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Implications of Manitoba Hydro's General Rate Application

submitted to the
Manitoba Public Utilities Board

on behalf of

the
Assembly of Manitoba Chiefs

by

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1. INTRODUCTION

I have been asked by the Assembly of Manitoba Chiefs (“AMC”) to review aspects of Manitoba Hydro’s General Rate Application (GRA), with particular regard to its impacts on Manitoba’s First Nation reserves.

As originally filed, the GRA called for an interim rate increase of 7.9%, to be effective August 1, 2017, followed by additional increases of 7.9% for each of the following four years.¹ Following Order 80/17, which granted an interim rate increase of 3.36% effective August 1, 2017, Manitoba Hydro revised its GRA to call instead for six consecutive increases of 7.9%, followed by one increase of 4.54%.²

In Appendix 10.5 of the original filing, Manitoba Hydro presented the report of its Bill Affordability Collaborative Process, including the report on Bill Affordability prepared by Prairie Research Associates.³ The analyses presented therein have since been updated to take into account the revised rate proposal.

This report will focus on the affordability implications of this proposal for Manitoba residents in general, and for First Nations reserves in particular.

¹ Tab 2, pages 2 and 58 of 61.

² Cover letter dated September 5, 2017.

³ Appendix 10.5, Appendix A.

2. IMPACTS OF THE PROPOSED RATE INCREASES ON ENERGY POVERTY

The Prairie Research Associates report (“the PRA Report”) explored in detail the implications of three rate options, none of which precisely aligned with that contained in the GRA.⁴ However, in response to several information requests from the Assembly of Manitoba Chiefs, PRA kindly provided new tables and text that correspond directly with the current rate proposal.

In restating its evidence to take into account the revised rate proposal, Prairie Research developed a fourth scenario, based on Manitoba Hydro’s revised GRA proposal of September 5, 2017, which is defined as follows⁵:

Table 1. PRA’s Scenario 4

Table 1: Annual nominal rate increases for the fourth scenario									
2017	2018	2019	2020	2021	2022	2023	2024	2025	2026-2036
1.40%	5.25%	7.90%	7.90%	7.90%	7.90%	7.90%	6.50%	3.48%	2.00%
Note: We assume that rate adjustments come into effect on August 1 st of each calendar year. To “annualize” these adjustments, rate increases listed in the table reflect the weighted average of the increase applying to the first seven months of each calendar year and the one in effect during the five remaining months. For example, the adjustment for 2018 is calculated as follows: $(7/12) \times 3.36\% + (5/12) \times 7.90\% = 1.96\% + 3.29\% = 5.25\%$.									

Unless otherwise specified, the analyses presented below refer to this Scenario 4.

⁴ All of the original PRA scenarios assumed that the fixed charge would remain constant, whereas the rate proposal in the original GRA filing also increased the fixed charge by 7.9% each year.

⁵ AMC/MH II-23a-c, page 2 of 16.

2.1. PRA's analysis of impacts of rate increases on LICO-125 households

As seen in the last column of Table 2, below, PRA's analysis shows that, for Scenario 4, inflation-adjusted average bill amounts are expected to increase by 40.5% by 2024, and by 45% by 2036.⁶

Table 2. Projected increases in average bill amounts

Year	Scenario 1 (3.95% nominal increases for 12 years)		Scenario 2 (5.95% nominal increases for 6 years)		Scenario 3 (7.95% nominal increases for 4 years)		Scenario 4	
	Amount	% change vs 2016	Amount	% change vs 2016	Amount	% change vs 2016	Amount	% change vs 2016
2016	\$1,624.23	0.0%	\$1,624.23	0.0%	\$1,624.23	0.0%	\$1,624.23	0.0%
2020	\$1,801.24	10.9%	\$1,906.09	17.4%	\$2,017.15	24.2%	\$1,886.14	16.1%
2024	\$1,964.59	21.0%	\$2,079.20	28.0%	\$2,077.30	27.9%	\$2,281.28	40.5%
2028	\$2,091.84	28.8%	\$2,092.92	28.9%	\$2,091.00	28.7%	\$2,322.67	43.0%
2032	\$2,105.67	29.6%	\$2,106.76	29.7%	\$2,104.82	29.6%	\$2,338.56	44.0%
2036	\$2,119.62	30.5%	\$2,120.72	30.6%	\$2,118.76	30.4%	\$2,354.60	45.0%

Source: PRA calculations based on survey of Manitoba Hydro customers.

These effects “are predicted to result in significant growth in energy poverty over roughly the next decade.”⁷ Figure 1 shows that, for the current rate proposal (Scenario 4 — the red circles), the percent of LICO-125 households expected to spend more than 6% of their household income on energy needs is **expected to rise from under 10% today to over 15% by 2024**, and then to decline slightly, to reach 13% by 2036.⁸

⁶ AMC/MH II-23a-c, page 4 of 16.

⁷ Ibid., page 5 of 16.

⁸ Ibid., page 6 of 16.

Figure 1. Impact of MH rate increases on proportion of LICO-125 households above 6% energy poverty threshold

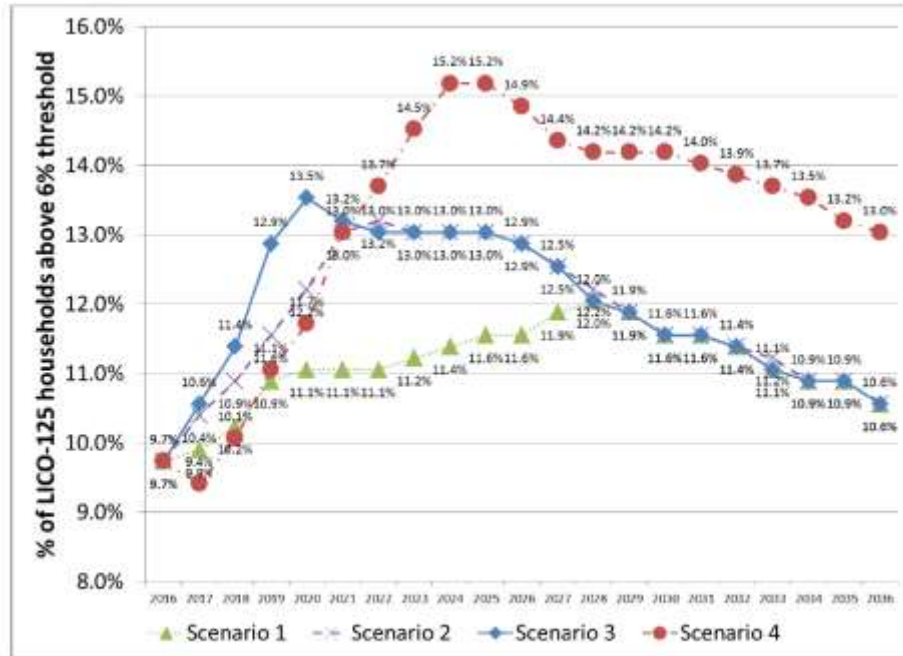


Figure 7: Impact of Manitoba Hydro rate increases on proportion of LICO-125 households above 6% energy poverty threshold, 2016–36, inclusive

A similar effect is seen for the 10% threshold:⁹

⁹ Ibid., page 7 of 16. The y-axis label is incorrect in the original; the caption clearly indicates that the data reflect a 10% energy poverty threshold.

Figure 2. Impact of MH rate increases on proportion of LICO-125 households above 10% energy poverty threshold

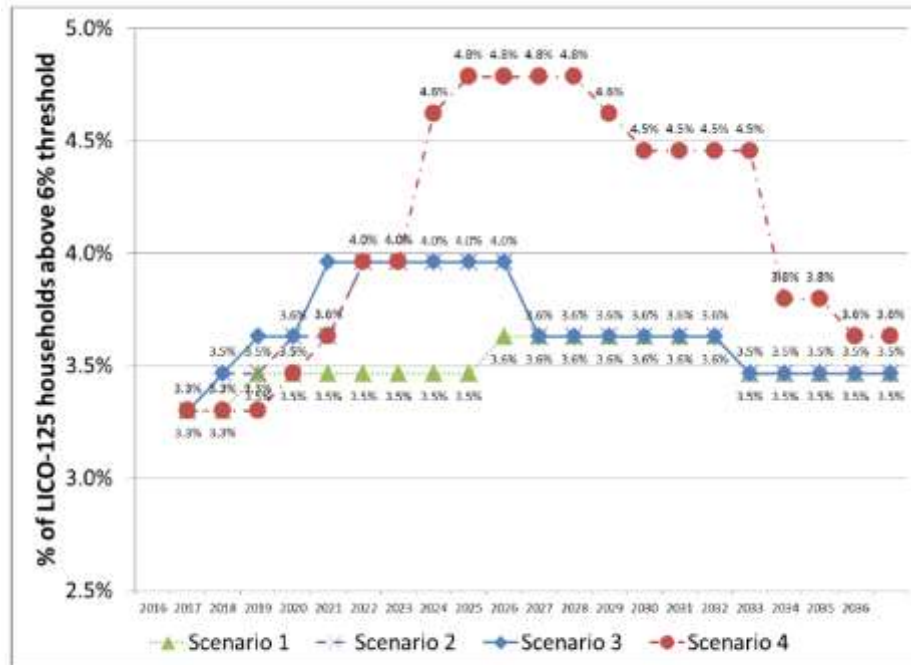


Figure 8: Impact of Manitoba Hydro rate increases on proportion of LICO-125 households with energy burdens exceeding 10%, 2016–36, inclusive

Source: PRA calculations based on survey of Manitoba Hydro customers

In both cases, the energy poverty rate is seen to increase far above current levels, and to remain substantially higher for the long term.

For households that are already energy-poor, the impact is even more substantial. For households defined as energy-poor based on a 10% threshold, the average energy burden is expected to rise from 18.9% in 2016 to 24.3% in 2024.¹⁰

¹⁰ Ibid., page 9 of 16.

Figure 3. Impact of MH rate increases on energy burdens experienced by energy poor and non-energy poor households (10% energy poverty threshold)

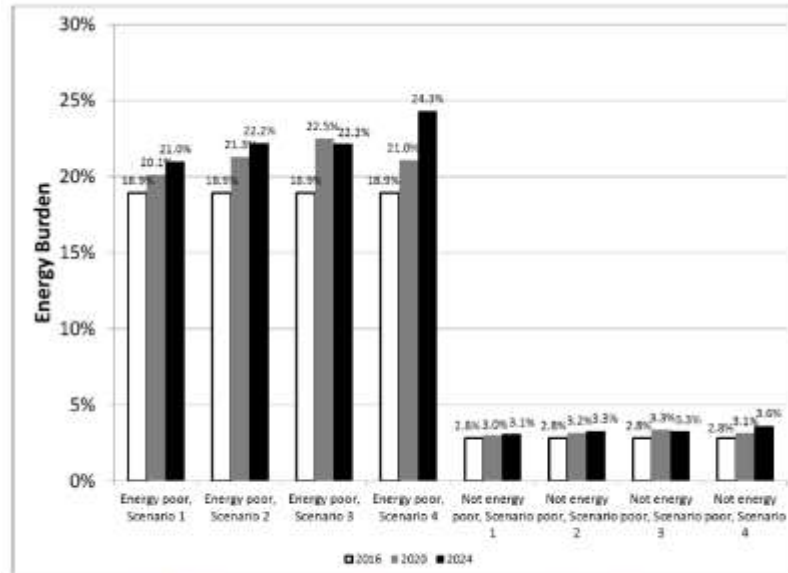


Figure 10: Impact of Manitoba Hydro rate increases on energy burdens experienced by energy poor and non-energy poor households (10% threshold), 2016–24 (n=20)

Source: PRA calculations based on survey of Manitoba Hydro customers

PRA’s analysis therefore demonstrates that **Manitoba Hydro’s current rate proposal would have substantial impacts on energy poverty in Manitoba. It would substantially increase the percentage of LICO-125 households that devote more than 6% or 10% of their total income to paying Manitoba Hydro bills, as well as the energy burdens experienced by those energy-poor households.**

2.2. Implications of assumptions regarding income growth and trailing rate increases

In fact, these figures presented by PRA are optimistic, in that they assume an annual growth in household income of 2.96% per year, despite evidence that “income growth has historically

occurred more quickly among higher-income households”.¹¹ Indeed, according to Statistics Canada, median total income growth for the province of Manitoba for the period 2005-2015 was 20.3%¹², equivalent to compound annual growth of just 1.87%. No justification has been provided for the assumption that income growth among low-income households in Manitoba will be 50% higher than the overall median growth rate over the last ten years.

