link

- Cost estimates for the Maritime Link are being prepared by Emera as part of its participation in Nova Scotia's regulatory process. Emera will be announcing their feasibility, or DG2, cost estimates later this fall
- Until then, the Maritime Link estimate will remain at \$1.2 billion, as presented in November 2010. This number is expected to change
- A sanctioning decision on the Maritime Link is expected in 2013

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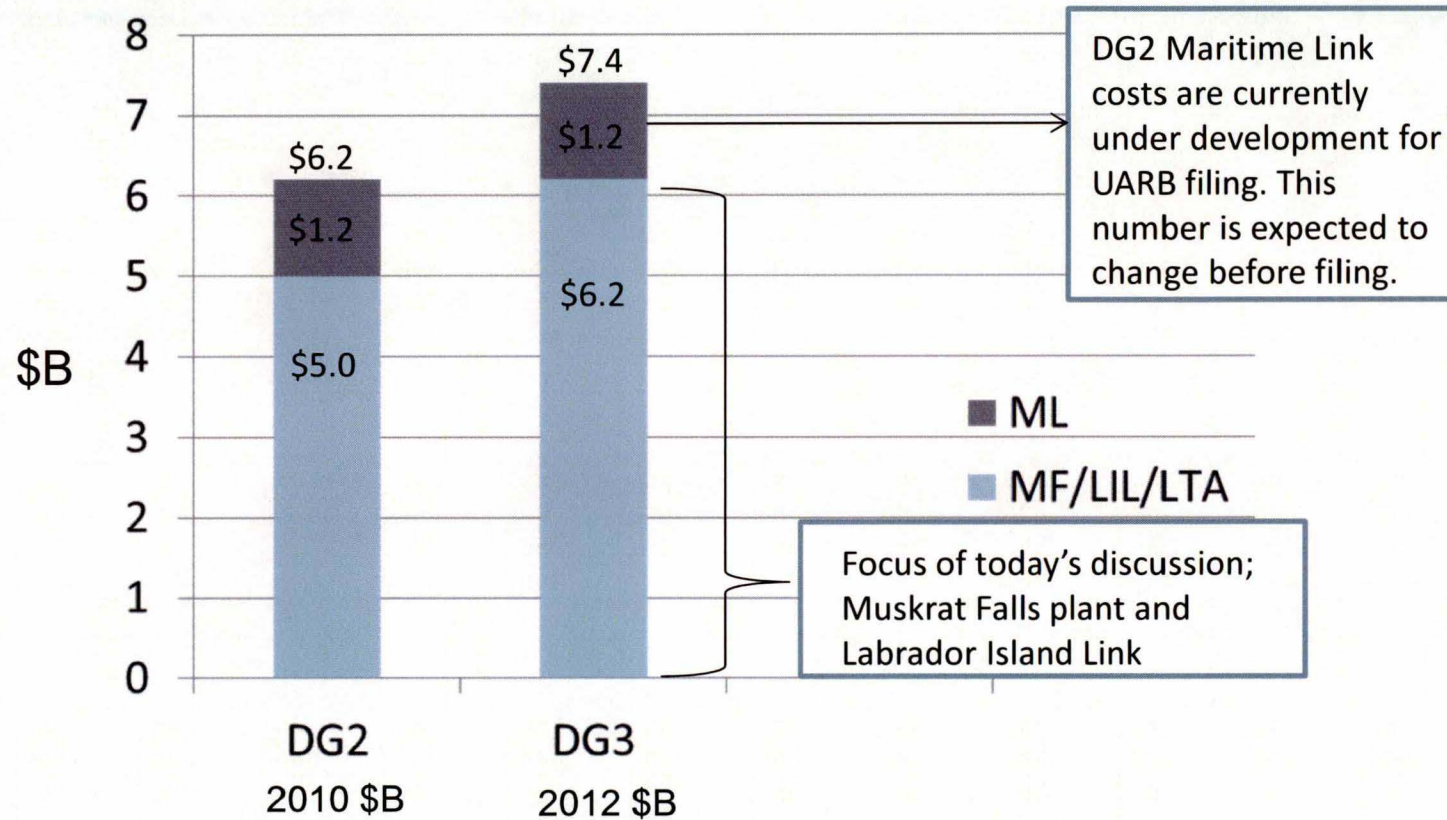
Isolated Island/Holyrood

- Between DG2 and DG3, Nalcor sought updated cost estimates for the Isolated Island/Holyrood option from engineering consultants based on the original project scope of work and design basis
- This was considered prudent in order to complete an apples to apples comparison of costs
- Capital costs have increased for projects included in Isolated Island by a margin similar to the Interconnected Island/Muskrat Falls project i.e. 20 to 25%

