

Assessment of Wind for
the Isolated Island of Newfoundland
Manitoba Hydro Study
October 31, 2012

Overview

- Nalcor has included 279 MW of wind energy in the Isolated Island Option (~10%)
- Wind proponents have promoted a sole wind power solution as replacement for the 824 MW Muskrat Falls Generating Station and Labrador-Island HVdc Link and, ultimately, the Holyrood Generating Station.
- Manitoba Hydro Inc. (MHI) was engaged by the Province to provide a review, opinion and commentary on the subject of wind in the Isolated Island Option.

Study Goals

- MHI had two study goals:
 1. Complete a due diligence review of the studies provided by Nalcor to determine if the amount of wind in the Isolated Island option is appropriate.
 2. Utilizing information provided by Nalcor and other sources, address two questions:
 - In an isolated island scenario, can sufficient wind be developed to replace Holyrood?
 - Is this a technically feasible and economic alternative to Muskrat Falls and the Labrador Island Link?

Study Goal 1 – Due Diligence Review

1. Hatch Engineering 2012 Wind Integration Study:

- Hatch assessed the amount of non-dispatchable wind generation that may be added to the isolated system.
- Hatch concluded that 10% is the maximum amount recommended for the Island system due to the uncertainty of untested technical and economic impacts.
- Higher penetration rates would require significant storage, backup generation and demand response systems.

Study Goal 1 – Due Diligence Review

2. Nalcor 2012 Technical Wind Integration Study

- The Nalcor study evaluated wind penetration levels for the Island.
- The study concludes that integrating new wind generation with existing generation requires having backup dispatchable energy on standby in order to meet load in instances when wind generation is insufficient.

Study Goal 1 – Due Diligence Review

- MHI concluded that the two reports were technically sound, met their study goals, and were performed in accordance with good utility practices.

Study Goal 2

- In an isolated island scenario, can sufficient wind be developed to replace Holyrood?
 - MHI conducted a high-level engineering exercise to evaluate options for replacement of Holyrood with large-scale wind development.
 - 1,100 MW of wind generation would be necessary to replace the 465 MW Holyrood station and its associated replacement generation planned up to 2067. This amount of wind power would produce up to 3.1 TWh of energy, assuming a 40% annual capacity factor for all wind turbines.
 - The 1,100 MW could be split into several farms to mitigate weather related impacts at each farms.
 - More detailed studies would have to be performed before considering such a large scale wind development.

Study Goal 2

- Is this a technically feasible and economic alternative to Muskrat Falls and the Labrador Island Link?
 - The penetration factor of 75% capacity exceeds existing utility experience, carries a high risk profile, and is significantly higher than the recommended penetration factor of 10%.
 - Significant investments in storage capacity, backup generation and sophisticated demand response system would be required.
 - Wind development does not allow for the monetization of excess power.
 - There are areas of the province where low temperatures and frequent ice storms can weaken and deteriorate infrastructure, which reduces stability and reliability. This increases the likelihood of failure and need for expensive backup generation on standby.

Study Goal 2

- Wind generation would have to be backed up by firm dispatchable sources.
- MHI assessed two backup sources:
 - Deployment of low capital but high-energy cost backup CT generators
 - Deployment of a massive 6 TWh battery bank.
- MHI conducted a CPW analysis on all options, and concluded that the Interconnected Option was the lowest cost.

CPW Analysis

	Cumulative Present Worth (Billions in 2012)			
	Interconnected Option	Isolated Island Option	Wind & Thermal Scenario	Wind & Battery Scenario
Total	\$8.37	\$10.78	\$11.86	\$17.43

Conclusions

- MHI does not recommend that wind options beyond a 10% penetration level be pursued at this time.
- Investment in the Muskrat Falls option provides a firm supply, and an opportunity to monetize the excess energy once another interconnection is made.
- MHI concludes that large-scale wind development, as a replacement for Holyrood, is not the least cost option at this time.