These projections also assume that nominal rate increases after 2026 will be limited to the rate of inflation.

Tables 3 and 4 demonstrate how these results would change under less optimistic assumptions.¹³

Table 3. Projected increase in percent of LICO-125 households that are energy-poor (6% threshold)

	Trailing increases limited to inflation		Trailing increases of inflation + 2%/yr	
	3%	0%	3%	0%
Nominal annual income growth				
2024	15.2%	17.5%	15.2%	17.5%
2030	14.2%	19.8%	15.3%	20.3%
2036	12.7%	20.5%	15.2%	21.6%

Table 4. Projected increase in percent of LICO-125 households that are energy-poor (10% threshold)

	Trailing increases limited to inflation		Trailing increases of inflation + 2%/yr	
	3%	0%	3%	0%
Nominal annual income growth				
2024	4.8%	9.7%	4.8%	9.7%
2030	4.5%	14.4%	5.1%	17.2%
2036	3.6%	18.0%	5.9%	21.8%

¹¹ Ibid.

¹² Statistics Canada, *Household income in Canada: Key results from the 2016 Census*, in *The Daily*, September 13, 2017, page 5, Table 1.

¹³ Data provided in AMC/MH II-28, pages 2-11 of 11.

The left-hand columns of Table 3 (using a 6% threshold to define energy poverty) and Table 4 (using a 10% threshold to define energy poverty) show the effect of forecast income growth on the evolution of energy-poor households, under the assumption that rate increases after 2025 are limited to the rate of inflation.

The first column of Table 3 shows that, under PRA's assumption that income will grow at a rate of 3%/yr, the incidence of energy poverty among LICO-125 households declines from 15.2% in 2024 to 12.7% in 2036. However, the second column shows that, **if income remains stagnant, the incidence of energy poverty among LICO-125 households instead would increase, from 17.5% in 2024 to 20.5% in 2036.**

Similarly, the left-hand columns of Table 4 (using a 10% threshold to define energy poverty) show that, under PRA's assumption that income will grow at a rate of 3%/yr, the incidence of energy poverty among LICO-125 households declines from 4.8% in 2024 to just 3.6% in 2036. However, if income is assumed to be stagnant, the incidence of energy poverty among LICO-125 households instead almost doubles, from 9.7% in 2024 to 18.0% in 2036.

The right-hand columns of the two tables present similar data, but with the assumption that rates do not remain stable in real terms after 2025, but rather increase at a rate of 2%/yr above inflation.

The tables show, not surprisingly, that the assumption with respect to trailing rate increases has a significant effect in the later years. The right-hand columns of Table 3 show that, under PRA's assumption that income will grow at a rate of 3%/yr, the incidence of energy poverty among LICO-125 households remains stable at about 15.2% from 2024 through 2036. However, **if income is assumed to be stagnant but trailing rates exceed inflation by 2%, the incidence of energy poverty among LICO-125 households instead would increase, from 17.5% in 2024 to 21.6% in 2036.**

Similarly, the right-hand columns of Table 4 (using a 10% threshold to define energy poverty) show that, under PRA's assumption that income will grow at a rate of 3%/yr, the incidence of energy poverty among LICO-125 households increases from 4.8% in 2024 to 5.9% in 2036.

However, if income is assumed to be stagnant but trailing rates exceed inflation by 2%, the incidence of energy poverty among LICO-125 households instead would increase dramatically, **from 9.7% in 2024 to 21.8% in 2036.**

We conclude that the current rate proposal creates a risk of a substantial increase in energy poverty among LICO-125 households, depending on the future evolution of household income and post-2025 Manitoba Hydro rates.

3. AFFORDABILITY MITIGATION MECHANISMS

3.1. Rate assistance mechanisms

The PRA Report looked in detail at three potential rate assistance mechanisms:

- Straight rate discount (25% of customer bills),
- Fixed charge waiver (which exempts customers from paying monthly charges, and so amounts to a bill reduction of a fixed amount each month), and
- Percentage of income payment plan (PIPP), which ensures that a household's energy bills do not exceed a pre-defined share of its gross income.¹⁴

With respect to the PIPP, the Working Group wrote as follows:

Percentage of income payment plan (PIPP): Further considerations

Noting that a PIPP could effectively eliminate energy poverty by design, the Working Group identified the PIPP as the rate option that best addresses both the accuracy and equity principles of energy affordability. However, in light of administrative costs related to implementation of an income-qualified program, and uncertainty about the sufficiency of potential offsets and overall costs of the PIPP at full subscription, the Working Group did not recommend this option, but instead agreed it may warrant further study by Manitoba Hydro. Further study may include consideration of the following measures to potentially reduce program costs:

- Target only the poorest of the energy-poor by using a higher income threshold (10%).

¹⁴ Appendix 10.5, page 26.

- Introduce a pilot program prior to full implementation, possibly in a remote northern Indigenous community, and utilize the pilot to enhance understanding of likely administration costs, rates of participation and program efficacy.
- Offer PIPP for electric customers only, as existing measures are in place for gas customers, and electric heat costs are greater than gas costs and are rising.
- Set aside a dedicated pool of program funding and administer it to individuals on an application basis, prioritizing those most in need.¹⁵

To the best of our knowledge, no further study of the PIPP has been undertaken by Manitoba Hydro.

With respect to the financing of such measures, the group wrote:

As noted in Section 8.9 below, the Working Group examined Recommendation #12 contained in the *Final Report of the Review Panel on Manitoba Hydro's Preferred Development Plan*, submitted by the Public Utilities Board and released by the Government of Manitoba in July 2014. In accordance with this funding recommendation, the Working Group (with the exception of Manitoba Hydro and the Manitoba Department of Families who abstained from recommendations to government) recommends that the government consider the recommendation "that the Government of Manitoba direct a portion of the incremental capital taxes and water rental fees from the development of the Keeyask Project be used to mitigate the impact of rate increases on lower-income consumers, northern and Aboriginal communities." While it is recommended that the costs of rate assistance subsidies be funded from this source, further analysis would be required to ensure that such a proposal meets all appropriate legislative requirements governing Manitoba Hydro.¹⁶ (emphasis added)

To the best of our knowledge, no action has been taken in this regard, either.

¹⁵ Ibid., page 28.

¹⁶ Ibid.

3.2. Rate impacts of affordability measures

3.2.1. PRA's analysis

Manitoba Hydro has indicated that these affordability measures would not be revenue-neutral, and so would have to be funded as part of the Corporation's revenue requirement.¹⁷

The PRA report indicates that the lost electricity revenues that would result from applying each of these three affordability measures would range from \$1.8 to \$25.8 million, as follows:¹⁸

Table 5. Estimated electricity revenues losses associated with affordability measures (\$ millions) (2020) (GRA as filed)

(in \$ millions)	6% threshold	10% threshold
Straight discount (25%)	\$18.6	\$7.3
Fixed charge waiver	\$5.5	\$1.8
PIPP	\$25.8	\$9.8

These values were corrected, based on the amended rate proposal, as follows:¹⁹

¹⁷ AMC/MH I-13a-b.

¹⁸ Appendix 10.5, page 121 of 242, Table 25.

¹⁹ AMC/MH II-23a-c, page 12 of 16.

Table 6. Estimated electricity revenues losses associated with affordability measures (\$ millions) (2020) (revised GRA)²⁰

(in \$ millions)	6% threshold	10% threshold
Straight discount (25%)	\$25.6	\$9.1
Fixed charge waiver	\$7.6	\$2.3
PIPP	\$36.4	\$14.1

The higher revenue losses associated with the affordability measures reflect the increased affordability impacts of the revised proposal, seen in the previous section.

The PRA Report also indicates the rate increases (including taxes) that would be required from residential ratepayers in order to fund these three affordability measures, again under either a 6% or a 10% threshold:²¹

Table 7. Rate increases required from residential ratepayers to replace lost electricity revenues resulting from affordability measures (GRA as filed)

3.95% increase for 12 years	6% threshold	10% threshold
Straight discount (25%)	0.42¢/kWh	0.15¢/kWh
Fixed charge waiver	0.12¢/kWh	0.03¢/kWh
PIPP	0.56¢/kWh	0.20¢/kWh

5.95% increase for 6 years	6% threshold	10% threshold
Straight discount (25%)	0.50¢/kWh	0.16¢/kWh
Fixed charge waiver	0.13¢/kWh	0.04¢/kWh
PIPP	0.70¢/kWh	0.25¢/kWh

²⁰ These amounts appear to be contradicted by PRA's restated conclusions in AMC/MH II-29, which reads as follows:

As shown, the results suggest that if a 6% threshold is used as the basis for defining energy poverty in Manitoba, introducing a 25% straight rate discount, a fixed charge waiver, or a PIPP would generate lost revenues to Manitoba Hydro in 2020 amounting to \$32.8 million, \$13.1 million, and \$45.9 million, respectively. By contrast, if a 10% threshold is applied, each form of rate assistance would result in lost revenues amounting to \$10.9 million, \$3.6 million, and \$17.2 million, respectively.

²¹ AMC/MH I-43, Table 5.

7.95% increase for 4 years	6% threshold	10% threshold
Straight discount (25%)	0.60¢/kWh	0.19¢/kWh
Fixed charge waiver	0.14¢/kWh	0.04¢/kWh
PIPP	0.88¢/kWh	0.31¢/kWh

This table was updated based on the current rate proposal, as follows:²²

Table 8. Rate increases required from residential ratepayers to replace lost electricity revenues resulting from affordability measures (revised GRA)

Scenario 4	6% threshold	10% threshold
Straight discount (25%)	0.49¢/kWh	0.16¢/kWh
Fixed charge waiver	0.15¢/kWh	0.04¢/kWh
PIPP	0.70¢/kWh	0.25¢/kWh

To improve readability, we can reorganize this information as shown in Table 9 (based on a 10% threshold) and in Table 10 (based on a 6% threshold):

Table 9. Lost revenues and rate impact (from non energy poor residential ratepayers) from affordability measures (10% threshold)

10% threshold	Lost revenues (\$M)	Rate impact²³
Fixed charge waiver	\$2.3	0.04¢/kWh
Straight discount (25%)	\$9.1	0.16¢/kWh
PIPP	\$14.1	0.25¢/kWh

Table 9 shows the lost revenues (left column) and rate impact (right column), where eligibility is limited to those households that spend 10% of their total household income on Manitoba Hydro bills.²⁴

²² AMC/MH II-23a-c, Table 4, page 16 of 16.

²³ Assuming recovery of lost revenues from non energy-poor residential customers only.

²⁴ PRA Report, page 56 of 242.

A fixed charge waiver — the lowest cost measure — would result in lost revenues of just \$2.3 million, with a rate impact of just 1/25th of a cent per kWh for non-energy-poor residential customers.

A bill discount of 25% for these households would result in lost revenues of \$9.1 million, with a rate impact of 1/6th of a cent per kWh.

And a PIPP — the most effective but also the most expensive of the affordability measures considered by the Working Group — would cost \$14.1 million, with a rate impact of 1/4 of a cent per kWh.

Table 10 shows the same data, but for a lower eligibility threshold (6% of household income dedicated to paying Manitoba Hydro bills).