Interconnected Island/Muskrat Falls

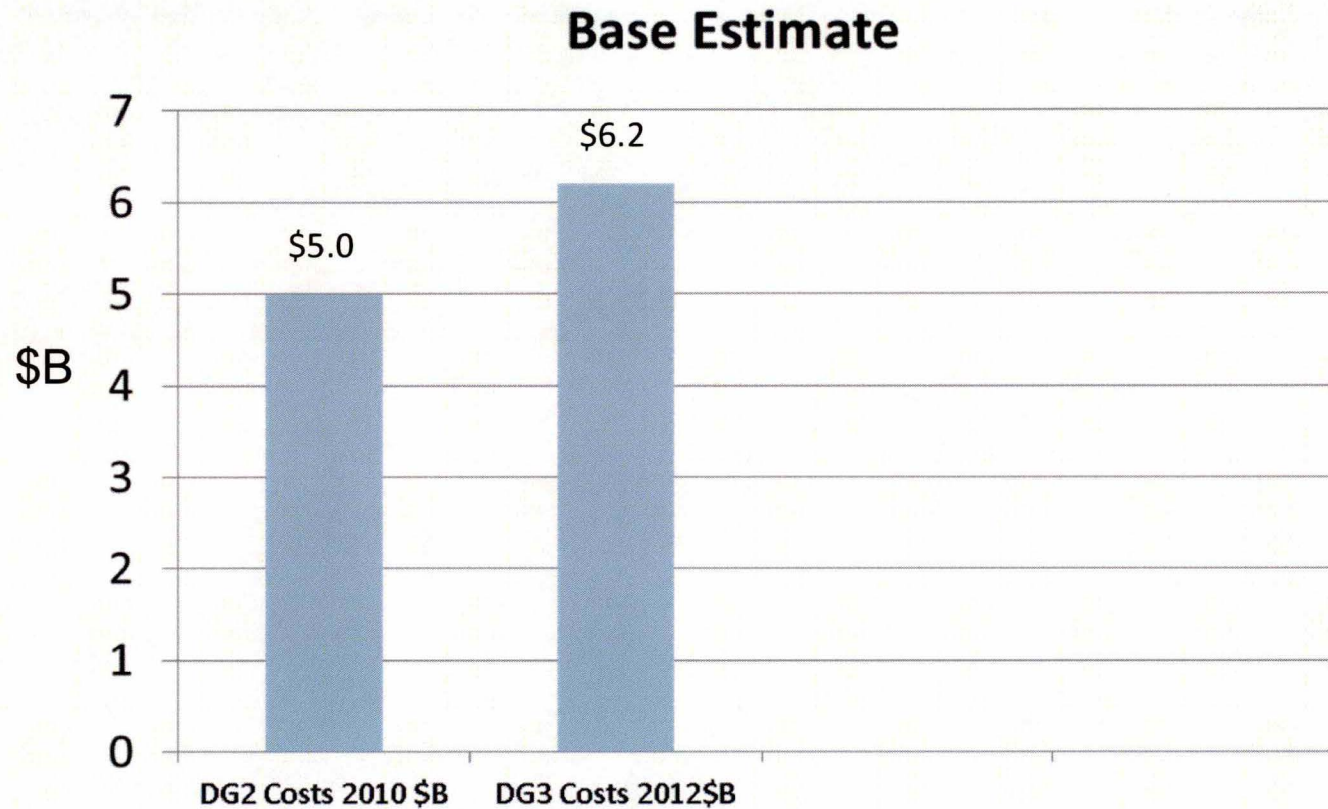
- The Interconnected Island/Muskrat Falls costs reflect the significant increase in engineering work completed since DG2 i.e from approx. 5% to currently over 50%
- Costs have increased with greater project definition, and with this comes much greater confidence in the estimate
- Design enhancements since DG2 provide a much more robust and reliable design thus avoiding costly rework during construction
- Overall this is a much more efficient design, which maximizes the energy output, reduces losses and improves operability and reliability thereby providing greater benefit to ratepayers and the people of Newfoundland and Labrador

Project Cost Including ML



Note: All costs exclude IDC

Project Cost Comparison excl ML



Note: All costs exclude IDC

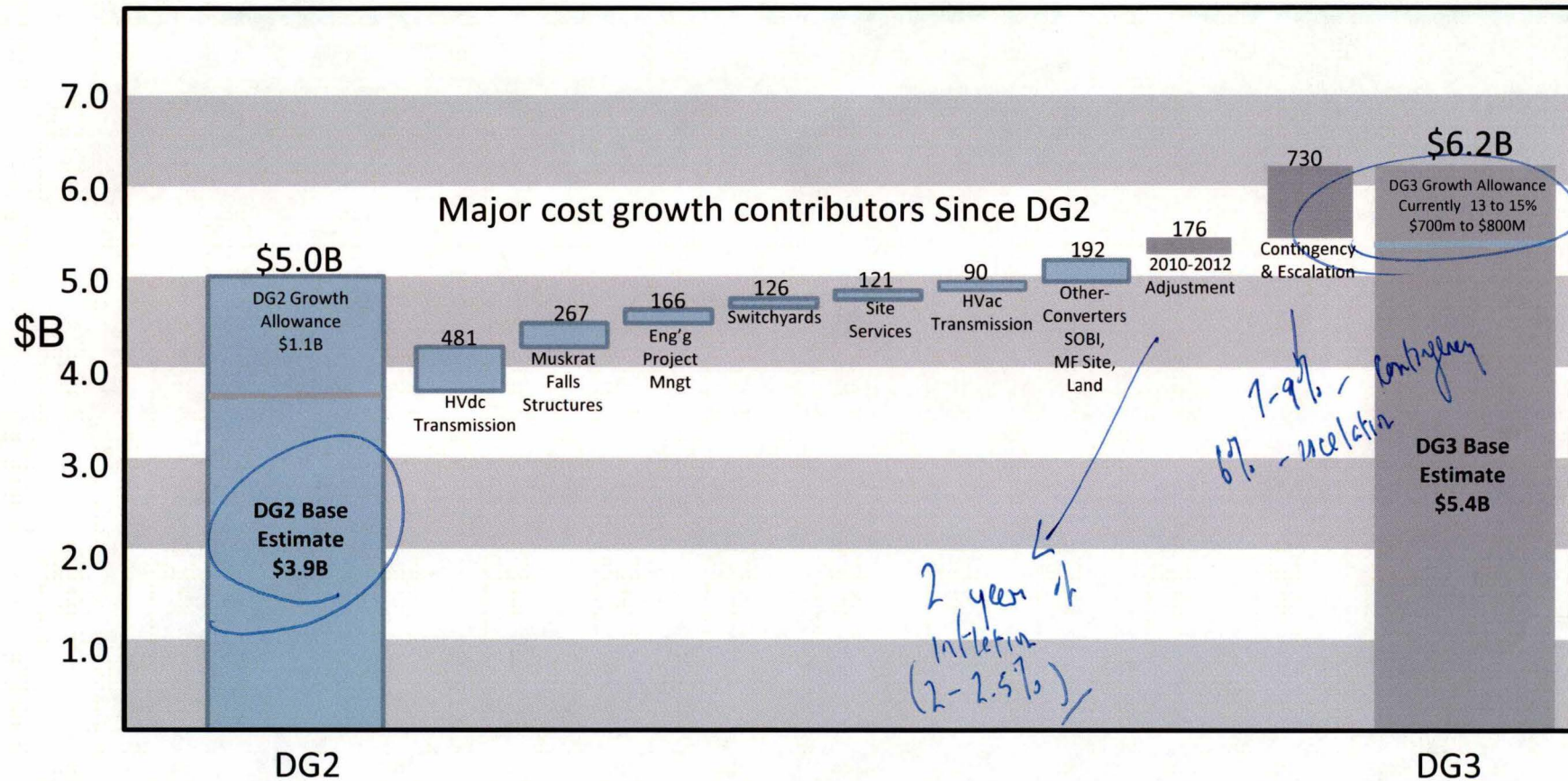
Drivers of Interconnected Island/ Muskrat Falls DG3 Costs

