MANITOBA PUBLIC UTILITIES BOARD

IN THE MATTER OF *The Crown Corporations Public Review and Accountability Act*

AND IN THE MATTER OF the Manitoba Hydro filing in respect to Increase Electric Rates for 2010/11 2011/12

REBUTTAL EVIDENCE OF MANITOBA HYDRO

WITH RESPECT TO THE WRITTEN EVIDENCE OF:

- **DR. ATIF KUBURSI AND DR. LONNIE MAGEE – Independent Consultants retained by the Manitoba Public Utilities Board ("PUB")**
- **DR. TOM CARTER, CARTER RESEARCH ASSOCIATES INC. on behalf of The Consumers' Association of Canada (Manitoba) Inc./Manitoba Society of Seniors ("CAC/MSOS")**
- **M. GREG MATWICHUK, STEPHEN JOHNSON, CHARTERED ACCOUNTANTS on behalf of The Consumers' Association of Canada (Manitoba) Inc./Manitoba Society of Seniors ("CAC/MSOS")**
- **JOHN D. MCCORMICK, J. D. MCCORMICK FINANCIAL SERVICES, INC. on behalf of The Consumers' Association of Canada (Manitoba) Inc./Manitoba Society of Seniors (CAC/MSOS)**
- **PAUL CHERNICK, RESOURCE INSIGHT, INC. on behalf of Resource Conservation Manitoba / Time to Respect Earth's Ecosystems ("RCM/TREE")**
- **ROGER COLTON, FISCHER SHEEHAN & COLTON on behalf of Resource Conservation Manitoba / Time to Respect Earth's Ecosystems ("RCM/TREE")**
- **JONATHON WALLACH, RESOURCE INSIGHT, INC. on behalf of Resource Conservation Manitoba / Time to Respect Earth's Ecosystems ("RCM/TREE")**
- **PATRICK BOWMAN AND ANDREW MCLAREN INTERGROUP CONSULTANTS LTD. on behalf of Manitoba Industrial Power Users Group ("MIPUG")**

December 31, 2010

Manitoba Hydro

MANITOBA HYDRO
2010/11 & 2011/12 GENERAL RATE APPLICATION

REBUTTAL EVIDENCE

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An unprecedented ten witnesses have filed eight reports in evidence in Manitoba Hydro's General Rate Application for the years 2010/2011 and 2011/2012:

- Dr. Atif Kubursi and Dr. Lonnie Magee – Independent Consultants retained by the PUB
- Dr. Tom Carter on behalf of CAC/MSOS
- M. Greg Matwichuk on behalf of CAC/MSOS
- John D. McCormick on behalf of CAC/MSOS
- Paul Chernick on behalf of RCM/TREE
- Roger Colton on behalf of RCM/TREE
- Jonathon Wallach on behalf of RCM/TREE
- Patrick Bowman and Andrew McLaren on behalf of MIPUG

Given the tight timeline allotted for the preparation of Manitoba Hydro's Rebuttal evidence, Manitoba Hydro has focused on the more significant areas of disagreement with the various reports. Failure to address a statement or assertion should not be interpreted as agreement. Manitoba Hydro reserves the right to address statements made in witness reports or in response to Information Requests during the course of the hearing.

FINANCIAL TARGETS & RATE STABILIZATION RESERVES

In this section of Rebuttal, Manitoba Hydro focuses on the evidence of the PUB's Independent Consultants Dr. Atif Kubursi and Dr. Lonnie Magee and CAC/MSOS' witness Greg Matwichuk regarding financial targets and rate stabilization reserves (RSR's). Manitoba Hydro outlines the benefits of the cost of service rate setting construct and refutes the alleged benefits of RSR's, export revenue variance accounts, minimum retained earnings targets and special rate riders. Manitoba Hydro also addresses the importance of its financial targets and the impact of those financial targets on the credit ratings of the Province of Manitoba.

Manitoba Hydro's Risk Tolerance is Aligned with that of its Ratepayers

Both the KM and CAC/MSOS evidence theorize that there may be "misaligned risk tolerances" between Manitoba Hydro and its domestic ratepayers.

Manitoba Hydro strongly disagrees that there are misaligned risk tolerances between it and its ratepayers. As a Crown Corporation, all of Manitoba Hydro's activities are focused on delivering service and value to ratepayers. Manitoba Hydro has no mandate or motive to enrich a select group of shareholders. The ultimate shareholders of Manitoba Hydro are the ratepayers and the citizens of Manitoba. As such, Manitoba Hydro's risk tolerances are totally aligned with its ratepayers.

There are a number of reports on the record of this proceeding that examined Manitoba Hydro's risk management practises and conclude that they are reasonable and in line with best practises in the utility industry. This conclusion is supported by MIPUG on pages 34 and 35 of its evidence as follows:

> *"For all intents and purposes, it appears all the major reports conclude that Hydro's systems and approaches for managing risk, particularly risks related to bulk power and marketing are reasonable. Each notes that there are means to improve or strengthen risk management practices via changes that are appropriately in the realm of Hydro's management team and not the regulatory forum."*

The view expressed in the KM evidence that the PUB is the only mechanism to review Manitoba Hydro's risk tolerance is not correct. Contrary to this statement, various levels of internal and governmental review (Manitoba Hydro-Electric Board, Crown Corporations Council, Standing Committee of the Legislature, Lieutenant Governor in Council, Auditor General of Manitoba as well as a number of Federal and Provincial regulatory bodies), in addition to the PUB, provide ample opportunity to assess Manitoba Hydro's performance in managing its risk and ensure it provides value to its customers.

Manitoba Hydro's Ratepayers have Benefited Significantly from Export Revenues

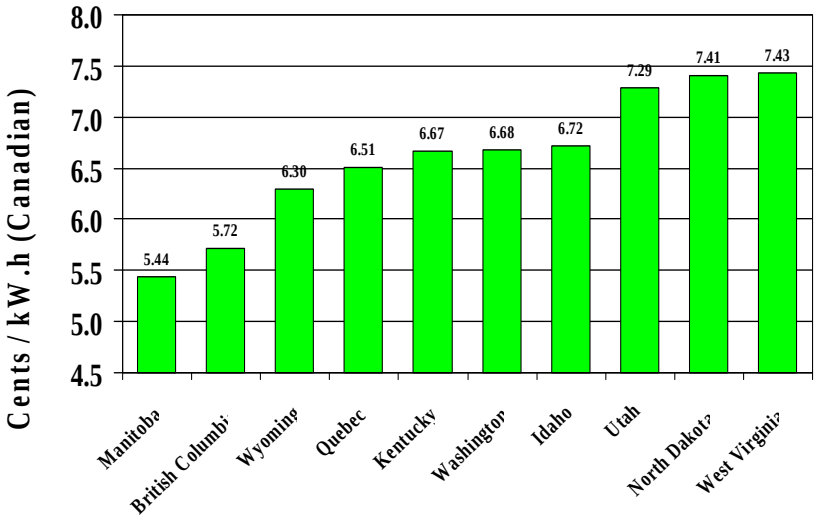
The CAC/MSOS evidence opines that "*domestic ratepayers have not explicitly benefitted from the rewards of the risks they bear*" from actual export revenues that are greater than forecast and further concludes that these rewards are internalized and used at Manitoba Hydro's discretion.

Manitoba Hydro asserts that there is ample evidence that its ratepayers have received the substantial benefits from export revenues as can be demonstrated by the following facts:

- Manitoba Hydro has the lowest rates in North America.
- Manitoba Hydro's cumulative rate increases have been lower than other comparable Canadian jurisdictions.
- Over the last twenty years cumulative rate increases have been well below the rates of inflation. This means that the "real" price of electricity is lower than it was twenty years ago.

One of clearest ways of demonstrating that Manitoba Hydro has been successful in passing along the benefits of export revenues to ratepayers is that its overall rate level has been and continues to be among the lowest of North American utilities. Manitoba Hydro achieved this significant accomplishment without sacrificing the high standard of electric service that Manitobans receive. The CAC/MSOS fails to recognize these achievements in its evidence. Figure 1 below shows the comparison of average retail electricity prices of the ten lowest cost provinces or states in North America.

