

**MUSKRAT FALLS RATE MITIGATION OPTIONS AND IMPACTS**  
**WRITTEN COMMENTS OCT 25 2019**

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**William R. Brown B. E. Mech NSTC (Retired)**

**INTRODUCTION**

**I am pleased to submit for your consideration the results of an** analysis that I recently performed on the Muskrat Falls electrical generation facility in Labrador. The analysis is based on a modelling technique which I used to evaluate a variety of projects when I worked in Industry. The final goal of the evaluation is to produce an ROI (Return On Investment) for management to determine whether the project should be continued or terminated.

**The following sections of this submission address PROJECT** MITIGATION, RATE MITIGATION, CONCLUSIONS and RECOMMENDATIONS. Although PROJECT MITIGATION is not a formal part of the PUB's mandate, it is included to support the rate mitigation issue.

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**PROJECT MITIGATION**

To determine whether any additional funds are needed, it was necessary to model both the CFL and MFL projects. The results of the CFL model are shown in Appendix CPL on the line named 'CUM CPL RETAINED EARNINGS'. Likewise the Appendix A1 derives the same on the line named 'MFL CUMULATIVE PROFITS'. Appendix A1 assumes that MFL will become operational in 2020 with \$100M included to address the problems of HORTH SPUR and METHYL MERCURY as well as LIL reliability by providing funding to keep HOLYROOD on standby ready status indefinitely.

The combined result of CPL + MFL are shown in Appendix A2. As can be seen, there is ample funding available to avoid any additional funding being required.

Three other iterations labelled Appendix B2, B3 and B4 are included illustrating what could hypothetically happen if the MFL project startup was delayed 1, 2 or 3 years. In these cases, the additional funds to address the above issues are raised to \$500M and additional funds for increased DCI of \$870M, \$965M, \$1035M respectively included.

All three of these cases will allow adequate time to address the SPUR and METHYL concerns. They will also be possible without any additional funding other than increasing the amount of the loans to a maximum of \$14,873M in the event that startup is not until 2023.

Models exist for all of the three MFL alternatives and can be provided upon request.

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RATE MITIGATION

**Two other appendices to this submission, labelled 8.5 years and 43 years** are included. They are updated versions of those that were presented at the PUBLIC PRESENTATION sessions.

**As can be seen the rate increase for both the 2019 Oct increase and** the proposed one for 2020 are well within the historic increases over the years. As far as this author is concerned they are acceptable and can be absorbed without any across the board mitigation. Of course there is always justification for providing a rebate to those who can not afford any further increases by special programs as do already exist for home heating oil etc.

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**CONCLUSION/RECOMMENDATIONS**

The major conclusion is that whatever needs to be done to ensure that the satisfactory resolution of the NORTH SPUR and METHYL MERCURY issues is done as is provided for in the models. This also applies to LIL reliability by keeping a standby capability in HOLYROOD as was also included in the model costs.

Recommendations include using accumulated earnings to install additional undersea cables to export power after 2041 to finding ways to use that power inside Newfoundland and Labrador such as:-

- > Electric Blast Furnaces for turning Iron Ore into Steel
  - > Electric Smelters for nickel
  - > Tunnel across the Straits
  - > Elimination of Provincial Debt
- Etc.