- Similar to the cost increases of the Isolated Island, the Interconnected island costs have increased by ~21% after 2010 to 2012 adjustment
- DG3 Costs are as a result of:
 - Greater definition and design improvements with engineering over 50% complete
 - Overland Transmission is a more robust and reliable design to withstand calculated ice and wind loads
 - Transmission voltage optimized to reduce line losses

Drivers of Interconnected Island/ Muskrat Falls DG3 Costs

- DG3 Costs are as a result of:
 - Muskrat Falls powerhouse re-orientation to maximize energy output
 - Muskrat excavation and concrete quantities increased to provide a more robust design to withstand calculated river flowrates, ice and other forces
 - Total project person hours increased from 15M to 20M to reflect these changes

Cost Estimate DG2 to DG3



Notes

1. All costs exclude IDC
2. Growth Allowance includes Contingency, Escalation and identified savings

Key Changes Affecting Estimate

- HVdc Overland \$481M
 - Operability / Reliability Driven Change
 - Design of transmission line for severe ice and wind loadings and optimized voltage , resulted in more robust design of towers with heavier towers and less line losses
 - These factors caused more steel and increased installation person hours
 - Constructability and Labour Driven Change
 - Access to very remote areas resulted in costlier helicopter construction and caused increased person-hours

Key Changes Affecting Estimate

- Muskrat Falls Structures \$261M

- Operability / Reliability Driven Change
 - Reorientation of structures to maximize energy output resulted in more excavation and more concrete
 - Intake structure stability and potential dam/spillway erosion issues also resulted in more excavation and concrete
 - Changed intake gate structure design to improve spillway reliability which resulted in more structural steel and concrete
 - These factors resulted in more materials and increased person hour installation costs
- Constructability Driven Change
 - Reservoir clearing – resulted in more roads
 - Ice management – resulted in additional cofferdam on South side which caused increased person hours and resulted in higher overall labour costs

Key Changes Affecting Estimate (continued)

- Engineering and PM \$166M
 - EPCM awarded after DG2
 - All engineering work in NL resulted in premium to relocate external workforce
 - Strong competition for experienced engineering and PM personnel
 - EA release delayed – carrying costs for two years

Key Changes Affecting Estimate (continued)

- Switchyards \$ 126M
 - Operability / Reliability Driven Change
 - More detailed design work resulted in larger Churchill Falls switchyard extension than initially planned, more civil work and greater cost
 - Muskrat Falls switchyard extension to allow future HVGB connection to facilitate potential economic growth in the region
 - Constructability and Labour Driven Change
 - Geotechnical site investigation identified additional excavation and fill needed
 - Additional camp required at Churchill Falls to accommodate more people
 - Increased logistic/transportation costs
 - These factors caused increased person-hours resulting in higher overall labour costs as well as additional material costs

Key Changes Affecting Estimate (continued)

- Site Services \$121M
 - Primarily driven by the increase in person hours as previously discussed
 - Operating costs increased as person hours have increased
 - Increased costs of services including ground transportation, drug and alcohol testing, pre employment medical screening, road maintenance and vehicles

Key Changes Affecting Estimate (continued)

- HVac Overland Transmission \$90M
 - Constructability, Reliability and Market Driven Change
 - Design of transmission line for severe ice and wind loadings resulted in more robust design of towers with heavier towers
 - Detailed line routing and construction methods finalized with quantified right of way clearing scope
 - These factors resulted in more clearing scope, more steel than at DG2 and increased installation person hours
 - Requirement for increased marshalling yards, catering, camp, medical and other support services
 - Actual bids now received for tower steel and transmission equipment

Key Changes Affecting Estimate (continued)