Table 10. Lost revenues and rate impact (from non energy poor residential ratepayers) from affordability measures (6% threshold)

6% threshold	Lost revenues (\$M)	Rate impact²⁵
Fixed charge waiver	\$7.6	0.15¢/kWh
Straight discount (25%)	\$25.6	0.49¢/kWh
PIPP	\$36.4	0.70¢/kWh

Here, the costs are of course greater, ranging from \$7.6 million for a fixed charge waiver, to \$36.4 million for PIPP. Rate impacts range from about 1/6th of a cent/kWh for the fixed charge waiver to 7/10 of a cent/kWh for the PIPP.

While these impacts are not negligible, they are not so great as to be beyond the bounds of consideration.

²⁵ Assuming recovery of lost revenues from non energy-poor residential customers only.

3.2.2. Methodological considerations

Manitoba Hydro has indicated that “the methodology used by PRA in preparing these tables is not consistent with the ratemaking treatment of such costs in this jurisdiction as directed by the PUB in Order 164/16.”²⁶ According to Manitoba Hydro:

In Order 164/16, the PUB provided its direction on the treatment of customer service related costs. It directed that costs related to serving and communicating with customers after delivery of energy, including meter reading, billing, collections, information and customer assistance, advertising, sales, sections, research and development, rates and cost of service, load research, and other departmental costs such as Power Smart Energy Services, shall be functionalized and classified as Customer Services and that such costs would be allocated to customer classes on the basis of customer weightings in the Cost of Service study.

In addition, late payment revenues are allocated on the basis of historical proportion of late payment revenues from each customer class. In Order 164/16, the PUB found that late payment revenues can be directly attributed to the classes from which they arise and comprise the majority of the late payment and customer adjustment costs, as discussed at page 88 of Order 164/16. Those revenues are assigned to the Residential class and form part of the cost of service for that class. Residential class revenues produced by rates are intended to recover the costs allocated and assigned to the class, with regard to the RCC of the customer class. Therefore all residential customers share cost responsibility for the cost of such programming.²⁷

While its point is not entirely clear, Manitoba Hydro appears to be drawing a parallel between the allocation of late payment revenues, addressed specifically in Order 164/16, and the allocation of lost revenues that would result from an affordability program. Since the Board found that late payment revenue and customer adjustments should be allocated based on the share of late payment revenue that was collected from each respective class, Manitoba Hydro appears to conclude that the costs of affordability programs should also be recovered from the residential class.

It is not entirely clear in what way this differs from the calculations undertaken by PRA, except perhaps in that PRA’s approach was to share the cost among “non energy-poor residential

²⁶ AMC/MH II-18a, page 3 of 5.

²⁷ Ibid., page 4 of 5.

ratepayers”²⁸. Manitoba Hydro appears to be suggesting that, since the resulting program cost would be added to the revenue requirement allocated to the residential class, recovery would not be limited to non energy-poor residential ratepayers, but rather would be spread among all residential ratepayers, including the energy-poor. The result would be to reduce the rate impact slightly, since it would be borne in part by the energy-poor as well as the non-energy-poor.

However, the logical link between these two questions — the allocation of a specific revenue line-item, on the one hand, and that of a an entirely new program designed to mitigate the impacts of the current and foreseen rate increases on those in society least able to absorb them — is far from obvious.

That said, there is a broader question to be resolved: Should costs of affordability measures be recovered from the residential class only, or from all of Manitoba Hydro’s ratepayers? The difference is material, as the residential class accounts for only 42.5% of the total revenue requirement (\$811 million out of \$1,910 million²⁹). Thus, if the burden were to be shared among all ratepayers, it would be less than half of the amounts described above.

Manitoba Hydro’s filing makes clear that the primary driver behind these substantial rate increases is the costs related to the commissioning of two facilities developed primarily (the Keeyask Generating Station) or in part (the Bipole III Reliability Project) for export. As Order 164/16 makes clear, export revenues (and costs) are allocated to all domestic classes based on their share of Generation and Transmission costs.³⁰ Since the non-residential classes also benefit from export revenue and share in export-related costs, there is no reason why they should be exempted from participating in these costs that contribute to mitigating the impacts that flow from Manitoba Hydro’s export-related investments.

²⁸ Ibid.

²⁹ Tab 8, p. 26 of 34, Figure 8.9.

³⁰ Order 164/16, page 9 and 38 of 116.

Furthermore, the Board makes clear that the cost of service study is just one of the elements it may take into consideration in setting rates in a GRA.

The Board accepts and applies the principle of cost causation in establishing the appropriate method of allocating Manitoba Hydro's financial costs to the various customer classes. The Board finds that other ratemaking principles for setting just and reasonable rates should be considered in a GRA, and not a cost of service process. A COSS neither determines nor changes rates, but may assist in rate setting and in evaluating whether customer classes pay their appropriate share of costs through rates. A COSS is normally filed with each GRA and, together with the proposed revenue requirement, rate design, and other pertinent information, forms the background supporting rate setting.³¹ (emphasis added)

Manitoba Hydro's conclusion that the recovery of costs related to affordability programs should be limited to the residential class is thus not well founded.

3.2.3. Summary

As we have seen, the costs of the affordability programs reviewed by the Working Group range from \$2.3 to \$36.4 million per year. If recovered solely from the residential class, these could lead to rate impacts of 0.04 to 0.7 cents/kWh. If recovered from all consumers, or from export revenues, the overall rate impact would likely be less than half that amount.

We recommend that the Board consider a full range of options, including sharing the costs of affordability programs among all classes and reserving a portion of export revenues for this purpose.

4. ENERGY USE AND ENERGY POVERTY IN FIRST NATIONS COMMUNITIES

In this section, we will review evidence suggesting that affordability issues are more acute for First Nations consumers than for residential consumers as a whole.

³¹ Order 164/16, page 6 of 116.

4.1. Poverty on Manitoba's First Nations reserves

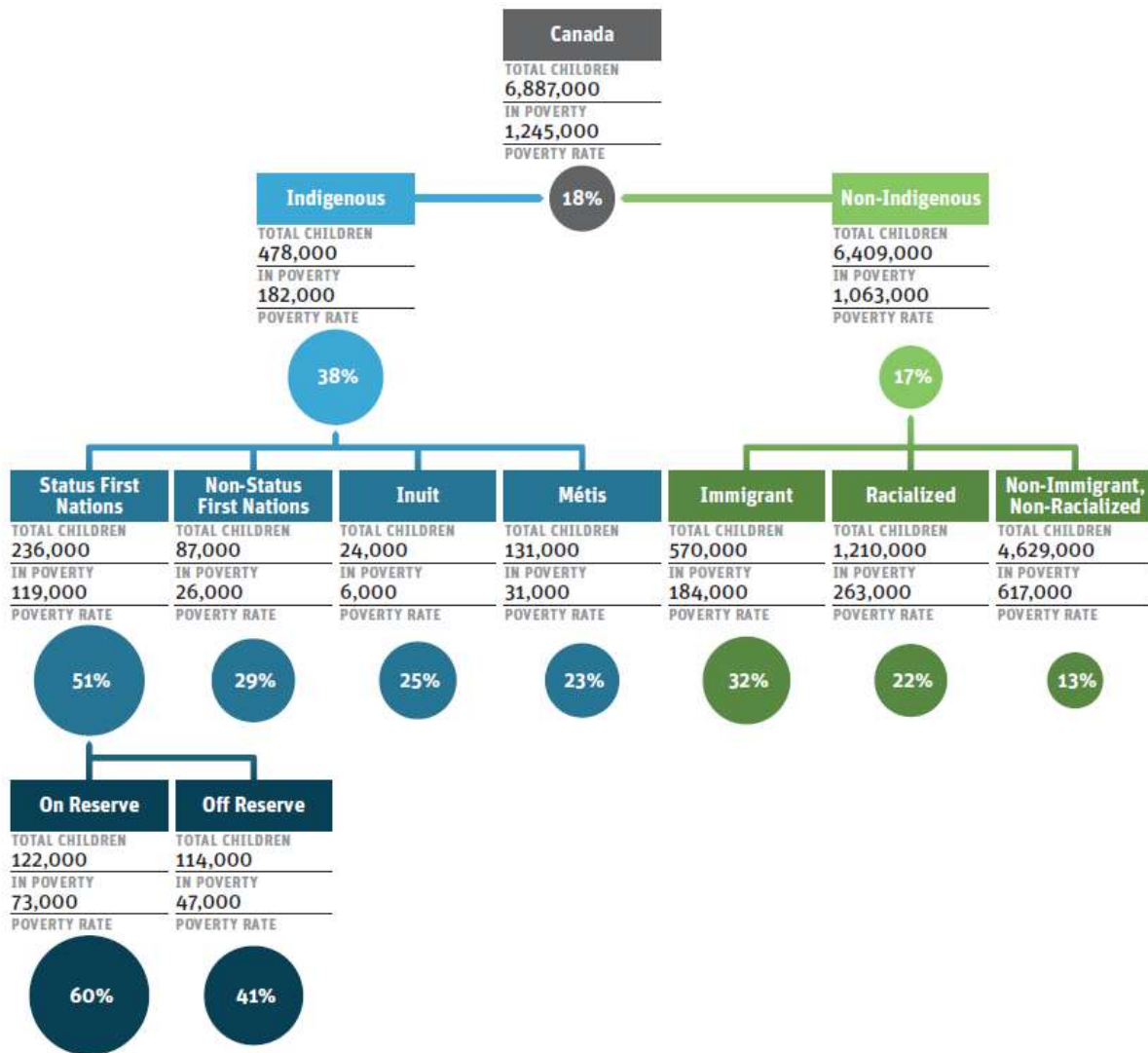
Information recently released from the 2016 Census (Statistics Canada) showed that, in Manitoba, **96% of First Nations reserves have median incomes below the poverty line.** In these communities, the median annual income is \$11,915.³²

The Canadian Centre for Policy Alternative published a study of child poverty in Canada, based on 2011 Census data. The report found that on-reserve status Indians had the highest level of child poverty (60%), compared to a nationwide average of 18%. (The lowest child poverty rate, 13%, was found among non-Indigenous, non-immigrant non-racialized families.)³³

³² Dylan Robertson, "Reserves gripped by poverty: census", *Winnipeg Free Press*, October 11, 2017, citing a compilation by the Canadian Press of 2016 Census Statistics Canada data. Data was available for 87% of Manitoba reserves (55 reserves out of 63). <https://www.winnipegfreepress.com/local/reserves-gripped-by-poverty-census-450362963.html>

³³ David Macdonald and Daniel Wilson, *Shameful Neglect: Indigenous Child Poverty in Canada* (Canadian Centre for Policy Alternatives, May 2016), p. 14. https://www.policyalternatives.ca/sites/default/files/uploads/publications/National%20Office/2016/05/Indigenous_Child%20Poverty.pdf

Figure 4. Breakdown of child poverty rates by identity³⁴



The study further showed that **Manitoba reserves had the highest child poverty rate in the country at 76%.**³⁵

³⁴ Ibid.

³⁵ Ibid., page 16.

Furthermore, the Canadian Press reported last year that Manitoba reserves were among the worse in the country on housing:

Internal government documents say Manitoba First Nations live in some of the most dilapidated homes in the country and it will cost \$2 billion to eliminate mould and chronic overcrowding in that province alone.³⁶

...