**APPENDIX A1**

	2019	2020	2021	2022	2023	2024	2025	2026	2040	2050	2051	2052	2053	2059	2060	2069	2070	2076	
<b>MUSKAT FALLS PROJECT</b>																			
2020 START UP	0	1	2	3	4	5	6	7	21	31	32	33	34	40	41	50	51	57	
CFL YR No.	43	44	45	46	47	48	49	50	64	74	75	76	77	83	84	93	94	100	
<b>MUSKAT FALLS PROJECT (CONST+DCI) \$M</b>	\$6,473	\$14,900	(includes \$2.1B for power lines and under sea cables, plus \$1.2B for amera, plus \$100M for reservoir cleaning))																
<b>MLK CAPITAL COST (EXCL 1.2 AMERA, 2.1 LIL) \$M</b>	\$11,600																		
<b>FIRST REFIT</b>	\$1,618																		
<b>EXPENSES</b>																			
<b>AMORTIZATION 11600 @ 3.8% FOR 40 YRS (P+I)</b>		\$569	\$569	\$569	\$569	\$569	\$569	\$569	\$569	\$569	\$569	\$569	\$569	\$569	\$0	\$0	\$2,566	\$2,566	
<b>(MOMS) MGMT+OPER+MAINT+SALES (CPI OF 3.5%) \$M</b> (uses annual rate per MW from CFL)	\$ 6.21	\$6	\$7	\$7	\$7	\$8	\$8	\$8	\$13	\$16	\$16	\$16	\$17	\$19	\$20	\$24	\$25	\$28	
<b>TOTAL COST PER YR \$M</b>		\$575	\$575	\$576	\$576	\$576	\$576	\$577	\$581	\$584	\$585	\$585	\$586	\$588	\$20	\$24	\$2,591	\$2,594	
<b>HOLYROOD (Fuel 50% in 2020, 90% thereafter)</b>		-\$144	-\$265	-\$272	-\$278	-\$285	-\$292	-\$299	-\$416	-\$528	-\$540	-\$553	-\$567	-\$653	-\$669	-\$828	-\$848	-\$978	
<b>SAVINGS (Operations 50% in 2020, 75% Thereafter)</b>		-\$123	-\$189	-\$193	-\$198	-\$203	-\$208	-\$213	-\$302	-\$386	-\$396	-\$406	-\$416	-\$482	-\$494	-\$617	-\$632	-\$733	
<b>NET COST PER YR \$M</b>		\$309	\$121	\$111	\$99	\$88	\$76	\$65	-\$137	-\$329	-\$351	-\$374	-\$397	-\$547	-\$1,143	-\$1,421	\$1,110	\$883	
<b>MWH PER YR (824-25 "for low water")</b>	799	799	799	799	799	799	799	799	799	799	799	799	799	799	799	799	799	799	
<b>COMMITMENT TO AMERA - 165 MWH FOR 35 YRS</b>	165	165	165	165	165	165	165	165	165	165	165	165	165	0	0	0	0	0	
<b>MWH AVAILABLE TO MFL (excl 165 for 35 yrs)</b>	634	634	634	634	634	634	634	634	634	634	634	634	634	634	634	634	634	634	
<b>AMERA PROJECT SIZE</b>	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	
<b>COMMITTED SALES TO AMERA/YR OF 165 MWH for 35 YR</b>	\$63	\$68	\$74	\$80	\$86	\$93	\$101	\$106	\$112	\$118	\$124	\$130	\$136	\$142	\$148	\$154	\$160	\$166	
<b>YEARLY %</b>	5.23%	5.66%	6.13%	6.64%	7.18%	7.78%	8.42%	9.14%	9.94%	10.81%	11.75%	12.75%	13.81%	14.94%	16.14%	17.41%	18.75%	20.16%	
<b>LIL PROJECT SIZE</b>	\$2,100	\$2,100	\$2,100	\$2,100	\$2,100	\$2,100	\$2,100	\$2,100	\$2,100	\$2,100	\$2,100	\$2,100	\$2,100	\$2,100	\$2,100	\$2,100	\$2,100	\$2,100	
<b>LIL \$ TO ACHIEVE 8% / YR Forever</b>	\$9,576	\$168	\$168	\$168	\$168	\$168	\$168	\$168	\$168	\$168	\$168	\$168	\$168	\$168	\$168	\$168	\$168	\$168	
<b>YEARLY EARNINGS %</b>	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	
<b>OPEN MKT PRICE PER MWH (incr 8.25%/yr)</b> (assumes annual rate incr of 8.25%)	\$59	\$64	\$69	\$75	\$81	\$88	\$95	\$103	\$312	\$689	\$746	\$807	\$874	\$1,406	\$1,522	\$3,106	\$3,363	\$5,411	
<b>SALES \$M</b>	\$304	\$329	\$356	\$386	\$417	\$452	\$489	\$529	\$1,484	\$3,279	\$3,549	\$3,842	\$4,159	\$6,692	\$7,244	\$14,785	\$16,004	\$25,751	
<b>MKL PROFIT (LOSS) \$M</b> (Sales - Net Cost - Amira - LIL)	-\$235	-\$28	\$4	\$38	\$75	\$114	\$156	\$194	\$1,146	\$2,763	\$2,999	\$3,254	\$3,529	\$7,071	\$8,219	\$16,038	\$14,726	\$24,700	
<b>MFL CUMULATIVE PROFIT/LOSS)</b>	-\$235	-\$264	-\$260	-\$221	-\$146	-\$32	\$124	\$6,655	\$28,048	\$31,047	\$34,301	\$37,830	\$72,024	\$80,243	\$189,311	\$204,038	\$325,044		
<b>ROI</b>														4.70%		5.73%	5.50%	6.02%	



APPENDIX A2  
HAMILTON RIVER PROJECTS (HRP)  
MUSKRAT FALLS (MFL)  
CFL

THROUGH====>  
MFL YR No.  
CFL YR No.