- Converters, SOBI, MF Site and Land \$192m
 - Operating voltage optimization resulted in costlier HVdc converter stations
 - SOBI cable size increased to accommodate the increased, optimized voltage resulting in cost increases to the three cables
 - Studies following DG2 identified need to protect from salt contamination at overland to sub sea transition points requiring additional buildings, structures and cable burying
 - Reliability requirements resulted in additional cable switching equipment to allow for remote switching of spare SOBI cable
 - MF Site - Construction power demand increased, telecommunications cost increased, MF Camp relocated
 - Land - Transmission line route finalized and costs previously unknown

Estimate Confidence MF/LTA/LIL

- At DG2 project engineering completion was approx. 5% with wide estimate accuracy range
- At DG3 project engineering completion is currently over 50% with much narrower accuracy range
- Nalcor completed computer modeling, built a 3D Model & a physical model of Muskrat Falls facilities, carried out field investigations, gathered/analyzed weather data, received firm bids for key equipment and contracts and have produced 5,000 engineering drawings and documents resulting in much greater confidence and certainty of the project's final costs

Schedule MF/LTA/LIL

- The project schedule plans for First Power in 2017
- Completing the early works program in 2012 is an essential first step towards achieving this Schedule
- Meeting subsequent weather dependent windows to achieve Powerhouse Construction, Cofferdam Completion and River Diversion are critical for First Power
- Rates will begin to be impacted in 2017 when power starts flowing

Federal Loan Guarantee

- The Government Canada has confirmed the provision of a loan guarantee to support the Muskrat Falls Project. This work is nearing completion
- The final value will be disclosed once the terms have been finalized. Current assumptions will remain commercially sensitive until an agreement is finalized

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Demand

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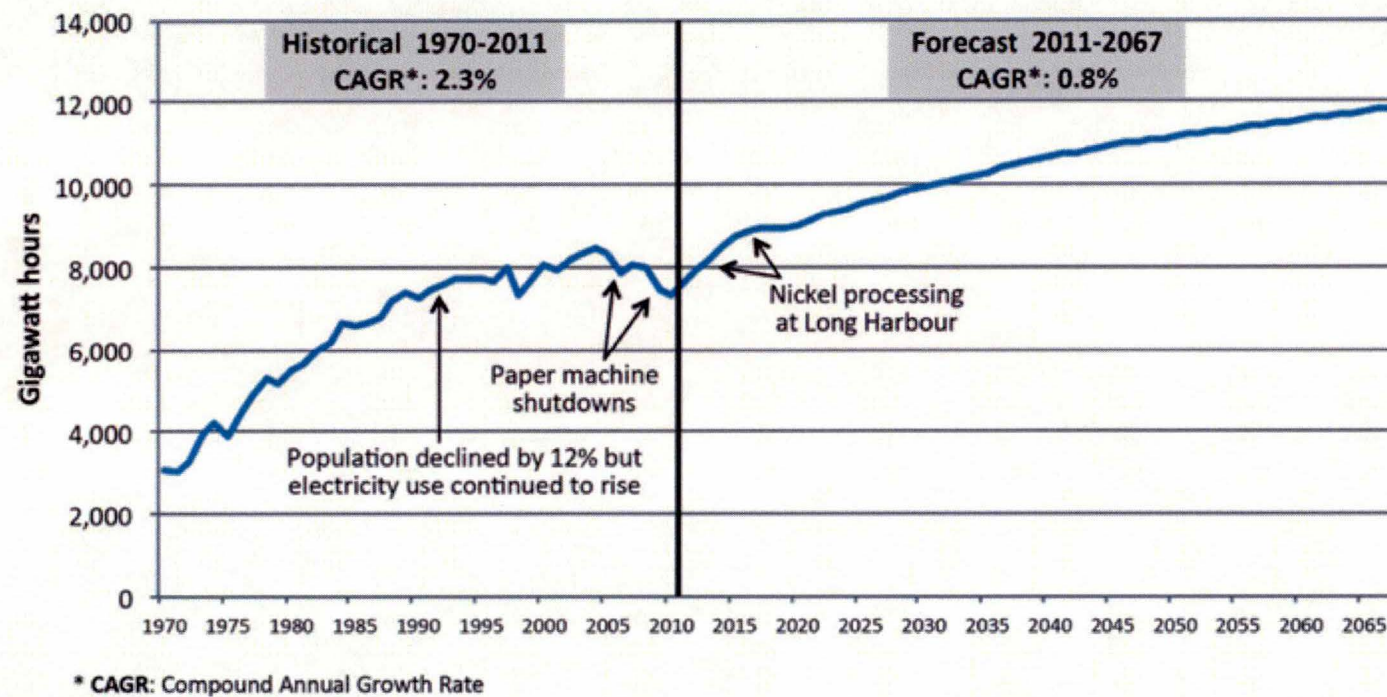
Confirmation of demand

- Analysis conducted by Nalcor Energy predicts continuing growth over long term planning horizon (0.8%/year going forward vs historical growth of 2.3%/year)
- Key short term driver: Introduction of Vale processing facility at Long Harbour in 2013
- Forecast employed does not include provisions for new large industrial customers
- Further details will be released over coming days