The report notes Manitoba has among the highest percentage at 29 of indigenous people living in poor housing in Canada. Officials say Alberta is the only other province in a similar situation. One quarter of existing homes on reserves in both provinces need to be repaired or replaced.³⁷

4.2. Energy poverty on Manitoba's First Nations reserves

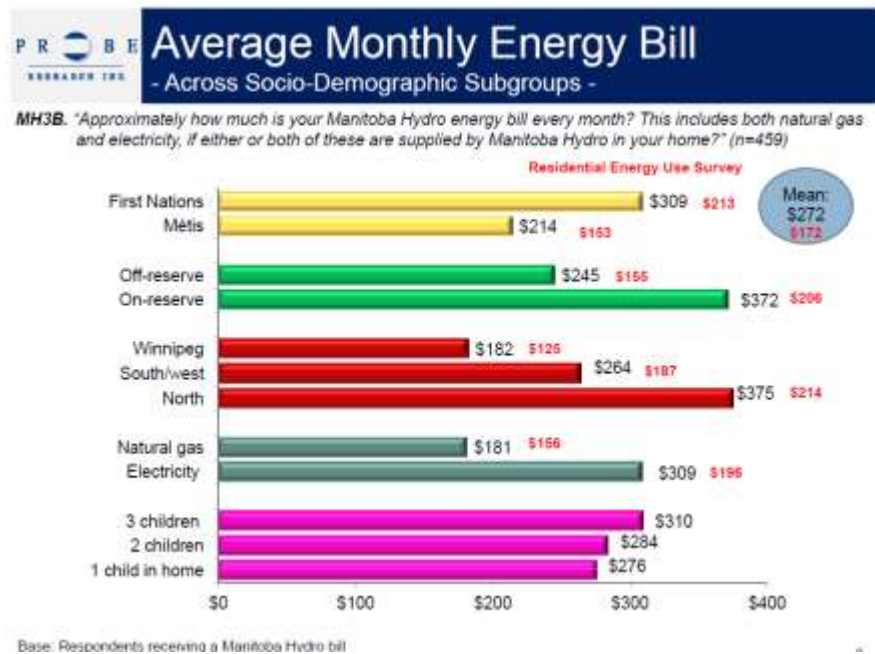
4.2.1. Energy costs on reserve

The Indigenous Voices Omnibus Survey 2017, undertaken by Probe Research for Manitoba Hydro, points in a similar direction. The results shown in Figure 5 demonstrate that energy costs are substantially higher for First Nations people on-reserve than off-reserve, and that they are much higher in the Southwest and North than in Winnipeg.

³⁶ Chinta Puxley, "Manitoba needs \$2-billion to fix mouldy, crowded First Nations homes" *Globe and Mail*, February 1, 2016, with reports from the Canadian Press.
<https://beta.theglobeandmail.com/news/national/manitoba-needs-2-billion-to-fix-mouldy-crowded-first-nations-homes/article28476330/>

³⁷ *Ibid.*

Figure 5. Average monthly energy bills³⁸



However, due to small sample sizes, few conclusions are drawn in the study.

4.2.2. Housing stock

The evidence indicates that electricity costs are considerably higher on First Nations reserves than in the province as a whole, for comparable income levels.

Table 11 compares average annual electricity consumption for electric heating customers province-wide with those for First Nations households. The last column shows that First Nations households use 23% to 29% more electricity than electric heating customers, for the same income categories.

³⁸ AMC/MH I-4, Attachment 1, page 8.

Table 11. First Nations total electricity consumption, compared to Electric Heat customers³⁹

Household Income	Annual kWh		
	Electric Heat	First Nations	difference
< \$25,000	20,456	26,456	29%
\$25,000-\$49,999	21,540	27,676	28%
\$50,000-\$74,999	25,561	32,336	27%
\$75,000-\$99,999	29,616	36,356	23%
\$100,000+	30,464	30,947	2%
LICO-125	22,419	27,833	24%
Non-LICO-125	26,125	32,969	26%

One important driver for this difference appears to be the quality of housing stock. A recent publication of Statistics Canada, based on the 2016 census, describes the housing conditions of aboriginal people in Canada. It found that **44.2%** of First Nations people who are registered status Indians or who have Treaty status lived in dwellings in need of major repairs.⁴⁰

This is a likely explanation for the differences in average energy consumption per square foot between First Nations households and electric heat customers in general. The 2014 Residential Energy Use Survey (REUS) demonstrated that, among all residential customers, average electricity consumption per square foot showed little variation based either on household income or on LICO-125 status.⁴¹ In all categories, it varied in a narrow range, between 12.6 and 13.4 kWh/sq ft.

³⁹ Electric heat customer data from PRA Report, Table 10, page 84 of 242; First Nations data from AMC/MH I-23, page 2 of 2.

⁴⁰ Statistics Canada, **Census of Population, 2016: The housing conditions of Aboriginal people in Canada** (Catalogue no. 98-200-X2016021; ISBN 978-0-660-20363-8) (October 25, 2017), page 2.

⁴¹ AMC/MH I-23, page 2 of 2.

Table 12. Average weather adjusted electricity consumption, per unit area

2014 Residential Energy Use Survey			
Average Weather Adjusted Electric Consumption			
All Residential Basic Customers			
By Household Income			
Household Income	Sample Size	Annual kWh	kWh/sqft
< \$25,000	510	12,045	13.4
\$25,000-\$49,999	1,271	13,827	12.7
\$50,000-\$74,000	1,195	16,080	13.0
\$75,000-\$99,999	802	17,478	13.3
\$100,000+	998	18,916	12.6
By LICO-125 Status			
LICO-125	1,323	14,487	13.8
Non-LICO-125	3,453	16,425	12.6

These data apparently include households heated by electricity, natural gas and other fuels. The PRA Report provides electricity consumption data by heating fuel from the same 2014 REUS.⁴² While the PRA Report did not include a measure of electricity usage per dwelling square footage, assuming that average dwelling size does not vary with heating fuel leads to the values for electric heat customers shown in Table 13.

⁴² Table 10 of the PRA Report (page 84 of 242). The consumption data are similar, but not identical to those given in Table 9

Table 13. Average electricity consumption for electric heating customers⁴³

Household Income	Annual kWh	avg sq ft	avg kWh/sq ft
< \$25,000	20,456	899	22.8
\$25,000-\$49,999	21,540	1089	19.8
\$50,000-\$74,999	25,561	1237	20.7
\$75,000-\$99,999	29,616	1314	22.5
\$100,000+	30,464	1501	20.3
		0	
LICO-125	22,419	1050	21.4
Non-LICO-125	26,125	1304	20.0

Only two Manitoba First Nations reserves have natural gas service available (Dakota Tipi First Nation and Roseau River First Nation).⁴⁴ Consequently, the appropriate comparator for electricity consumption on First Nations reserves is electric heat customers.

For First Nations residential customers, according to the same REUS, average electricity consumption and average energy consumption per square foot were considerably higher, ranging between 26,000 and 36,000 kWh/year and between 25.8 and 39.1 kWh/sq ft.⁴⁵

⁴³ Consumption data from PRA Report, Table 10, page 84 of 242. Average dwelling square footage derived from Table 12. Average kWh/sq ft calculated from first two columns.

⁴⁴ AMC/MH II-32, Attachment 1. Average electricity consumption in those First Nations is no lower than in others, suggesting that few if any homes heat with gas.

⁴⁵ AMC/MH I-23, page 2 of 2.

Table 14. First Nations average weather adjusted electricity consumption, per unit area

2014 Residential Energy Use Survey
Average Weather Adjusted Electric Consumption

First Nations Residential Basic Customers			
By Household Income			
Household Income	Sample Size*	Annual kWh	kWh/sqft
< \$25,000	14	26,456	28.3
\$25,000-\$49,999	5	27,676	29.1
\$50,000-\$74,000	12	32,336	27.1
\$75,000-\$99,999	3	36,356	39.1
\$100,000+	1	30,947	25.8
By LICO-125 Status			
LICO-125	23	27,833	27.8
Non-LICO-125	12	32,969	31.0

Comparing on-reserve First Nations average electricity consumption and average per unit dwelling area with similar figures for electric heat customers in general reveals substantially higher values for First Nations customers, in both categories.

For total electricity consumption (Table 11), on-reserve First Nations consumption is from 23% to 29% higher for all income categories; for average electricity consumption per unit dwelling area (Table 15), the First Nations values are from 24% to 47% higher.⁴⁶

⁴⁶ These comparisons exclude the income categories \$75,000-\$99,999 and \$100,000+ because of the very small sample sizes for the First Nations customers (3 and 1, respectively).

Table 15. First Nations average electricity consumption per unit dwelling area, compared to Electric Heat customers⁴⁷

Household Income	Electric Heat	First Nations	difference
< \$25,000	22.8	28.3	24%
\$25,000-\$49,999	19.8	29.1	47%
\$50,000-\$74,999	20.7	27.1	31%
\$75,000-\$99,999	22.5	39.1	73%
\$100,000+	20.3	25.8	27%
LICO-125	21.4	27.8	30%
Non-LICO-125	20.0	31	55%

It should be mentioned that the source of the First Nations data shown in Table 14 is not entirely clear. In the REUS report⁴⁸, the only First Nations identifier is “aboriginal self-declared ancestry”. If these figures include all such persons (of whom on-reserve First Nations people constitute a subset), it is possible that Table 15 underestimates the extent of the differential.

While the sample size is small, **there appears to be little doubt that average energy consumption is substantially higher on First Nations reserves than among the general population.**

4.2.3. Payment issues

PRA found that rates of both arrears and disconnections are substantially higher on First Nations reserves than for all Manitoba Hydro customers:

Payment issues among First Nations communities are especially severe, with one-quarter or more of residential accounts in arrears over most of each year. Amounts owing among households in these communities typically account for well over half of all payments outstanding at any given time, despite the fact that First Nations customers constitute approximately three percent of all Manitoba Hydro customers.

⁴⁷ Electric heating customer data from Table 13; First Nations data from Table 14.

⁴⁸ PUB/MH I-125a-d, Attachment 1.

Similar to arrears, the number of service disconnections by Manitoba Hydro due to non-payment exhibits substantial seasonality, which is likely attributable in part to the utility's moratorium on winter disconnections for most residential customers. In 2014, urban, rural, and northern customers accounted for 46.5%, 35.6%, and 18.0% of all disconnects; such service terminations fall disproportionately on First Nations customers, who experienced 22.3% of all disconnects in the same year. Data from 2012 to 2014 suggests sizable increases in disconnections among all customer segments over that interval.⁴⁹ (emphasis added)

Unfortunately, few conclusions can be drawn regarding energy use, bill affordability and energy poverty in on-reserve First Nations communities, because sample sizes for First Nations respondents were so low.

4.3. Energy conservation programs

Energy conservation programs play an important role in reducing energy costs, especially in communities where housing stock may be substandard.

According to the data provided by Manitoba Hydro, almost one-third of all First Nation on-reserve dwellings have participated in Indigenous Power Smart, and 18.7% have received insulation retrofits.⁵⁰ While there is clearly a long way to go, these results testify to a serious effort on the part of Manitoba Hydro to reach First Nations communities. However, it was surprising to learn that Manitoba Hydro has just one dedicated Indigenous Energy Advisor, responsible for serving all 63 First Nations communities.⁵¹

That said, there remains a certain amount of confusion about the conservation programs offered in First Nations communities. For example, it is indicated that the Indigenous Power Smart program (also referred to as First Nations Power Smart (FNPS)) is separate from and superior to the Home Insulation Program (which is part of the Affordable Energy Program, or AEP). More

⁴⁹ Ibid., page 127 of 242.

⁵⁰ AMC/MH II-5a-g, page 2 of 4.

⁵¹ AMC/MH II-22.

than 3000 First Nation homes have been retrofitted with insulation under the FNPS⁵², whereas just 49 on-reserve homes have been retrofitted with insulation under the HIP — of which 94% (46 homes) were located in just two communities!⁵³

The Community Geothermal Program is offered only in Indigenous communities, but it is unclear how many systems have been installed.⁵⁴

The First Nations Power Smart program generally offers more generous benefits than the residential offering under the AEP.⁵⁵

4.3.1. Inadequate data

The PRA Report does not include a detailed quantitative analysis of energy poverty among First Nations customers, either on- or off-reserve.⁵⁶

PRA further explained the limitations of its report with respect to First Nations as follows:

Two important limitations of the customer survey should be noted. First, although customers in arrears were over-sampled on the assumption that those in arrears would generally have lower income and/or be energy poor compared to the overall Manitoba Hydro customer base, the survey results revealed that this was not the case. As a result, the energy poor subgroups have small sample sizes, and all analyses based on these subgroups should be interpreted with caution. Second, the customer survey did not set regional quotas. As a result, relatively few customers in northern Manitoba were among the survey respondents, and those who completed the survey resided primarily in urban centres in the north. The ability to undertake

⁵² AMC/MH II-3-Attachment 1, page 2 of 2.