Figure 1



Source: US Dept of Energy (May 2010) & Edison Electric Survey (January 2010)
(Exchange rate = 1.0279)

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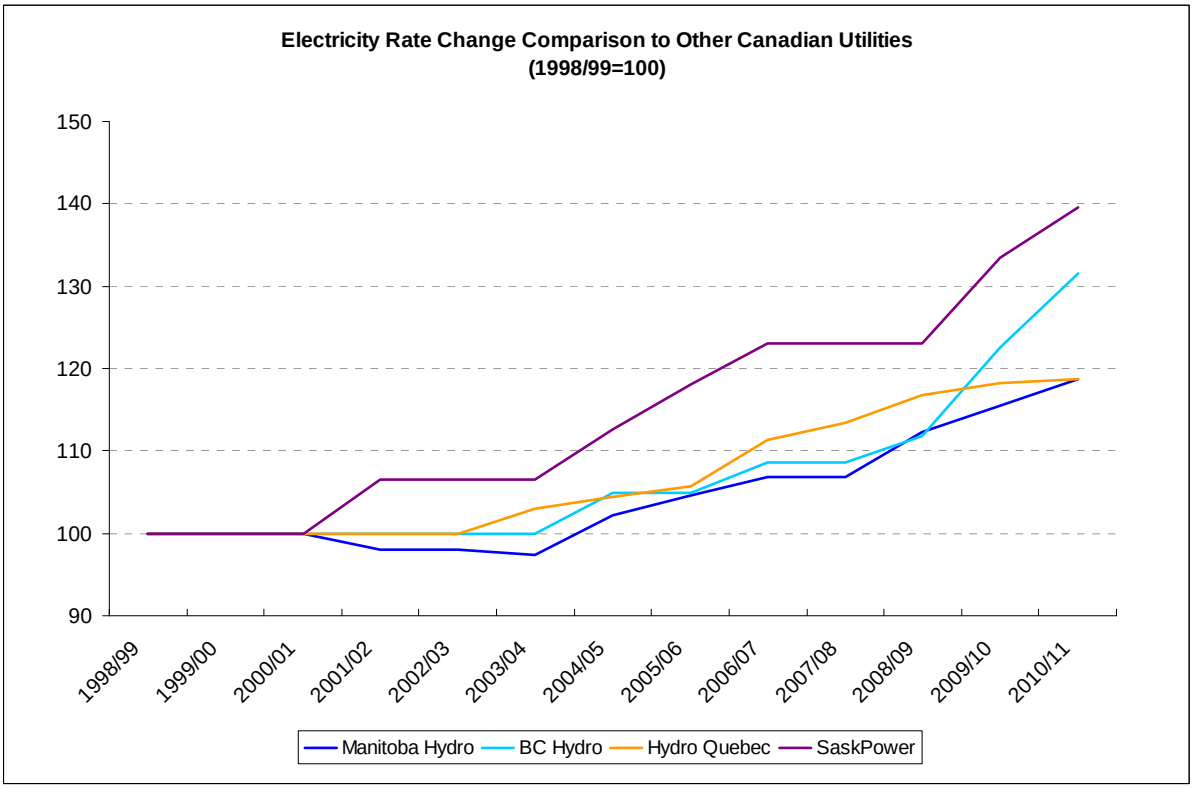
Manitoba Hydro's achievement of the lowest overall rates is not a one-time phenomenon. Manitoba Hydro customers have enjoyed lower rate increases over the past several years relative to other comparable Canadian electric utilities. Over the 11 year period since 1999, the cumulative 19% rate increase in Manitoba to 2010 compares to BC Hydro's cumulative 32%, Hydro-Quebec's cumulative 19% and SaskPower's cumulative 40% rate increases over the same period as is demonstrated in Figure 2 below.

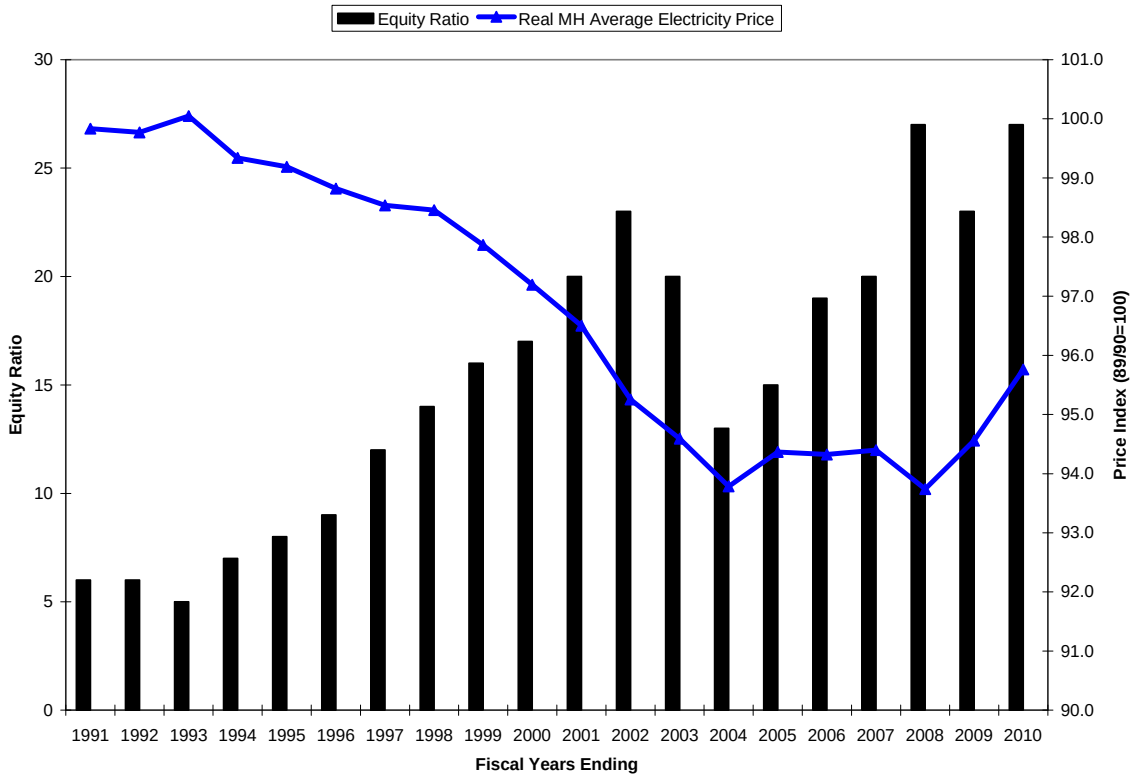
Figure 2



While the CAC/MSOS evidence emphasizes that Manitoba Hydro has had a number of general rate applications since 2004, the rate increases implemented in this period have been modest and follow on the heels of seven years where rates were held constant.

The financial strength of the Corporation has improved significantly over the last two decades due partly to excellent export market conditions. Ratepayers have benefited significantly over this period of time as demonstrated in Figure 3 below. As indicated, the real electricity prices have declined over the last twenty years while the equity ratio has improved over the same period.

Figure 3



Ratepayers not only benefit from low rates but also from improvements in the financial position of the Corporation. In a Crown-owned Corporation such as Manitoba Hydro, there are no other stakeholders who directly benefit from improvements in the financial position of the Corporation other than ratepayers.

The Cost of Service Rate Setting Model is Working for the Benefit of Ratepayers

Manitoba Hydro's current approach to managing financial risk is to use its financial targets (debt to equity ratio, interest coverage ratio and capital coverage ratio) to guide in decision making and rate proposals. A major part of this approach is maintaining a debt to equity target ratio in order to provide a level of equity that is sufficient to withstand the financial impacts of the risks faced by the Corporation as well as implementing regular and reasonable rate increases using the cost of service rate setting model while being sensitive to rate stability and customer impacts.

CAC/MSOS's evidence indicates that any under-forecasting of export revenues by Manitoba Hydro results in customers' rate increases being higher than what they otherwise need to be. Manitoba Hydro does not agree with this viewpoint and observes than any variances between actual and forecast export revenues do not harm ratepayers as a result of the self-correcting nature of the cost of service rate setting model. Under this model, any variances between actual and forecast export revenues flow to retained earnings. The current and future expected level of retained earnings is one of the prime considerations in determining future rate increases and as such any positive variances will serve to reduce future rate increases. This conclusion is supported by MIPUG on pages 26 and 27 of its evidence as follows:

> *"The suggestion that the "potential" rewards of risk-taking are internalised within MH" is not true in the financial sense for the same reason as noted above – all "rewards" (ceteris paribus) will in effect show up in larger net income and ultimately in Retained Earnings (and lower debt borrowings and related interest costs). In time, these higher levels of debt:equity will lead to lower requirement for domestic rates."*

The current cost of service rate setting model coupled with Manitoba Hydro's general rate making approach of gradualism and sensitivity to customer impacts has and continues to provide the flexibility that is necessary to ensure rate stability for ratepayers. This is evidenced by Manitoba Hydro's approach in dealing with the negative financial consequences of the 2004 drought. This approach allowed Manitoba Hydro to recover from the financial impacts of the drought through a series of smaller rate increases without the need to resort to a large rate increase nearing double digits.