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Island Electricity Needs



Alternative scenarios examined by Nalcor at DG3

Background

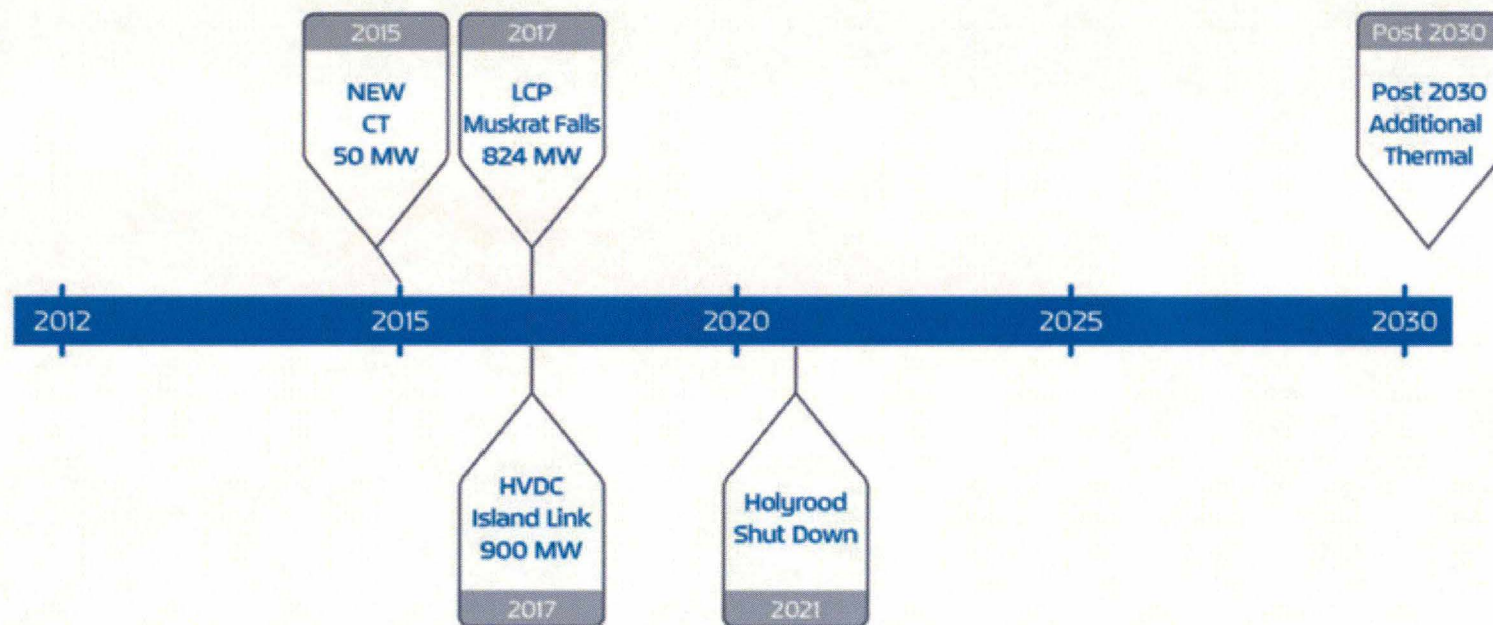
- Nalcor considered numerous alternatives for meeting future energy requirements at DG2 including coal, biomass, wind, nuclear, Island hydroelectric, solar, wave/tidal, LNG, Natural Gas, electricity imports, Labrador hydroelectric, interconnection, CT's, CCCT's
- Alternatives deemed appropriate for further evaluation were developed. Two general scenarios for supplying the island grid were prepared:
 - Isolated Island/Holyrood – Largely dependent upon Holyrood with the addition of small hydro, wind and other thermal
 - Interconnected Island/Muskrat Falls – Muskrat Falls and a transmission link with the Island

Alternatives

Interconnected Island/Muskrat Falls Scenario

- 824MW Muskrat Falls Generating Station
- 900 MW Labrador-Island Transmission Link
- Maritime Link to Nova Scotia (Sanction decision expected in 2013)
- Other generation sources include:
 - 50MW CT's
 - A single 170MW CCCT (2060 install)
 - These units are primarily for emergency backup and minimal electricity peaking periods. They will be available but expected to use minimal fuel

Interconnected Island Alternative (2012-2030+)



Alternatives

Isolated Island/Holyrood Scenario

- Largely thermal based & dependent upon Holyrood
- No island transmission interconnection with mainland grids
- Employs refurbished and eventually replaced Holyrood Thermal Generating Station plus:
 - Round Pond, Island Pond and Portland Creek small hydro
 - 25MW wind farms
 - 50MW CT's
 - 170MW CCCT's

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Alternatives

Wind power in Isolated Island/Holyrood Scenario

- Nalcor has already integrated 54 MW of wind and at DG2 committed to an additional 25MW in 2014-2015
- Nalcor's 2010 PUB submission identified the possibility of 200MW additional wind to Isolated/Holyrood system
- Subsequent analysis by Hatch confirmed a total of 300MW as maximum amount of wind which could be technically and economically integrated into Isolated/Holyrood system