⁵³ AMC/MH II-5a-g, page 3 of 4.

⁵⁴ AMC/MH II-7a-d, p. 2 of 2.

⁵⁵ AMC/MH II-8a-j, p. 3 and 4 of 6.

⁵⁶ PRA Report, page 48 of 242.

regional analysis and/or analysis of customers residing in northern and remote First Nations communities was therefore limited.⁵⁷ (emphasis added)

Under the heading, “Factors in energy poverty and arrears among First Nations,” PRA wrote:

Any discussion of energy poverty and arrears in Manitoba must acknowledge the unique circumstances of First Nations communities. As previously noted, due to methodological limitations, the survey of Manitoba Hydro customers did not obtain the data required to undertake a quantitative analysis of factors contributing to energy poverty and arrears within these communities. A document review and key informant interviews with First Nations community representatives were therefore undertaken to fill this gap.⁵⁸ (emphasis added)

The “key informants” with respect to First Nations issues consisted of two persons from Manitoba Hydro, two persons from INAC, and two representatives of two First Nations communities in Manitoba.⁵⁹

Again, few conclusions can be drawn regarding energy use, bill affordability and energy poverty in on-reserve First Nations communities, because sample sizes for First Nations respondents were so low.

We recommend that the Board require Manitoba Hydro to carry out an in-depth study of electricity consumption and affordability on First Nations reserves, in order to inform future decision-making.

5. IS UTILITY CROSS-SUBSIDIZATION APPROPRIATE?

Manitoba Hydro makes clear that, as a matter of principle, it rejects any bill affordability measures that would involve any form of cross-subsidization:

⁵⁷ Ibid., page 56 of 242.

⁵⁸ Ibid., page 86 of 242.

⁵⁹ PRA Report, page 55 of 242.

In Manitoba Hydro's view, the bill affordability measures discussed in this response are direct customer bill subsidies. The direct subsidization of low income customers in this manner is akin to addressing issues of household income sufficiency and such matters are more appropriately addressed by government and not by Manitoba Hydro.

Therefore, regardless of the order of magnitude of any of the potential options discussed in this response, Manitoba Hydro is not in a position to consider any such customer subsidies.⁶⁰

That said, Manitoba Hydro did participate in the Report of the Working Group, which recommended that the utility undertake study with regard to the PIPP:

Noting that a PIPP could effectively eliminate energy poverty by design, the Working Group identified the PIPP as the rate option that best addresses both the accuracy and equity principles of energy affordability. However, in light of administrative costs related to implementation of an income-qualified program, and uncertainty about the sufficiency of potential offsets and overall costs of the PIPP at full subscription, the Working Group did not recommend this as an option, but instead agreed that it may warrant further study by Manitoba Hydro.⁶¹

The bigger question is: is it appropriate for programs that subsidize the cost of serving certain ratepayers to be supported by utilities (i.e. by other ratepayers), or must such programs be supported directly by government (taxpayers)?

Cross-subsidization of one type or another through regulated utility rates is in fact quite common. Perhaps the most well known and widespread example in Canada is that of off-grid (diesel) communities, which are generally far more costly to serve than are grid-connected customers. While the details vary from one jurisdiction to another, in most cases rates charged in off-grid communities are far below the actual cost of service, resulting in a deficit that is borne, for the most part, by other utility customers.

It is also true that, in some provinces, governments contribute directly to easing these burdens. For example, in Newfoundland and Labrador, the Northern Strategic Plan Rebate alleviates some of the burden of electricity rates on residents of most off-grid Labrador communities. However,

⁶⁰ AMC/MH II-18b.

⁶¹ Appendix 10.5, page 28, quoted in AMC/MH II-19a-b

this government subsidy serves to complement rather than replace the cross-subsidization implicit in Newfoundland and Labrador Hydro's rate structure.⁶²

It is thus inappropriate to simply exclude the question of affordability programs supported by cross-subsidization, as Manitoba Hydro suggests. Rather, given the relatively modest costs associated with such cross-subsidization, as detailed in Table 8, we would encourage the Board to require that Manitoba Hydro bring to the table concrete proposals to ensure that the effects of its rate increases on those least able to pay remain tolerable.

Because Manitoba Hydro enjoys significant export revenues, it is reasonable to consider the application of export revenues to support affordability programs. In its Order No. 164/16, the Board found that "export revenues are not a 'dividend' that can be assigned or based on considerations other than cost causation."⁶³ Thus, it concluded that the costs related to the Uniform Rate Adjustment (URA) — which accounts for unrecovered costs resulting from the application of what were formerly known as Zone 1 costs (for the City of Winnipeg) to what were formerly known as zones 2 and 3 — should not be deducted from export revenues in the COSS, nor should any costs from the Diesel class.⁶⁴ It did, however, find that the costs of the Affordable Energy Fund established under the *Energy Savings Act* should still be deducted from export revenues, because the legislation so requires.⁶⁵

The Board explained these findings as follows:

If the COSS methodology is driven by considerations other than cost causation, then the final results of the COSS are muddled. Subsidies within the COSS are challenging to disentangle at the ratemaking stage. The Board is of the view that additional transparency is achieved

⁶² The distribution of this burden was modified by the NLPUB in NLH's last GRA. P.U. 49(2016), pages 86-92..

⁶³ Order No. 164/16, page 38 of 116.

⁶⁴ Ibid., pages 40 and 41 of 116.

⁶⁵ Ibid., page 41 of 116.

with the COSS and the ratemaking process if these implicit or explicit subsidies are eliminated from the COSS.⁶⁶ (emphasis added)

Manitoba Hydro described this approach as follows:⁶⁷

The PUB determined that cost causation should be the primary objective of a cost of service study and that other ratemaking principles should be considered at the rate setting stage of the process after the cost of service results are known!. (emphasis added)

The footnote refers to the following passage from Order 164/16:

The Board finds that Manitoba Hydro's ratemaking principles and goals of rate stability and gradualism, fairness and equity, efficiency, simplicity, and competitiveness of rates should be considered in a General Rate Application ("GRA") and not in the cost of service methodology. While ratemaking principles are important in the overall process of setting rates, these concepts are issues for rate design and should therefore not be considered at the COSS stage. Likewise, consideration of RCC ratios is a rate design matter that should be addressed in the rate-setting phase of the GRA. (emphasis added)

And Manitoba Hydro continues:

RCCs provide a measure of the cost coverage, as defined by the COSS, against class revenues. The ratios provide some indication of the degree of cross subsidy that may exist among customer classes. However, there may be other compelling policy reasons for the PUB to accept a certain RCC outcome for a customer class, regardless of the cost coverage that has been measured. If the PUB determines that there is sufficient reason to afford one customer class rates that produced more or less than their allocated cost, it has the authority to do so. While class RCCs provide a measure of cost coverage, the PUB ultimately has the authority to take into consideration policy or other factors and find those rates to be just and reasonable, and neither unduly discriminatory nor unduly preferential.⁶⁸ (emphasis added)

All of this indicates that the Board would be within its authority to require that Manitoba Hydro undertake an affordability program, and to determine how its costs should be shared. The Cost of Service Study is meant to guide and inform such judgements, not to replace them.

⁶⁶ Ibid., page 38 of 116.

⁶⁷ PUB/MH I-37a-b, page 2 of 5.

⁶⁸ Ibid., page 3 of 5.

The Board's finding that "export revenues are not a 'dividend' that can be assigned or based on considerations other than cost causation" refers specifically to the COSS, and not to the ratemaking process. **The GRA is thus the appropriate forum for exploring the application of export revenues to support affordability programs.**

6. SUMMARY AND DISCUSSION

In this report, we have seen that:

- The proposed rate increases can be expected to substantially increase rates of energy poverty in Manitoba in 2024 to 15%, based on a 6% threshold, and to 4.8% based on a 10% threshold (percent of total household income dedicated to paying Manitoba Hydro bills). For households that are already energy poor (based on a 10% threshold), the average energy burden is expected to rise to 24.3% in 2024;
- These projections are based on optimistic assumptions concerning both income growth (2.96% per year) and trailing rate increases (2% per year). PRA's analysis demonstrates that, if less optimistic assumptions are used for either or both of these parameters, the impacts on energy poverty would be substantially greater;
- The annual costs of the three affordability mechanisms evaluated by the Working Group vary from \$2.3 to \$14.1 million, for a 10% threshold, or for \$7.6 to \$36.4 million, for a 6% threshold; and
- The rate impacts, assuming that these costs are borne by non energy-poor residential customers, were evaluated at 0.04¢ to 0.25¢/kWh, for a 10% threshold, or 0.15¢ to 0.70¢/kWh, for a 10% threshold.

We have also seen that poverty is common on Manitoba's First Nations reserves, and that energy costs appear to be substantially higher than for Manitobans in general who rely on electric heat, whether measured in amount of electricity consumed each year, or on amount used per unit dwelling area.

We have seen that Manitoba Hydro has made a real effort to promote energy efficiency in First Nations communities, including a substantial number of insulation retrofits. Nevertheless, only a small minority of households in First Nations communities have benefited from these programs to date.

We have seen that there is no conceptual barrier to affordability programs supported by other utility customers, and that the present GRA hearing is the appropriate forum for consideration of these options.

As the Board pointed out in its recent decision on interim rates, the present filing represents a significant change in financial strategy on the part of Manitoba Hydro, and this change is directly responsible for the level of rate increases requested:

First, MH16 and MH16 Update incorporate for the first time a 10-year timeframe for the achievement of Manitoba Hydro's debt-to-equity target of 75/25, with the first five of those 10 years seeking annual 7.9% rate increases followed by five years with 2% annual rate increases. In the 2014 Needs For and Alternatives To Review, a 20-year timeframe, or the fiscal year of 2031/32, was identified by Manitoba Hydro as the target for reaching its 75/25 debt-to-equity ratio through equal annual 3.95% rate increases for its Preferred Development Plan. Manitoba Hydro has used a 20-year timeframe since before the 2014 Needs For and Alternatives To Review of Manitoba Hydro's capital expenditure plans.

Manitoba Hydro's Integrated Financial Forecast 14 maintained a 20-year timeframe, with 2033/34 being the targeted year for reaching 75/25. Order 59/16 continued to reflect Manitoba Hydro's target year for 75/25 debt-to-equity of 2033/34. At the same time, the Board has supported a relaxation of the 75/25 debt-to-equity ratio to minimize and smooth out consumer rate increases while still maintaining sufficient retained earnings. The change in pacing to a 10-year timeframe for the achievement of a 75/25 target appears to be fundamental change in approach by Manitoba Hydro that must be examined in the General Rate Application. Similarly, Manitoba Hydro's target level of 75/25 for the debt-to-equity ratio is likely to be a significant and contentious issue in the General Rate Application and cannot be sufficiently reviewed in an interim process.⁶⁹

The relation between this strategy and its consequent rate increases and the major capital projects nearing completion is clearly stated in the Application:

⁶⁹ Order No. 80/17, page 21 of 29.

The key reasons for the Application are:

- Manitoba Hydro's current and projected financial situation, absent the proposed rate increases, represents an untenable risk to both the financial sustainability of the corporation and the overall economic health of the Province of Manitoba.
- Previous financial plans did not adequately prepare Manitoba Hydro to absorb the significant increase in operating and borrowing costs that result from the completion of major capital projects currently underway while still ensuring the continued financial strength of the corporation. ...⁷⁰

There is little doubt that exports played an important role in the justification for these major capital projects. Thus, the nexus between export revenues and the substantial new rate increases has been clearly established.