As was demonstrated in the previous section, Manitoba Hydro's approach has been very successful in the last 20 years in terms of improving the financial position of the Corporation and sharing the benefits of export revenues with ratepayers. IFF10 demonstrates that this approach can be used successfully in the future to protect customers against the major financial risks of the Corporation in that retained earnings are projected to increase significantly to $4.3 billion in the next decade. Use of the current cost of service rate setting model together with regular and reasonable rate increases is working for the benefit of

customers and is a flexible mechanism which allows for the most appropriate rate setting responses based upon current circumstances and future financial projections.

It would seem fairly evident that the annual review of the financial position, financial projections and rate proposals of the Corporation by the Manitoba Hydro-Electric Board and the periodic review through a public hearing process of those rate proposals by the PUB is indeed a reliable and formalized mechanism to ensure fair and reasonable rates for ratepayers. Moreover, it is a transparent approach that has proven to be successful and, as such, does not require the added complexity of the recommendations put forward by various Intervenors.

There are No Additional Benefits of RSR's, Variance Accounts or Special Rate Riders

Manitoba Hydro does not agree that there is a need for or any additional benefit of establishing a RSR or a special rate rider fund or moving away from the debt to equity target in favour of establishing a minimum level of retained earnings as has been recommended by the Intervenor witnesses.

CAC/MSOS indicates on page 27 of its evidence that *"the general purpose of a RSR is to provide ratepayers with some level of protection against large rate increases that may become unavoidable due to sudden or unanticipated adverse conditions"*.

However, CAC/MSOS then goes on to refer to the recommended mechanism as a *"regulatory liability/asset"*, which appears to be a form of an export revenue deferral or variance account and not an RSR. It was subsequently clarified in the response to MIPUG/CAC/MSOS-3(a) that the mechanism being recommended was *"akin to a review of a disposition of a variance account or the gas variance account of Centra Gas Manitoba Inc."* The proposal will result in an automatic amortization of export variances each and every year which may or may not coincide with a significant financial loss or other financial and rate setting signals that are prevalent at the time. As such, this mechanism will not serve to stabilize rates in the event of a significant financial loss.

Manitoba Hydro submits that a RSR serves no further purpose than retained earnings as a means of mitigating losses; the former is merely a subset of the latter. In fact, as was noted in the response to Directive #6 from Order 101/04, Manitoba Hydro had for many years maintained a segregation of its retained earnings into a Rate Stabilization Reserve and a Contingency & General Reserve and in 1992 the two reserves were consolidated into one Reserve account which was subsequently renamed "Retained Earnings" in 1993. Other comparable Canadian hydro-electric utilities, such as BC Hydro and Hydro-Quebec do not employ RSR's. BC Hydro established a RSR in 2000 but subsequently revoked it in 2004. Similar to Manitoba Hydro, these utilities rely on a reasonable capital structure to guard against losses and manage financial risk.

As was explained in the previous section, because of the self-correcting nature of the cost of service rate setting model, an export revenue variance account is not necessary and would serve no additional purpose.

KM has outlined conceptual recommendations in terms of a minimum retained earnings target and a special rate rider but has offered few details on the quantum of these measures and how they would function, instead opting to say that this would be worked out between Manitoba Hydro and the PUB in the future.

The above noted recommendations by the Intervenors would all limit the flexibility of the current approach by moving to mechanistic constructs that offer no net benefits to the ratepayers and may result in higher rate increases to customers than necessary in the case of special rate riders. Manitoba Hydro is also of the view that the time and energy spent debating and devising rules around these mechanistic approaches would be distracting and take the focus off of the real issue, protecting customers from sudden and large rate increases through sound financial and ratemaking policy.

Importance of Retained Earnings & Financial Targets to Manitoba Hydro

CAC/MSOS's contentions that retained earnings are not a strong indicator that an entity can withstand adversity and that no level of debt to equity target can be supported for Manitoba

Hydro is curious in light of well established financial principles and previous findings of the PUB in past Orders.

As a Crown Corporation, Manitoba Hydro does not issue any share capital and it is financed exclusively through retained earnings and debt. All things being equal, the less retained earnings that Manitoba Hydro has the more debt that is required to finance its operations. The more debt or leverage that is employed by the Corporation then more fixed payments and the more financial risk. It is the ratepayers that ultimately bear the risk of Manitoba Hydro's operations and as such the more financial risk for the Corporation, the more risk for the ratepayer.

Therefore, CAC/MSOS's conclusion that retained earnings and debt to equity ratios are not important to Manitoba Hydro and represent a corporate versus ratepayer perspective seems to be at odds with their stated desire to protect the ratepayers from the risks that they bear. What CAC/MSOS fails to recognize in its evidence is that retained earnings in a publically owned Corporation like Manitoba Hydro is not for the benefit of management or private shareholders but rather for the benefit of ratepayers.

Government business entities like Manitoba Hydro are by their nature designed to be financially self-sustaining and generate sufficient revenues to cover their costs including debt servicing and repayments without requiring support from their Provincial owner. As such, these types of organizations should have modern financial targets that allow for an appropriate understanding by their stakeholders of their financial position and comparability within the utility industry much like profit-oriented organizations. The modern financial targets contrast with rather archaic structures such as rate stabilization accounts which were abandoned by Manitoba Hydro the better part of two decades ago. Manitoba Hydro's approach is consistent with other comparable Crown-owned electric utilities in Canada like B.C. Hydro and Hydro Quebec and is commonly understood and accepted by the financial community.

CAC/MSOS indicates that the fact that Manitoba Hydro's debt to equity ratio is projected to slip below the target in the decade of investment suggests that the 75:25 target has limited value. While the management and Board of Manitoba Hydro is concerned about the

potential slippage in the financial ratios and will do everything they can to manage as close to the targets as possible the requirement to invest in new generation and transmission assets to meet the future energy needs of Manitobans does not negate the value of having long-term financial targets. Manitoba Hydro therefore strongly disagrees with CAC/MSOS's assertion that its debt to equity target is irrelevant during a period of substantial investment.

The PUB echoed this view as part of its finding in Order 1116/08 at page 147:

> *"The three measures of financial health and stability (debt to equity, interest coverage and capital coverage) are taken seriously by debt rating agencies and others, and while the ratios may not be expected to be maintained throughout the whole forecast period due to the effects of the expanded capital program, they still remain important."*

CAC/MSOS also questions the need for Manitoba Hydro to have an interest coverage target in excess of 1.0 and in the response to PUB/CAC/MSOS 24 (a), recommends that the interest coverage target for rate setting purposes be changed from 1.20 to somewhere in the range of 1.05 to 1.10. There is no evidence offered to support this recommendation.

An interest coverage target at or greater than 1.2 provides a measure of assurance that the Corporation is generating sufficient net income to pay all operating expenses including interest payments to bondholders and is a ratio that is closely monitored by credit rating agencies. The importance of this financial target was also recognized by the PUB in Order 143/04 at page 92 where it expressed concern over a previous change in the target from 1.20 to 1.10 and requested that Manitoba Hydro reconsider this change. Manitoba Hydro subsequently reviewed the issue and returned the interest coverage target back to 1.20 in 2005.

Importance of Manitoba Hydro's Financial Performance to Provincial Credit Ratings

CAC/MSOS concludes that Manitoba Hydro's financial performance as evidenced through its financial targets is not an important consideration in the credit ratings and cost of financing of the Province of Manitoba and Manitoba Hydro. This conclusion is erroneous

based on past evidence provided by Manitoba Hydro, previous findings of the PUB and third party evidence from external credit rating agencies reports.