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Alternatives

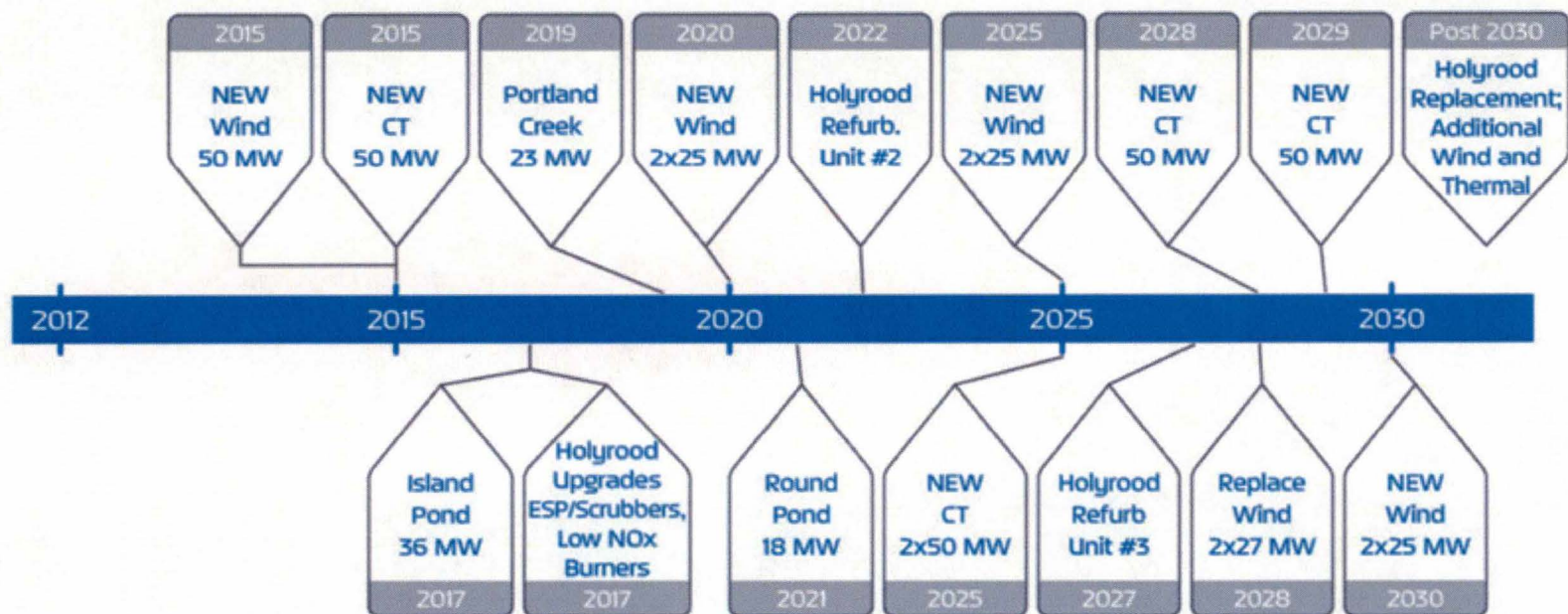
Isolated Island/Holyrood Scenario continued

- 279MW wind power (54mw+25MW+200MW) has been included in DG3 Generation Expansion Plan for Isolated Island scenario
- Nalcor's wind penetration plan of 10% is at the outer limits of what is currently employed in isolated systems elsewhere in the world
- Exceeding 10% penetration rate would not be considered good utility practice for an isolated power grid

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Isolated Island Alternative (2012-2030+)



CPW

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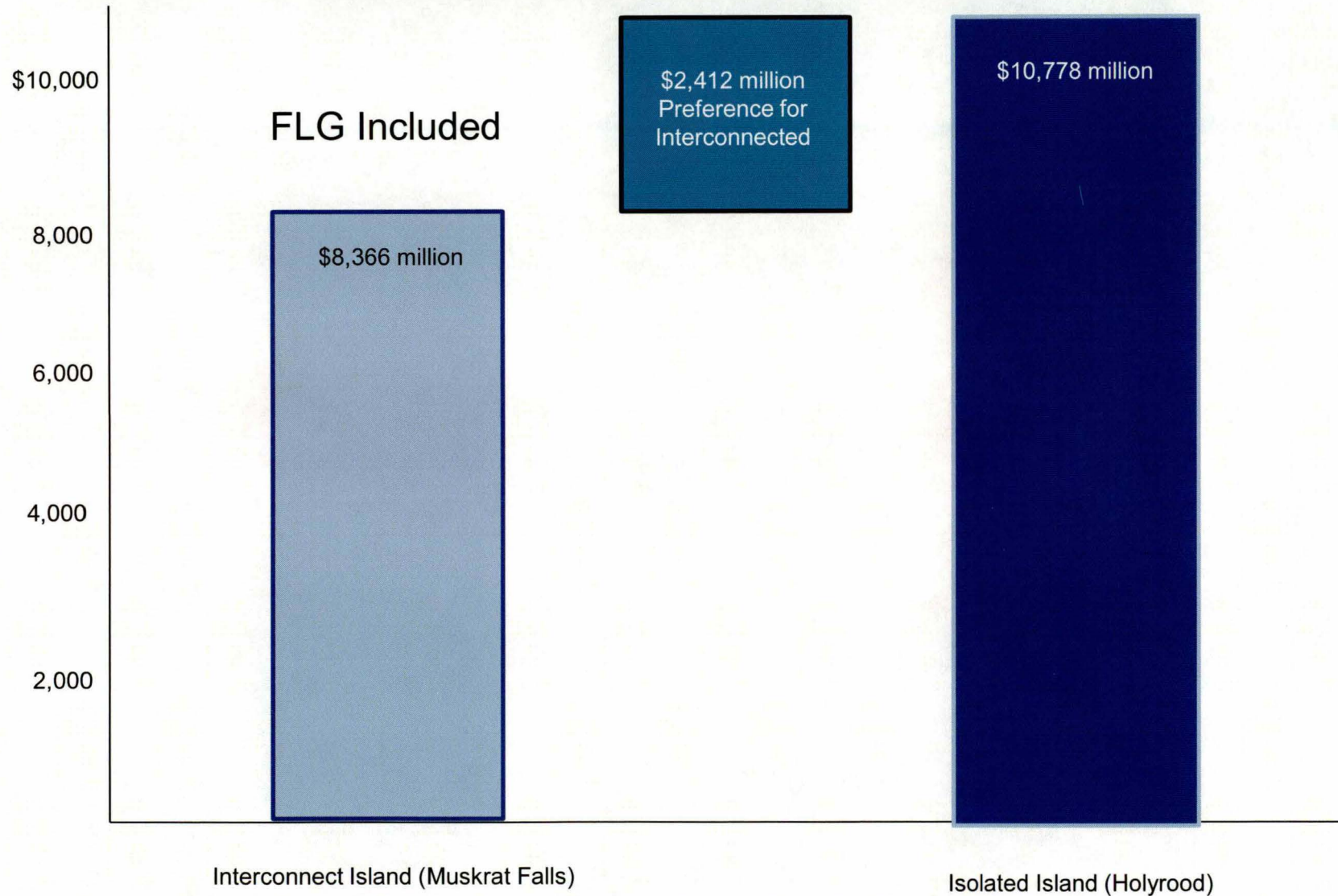
What is CPW?