While the information in the Application concerning rate impacts on First Nations reserves is unfortunately weakened by small sample sizes in the REUS and the affordability research, it clearly suggests that, on reserves, compared to the rest of the province:

- housing quality is lower, leading to higher energy consumption per square foot,
- incomes and income growth are lower, and
- the rate of energy poverty is higher.

Manitoba Hydro should undertake focused research to achieve greater clarity with respect to these three issues.

Furthermore, there can be little doubt that, seen as a whole, the development of Manitoba Hydro's hydropower system has impacted First Nations communities more than it has the population in general.

Taken together, these elements suggest that developing bill affordability mechanisms for First Nations on-reserve communities should be a priority for Manitoba Hydro, not an afterthought.

⁷⁰ Tab 2, page 2 of 61.

Manitoba Hydro has acknowledged that there would be no technical impediment to using Indian status as an eligibility criterion for a bill affordability program.⁷¹

While it would be premature to recommend the adoption of any particular program, we recommend that the Board require Manitoba Hydro to:

- **deepen its research on affordability mechanisms, particularly with regard to on-reserve First Nations communities; and**
- **develop proposals for utility funding of bill affordability mechanisms.**

⁷¹ AMC/MH II-3c, page 1 of 1. This response likely refers to the tax exemption for on-reserve residents with Indian status.

7. QUALIFICATIONS

Philip Raphals is cofounder and executive director of the Helios Centre, a non-profit energy research and consulting group based in Montreal. Over the last 25 years, he has written extensively on issues related to hydropower and competitive energy markets, and has appeared many times as an expert witness before energy and environmental regulators in several provinces.

Mr. Raphals has been formally recognized as an expert witness by energy regulators in the provinces of Quebec, Nova Scotia and Newfoundland and Labrador:

- In Quebec, he has provided expert testimony in 14 proceedings before the Régie de l'énergie du Québec. The Régie has recognized his expertise in fields including transmission ratemaking, security of supply, energy efficiency and avoided costs;
- The Nova Scotia Utilities and Review Board has qualified Mr. Raphals as expert in sustainable energy policy, least-cost energy planning and utility regulation (including transmission ratemaking). He provided expert testimony in two proceedings there concerning the Maritime Link, including critical analysis of long-term demand forecasts, resource options and financial analyses submitted by NSP Maritime Link Inc., a subsidiary of Emera, in support of its proposal to build an undersea transmission link between Newfoundland and Nova Scotia, and the accompanying long-term electricity supply contracts. In its decision, the Board quoted Mr. Raphals' report and relied in part on his analyses;
- The Newfoundland and Labrador Public Utilities Board has qualified Mr. Raphals as an expert in electric utility rate making and regulatory policy. He has provided expert testimony in in 2011 Muskrat Falls Review and in its hearings on the 2013 General Rate Application of Newfoundland and Labrador Hydro.

Mr. Raphals is currently acting as an expert witness in rate proceedings before the Newfoundland and Labrador Public Utilities Boards.

Mr. Raphals appeared as an expert witness on behalf of Grand Riverkeeper Labrador Inc. in the hearings of the Joint Review Panel (JRP) on the Lower Churchill Generation Project, which

relied on his analysis of project justification. The Panel cited him in its report and relied on his analyses for several of its findings.

In British Columbia, Mr. Raphals appeared as an expert witness on behalf of the Treaty 8 Tribal Association in the hearings of the Joint Review Panel on the Site C Hydroelectric Project. The Panel cited him in its report and relied on his analyses for several of its findings. In 2016, he presented expert affidavits in two related proceedings before the B.C. Supreme Court, one of which was not received by the Court. This year, he was author or coauthor of several expert reports submitted on behalf of the Program on Water Governance of the University of British Columbia to the British Columbia Utilities Commission, as part of its government-mandated Inquiry into the Site C Project, as appeared as an invited witness at a technical session before the BCUC.

From 1992 to 1994, Mr. Raphals was Assistant Scientific Coordinator for the Support Office of the Environmental Assessment of the Great Whale Hydroelectric Project, where he coauthored with James Litchfield and Roy Hemmingway a study on the role of integrated resource planning in assessing the project's justification.

In 1997, Mr. Raphals advised the Standing Committee on the Economy and Labour of the Quebec National Assembly in its oversight hearings concerning Hydro-Quebec. In 2001, he authored a major study on the implications of electricity market restructuring for hydropower developments, entitled *Restructured Rivers: Hydropower in the Era of Competitive Energy Markets*. In 2005, he advised the Federal Review Commission studying the Eastmain 1A/Rupert Diversion hydro project with respect to project justification. Later, he drafted a submission to this same panel on behalf of the affected Cree communities of Nemaska, Waskaganish and Chisasibi.

Mr. Raphals chairs the Renewable Markets Advisory Panel for the Low Impact Hydropower Institute (LIHI) in the United States. He has been an invited speaker before the Senate Standing Committee on Energy, the Environment and Natural Resources and at numerous energy industry conferences, including the Canadian Association of Members of Public Utility Tribunals

(CAMPUT). He has also been an invited speaker at Yale University, Concordia University and McGill University.

In 2013, Mr. Raphals was an invited participant in an expert roundtable on electricity surpluses and economic development, convoked by the Quebec Commission on Energy Issues. The Commission's report relied on several of his analyses.

In 2015, he was a finalist for the R.J. Tremplin Prize, awarded by the Canadian Wind Energy Association for "scientific, technical, engineering or policy research and development work that has produced results that have served to significantly advance the wind energy industry in Canada."

APPENDIX A



“Energy research for a sustainable future”

Philip Raphals

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PROFESSIONAL EXPERIENCE

1996- **HELIOS Centre, Executive Director (since 2004)**

An independent, non-profit research organization dedicated to the analysis of energy regulatory or investment options and the design of strategies and policies for the sustainable use and development of energy resources. Responsible for management and development of the Helios Centre, direction of its publication Enjeux-ÉNERGIE (2004-2007), and consulting activities.

Selected projects:

- ¶ **Régie de l'énergie:** Expert testimony on behalf of the Regroupement national des conseils régionaux de l'environnement du Québec (RNCREQ), l'Union de consommateurs, the Fédération des commissions scolaires du Québec, and other groups (including the Groupe de la charge locale), in hearings concerning:
 - ¶ Hydro-Québec's transmission tariff (R-3401-98, R-3493-04, R-3605-06; R-3549 phase 2, R-3640-07 and R-3669-08 phase 1; R-3669-08 phase 2 (harmonization with Order 890); R-3738-10);
 - ¶ the framework agreement between HQ-Production and HQ-Distribution (R-3622-06),

- ¶ the need for a balancing contract for wind energy (R-3550-04 and R-3648-07),
- ¶ Hydro-Québec's security of supply (concerning its resource plans R-3470-01 and R-3550-04, its interruptible tariffs in R-3518, and its Suroît project in R-3526-04),
- ¶ Hydro-Québec's energy efficiency plan and avoided costs (R-3473, R-3519 and R-3708-09),
- ¶ sustainable development criteria (R-3525-04), and
- ¶ acquisition of power from small hydro developers (R-3410).
- ¶ **University of British Columbia — Program on Water Governance:**
 - ¶ Reassessing the Need for the Site C Hydroelectric Project (2017)
 - * Submissions to the British Columbia Utilities Commission regarding the Site C Hydroelectric Project (August through October 2017)
 - * **Front commun pour la transition énergétique:** Critical review of the NEB's role in electricity regulation and energy information (for NEB Modernization Expert Panel) (2017)
 - * **Peace Valley Landholders' Association:** Expert affidavit in injunction proceeding (2016)
 - * **Treaty 8 Tribal Association:**
 - * Expert affidavits in support of judicial review and injunction applications (2014 - 2015)
 - * Expert testimony in the Environmental Assessment of the Site C Hydroelectric Project (2013 - 2014)
 - * **Innu Nation (Labrador):** Expert testimony in general rate application hearing of Newfoundland Labrador Hydro (2013 -2015)
 - * **Grand Riverkeeper Labrador :** Expert testimony in NL PUB hearing on supply issues (2014 -); Expert testimony on the justification for the proposed Lower Churchill Project (2011); Testimony before the Public Utilities Board of Newfoundland and Labrador regarding the Muskrat Falls Reference (2012); Affidavit In support of Federal Court File No. T-2060-11 (judicial review of Joint Panel Report (2012); Comments on the justification of the proposed Labrador-Island Transmission Link (2012)
 - * **Technocentre éolien – Étude sur l'énergie éolienne et les exportations d'électricité** (2014)
 - * **Low Power Rates Alliance:** Expert testimony before the Nova Scotia Utility and Review Board concerning the compliance filing of NSPI (2013)

- * **CanWEA (Canadian Wind Energy Association):**
 - * Expert testimony before the Nova Scotia Utility and Review Board concerning the proposed Maritime Link and related agreements.
 - * Study on rate impacts of wind energy in Quebec (*L'impact de l'énergie éolienne sur les tarifs d'Hydro-Québec Distribution*) (2013)
- * **Canmet ÉNERGIE:** Review of regulatory policies relevant to Smart Grid development in Canada's provinces and territories (2012)
- * **Natural Resources Defence Council :** Power supply issues concerning the Champlain Hudson Power Express (2010)
- * **SPG Hydro inc. :** Market study on in-stream hydropower (*Étude de marché sur la filière de l'hydrolienne fluviale*) (2008)
- * **Service d'actions entrepreneuriales Manicouagan :** Étude sur les coûts de revient de la nouvelle filière de l'hydraulienne fluviale. (2008)
- * **Communauté innue d'Ekuanitshit :** Conseils sur les enjeux énergétiques et économiques du Complexe La Romaine (2008)
- * **Groupe Pacific:** Electric supply options for a new residential community on Montreal Island. (2008)
- * **Hydro-Québec / ACDI / Électricité d'Haïti:** Études sur le potentiel et la mise en œuvre des énergies renouvelables en Haïti
 - Survol des technologies d'énergie renouvelable et technologies d'appoint (2007)
 - Options pour l'intégration des énergies renouvelables dans le réseau de Jacmel (2007)
- * **Centre local de développement Manicouagan:** Étude sur les coûts de l'Entente entre le gouvernement du Québec et Alcan (2007)
- * **Association québécoise des consommateurs industriels d'électricité:** Étude sur l'évolution des prix disponibles sur les marchés d'exportation d'Hydro-Québec Production (2007)
- * **Latin American Energy Organization (OLADE):** Competition in Energy Markets: An Analysis of the Relevance of North American Experiences to the Latin American and Caribbean Region. Project leader and principal consultant (with Peter Bradford). Project includes an in-depth review of the impact on restructuring on electricity and natural gas consumers in the U.S. and Canada, with an emphasis on regulatory policy concerning transmission, guidance and oversight of case studies of electricity restructuring experience in Brazil, Chile, Peru and Trinidad and Tobago,

and the development of policy guidelines to regulate energy markets in the public interest in Latin America and the Caribbean. (2003 - 07)