The credit ratings of Manitoba Hydro are a flow-through of the ratings of the Province of Manitoba given that the Province issues and guarantees the vast majority of Manitoba Hydro's debt. It is clear from the documents that form part of this proceeding that Manitoba Hydro's financial performance, as evidenced by its financial targets and ratios and in particular the assessment that its debt is self-supporting forms an important consideration in the credit ratings and by extension, the financing costs of the Province of Manitoba and Manitoba Hydro. The following excerpts from the MHEB Credit Rating reports demonstrate this fact:

> *"As noted above, MHEB's rating primarily reflects the Province's guarantee and liquidity support. However, MHEB's financial ratios, including interest coverage, are an indication of the extent to which it is capable of supporting its debt independently, which is a consideration in the rating of the Province."* (Moody's Credit Opinion – MHEB – Appendix 39, Attachment #2)

> *"In our opinion, the ratings on Manitoba reflect the province's gradually falling tax-supported debt burden and strong financial and economic performances. Offsetting these strengths are Manitoba's direct and tax-supported debt burdens, which are average compared with those of its Canadian and international peers; and ongoing increases in the self-supported debt of Manitoba Hydro. The ratings on Manitoba capture the company's contribution to the province's business risk and cash flow. This report focuses on the utility's business risks and financial risk profile."* (S&P – Corporate Credit Rating – MHEB – Appendix 32, Attachment #3)

The PUB findings on this issue in Order 116/08 support the view that the financial health of the Corporation is not only important to the future of the utility and its customers but also to Manitobans in general as the financial strength of Manitoba Hydro has a significant influence on the finances and the credit rating of the Province and were as follows:

"It is the Board's understanding that rating agencies look prominently at MH's financial strength in assessing the credit rating of the Province. A weakening of the financial strength of MH would not be viewed favourably by those credit rating agencies and may have implications impacting the credit rating of the Province, making provincial borrowing more expensive. Such a development would not be in the public interest." (Page 150)

MANITOBA HYDRO'S OM&A COST INCREASES ARE REASONABLE

In this section of Rebuttal, Manitoba Hydro addresses the reasonableness of its Operating, Maintenance and Administration (OM&A) costs. On pages 46 to 48 of their evidence, MIPUG has suggested that Manitoba Hydro has not controlled its costs effectively. To support this contention, they have provided graphical representations of the forecast of electric operating costs that Manitoba Hydro provided in IFF02, IFF07, and IFF09 and tabular representations of OM&A cost per customer experience and forecasts. Because the forecasts of costs have increased in subsequent IFF's and that actual cost per customer experience has exceeded CPI, they have concluded that *"it is likely necessary for the Board to remain focused on this area of concern"*.

OM&A Costs

The following table provides the details which breakdown consolidated OM&A into business segments and provides the impact of accounting changes on electric OM&A:

MANITOBA HYDRO
OPERATING, MAINTENANCE & ADMINISTRATIVE COSTS
(in millions of dollars)

	Actuals					Forecast		Compounded Average
	2005/06	2006/07	200708	2008/09	2009/10	2010/11	2011/12	Annual Increase
Consolidated OM&A	$ 375	$ 386	$ 391	$ 442	$ 456	$ 476	$ 482	4.3%
Less:								
Centra Gas	(53)	(54)	(56)	(60)	(61)	(63)	(64)	
Subsidiaries	(11)	(9)	(12)	(18)	(17)	(15)	(16)	
Electric OM&A	311	323	323	364	378	398	402	4.4%
Less Accounting Changes:								
CICA Changes				(10)	(13)	(13)	(13)	
Reclassifications				(3)	2	2	(3)	
Provision for Acct. Changes						(18)	(14)	
Net Electric OM&A after Accounting Changes	$ 311	$ 323	$ 323	$ 351	$ 367	$ 369	$ 372	3.0%
Year over Year % Increase Net of Acctg Changes		4.1%	-0.2%	8.9%	4.3%	0.6%	0.9%	
CPI		2.3%	1.4%	1.2%	1.4%	2.0%	2.0%	1.7%

As illustrated in this table, Manitoba Hydro electric operations has forecasted an average annual increase in OM&A of 3.0% between 2005/06 and 2011/12, after adjusting for accounting changes. This increase is above the average annual increase in Canadian CPI at 1.7%, reflecting higher costs and maintenance requirements that have been experienced by Manitoba Hydro and most other electrical utilities in Canada.

Manitoba Hydro has provided substantial evidence in this and previous GRA's with respect to cost and business drivers which have caused actual OM&A costs to exceed CPI. Details of those cost drivers have been provided in Appendix 4.4 of this application.

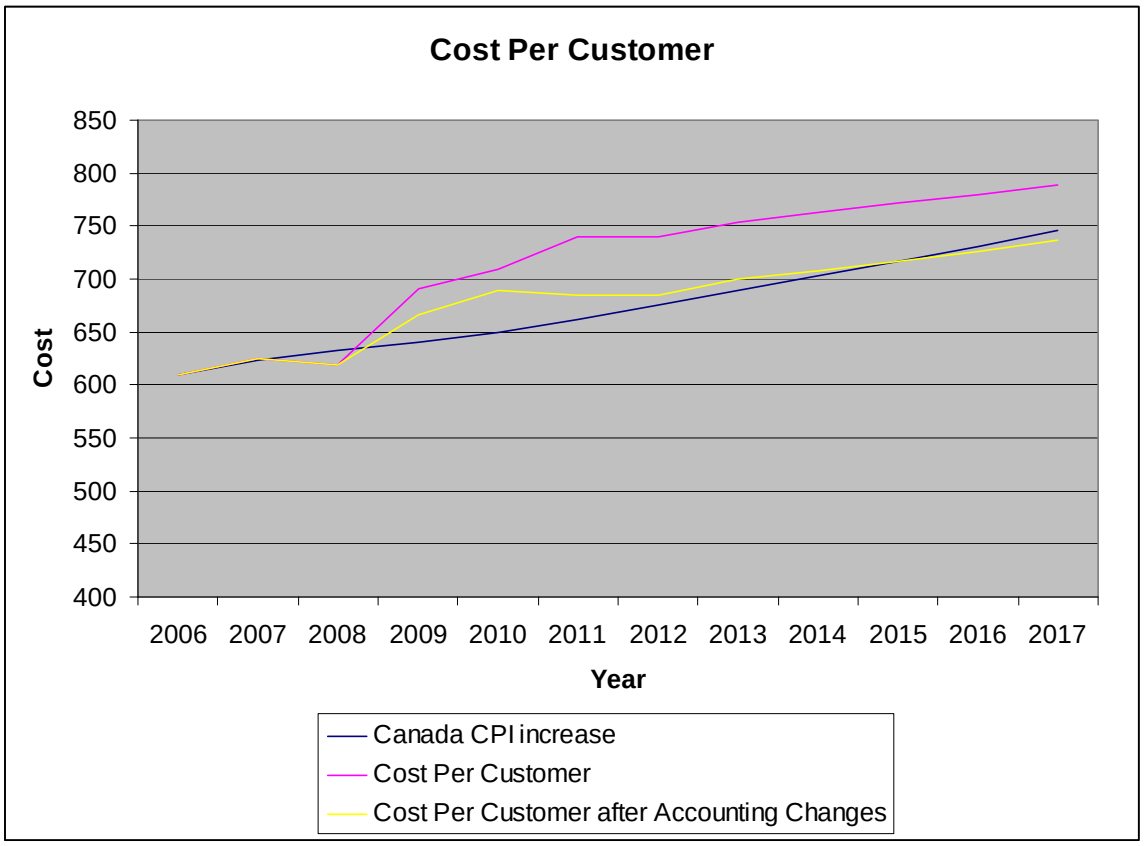
To offset these cost drivers, Manitoba Hydro has focused on productivity improvements and has initiated various cost constraint measures. These measures are also outlined in Appendix 4.4 and have been supplemented by several more stringent controls on hiring, travel, and overtime. Operating costs for 2010/11 to date are approximately $5 million below budget which serves to confirm the effectiveness of these controls.