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2041	2042	2059	2060	2076
MFL YR No.	1	2	3	4	5	6	7	8	9	10	11	22	23	23	40	41	57
CFL YR No.	43	44	45	46	47	48	49	50	51	52	53	54	65	66	83	84	100

MFL 2020 FIRST POWER VERSION

CAPITAL (1976\$)

CFL CUMULATIVE PROFIT(LOSS) \$M

MFL CUMULATIVE PROFIT(LOSS) \$M  
(incl Holyrood Savings)

TOTAL CUM (CFL+MFL-HOLYROOD) \$M

\$1,244	\$1,307	\$1,375	\$1,454	\$1,525	\$1,609	\$1,700	\$1,599	\$1,508	\$1,426	\$1,354	\$1,610	\$10,971	\$366,564	\$406,463	\$1,749,707
-\$235	-\$264	-\$260	-\$221	-\$146	-\$32	\$124	\$323	\$570	\$868	\$1,219	\$9,915	\$11,298	\$72,024	\$80,243	\$325,044
\$1,008	\$1,043	\$1,115	\$1,233	\$1,379	\$1,577	\$1,823	\$1,923	\$2,078	\$2,293	\$2,573	\$11,525	\$22,269	\$438,588	\$486,706	\$2,074,750

ROI

\$976

1.00%

1.25%

1.65%

4.80%

7.63%

7.67%

8.00%





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**RETAIL RATE HISTORY -LAST 8.5 YEARS**

CITY	Apr 1, 2011 <u>RATE</u>	, Oct 1, 2019 <u>RATE</u>	<u>GROWTH</u>
HALIFAX	13.6	16.4	2.8
CHARLOTTETOWN	14.6	16.2	1.6
REGINA	13.8	16.0	2.2
TORONTO	12.9	13.8	0.9
ST. JOHN'S	11.0	13.1	2.1
MONCTON	11.8	12.8	1.0
VANCOUVER	8.3	12.7	4.4
WINNIPEG	7.3	9.4	2.1
MONTREAL	6.8	7.2	0.4
TOTAL	100.1	117.6	17.5
8.5 YR AVG	11.78	13.84	2.06
YEARLY %			1.92%

**RATE INCREASE RECOMMENDATION**

BASED ON ABOVE AND NO RATE INCREASE IN 2019  
PRIOR TO OCT 1

- THE ABOVE ANNUAL PERCENTAGE OF 1.92%  
APPEARS TO BE SUGGESTED.

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RETAIL RATE HISTORY - LAST 43 YEARS

(NOTE:- RETAIL RATE INCR SAME AS 8.25% WHOLESAL E INCR/YR)

YEAR	NL HYDRO				QUE HYDRO		
	WHOLE -SALE	RETAIL	RESID -ENTIAL		WHOLE -SALE	RETAIL	RESID -ENTIAL
1977	0.19	0.19	3.80		0.19	0.20	3.90
1985	0.37	0.37	0.75		0.20	0.37	0.95
1993	0.75	0.75	1.50		0.20	0.75	0.95
2002	1.50	1.50	3.00		0.20	1.50	1.70
2010	2.80	2.80	5.60		0.20	2.80	3.00
2018	5.60	5.60	10.70		0.20	5.80	6.00
2019	6.00	6.00	12.00		0.20	6.50	6.70
2020	6.40	6.40	12.80		0.20	7.00	7.20

RATE INCREASE RECOMMENDATION

BASED ON ABOVE WHICH INCL A 6.4% INCR IN 2019

- A RATE INCREASE OF 7% NEXT YEAR IS WARRANTED  
 (HOWEVER A RATE INCREASE CONSISTENT WITH  
 THE HISTORICAL WHOLESAL E RATE INCREASE  
 OF 8.25% MAY BE REQUIRED TO AVOID FUTURE  
 CATCH UP PROBLEMS.)