- * **Law Offices of Scott Hempling (Washington, D.C. law firm specializing in energy regulatory matters):** Senior policy advisor. (2005-06)
- * **Hydro-Québec, Direction Réseaux Autonomes:** Renewable energy potential in off-grid communities (2005-06)
- * **National Grid USA: Economic Development and Environmental Impacts of Narragansett Electric's Energy Efficiency Programs:** Analysis of avoided cost component (for the Goodman Group) (2006)
- * **Cree Nations of Nemaska, Waskaganish and Chisasibi:** Comments on the Justification of the Eastmain -1A/Rupert Diversion Project (2006)
- * **Cree Nation of Nemaska:** Advice concerning wind energy development and community energy planning (2005-06)
- * **Canadian Wind Energy Association:** Submission to the Ontario Power Authority's Supply Mix Consultation (with Hélimax Énergie inc.) (2005)
- * **National Roundtable on the Economy and the Environment:** Background paper on the role of hydropower in a carbon-constrained energy future for Canada (2005)
- * **Federal Review Commission, Eastmain 1A/Rupert Hydroelectric Project:** Report on the conformity of the Eastmain 1A/Rupert Environmental Impact Study, with respect to project justification (2005)
- * **Institut d'énergie et de l'environnement de la Francophonie (IEPF):** Editorial supervision and co-author, *Mettre en Place Une Autorité Nationale Désignée pour le MDP: Pourquoi et Comment?*, presentation at COP-11 in Montreal; Profiles of the Clean Development Mechanism potential of the developing countries in the Francophonie (with Helios staff). Presentation at COP-10 in Buenos Aires. (2004)
- * **Mushkegowuk Council (Ontario):** Critical review of power supply options (including transmission upgrades) for De Beers' Victor diamond mine (CEAA environmental assessment process). (2004)
- * **Pemex – Refinación:** Co-facilitator with Jay Ogilvy and Napier Collyns of Global Business Network of a strategic planning scenario workshop for the company's management. (2004)
- * **Nuclear Waste Management Organization:** Expert participant in interdisciplinary scenarios team for long-term management of high-level reactor waste in Canada. (2003)
- * **Energy Foundation:** Proposed eligibility criteria for hydropower in the New York State Renewables Portfolio Standard. (2003)

- * **Low Impact Hydropower Institute:** Principal consultant for pilot project to develop an international green standard for small-scale hydropower, funded by North American Fund for Environmental Cooperation. (2002-03)
 - * **Commission for Environmental Cooperation:** Expert reviewer for *Environmental Challenges and Opportunities of the Evolving Continental Electricity Market*. (2002)
 - * **Pimicimak Cree Nation:** Research on hydropower mitigation costs and operations reviews. (2002)
 - * **Hydro-Québec-Recouvrement/ARC/CACQ/FACEF :** Review of low-income customer assistance programs in U.S. (2001)
 - * **International Rivers Network:** Commissioned book-length study: *Restructured Rivers: Hydropower in the Era of Competitive Markets*. (2001)
 - * **Low Impact Stakeholders Alliance (Ontario):** Options paper on environmental rating of electricity; consultations on certification of hydroelectric facilities for green power market. (2000-01)
 - * **Innu Nation (Labrador):** Overview of Quebec and U.S. energy policy issues. (2000)
 - * **Grand Council of the Crees (of Quebec) :** Orientations for a Cree Energy Policy (2009)
- Drafting project justification section of *Draft Directives for the Preparation of the Impact Statement for the Eastmain-1A and Rupert Diversion Project* (for COMEV, the tripartite Evaluating Committee under the JBNQA). (2003)
- Expert testimony before U.S. Court of Appeal (D.C. Circuit) on role of exports in Hydro-Québec planning; technical analysis for FERC consultation on Regional Transmission Organizations and for the World Commission on Dams. (1999)
- Assistance in preparation of technical affidavits submitted to the Federal Energy Regulatory Commission concerning the application by Hydro-Québec U.S. Inc. for energy marketer status. (1997)
- * **HéliMax Inc. :** Report on the Implications of the Kyoto Protocol for Renewable Energy Projects in Developing Countries (1999)
 - * **World Bank:** Critical review of French translation of *Environmental Assessment Sourcebook*, chapter on economic analysis of projects and policies. (1999)
 - * **Option consommateurs :** Study on traditional and incentive ratemaking approaches in electricity regulation (1998)
- Study on electricity market restructuring options and rate impacts. (1997)

* ***Standing Committee on the Economy and Labour, National Assembly of Quebec:***

Analysis of Hydro-Québec's Strategic Plan 2000-2004. (2000)

Analysis of Hydro-Québec's Strategic Plan in relation to the Committee's June 1997 recommendations; drafting of questions. (1998)

Expert assistance in oversight hearings concerning Hydro-Québec, especially with respect to market restructuring and energy efficiency, including drafting introductory texts, seminars with committee members, drafting report. (1997)

* ***Rivers Canada*** : Preliminary study on the implications of the restructuring of electricity markets in North America for the preservation of Canada's rivers. (1997)

* ***Quebec Forestries Industries Association:*** Workshop on electricity market restructuring and competition, and their impacts on Quebec electricity rates, energy efficiency and biomass generation. (1997)

* ***Averyt and Associates (for Green Mountain Power)*** : Report on Native issues in the context of Quebec energy policy. (1996)

* ***Ad hoc working group of American and Canadian environmental groups*** : Design of legislative mechanisms to reduce the environmental impacts of electricity restructuring. (1996)

1995- **Independent energy analyst**

Environnement Jeunesse (1996-97)

Representative at the *Commission of inquiry into Hydro-Québec's purchase policy for private producers.*

Université de Montréal (1995)

Coordination of a lecture series on *Energy and Resources at the Dawn of the 21st Century*. Lectures by David Freeman (then CEO of New York Power Authority), Allen Kupcis (CEO of Ontario Hydro) and Victoria Yegorova (Donetsk Research Institute, Ukraine).

Government of Québec: Natural Resources Department (1995)

Study on approach used for the regulation of energy in British Columbia and on the interest of this model for Quebec, published for the Quebec Public Debate on Energy.

Government of Canada: Environment Department (1995)

Quebec chapter of a study on the treatment of externalities (social costing methodologies) in Canada, under subcontract from Passmore Associates.

Grand Council of the Crees (of Québec) (1995-)

Expert assistance on costs and benefits of different generating technologies, alternative solutions, and methodologies for taking externalities into account in competitive energy markets.

**1992-95 Deputy Scientific Coordinator
Great Whale Public Review Support Office**

- ‡ Member of the support staff for the committees and commissions responsible for the assessment of the Great Whale project.
- ‡ Responsible for analyses concerning project justification.
- ‡ Drafting of preparatory documents and preliminary versions of reports; selection and oversight of consultants.
- ‡ Co-author, with James Litchfield and Roy Hemmingway, of a study on integrated resource planning and its application to the project.
- ‡ Editor of study on mitigation measures at the La Grande hydroelectric complex.
- ‡ Assisted in editing and publishing of 9 other studies on issues related to the project (mercury, dam safety, traditional ecological knowledge, etc.)
- ‡ Involved in designing, planning and carrying out all aspects of the public review process.

1987-92 Freelance science journalist

- ‡ Articles on energy, science and medicine in *Science*, *The New Scientist*, *The Medical Post* and other specialized publications.

ÉDUCATION

- 1976 M. Music (performance), Boston University
- 1974 B.A., *cum laude*, in philosophy, Yale University. Minor in biological sciences.

LANGUAGES

- ¶ **English, French and Spanish** (written and spoken fluently)
- ¶ **German and Italian** (limited comprehension)

CONFERENCE PRESENTATIONS

Present Value Analysis of the Site C Hydroelectric Project. Presentation to British Columbia Utilities Commission, Site C Inquiry, Technical Session, October 14, 2017.

Rencontre expert sur les surplus d'électricité. Commission sur les enjeux énergétiques du Québec. Montréal, le 21 octobre 2013.

Greenhouse gas emissions and hydropower. 13th Annual Waterkeeper Alliance Conference, Northwestern University, Evanston, Illinois, June 24, 2011.

Invited testimony, Senate Standing Committee on Energy, the Environment and Natural Resources. February 2011.

La filière hydrolienne : Une introduction. AQPER Colloque — Québec: Carrefour des énergies renouvelables octobre 2009.

L'avenir énergétique au Québec et ailleurs : structures institutionnelles et les nouvelles technologies d'énergie verte. Réseau des ingénieurs du Québec, Congrès annuel des ingénieurs, 25 novembre 2008.

Tarification sur la base des coûts, ou des coûts d'opportunité ? Réplique au Groupe de travail sur la tarification des services publics (Groupe Montmarquette), Forum québécois sur l'électricité, 14 mai 2008.

La filière de l'hydraulienne fluviale : un premier regard sur les coûts, Ocean Renewable Energy Group, Spring Symposium, Canada's Ocean Energy Future: New Partnerships and Wider Opportunities, Québec, 21 avril 2008 (à venir).

Les coûts de l'Entente Alcan: un deuxième regard, Conférence sur le développement durable dans l'industrie de l'aluminium (Céddi-AL), Baie-Comeau, Québec, September 20, 2007.

The Restructuring of North American Energy Markets, Seminario regional de OLADE sobre el futuro de los mercados energéticos en Latinoamérica y el Caribe, Buenos Aires, March 8, 2007.

Des monopoles aux marchés concurrentiels : Implications environnementales de la restructuration des marchés, 3e conférence internationale sur la mise à niveau

environnementale : Entreprise et économie d'eau et d'énergie, CITET, Tunis, le 8 décembre 2006.

Technologies émergentes de production d'électricité, AQPER Colloque sur l'énergie éolienne ... et autres énergies vertes 30 octobre 2006.

politiques européennes sur les énergies renouvelables, l', 9 juin 2006.

L'application conjointe : un outil méconnu mais prometteur, Les énergies traditionnelles, les énergies nouvelles, les énergies de demain », November 4, 2005.

La sécurité énergétique et les sources alternatives de production d'énergie : oui mais à quel prix ? », (Montreal, April 18, 2005).

« Le MDP dans la Francophonie: Fiches d'information sur le potentiel et les opportunités dans les pays de la Francophonie », présentation aux représentants de la Francophonie en marge de 10^e Conférence des parties de la Convention sur le climat (Buenos Aires, December 2004).

"Toward an International Green Standard for Small-Scale Hydropower, ," World Renewable Energy Conference, Denver, Colorado (September 2, 2004).

"The Role of Hydropower in Green Power Markets," Ontario Green Power Trade Show, (Toronto, Oct. 2002)

"Creating Value by Working with NGOs," HydroVision (Portland, Oregon, August 2002)

"Quebec Energy Policy," Environmental Law McGill Forum on James Bay and Sustainable Development (Montreal, March 2002)

"Approaches to Green Power Certification," Ontario Green Power Trade Show, (Toronto, Nov. 2001)

Guest Lecturer, Hydropower and Sustainable Energy Policy, Yale School of Forestry and Environmental Sciences, FES 850b (Energy Policy and Environmental Protection, 2001-02)

North American Commission for Environmental Cooperation, Symposium on Understanding the Linkages between Trade and the Environment (discussant). (Washington, D.C., October 2000)

Harvard Electricity Policy Group, Special Session: Retail and Wholesale Transmission Markets: Can They Be Unified? Defining the Issues and the Ramifications (Invited participant) (Washington, D.C., March 19, 1999)

Ontario Low Impact Stakeholders' Alliance, Public Workshop, *Environmental Ranking of Hydropower Facilities in Canada*. (Toronto, May 2000)

Canadian Association of Members of Public Utility Tribunals, annual meeting. Lecture on the implications of electricity deregulation for the environment. (1997, Whistler, B.C.)