Cost Per Customer

Actual and Forecast Cost per Customer is provided in the following table:

	2006	2007	2008	2009	2010	2011	2012
Operating Costs ($ millions)	311	323	323	351	367	369	372
Customers	509791	516861	521599	527472	532359	538002	543574
Cost Per Customer	610	625	619	666	689	685	684

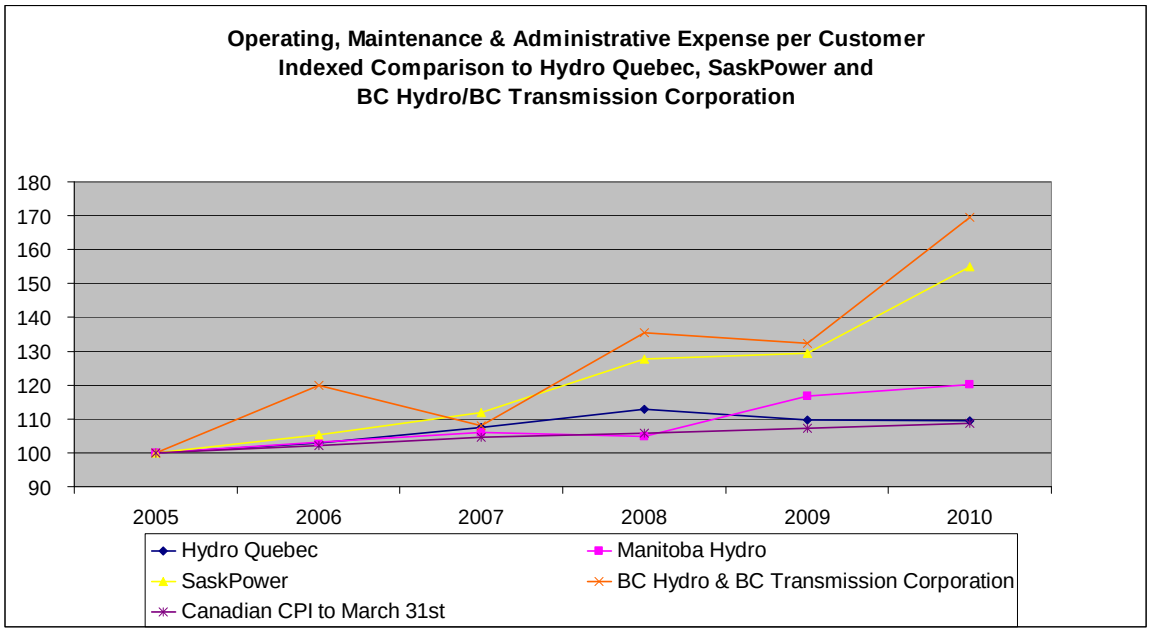
Cost per customer is forecast to increase at a level greater than CPI mainly as a result of IFRS related accounting changes. This is illustrated in the following chart which shows cost per customer before and after accounting changes compared with actual and forecast CPI increases over the same period.



Comparisons to Other Utilities

Cost Per Customer

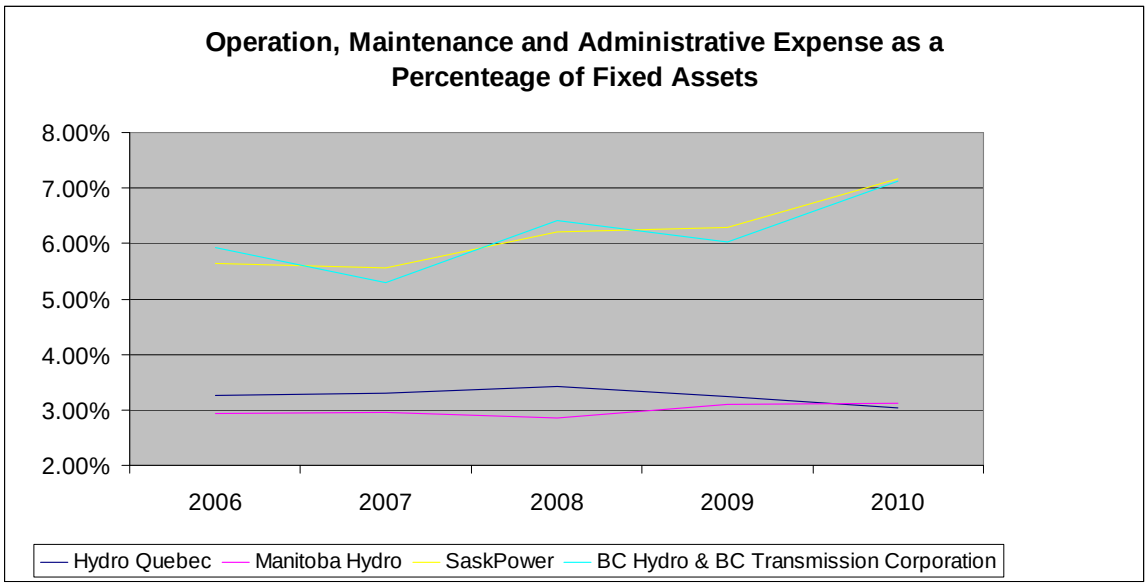
Other comparative utilities in Canada are experiencing the same cost pressures and the resulting cost per customer experience is illustrated in the following table which provides indexed cost per customer for each utility along with Canadian CPI (March, 2005 = 100):



This table shows that Manitoba Hydro's cost per customer experience from 2005 is moderately above Canadian CPI and Hydro-Quebec, but substantially below the experience of SaskPower and BC Hydro.

OM&A to Fixed Asset Ratio

Another perspective of OM&A is the correlation of OM&A costs to the cost of fixed assets in service. The following table provides comparison of Manitoba Hydro's ratio to other utilities:



This table shows that Manitoba Hydro's OM&A cost to fixed asset ratio is lower than BC Hydro/Transmission and SaskPower and that it remains stable over the period.

In summary, Manitoba Hydro has experienced substantial cost pressures and is managing them effectively. MIPUG's contention that the existence of higher costs than those predicted 7 years ago represents evidence of ineffective cost management is completely without merit. It was impossible in 2002 to predict the level of cost changes that have occurred since then and would have been inappropriate to embed them into those forecasts at that time as a contingency.

DEBT MANAGEMENT AND INTEREST COSTS

Interest Cost Deferral Mechanism

Mr. McCormick's primary advocacy in this GRA was stated in the following excerpt from the response to PUB/CAC/MSOS (McCormick) I - 16:

> *"To be clear, his primary recommendation for this GRA, is the adoption of an interest cost deferral mechanism."*

This perspective seems to be based on a misconception that ratepayers do not benefit from a strengthened balance sheet with healthy retained earnings. For example, as stated in response to PUB/CAC/MSOS (McCormick) I - 16, Mr. McCormick and/or CAC/MSOS opines that *"in the absence of a close regulatory review or a deferral account, a utility has the advantage of bringing forward a generous estimate of its interest costs and should the actual costs be lower, it keeps the surplus."* This perspective was further evidenced in the response to PUB/CAC/MSOS/ (McCormick) I - 8 wherein it is stated that *"Manitoba Hydro has an asymmetric advantage in that it sets the forecast methodology and retains any benefits of excess forecast interest included in the rates."* The reference to "keeping the surplus" implies that management and/or shareholders are enriched by purposely over-estimating financing costs. This is fundamentally wrong.

In recommending an interest cost deferral account, Mr. McCormick fails to acknowledge that Manitoba Hydro's rates are set under a rigorous cost of service methodology (and not a rate-base rate of return approach), and he fails to recognize the fact that the retained earnings and net income of Manitoba Hydro are held for the benefit of ratepayers. To the extent that interest costs are higher or lower than forecast, the difference, along with all other differences, flows to retained earnings. Retained earnings are not distributed as dividends to private shareholders (as may be the case in jurisdictions with a rate-base rate of return methodology) or used for any purpose other than managing the risks and revenue requirements on behalf of Manitoba Hydro's customers. To the extent that there are higher contributions to retained earnings as a result of this difference, there will be lower future rate increase requirements. Manitoba Hydro views this no differently than the impact on earnings of weather or any other revenue and expense variable.

The topic of an interest rate deferral account was previously raised by Mr. McCormick at the 2009/10 & 2010/11 Centra Gas GRA that was before the PUB in the spring of 2009. During the public hearing for that Application, Centra testified that a deferral account would not be required nor appropriate under its cost of service rate setting methodology, as stated by Mr. Warden on page 679 of the transcript:

> *"One of the advantages of regulation on a cost-of-service basis is that any variance from forecast, not only finance expense, but in any line item of our operating forecast, any variance flows through to retained earnings, either debit or credit. And whenever we come forward with a rate application we look at the level of retained earnings and make an assessment as to whether or not or what the magnitude, if any, the rate increase should be. So the attractiveness of the cost-of-service methodology, it's self-correcting. So any kind of a variance that occurs at any time on any item is corrected through the balance in the retained earnings."*

The PUB deliberated on Mr. McCormick's recommendation to create an interest rate deferral account and provided its findings on September 16, 2009 in Order 128/09 (p. 63):

> *"The Board does not agree with CAC/MSOS on the need for a deferral account for Finance Expense. The Board believes that the update provided for in this Order and the methodology changes proposed for future applications should adequately ensure that an appropriate interest rate is determined for rate setting purposes."*

Manitoba Hydro's position remains that interest or finance expense deferral accounts are neither necessary nor appropriate.