- Cumulative Present Worth (CPW)
 - Standard industry metric used in making an apple to apple cost comparison to determine lowest cost generation alternative
 - Compares the alternatives by weighing all future costs. The alternative with the lowest CPW over the project life will have the lowest cost and is therefore the preferred alternative
 - Costs measured include capital expenditures for the construction of new facilities, operating and maintenance costs, fuel costs, financing costs and the cost of purchased power

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CPW Interconnected vs Isolated



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Why has the CPW changed?

- PIRA fuel forecast decreased 5-10% below DG2 estimates
- Increases to capital cost estimates for both Interconnected/Muskrat Falls and Isolated/Holyrood scenarios
- Discount rate changed from 8% to 7% consistent with NLH Weighted Average Cost of Capital
- Financing costs decreased
- Inclusion of Federal Loan Guarantee at DG3

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Why has the CPW changed?

- Adjustment from 2010\$ to 2012\$
- Integration of more wind in Isolated/Holyrood scenario than provided for in DG2

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Sensitivity Analysis

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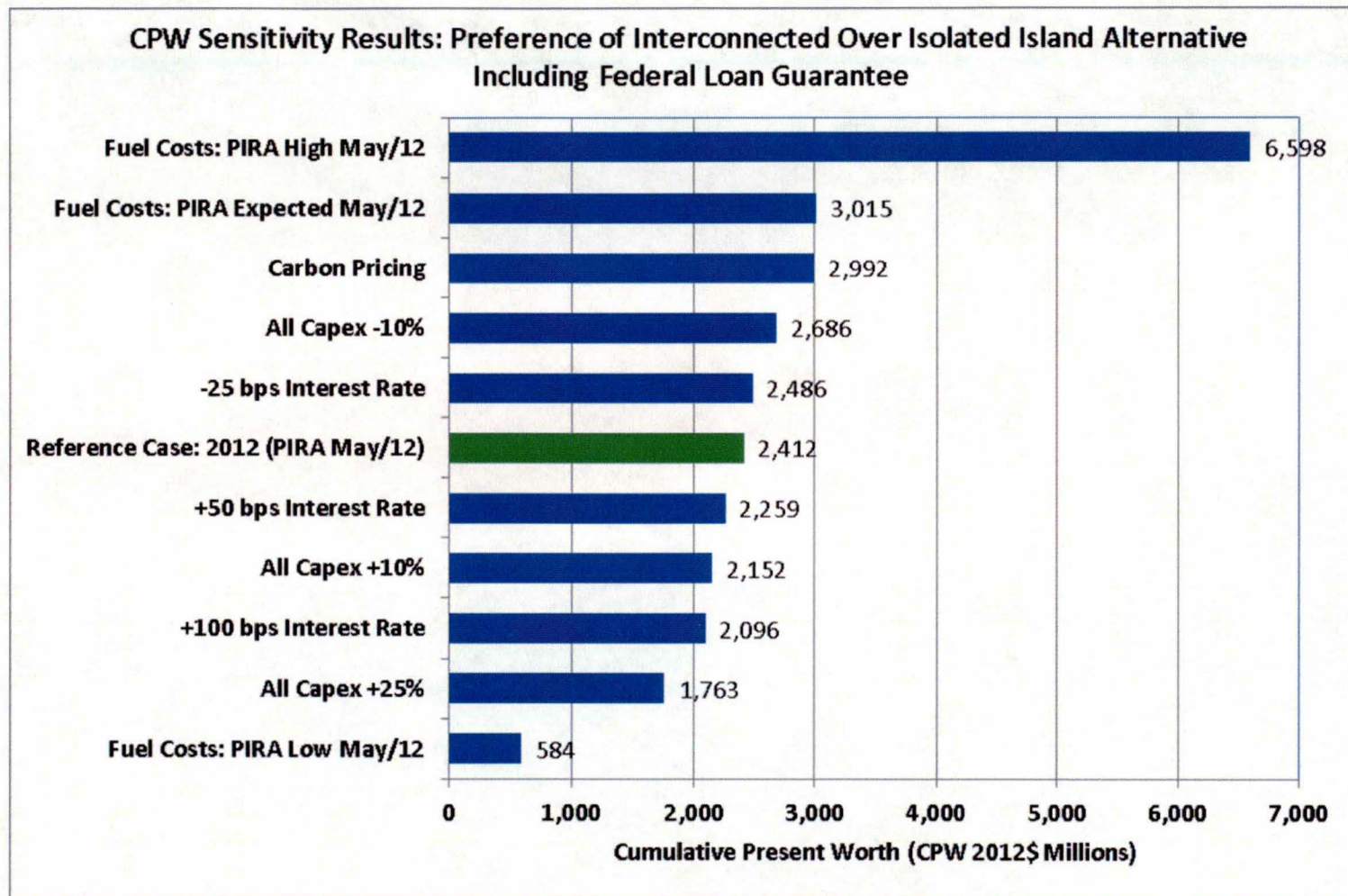
Sensitivity analysis

