Section:		**Page No.:**	**6-17, lines 13-14**
Topic:			
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Issue:	**Pre-Filed Testimony of Patrick Bowman**		

PREAMBLE TO IR (IF ANY):

"The market for conservation devices and activities is well accepted to be maturing and accelerating in many areas."

Understanding basis of assertion.

QUESTION:

a) Please provide the documents that demonstrate that "The market for conservation devices and activities is well accepted." in the absence of conservation programs.

b) Please define the terms "many areas" as Mr. Bowman uses it here, and specify whether he is referring to geographical areas, customer segments, technologies, or something else.

c) Please explain whether by "well accepted," Mr. Bowman means that the idea is accepted, or that customers are accepting the conservation measures in the absence of conservation programs and incentives.

d) Please list the "many areas" to which Mr. Bowman refers.

RESPONSE:

(a)

Mr. Bowman's comments are not based on a specific document. However a large range of industry and government documents and information portray the general market maturation and development for energy efficiency investments and devices. For example, Canadian climate change efforts include significant advancement in building code requirements for

energy efficiency.[1] As part of building codes, the technologies become required investments in new construction, and does not require marketing programs by Manitoba Hydro to advocate the technology.

Similarly, the mass market availability of a large range of energy efficiency equipment, such as LED light bulbs, smart thermostats, and commercial lighting, by mass market manufacturers (e.g., in respect of smart thermostats - Google, Honeywell, and Microsoft) and broad retail establishments means these are not niche products. Each of these technologies is included under Hydro's DSM spending.

(b)

Customer segments and technologies.

(c)

The technologies referenced are in the mass market, customers are adopting the technologies. Payback times are short (e.g., smart thermostats advertised as 2 years).

(d)

See part **(b)**.

[1] E.g., https://www.canada.ca/en/services/environment/weather/climatechange/pan-canadian-framework/complementary-actions-reduce-emissions.html.

Section:		**Page No.:**	**6-18, lines 2–3**
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PREAMBLE TO IR (IF ANY):

"It is reasonable to conclude that absent Hydro's DSM spending much of the same conservation achievements would be seen over the long-term."

Understanding basis of assertion.

QUESTION:

a) Please quantify the meaning of "much of the same conservation achievements." Does Mr. Bowman mean 5%, 50%, or 95%?

b) Please quantify the meaning of "the long-term." Does this mean 20 years?

c) Please provide the basis for Mr. Bowman's "reasonable" conclusion.

d) Please provide any analysis or report that Mr. Bowman relied on, regarding the rate at which electric customers have installed higher-efficiency lighting, both with efficiency programs and without such programs.

e) Does Mr. Bowman believe that the PowerSmart program assumptions require increased scrutiny from independent experts, to improve the savings estimates? If so, how does he believe that scrutiny should be structured?

RESPONSE:

(a)–(c)

Mr. Bowman has not quantified the adjective "much"; however, there are two factors that lead to Mr. Bowman's conclusion:

The energy savings value with respect to generation deferral arises in the 2030s (new plant is not required before about 2030 without any DSM, and about 2040 with DSM). So energy saved today by a program that matures and sees attrition before the 2030-2040 period is of limited value for generation deferral – at most such energy is valuable for export for a limited time period. However, as reviewed extensively in the GRA, the market value of exported power continues to decline and suggests significant limits be recognized in the value of such programs.

An example of this may be Hydro's "refrigerator retirement program". Among the residential programs, this is Hydro's biggest single initiative through 2026 (Appendix 7.2, pdf page 86 of 128) peaking at 45.6 GW.h/year savings. However, the effect of this program then quickly wears off, as would be expected given the fridges are being retired today, and are likely the older second fridges in use in an individual's home. Assuming that the average fridge retired is 15 years old at the time Hydro takes it out of the house, by 2026 this fridge would be over 25 years old – in short, there is a likelihood this fridge would have been retired in any event after 2026, so Hydro has only incented an advancement of the retirement of the fridge. By 2030, when the best value of avoided energy is starting to arise, tied to generation deferral, the savings from this program are estimated at only 7.6 GW.h and rapidly declining, or less than 20% of the peak savings. In short, there is little to no long-term benefit to this program that targets any timeframe relevant to generation deferral.

The long-term forecasts used by Hydro fail to take into account attrition arising from a proper counter-factual baseline. While Hydro may incent certain investment in advancing energy efficient technology, there needs to be consideration that, absent Hydro's investments, customer choices would not necessarily stay stagnant. A savings arising from getting a customer to stop using a non-energy-efficient technology in 2017 can be recorded as a benefit of DSM in 2017, 2018 etc.; however, this does not mean that the customer would not, in the absence of DSM, stopped using that technology of their own accord at some point in future years or decades, even absent DSM spending by Hydro.