Interest Rate Forecasts

In his written evidence in response to Q.16, Mr. McCormick made observations regarding the enhancements implemented by Manitoba Hydro in a number of interest rate forecasting topics addressed in Order 128/09. As discussed in the following text, only one of his identified topics remains for additional consideration. In this section of the rebuttal, Manitoba Hydro will also address Mr. McCormick's recommendation regarding credit spreads.

Timeliest Forecasts

The use and alignment of current date forecasts has already been incorporated into Manitoba Hydro's interest rate forecasting process for IFF09 and beyond. For example in reference to IFF09, as stated in Manitoba Hydro's response to PUB/MH I-46(b):

> *"Short and long term interest rates for the 2009/10 - 2012/13 period were reviewed and revised in July 2009 based on currently available information. As noted in Tab 5.2, page 2, lines 1-16, the forecast of exchange rates and interest rates were again reviewed in October 2009 due to the continuing volatility of the Canadian dollar. This review resulted in a further revision to the long term Canadian debt rate for 2009/10 and 2010/11."*

See CAC/MSOS/MH II-161(c) REVISED for additional details regarding Manitoba Hydro's forecasting sources, the frequency of their forecasts, and the updating process. Mr. McCormick's statement on page 22 that *"Manitoba Hydro does not appear to be particularly vigilant in checking for updates from its sources"* is unfounded.[1]

Independent Forecasters

Manitoba Hydro confirms that the elimination of non-statistically independent forecasters was implemented in the years 2009/10 through 2012/13 in IFF09, and for the entire forecast period in IFF10.

With respect to forecaster independence, a recommendation was made in the KM Report (pg 119) to develop an in-house macro econometric model for forecasting. Although there may be some limited value in developing a supplemental economic forecast that is contextualized for Manitoba Hydro's use, it is Manitoba Hydro's opinion that the consensus approach utilizing credible external forecasters is superior to in-house economic modeling as Manitoba Hydro's existing portfolio of external forecasters are more independent.

[1] In Q.18 of his written response, Mr. McCormick's allegation that Manitoba Hydro has been lax in updating its forecast inputs is based exclusively on his observation that Manitoba Hydro did not update the forecasts for Province of BC, Federal Finance and Consensus Economics. In so doing he ignores Manitoba Hydro's statement in response to CAC/MSOS/MH I-141(b) that these forecasts will be "excluded from future interest rate forecasts" and his own argument that Manitoba Hydro should not utilize these forecasters and hence these forecasts should not be updated.

Average Versus End of Period Data Points

Manitoba Hydro confirms that all end of period forecasts were adjusted to reflect average period forecasts in the years 2009/10 through 2012/13 in IFF09, and for the entire forecast period in IFF10.

As stated in Manitoba Hydro's response to PUB/MH I-46(b), *"for forecasters that provided end of period rates, the rates in Table 1 and Table 3 reflect rates adjusted to a comparable average period basis.* ***It should be noted that adjusting end of period forecasts to average forecasts may or may not result in a better consolidated forecast.*** *… The adjustments which put all of the independent forecasts on an equivalent basis have the potential to qualify, to some extent, the independence of externally derived forecasts. Further, the use of end of period versus average is* ***normally immaterial*** *in the overall scheme of the financial forecast which has many moving parts. Nevertheless, such adjustments may have some value during extreme volatility in rates"* [emphasis added].

Forecaster Accuracy and "Pruning"

In his written evidence on page 22, Mr. McCormick states that *"Manitoba Hydro does not appear to accept that evaluating the accuracy of forecasters is a worthwhile exercise, and that pruning the list of those forecasters which are perennially low or high or otherwise do not assist in creating a robust interest rate forecast is a good idea."*

This is a mischaracterization of Manitoba Hydro's position on this topic. Prior to embarking on a "pruning" process, it is important to recognize that Manitoba Hydro utilizes the forecasts produced by Canada's primary financial institutions in addition to several other independent sources, all of which are well known and respected. All of the forecasters utilize professionally trained and experienced economists who have their own proprietary processes and perspectives. These differing processes and perspectives will lead in most circumstances to differing recommendations. It is true that all forecasters are not all equal. If all views were equal, then it would be redundant to consider more than one perspective.

The rationale for a broad consensus approach is further reinforced when one considers, as stated in the KM Report on page *xxv*, that it is *"impossible to perfectly predict outcomes from complex systems such as weather, economics, or financial markets. Not only is it difficult to predict accurately, it is also very difficult to decide which prediction method is best."* In response to this quote, KM stated in MH/KM-29 that there is *"definitely a role for qualitative professional judgment. Ultimately professional judgment is an important 'backstop' to quantitative analysis with human knowledge and experience being important factors."*

Forecasting Credit Spreads and Other Forecasting Matters

Mr. McCormick states on page 36 of his written evidence that *"one should gather data appropriate to the variable that you are attempting to estimate. On a more philosophical basis, there is a logical discontinuity in using only a 10 year data period to estimate spreads for the 20 year period out to 2030."* He then opines that *"it is an inferior practice to forecast a 20 year term when relying on data derived from a period only half as long"* and recommends a *"longer period of analysis to establish the long end of this forecast."*

As stated by Manitoba Hydro in response to CAC/MSOS/MH I-148(b),

> *"…although the benchmark Government of Canada rates dropped to unprecedented lows during this time, this was counterbalanced by a sharp elevation in the credit spread between benchmark Government of Canada bonds and the all-in cost to the Province of Manitoba. Consequently, the all-in cost for Manitoba Hydro's long bonds remained at historically low levels in spite of the steep increase in the borrowing spread. By 2009 the spreads had decreased sharply and have since showed preliminary signs of stabilization, although still remaining elevated above the pre-crisis levels."*

CIBC has recently conducted research on the interrelationship between benchmark rates and credit spreads and in October 2010 CIBC published an article entitled *"Volatility and Spreads: A Closer Look"*. As stated on page 12 of the publication:

> *"…volatility can also help inform the dynamic between spreads and underlying yields. As in the past, today's low-volatility environment has coincided with a positive correlation between credit spreads and yields. In other words, as volatility wanes, yields and spreads have tended to fall together. Periods of heightened volatility, illustrated in Chart 3, are another matter entirely. As Table 2 details, high-volatility periods have meant a meaningful negative correlation between spreads and yields (Table 2)."*

The recognition that complex statistical correlations exist between credit spreads and benchmark rates, stands in sharp contrast to the position espoused by Mr. McCormick.