- Nalcor completed key sensitivities for both scenarios to confirm robustness of Muskrat Falls
 - Fuel cost
 - Capital costs
 - Financing costs
- A sensitivity to allow for carbon pricing has also been included based on projections developed by US Department of Energy

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Sensitivity analysis

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Revenue Requirements

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NLH Revenue Requirements

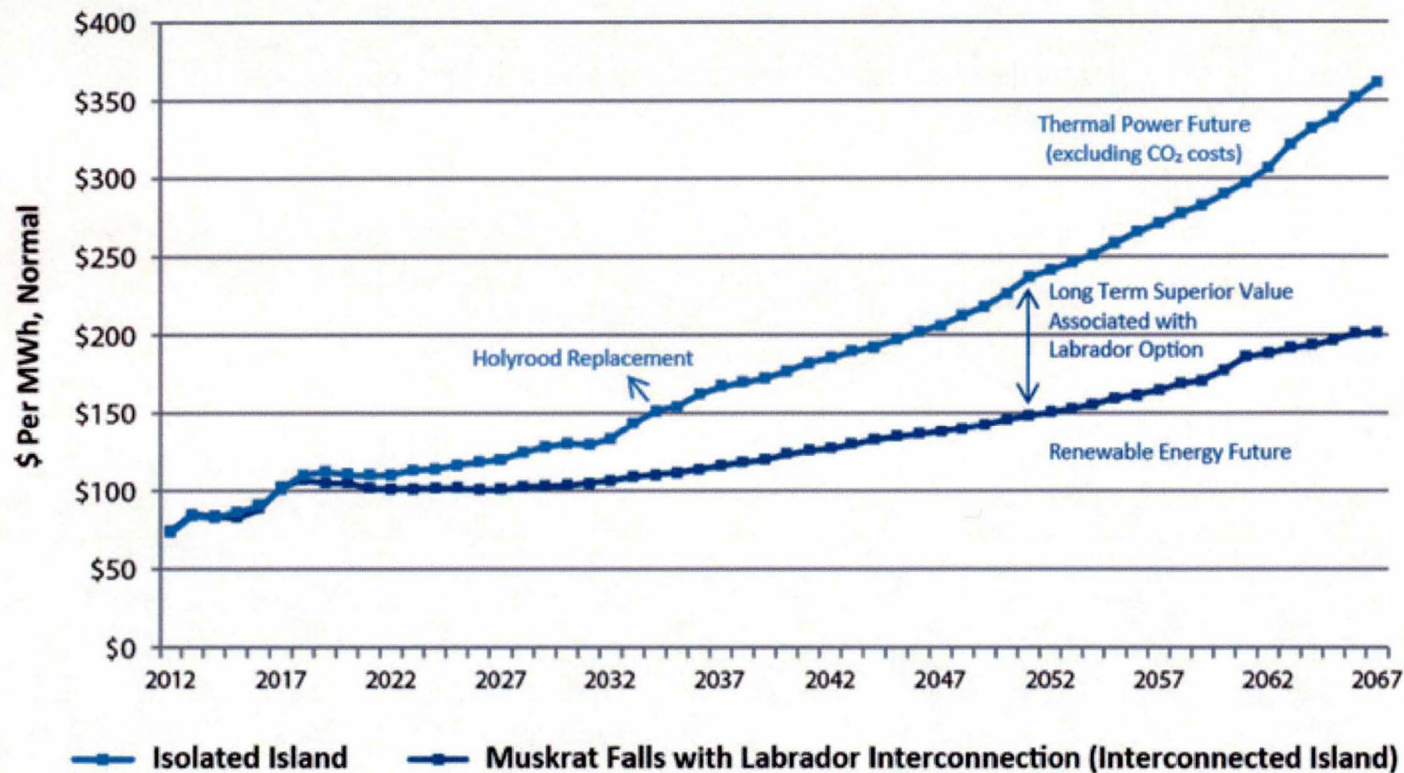
- NLH's overall wholesale revenue requirement is the amount of revenue required annually to recover its Island Grid costs from all island customers, inclusive of a rate of return on capital employed
- Analysis shows the Interconnected Island scenario provides considerable long term superior value for rate payers
- Additional details to be released in coming days

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Island's Regulated Revenue Requirements for NLH

(Overall wholesale costs to be recovered from all NLH customers)



Conclusion and Recommendation

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Conclusion

- Interconnected Island Scenario remains the least cost generation expansion option for meeting future electricity demand on the Island
 - This means lower costs for rate payers
- Muskrat Falls is robust under a number of relevant sensitivities.
 - Nalcor's underlying Brent forecast is \$110 US in today's currency
 - This would have to decrease to approx. \$50 US to make the Muskrat Falls option equal to the Holyrood option

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Recommendation

- Nalcor recommends proceeding with the Interconnected Island generation expansion alternative featuring:
 - 824MW generating station at Muskrat Falls
 - 900MW Labrador Island Transmission Link
 - Associated supporting thermal generation sources
- A recommendation on the Maritime Link will be forthcoming as that project proceeds to its sanction decision in 2013

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