National Forum on Markets, Regulation and the Future for Canadian Energy Utilities.
Talk on IRP in a competitive market. (1995, *Whistler, B.C.*)

Quebec Public Debate on Energy : presentations on the application of integrated
resource planning in the Quebec context and on resource portfolio analysis. (1995,
Montreal)

COMMITTEES, BOARDS AND AWARDS

- 2015 Finalist, R.J. Templin Award (CanWEA)
- 2010- Choeur de chambre Tactus, Board of Directors (Chair)
- 1999- Low Impact Hydropower Institute, Renewable Markets Advisory Panel (Chair
2003-)
- 1997- Helios Centre, Board of Directors (Vice President and Secretary)
- 2009-10 Ecologo Advisory Committee, Renewable Low-Impact Electricity
- 2008 Expert Review Panel, National Centres for Excellence, Centres of Excellence
for Commercialization and Research (CECR).
- 2007-08 Comité d'Experts francophones, Stratégies nationales de développement
durable des pays africaines, Délégation au développement durable de la
France.
- 2005 Conseil de la science et de la technologie du Québec, Groupe de travail sur
les défis en énergie.
- 2004-05 Quebec Climate Change Action Centre, Advisory Committee
- 2003-04 National Roundtable for Energy and the Environment, Ecological Fiscal
Reform and Energy Program, Advisory Committee on Energy Efficiency
- 1995-98 Working Group on Methodology, Focalisation, Evaluation and Scope of
Environmental Impact Assessment (NATO *Committee on Challenges to
Modern Society*)
- 1995-97 Environnement Jeunesse, Board of Directors

PUBLICATIONS

■ ACADEMIC AND TECHNICAL PRESS

- Hendriks, R., Raphals, P. and K. Bakker (2017) Reassessing the Need for Site C. Program on Water Governance, University of British Columbia: Vancouver.
- P. Raphals and R. Hendriks, Towards a Sustainable Low-Carbon Electric System: Challenges and Opportunities, in Potvin, C., et al. (eds.), *Acting on Climate Change: Extending the Dialogue Among Canadians*, UNESCO-McGill Chair for Dialogues on Sustainability, 2015 (in press).
- P. Raphals and R. Hendriks, Vers un système électrique sobre en carbone et durable : défis et opportunités, in Potvin, C., et al. (eds.), *Agir sur les changements climatiques : vers un dialogue élargi à la société civile canadienne*, UNESCO-McGill Chair for Dialogues on Sustainability, 2015 (in press).
- P. Dunsky and P. Raphals, Challenges for Effective Competition in Large Hydro-Dominated Markets — The Case of Québec, in Zaccour, Georges (ed.), *Deregulation of Electric Utilities*, (Boston : Kluwer Academic Publishers), 1998
- P. Dunsky and P. Raphals, « Pour une fiabilité énergétique accrue — Quelques leçons à tirer de la récente tempête de verglas », in *L'Énergie au Québec : Quels sont nos choix?* (Montréal : ÉcoSociété, 1998), pp. 85-98.
- P. Raphals and P. Dunsky, Ouverture des marchés de l'électricité au Québec — Modèles, impératifs d'une réelle concurrence et implications pour les prix globaux, *Option consommateurs*, October 1997
- M.A. Bouchard and P. Raphals, *Mécanismes et méthodologies d'évaluation d'impacts dans le cadre de la restructuration du marché de l'électricité*, Association québécoise pour l'évaluation des impacts, June 1997

■ TESTIMONY

- Raphals, P. and Hendriks, R. (October 2017). An Updated Present Value Cost Analysis of the Site C Project.
- Raphals, P. and Hendriks, R. (August 2017). Submission to the British Columbia Utilities Commission regarding the Site C Hydroelectric Project.
- Les achats de court terme d'Hydro-Québec Distribution, rapport d'analyse externe préparé pour le RNCREQ dans le cadre du dossier R-3986-2016 de la Régie de l'énergie du Québec, sur le Plan d'approvisionnement 2017-2026 d'HQ Distribution, 4 avril 2017.

- Avis de la Régie de l'énergie sur les mesures susceptibles d'améliorer les pratiques tarifaires dans le domaine de l'électricité et du gaz naturel, Rapport d'analyse externe pour le RNCREQ, dossier R-3972-2016 de la Régie de l'énergie, 18 janvier 2017.
- Costs and benefits to ratepayers of delaying the construction and commissioning of the Site C Hydroelectric Project, expert testimony submitted to the Supreme Court of British Columbia in reply to an injunction proceeding, February 11, 2016.
- Commentaires sur le dossier tarifaire 2016-17 d'Hydro-Québec Distribution, Régie de l'énergie du Québec, témoignage pour le RNCREQ, Régie de l'énergie du Québec, R-3933-2015, 10 novembre 2015.
- Costs and benefits of delaying the construction and commissioning of the Site C Hydroelectric Project, expert testimony submitted to the Supreme Court of British Columbia in support of a judicial review petition and injunction application of the Prophet River and West Moberly First Nations, July 7, 2015.
- Comments on the Amended 2013 General Rate Application of Newfoundland Labrador Hydro, expert testimony submitted to the Public Utilities Board of Newfoundland and Labrador on behalf of the Innu Nation, June 23, 2015.
- Bénéfices potentiels des compteurs « intelligents » pour répondre aux besoins en puissance, Régie de l'énergie du Québec, R-3864-2013, Plan d'approvisionnement d'Hydro-Québec Distribution, pour le RNCREQ, 21 mai 2014.
- Comments on the 2013 General Rate Application of Newfoundland Labrador Hydro, expert testimony submitted to the Public Utilities Board of Newfoundland and Labrador on behalf of the Innu Nation, April 28, 2014
- Response to BC Hydro Rebuttal Evidence, submitted to the Joint Review Panel for the Site C Hydroelectric Project on behalf of the Treaty 8 Tribal Association, January 18, 2014
- Need for, Purpose of and Alternatives to the Site C Hydroelectric Project, submitted to the Joint Review Panel for the Site C Hydroelectric Project on behalf of the Treaty 8 Tribal Association, November 25, 2013.
- Conformity of the Maritime Link Compliance Filing with the NSUARB Condition Concerning Market-Priced Energy, expert testimony submitted to the Nova Scotia Utility And Review Board on behalf of the Low Power Rates Alliance, November 7, 2013.
- Comments on the Proposed Maritime Link Project, expert testimony submitted to the Nova Scotia Utility and Review Board on behalf of the Canadian Wind Energy Association (CanWEA), April 17, 2013.
- Comments on the Justification for the Lower Churchill Transmission Project (Labrador-Island Transmission Link), submitted to the Canadian Environmental Assessment

- Agency — Comprehensive Study on the Lower Churchill Transmission Project and to the Government of Newfoundland and Labrador, Department of Environment and Conservation, expert testimony on behalf of Grand Riverkeeper Labrador Inc., June 12, 2012.
- Demande d'approbation du Projet de Lecture à Distance, Phase I d'Hydro-Québec Distribution, Régie de l'énergie du Québec, R-3770-2011, *Mémoire* du RNCREQ (with Christian Martel), December 6, 2012.
- Expert Testimony before the Public Utilities Board of Newfoundland Labrador on the Muskrat Falls Reference, February 23, 2012.
- Affidavit before the Federal Court of Canada concerning the judicial review of the Joint Panel Report on the Lower Churchill Generation Project (Court File No. T-2060-11), February 1, 2012.
- Comments on the Justification for the Lower Churchill Generation Project, submitted to the Joint Review Panel for the Lower Churchill Generation Project, on behalf of Grand Riverkeeper Labrador Inc., February 28, 2011.
- La politique d'ajouts : L'application du concept de neutralité tarifaire à la Charge Locale (Témoignage expert pour UC, ACEFO, FCEI, UMQ et ACEFQ), Régie de l'énergie du Québec, R-3738-2010, 15 novembre 2010.
- La modification des Tarifs et conditions de TransÉnergie en fonction de l'Ordonnance 890, Régie de l'énergie du Québec, R-3669-08 phase 2 (témoignage expert pour le RNCREQ et UC), 15 juin 2009 ; v. rév. 23 sept. 2010.
- La proposition du Transporteur concernant les Services de compensation des écarts de livraison et de réception, Régie de l'énergie du Québec, R-3669-08 phase 2 (témoignage expert pour le RNCREQ et UC), 19 juin 2009 ; v. rév. 23 sept. 2010.
- Les coûts évités d'Hydro-Québec Distribution, Régie de l'énergie du Québec, R-3708-09 (témoignage expert pour le RNCREQ), 3 novembre 2009.
- La tarification des Services de compensation des écarts de livraison et de réception, Régie de l'énergie du Québec, Régie de l'énergie du Québec, R-3669-08 (témoignage expert pour le RNCREQ), 4 novembre 2008.
- The Fixed Charge in Hydro-Québec Distribution's Domestic Rates, Régie de l'énergie du Québec, R-3677-08 (pour le RNCREQ), 28 octobre 2008.
- L'énergie éolienne, l'équilibrage et la demande à la pointe, dans le contexte du contrat patrimonial, Régie de l'énergie du Québec, R-3648-07 (témoignage expert pour le ROÉÉ et le RNCREQ), 28 mars 2008.
- Reforming the rate structure to better reflect marginal costs : Comments on Hydro-Québec Distribution's 2008 Rate Proposal (Testimony of Jim Lazar, in collaboration with Philip Raphals), Régie de l'énergie du Québec, R-3644-07, October 30, 2007.

- P. Raphals, Allocation of transmission costs in Hydro-Québec Distribution's 2008 rate filing, Régie de l'énergie du Québec, R-3644-07, October 30, 2007.
- Commentaires sur la demande tarifaire 2008 d'Hydro-Québec TransÉnergie, Régie de l'énergie du Québec, témoignage expert pour le RNCREQ, Régie de l'énergie du Québec, R-3640-07, 15 octobre 2007 (en anglais).
- Commentaires sur l'entente cadre 2006 entre Hydro-Québec Distribution et Hydro-Québec Production, Régie de l'énergie du Québec, R-3622-06, April 18, 2007.
- TransÉnergie's *Tarifs et conditions*: comments concerning rates, discounts, interconnection costs and generation imbalance service, Régie de l'énergie du Québec, R-3549 phase 2, Expert testimony, October 18, 2005.
- Implications pour Hydro-Québec Distribution de l'ajout des parcs éoliens en Gaspésie, Régie de l'énergie du Québec, R-3550-04, témoignage expert, May 25, 2005.
- Témoignage expert sur la demande tarifaire 2005 de TransÉnergie, Régie de l'énergie du Québec, R-3549-04, 22 décembre 2004.
- La contribution du projet Suroît à la sécurité des approvisionnements en électricité d'Hydro-Québec Production, Régie de l'énergie du Québec, R-3526-04, 22 avril 2004.
- Proposition pour un critère non monétaire relié au développement durable, Régie de l'énergie du Québec, du Québec, Régie de l'énergie du Québec, R-3525-04, 12 août 2004.
- Les coûts évités d'Hydro-Québec Distribution, Régie de l'énergie du Québec, R-3519-03, témoignage expert, 15 mars 2004.
- Le tarif BT et l'Entente concernant son alimentation, Régie de l'énergie du Québec, R-3492-02, phase 2, pour la Fédération des commissions scolaires du Québec, 22 octobre 2003.
- Concernant la demande d'approbation des dispositions tarifaires applicables à une option d'électricité interruptible, Régie de l'énergie du Québec, R-3518-03, 21 novembre 2003.
- On Hydro-Québec's Energy Efficiency Plan 2003-2006, Régie de l'énergie du Québec, R-3473-01, February 5, 2003 (expert testimony, with Tim Woolf).
- Rapport d'expert concernant les tarifs de court terme de TransÉnergie, Régie de l'énergie du Québec, R-3493-02, 13 septembre 2002.
- La sécurité des approvisionnements patrimoniaux dans le cadre du Plan d'approvisionnement, Régie de l'énergie du Québec, R-3470-01, phase 2, témoignage expert, April 23, 2002.

- Testimony Concerning Hydro-Québec's Revised Application For The Modification Of Rates For The Transmission Of Electric Power, Quebec Energy Board Régie de l'énergie du Québec, R-3401-98, February 7, 2001 (expert testimony with Peter A. Bradford and Ellis O. Disher).
- Critical Review of the Reliability Assessment Prepared for the Régie de l'énergie du Québec, Régie de l'énergie du Québec, R-3416-98, June 7, 2000 (with Robert McCullough).
- General Regulatory Principles Concerning the Choice of Test Year and the Identification and Treatment of Non-Regulated Activities, Régie de l'énergie du Québec, R-3405-98, April 9, 1999 (expert testimony with Peter A. Bradford).
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Professional cellist

Choral singing (amateur)