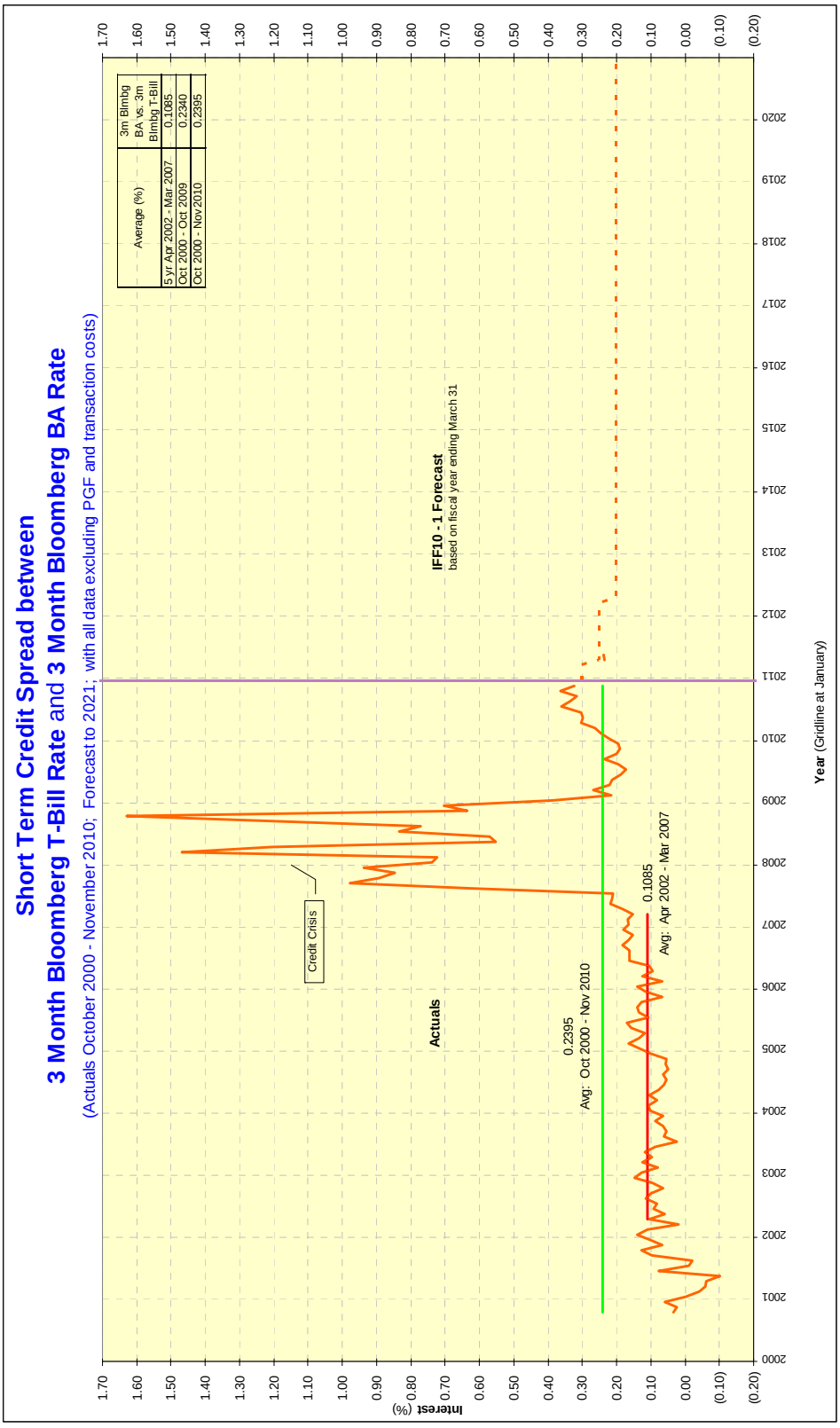
As described in response to CAC/MSOS/MH I-135(f), in determining the appropriate credit spreads for inclusion in the *Economic Outlook*, Manitoba Hydro balances both near term considerations and longitudinal historical data. This is because in this specific situation where the factors are correlated, there may be times when using end of period or near term calculations may be more representative for forecasting purposes than using historical, average period data. This was especially evident during the apex of the financial market crisis when the significant volatility presented significant challenges to forecasters. Consequently, Manitoba Hydro closely monitors this spread relationship, especially in the context of its new long term debt issuances. Manitoba Hydro observes that Mr. McCormick has not yet embraced the concept that one must apply caution when simply adding future oriented benchmark Canada yields with historical credit spreads to arrive at a forecasted all-in interest rate.

In his written evidence on page 37, Mr. McCormick suggests that Manitoba Hydro reduce the short term interest rate spread to 10 basis points under the presumption that *"government efforts to calm the markets"* will be successful and that spreads will *"return to pre-crisis levels."* Manitoba Hydro notes that Mr. McCormick provides no empirical evidence for this suggestion. The quotation cited by Mr. McCormick that the "financial markets will return to a more normal environment in 2011/12" was provided by Manitoba Hydro in the context of the height of the crisis and was not intended to convey that the spread would return to 10 basis points. The relative nature of this quote is clearly evidenced by the fact that Manitoba Hydro selected a 20 basis point spread for 2011/12 and not 10 basis points. In the response to

CAC/MSOS/MH I-135(f), Manitoba Hydro further stated that "*given the magnitude of the crisis and the residual uncertainty in the financial markets, more time will be required to assess if the current levels are a new normal or if a return to pre-crisis spreads will occur. Manitoba Hydro will continue to monitor this spread relationship.*"

In continuing its ongoing monitoring, Manitoba Hydro has updated the following short term credit spread chart that was originally part of Manitoba Hydro's response to CAC/MSOS/MH I-135(f). The evidence shows that the average short term credit spread dating back to October 2000 has elevated from 23.40 to 23.95 basis points (for long run averages concluding at the end of October 2009 and November 2010 respectively). The chart also illustrates that the near term experiences in 2010 show an upward slope with spreads in excess of 30 basis points.

The evidence clearly shows that Mr. McCormick's analysis and suggestion to have the short term interest rate spread reduced to 10 basis points is not corroborated by either the updated near term experiences or longitudinal historical data.


Short Term Credit Spread between
3 Month Bloomberg T-Bill Rate and 3 Month Bloomberg BA Rate
(Actuals October 2000 - November 2010; Forecast to 2021; with all data excluding PGF and transaction costs)
Average (%)
3m Bimbg BA vs. 3m Bimbg T-Bill
5 yr Apr 2002 - Mar 2007
0.1085
Oct 2000 - Oct 2009
0.2340
Oct 2000 - Nov 2010
0.2395
IFF10 - 1 Forecast
based on fiscal year ending March 31
Credit Crisis
Actuals
0.2395
Avg: Oct 2000 - Nov 2010
0.1085
Avg: Apr 2002 - Mar 2007
Interest (%)
Year (Gridline at January)

National Bank Financial (NBF) Report

Meeting the Directive

Regarding the value derived from the *NBF Report*, it is important to consider that Board Order 150/08, Directive No.4 instructed:

> *"Manitoba Hydro to provide the Board an independent assessment of the Corporation's relative weighting of fixed vs. floating debt, and file a report with the Board on or before June 30, 2009."*

This Directive was associated with arguments put forth by a coalition of interveners ("Coalition" which included CAC/MSOS) in the 2008/09 General Rate Application hearings. The Coalition's case was primarily based on the premise that Manitoba Hydro was underweighting its floating rate debt below levels prescribed by the theory of portfolio optimization. To describe the portfolio optimization methodology, the Coalition filed an article that was published nearly ten years prior to the Hearing (using outdated interest rate data from 1989 - 99)[2].

When preparing the Request for Proposals (RFP), it was Manitoba Hydro's perspective that the Directive requirements would be satisfied upon filing a consultant report that derived an optimal range of Manitoba Hydro's floating rate debt (utilizing the same approach previously cited by the Coalition). All other requests in the RFP's terms of reference pertaining to academic literature, peer group reviews and financial analysis were terms of reference beyond the Directive and were inserted by Manitoba Hydro in order to obtain additional value from the proposed engagement.

[2] BMO Harris Bank Nesbitt Burns article: "*Is there an Optimal Mix of Fixed and Floating Rate Debt?"* As stated in the COALITION response to MIPUG Information Requests page 8, dated February 20, 2008: "That article looked at 10 years of daily data from May 1989 to May 1999, and looked at the cost and earnings volatility of a group of hypothetical debt portfolios ranging from 100% fixed through 100% floating rate debt."

Upon receiving the engagement in 2009, NBF satisfied the base requirements of the Directive by deriving a potential range of Manitoba Hydro's floating rate debt utilizing the Modern Portfolio Theory (MPT) approach previously cited by the Coalition. Note that the discussion of the approach, the use of updated interest rates for the period from 1999 to 2009, the yield correlations, the results, and the analysis of the strengths and weakness of this MPT methodology is stated in Chapter 2 of the *NBF Report*.

Manitoba Hydro observes that the MPT methodology (with yield correlations arising from flat, steep and inverted interest rate environments) and the traditional market timing theory (that would prescribe a higher proportion of floating rate debt during periods of steep yield curves) seem to closely align with the approaches advocated by the Coalition (CAC/MSOS) and more recently Mr. McCormick[3]. Were NBF interested in simply meeting the minimum requirement of the Directive, NBF could at this time have concluded their debt optimization modeling and the Directive could have been satisfied with a recommended MPT range for Manitoba Hydro of 12 - 23%.[4]

However as outlined in Chapter 2 of the *NBF Report*, NBF was aware of the limitations of the results using the MPT methodology[5] and given their awareness of a growing body of innovative academic research that indicated the applicability of the asset liability approach for debt management, NBF recommended that Manitoba Hydro augment the results from the MPT analysis with an asset liability framework utilizing a Monte Carlo debt optimization model. This supplemental approach was not envisioned by Manitoba Hydro during the

[3] For example, in response to Q.33, Mr. McCormick poses a market timing argument that Manitoba Hydro should take on more floating rate debt in periods of steep yield curves. In response to Q.51, Mr. McCormick stated that "Common sense might suggest that one would prefer to be 100% fixed, or at the low end of the floating rate range, as one approaches a period with a substantially inverted yield curve."

[4] Although the MPT results and analysis are clearly stated in the *NBF Report* and have been cited by Manitoba Hydro in the response to CAC/MSOS/MH II-127(a) and CAC/MSOS/MH II-135(a) REVISED, Mr. McCormick has been silent on the fact that NBF replicated the approach advanced by CAC/MSOS at the previous Hearing and that the results showed a more conservative range (12 - 23%) than Manitoba Hydro's current target range (15 - 25%) as well as the range from derived using the asset liability framework (14 - 27%).

