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Comments on the Muskrat Falls Reference

**Presentation to the Public Utilities Board of
Newfoundland and Labrador**

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For Grand Riverkeeper Labrador Inc.

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Optimality

- « How did you ensure that ... you were dealing with the optimal scenario under each one? »
 - > Technical optimization vs. planning processes
 - > Iterative process seeking robust solutions
 - > Real time (evolutive) versus planning exercise
 - > Avoiding irrevocable choices that would turn out badly in certain possible futures
 - > Scenario versus plan

PPA payment options

- “Does the 2035 ratepayer have to pay more so that the 2017 ratepayer can pay less?”
 - > Nominal LUECs vs. escalating prices
 - > Same present value, but different reality
 - > Consumers unlikely to prefer escalating prices

PPA vs COS

- Simulate annual costs for Muskrat Falls under COS
 - > Higher than PPA in early years
 - > Drastically lower in later years
- Prices post 2067
 - > PPA: maintaining 2067 price levels (\$400/MWh) ⇒ windfall profits
 - > COS: continue to decline (< \$20/MWh)

CDM

■ MHI

- > model CDM like generation
- > End-use modelling

■ Nalcor's approach

- > Integrate into load forecast through technological change variable
- > No measure-by-measure or program-by-program analysis

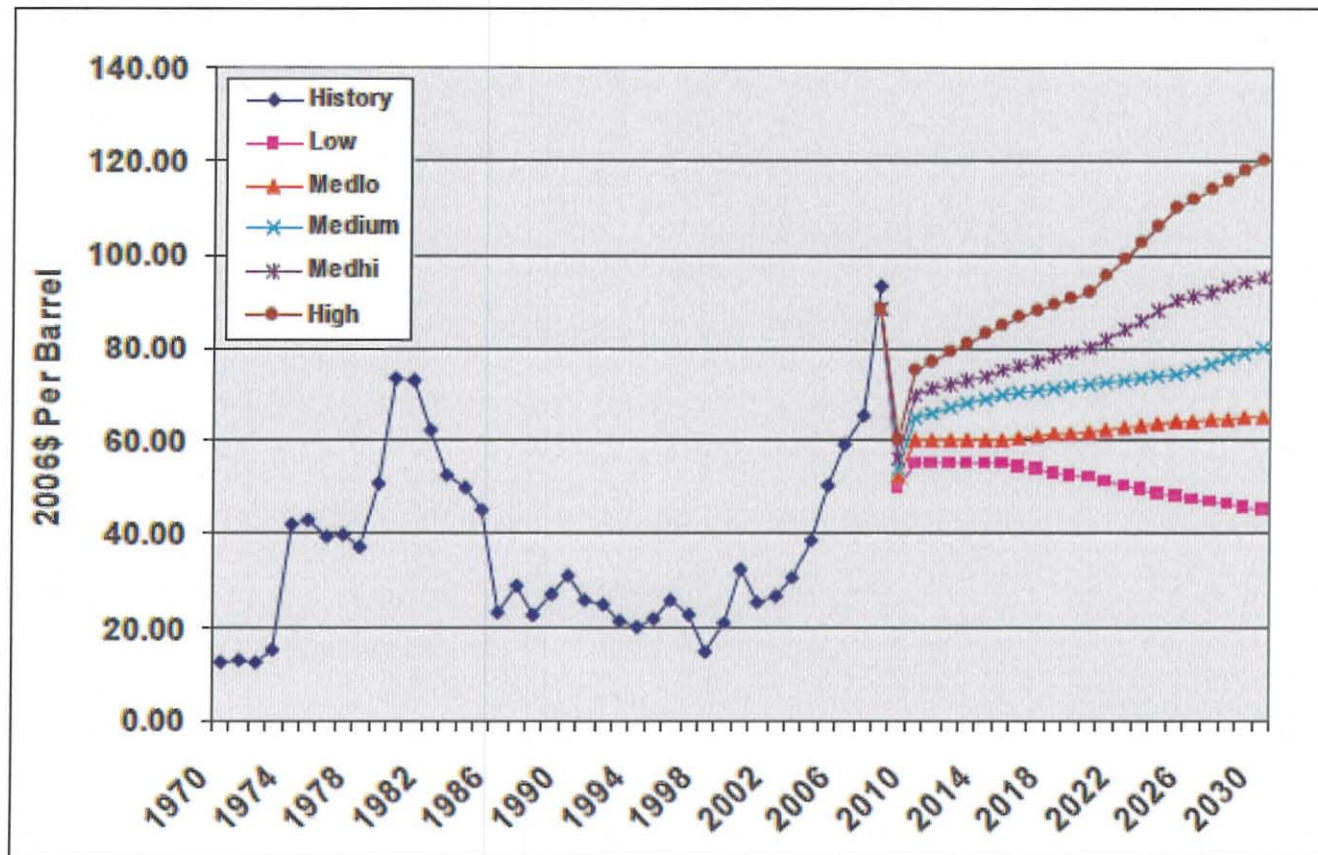
■ Objectives to date not met

■ Sensitivities

- > Far less than Marbek scenarios
- > At low demand (= high CDM) scenarios, CPW preference for Muskrat drastically reduced

Fuel price forecasts

Figure A-9: World Oil Prices: History and Forecast



NWPPC fuel forecast 2009

EIA Retrospective Review

Table 4. World Oil Prices, Projected vs. Actual
(Percent difference)

	1985	1988	1987	1986	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009		
AEO 1982	0.0	146.7	28.5	220.0	107.2	171.4																					
AEO 1983	7.4	150.0	80.2	170.0	154.5	144.2																					
AEO 1984	3.7	150.0	30.8	130.5	105.9	87.4																					
AEO 1985	0.0	84.7	36.9	70.9	64.2	55.1																					
AEO 1986	7	-1.3	-12.5	18.8	-4.3	-5.2	19.0	39.4	84.3	124.7	202.8	281.0	241.7	132.5													
AEO 1987			-0.1	19.0	-8.2	-8.4	11.8	19.8	40.7	77.3	99.0	108.4															
AEO 1988*			1.0	-17.4	-24.9	-8.1	9.2	34.2	62.9	69.7	60.4	60.4															
AEO 1989				-2.1	-19.2						95.1	86.7															
AEO 1991				1.1	32.4	42.6	42.6	43.9	76.3	95.8	42.6	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5
AEO 1992				1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	
AEO 1993				3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	
AEO 1994				10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	
AEO 1995				-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	
AEO 1996				0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
AEO 1997				-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	-3.1	
AEO 1998				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
AEO 1999				3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	
AEO 2000				0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	
AEO 2001				1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	
AEO 2002				-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5	
AEO 2003				-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	
AEO 2004				-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	
AEO 2005				4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	
AEO 2006				-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	
AEO 2007				7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	
AEO 2008				-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	
AEO 2009				6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	
AEO 2010				-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1	

Wind power assessment

■ 2004 NLH study

- > Sole source for Strategist inputs
- > 80 MW limits primarily economic
 - Based on minimizing spill
 - Fails to take into account cost of wind, net of curtailment or spills
- > « preliminary »
- > Government RFP shows that higher penetration remains an objective

Conclusions

- Reference question
 - > Verify that the costs attributed to each scenario are correct?
 - > Verify that each scenario makes sense?
- Analyses of MHI and others
 - > Results highly dependent on assumptions
 - > Great uncertainties
 - > Little confidence that the Isolated Island scenario would play out as defined
- If Muskrat Falls does not go forward
 - > planning process will continue
 - > May lead to solutions very different from IIS
- Thus Reference Question largely academic