Consider the LED streetlighting program, which is Hydro's second largest commercial DSM program as at 2023. Hydro records a benefit from this program growing from 9.4 GW.h in 2017 to 42.6 GW.h in 2021. At that date, Hydro stops its annual $10 million spending on this program (Appendix 7.2, pdf page 87 of 128). However, Hydro indicates that the full 42.6 GW.h annual benefit continues flat at least to 2031 with zero attrition (and potentially beyond for a substantial period – no projections are provided beyond 2031 in the 15 year plan so it is not known how long Hydro continues to assume a benefit). Implicit in this assumption is that, absent Hydro spending on incentives in the 2017-2021 period, the customer would have continued to have no investment whatsoever in energy efficient lighting and would have continued to use the prior technology (HPS, 1970s technology). A

more realistic baseline should have considered (1) that, absent Hydro's investment in a major LED changeout, there is a reasonable basis to conclude that LED technology may have become the industry standard and would have been in use as a baseline before 2030, and (2) that as LED prices fall, the full changeout program potentially could have been completed in a date prior to the "need" date which arises in the 2030s, at a cost much less than the program undertaken (with potentially no DSM funding needed at all, just normal utility investment assigned to the customer). If these alternative scenarios were considered as the baseline, the "savings" from the LED program over the relevant long-term would have been much lower than claimed by Hydro. A similar example arises for residential LED lighting – if any energy savings assumption is that the baseline is the technology the customer was using BEFORE the LED bulb was installed (e.g., incandescent) this would record a large energy savings, ignoring that in the future the customer would have had no option to continue using the incandescent bulb and would have had to use a more efficient choice, as these bulbs are now banned in Canada. In short, even absent Hydro's DSM program, it is reasonable to assume much of this energy efficiency would have had to arise by 2030 (assuming at most very few incandescent bulbs in use would last 20 or more years).

(d)

Mr. Bowman has not relied on any specific report regarding Manitoba Hydro.

(e)

Mr. Bowman's concerns regarding the DSM programming relate to the conceptual framework that Hydro uses to determine savings. Additional independent expert review will not be of benefit without an assessment framework that:

1) Provide for a credible assessment of attrition (this part Hydro appears to include– e.g., the fridges example above – proper review may benefit assessing if this analysis has been done reasonably).

2) Provides for a credible assessment of the evolving baseline against which the energy savings should be measured. This is in part at the root of the overly optimistic assumptions regarding LED streetlighting failing to consider the likely natural adoption of the technology (or, for some programs, even better technology).

3) A credible assessment of optimizing timing. For example, even if an LED streetlight changeout can pass simple economic metrics today compared to a proper baseline, is it likely that waiting a number of years (during which the energy savings are of low value anyway) and undertake the changeout in future years when the technology may have become less costly, more functional, or the alternatives become unavailable in

> the market (such as by natural market drop-off, if HPS were to become far less available) and potentially therefore require less DSM funds (if at all). The basic premise being, why would Hydro pay to incent a customer to do something now that the customer will be required and/or elect to do on their own anyway in a few years, especially if the power benefits over that few years of delay are of limited value on export markets and are of no generation deferral value.

It is Mr. Bowman's understanding that further independent assessment will be required in future in any event under the new Efficiency Manitoba Act.

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PREAMBLE TO IR (IF ANY):

"Near-term Environmental Benefits: Changes in the US and Saskatchewan utility supply mix now suggest that there is a much lower likelihood that exported power from Manitoba would serve to offset coal generation, which is the highest environmental value for exported power."

Understanding basis of assertion.

QUESTION:

a) Please describe, quantify and document the "Changes in the US and Saskatchewan utility supply mix" to which Mr. Bowman refers.

b) Please provide the documents and computations that underlie Mr. Bowman's conclusion that "there is a much lower likelihood that exported power from Manitoba would serve to offset coal generation."

c) Please quantify the "much lower" likelihood to which Mr. Bowman refers.

    a. Please provide Mr. Bowman's estimate of this likelihood for exports to US MISO utilities.

    b. Please provide Mr. Bowman's estimate of this likelihood for exports to Saskatchewan.

d) Please identify the type of generation that Mr. Bowman believes will be more likely to be offset by exports, as a result of exports being less likely to offset coal generation.

e) Is Mr. Bowman aware of any coal plants in the US MISO system or in Saskatchewan whose retirement may be accelerated by deliveries of firm power from Manitoba Hydro?

f) Please quantify the "environmental value for exported power" that serves to offset each of the following existing energy sources:

   a. coal-fired plants,

   b. gas-fired boiler plants,

   c. gas-fired simple-cycle combustion turbines, and

   d. gas-fire combined-cycle combustion turbines.

RESPONSE:

(a)-(d)

The focus on near-term is power freed up from DSM activities in advance of that power serving a role in generation deferral in Manitoba, so up until about 2030.

With respect to MISO, coal generation is down while natural gas (and renewables) are up, combined with a reduced relevance of coal as a marginal fuel, as noted in the following except from Potomac Economics, MISO's market monitor:[1]

> Another indication of highly competitive markets is that electricity price movements had a "strong relationship" with natural gas prices, Patton said. Natural gas prices dropped by 50% in 2015, while average real-time electricity prices fell 32% to $27/MWh.
>
> "The cost advantage of coal has been shrinking," Patton said.
>
> As a consequence, coal-fired generation's share of the market fell from about 58% in 2014 to about 52% in 2015, while natural gas-fired generation's share swelled from 17% in 2014 to 23% in 2015.
>
> And natural gas-fired generation has increased its percentage of setting the system wide marginal price from 59% in 2014 to 76% in 2015, while coal-fired generation's marginal price percentage plunged from 40% in 2014 to 23% in 2015.

[1] As reported: https://www.platts.com/latest-news/electric-power/houston/miso-energy-markets-efficient-capacity-markets-26481117.

> "Even in off-peak hours, natural gas is setting prices more frequently than it has in the past," Patton said.
>
> The 2016 market monitor report notes:[2]
>
> Historically, baseload coal-fired units set prices in the majority of hours. After the integration of MISO South and the reduction in natural gas prices over the past two years, gas-fired units set MISO's energy prices in most peak hours and in constrained areas.

With respect to SaskPower, the absolute constraint is that "The federal government states that all coal-fired units built before 1975 must close by 2020, and units built after 1975 will close by 2030".[3] These retirements will occur regardless of the presence of additional Manitoba Hydro generation. SaskPower further notes that their system dispatch order is based on natural gas as their internal incremental fuel, and imports will be weighed against this source:

http://www.saskratereview.ca/docs/saskpower2017/saskpower-2018-rate-application-srrp-round-1-irs-q1-to-q148-public.pdf

Page 54 has the information about the system dispatch order and notes that dispatchable gas is usually last in line.

(e)

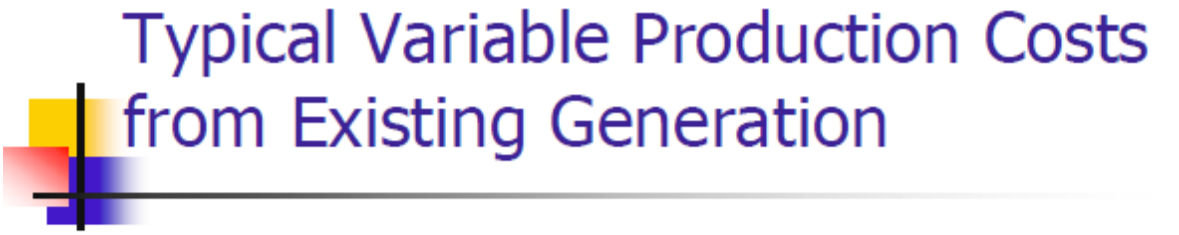
Coal plant retirements are not anticipated to be adjusted due to increased Manitoba Hydro export over the near-term. Plant changes are generally only underpinned by long-term export arrangements on a firm basis.

(f)

Please see Figure 1 below, which is excerpted from Manitoba Hydro's Appendix 56 Attachment 6 from the 2010 GRA, noting the emissions factors for the fuel sources noted.

[2]https://www.misoenergy.org/Library/Repository/Report/IMM/2016%20State%20of%20the%20Market%20Analytical%20Appendix.pdf.
[3] http://www.saskpower.com/our-power-future/our-electricity/supply-options/coal/.

Figure 1: Excerpt from Manitoba Hydro's Appendix 56 Attachment 6 from the 2010 GRA



Plant Characteristics	Coal Plant	Combined Cycle Gas Turbine	Simple Cycle Gas Turbine
Typical Coal Heat Rate range	10,000 - 12,000 Btu/KWh		
Typical Combined Cycle Heat Rate range		7,500 - 10,000 Btu/KWh	
Typical Combustion Turbine Heat Rate range			9,000 - 13,500 Btu/KWh
Approximate Non-Fuel O&M ($/MWh)	$4.00	$7.00	$10.00
Typical Emssions Rates (Tons CO2/MWh)	1.17 - 1.41	0.43 - 0.59	0.52 - 0.82