[5] NBF concluded on page 13 of the *NBF Report* that this methodology results "in an incomplete analysis." The *NBF Report* then described the asset liability methodology and concluded on page 17 that "the asset liability management approach is the most appropriate framework for assessing Manitoba Hydro's fixed vs. floating rate debt policy."

development of the RFP and demonstrated NBF's innovative commitment to provide a fulsome response to the PUB Directive.

Note that in the development of their asset liability model, NBF provided 17 academic citations as part of its academic research, with additional academic footnotes and references also included within the cited articles.[6] The identification of Manitoba Hydro specific asset liability variables and volatility metrics, which form the basis for the proprietary nature of the customized modeling tool, were then described by NBF in the *Technical Analysis* section of their report.

During their technical analysis, NBF identified that there exists a statistical correlation between short term interest rates and short term export power prices, and that net income can be stabilized by adding a floating element to the overall debt portfolio.[7] In practical terms that can be seen today, the economic downturn that led to low short term interest rates also contributed to low short term export power prices.

NBF then derived an optimal range of 14 - 27% for Manitoba Hydro. According to NBF's modeled results, sub-optimization occurs outside of the 14 - 27% range with portfolios that have less than 14% and greater than 27% floating rate debt. As stated in response to CAC/MSOS/MH II-123(a), *"subject to Manitoba Hydro's level of risk tolerance, all portfolios within NBF's 14 - 27% modeled range of floating rate debt can be considered optimal for the Corporation, including Manitoba Hydro's target range of 15 - 25% floating rate debt."*

[6] Building upon the foundational body of knowledge accumulated by NBF, Manitoba Hydro has since expanded its academic literature research on debt management practices. Included within this literature review are citations from the Bank of Canada and the UK Debt Management Office.

[7] The statistical correlations and the identification of key asset liability factors are described in Chapter 5 of the *NBF Report*. For example, as indicated on page 32, the statistical correlation between Canadian short term interest rates and short term export power prices for the period from 2005-09 is 0.46. The rationale for using economic data from 2005-09 was clearly described in response to CAC/MSOS/MH I-154(a). It is not the intention of the debt optimization modeling to describe all of Manitoba Hydro's income volatility nor is it appropriate to suggest that it should. Mr. McCormick's inference that NBF's modeling should have considered hydrology ignores the NBF response in CAC/MSOS/MH I-117(c) that you cannot use weather to predict macroeconomic indicators.

On this basis, and also due to the fact that the two ranges are similar, NBF reasserted in response to CAC/MSOS/MH I-163(a) *"that Manitoba Hydro's current guidance range of 15% to 25% floating rate debt represents a range that is sufficiently close to optimal under the asset/liability management framework."* On page 41, *"NBF recommends that Manitoba Hydro should maintain this guidance range given that this risk reduction approach appears appropriate in the context of its overall business risk."*[8]

Note that if Manitoba Hydro adopted the MPT approach advanced by the Coalition, then the optimal range would have been more conservative than with the asset liability approach (12 - 23% versus 14 - 27% respectively).

Given that NBF met the original intent to provide a MPT range, and given that NBF added extra value by providing an additional and superior asset liability modeling approach, Manitoba Hydro asserts that the *NBF Report* is fully responsive to the PUB Directive on this matter.

Beyond the Directive

The peer group analysis component of the engagement went beyond the requirements of the Directive and represented a potential value-added benefit to Manitoba Hydro. It was recognized by Manitoba Hydro that obtaining peers to agree to publicly disclose their financing policies and target ranges would be challenging. Under the assumption that peers would be in compliance with their policies, operational ranges were considered as a peer group performance measure for the *NBF Report*. In addition, it was recognized that there might be varying calculation mechanics, hedging approaches and operating contexts.

Accordingly, it was Manitoba Hydro that concluded that the engagement would be well served by obtaining general insight and that NBF did not need to drill deeper than the audited annual statements. Any suggestions by Mr. McCormick that NBF omitted to provide sufficient granularity during the peer group portion of the engagement, or that NBF omitted

[8] Consequently, as stated in response to CAC/MSOS/MH II-124(a) REVISED and CAC/MSOS/MH II-136(a), there was no requirement for an implementation plan.

to review peer group hedging activities are therefore misdirected. As per CAC/MSOS/MH II-117(a) REVISED:

> *"NBF consistently utilized the audited financial statements as its data source for the purposes of determining an entity's fixed versus floating rate debt percentage.*
>
> *It is important to recognize that due to the inherent limitations of comparing organizations that have varying operating and business environments, the purpose of the peer group analysis was to obtain general insight into the relevant peer group's choice of floating rate debt mix data. Any data variations inferred by the Intervener would not have affected the modeling performed by NBF, nor the following peer group observations:*
>
> *a) 'Manitoba Hydro's peers utilized market timing to adjust their fixed vs. floating rate debt mix to account for prevailing interest conditions' [page 23, NBF Report], and that,*
>
> *b) 'This analysis yielded a statistically significant correlation between the crown utility peers' proportion of export revenues and their levels of floating rate debt' [page 4, NBF Report] and that 'as revenues become more dependent on exports, the floating rate debt component becomes more prevalent' [page 28, NBF Report].*
>
> *NBF was not engaged to drill deeper than the audited financial reports of the peers selected in their analysis, nor were they engaged to provide an evaluation of the peer group's hedging activities."*

Mr. McCormick has made a claim that NBF should amend their report due to an immaterial short term advance for bridging purposes that occurred seven years ago in 2003. Manitoba Hydro seriously questions the relevance of this line of reasoning, and as described by Manitoba Hydro in response to CAC/MSOS/MH II-120(b) REVISED:

> *"This advance represented a relatively small amount, slightly over 1% of SaskPower's total debt as at December 31, 2003. As such, the observation in Section 4.2.2.3 of the NBF report remains materially correct. Further this information does not impact the modeling performed by NBF. Consequently, the data variation inferred by the Intervener would not affect the peer group observations noted in response to CAC/MSOS/MH II-117(a), or the modeling performed by NBF."*

In conclusion, Manitoba Hydro asserts that the *NBF Report* is fully responsive to the PUB Directive on this matter.

Interest Rate Risk on Floating Rate Debt

In response to Q.33, Mr. McCormick poses a market timing argument that Manitoba Hydro should take on more floating rate debt in periods of steep yield curves. This position is further extrapolated in his recommendation that *"the Board should adopt a revenue requirement going forward on the basis of forecast interest costs assuming a 25% or 27% floating rate component and spread based on the spread of recent issues of shorter term or timely forecast of shorter term rates."*

Contrary to the advice of Mr. McCormick, there has been an ongoing trend among provincial issuers and utilities to favor long term fixed rate financing in the current interest rate environment.

As stated in response to PUB/MH/RISK-8 REVISED, Moody's Investors Service published a Special Comment report in February 2010 entitled "*Canadian Provinces: Conditions Remain Challenging.*" Within this report, Moody's speaks to *"downward pressure on ratings if debt affordability deteriorates"* and specifically states that:

> *"…when interest rates rise, provinces that relied heavily on short-term or variable-rate debt financing will be more affected than those who opted to 'lock-in' historically low interest rates for long-dated maturities, effectively ensuring debt service certainty for a long period of time. … Our global macro risk scenario for 2010-11 points to higher global interest rates and, while not expected, sharp*

increases in interest rates over short periods of time have occurred in the past and cannot be ruled out."

As reported by T. Argitis and C. Fournier in a December 17 article in Bloomberg entitled "*Provincial Long-Term Bond Sales Return to Normal: Canada Credit":*

"'Provincial issuers want to extend the term of their debt at what has been historic low interest rates,' Marc Rouleau, a fund manager who helps oversee about C$20 billion in bonds at Standard Life Investments in Montreal, said via e-mail. 'For them it's the cheapest time to take on debt in the long term.'… 'The simple fact of the matter is that in 2010, we saw unprecedented long supply,' said Warren Lovely, a government bonds strategist at CIBC World Markets in Toronto, adding that this year's C$21 billion worth of long-term issues is a record. 'Long-term funding remains extremely attractive by historic standards, and I would expect a number of provincial issuers to remain focused on the long end.'"

Canadian utilities have also adopted the same balanced perspective. For example, BC Hydro has stated on page 72 of the *BC Hydro Annual Report 2010* that

"Falling interest rates resulting from the global financial turmoil have allowed BC Hydro to take advantage of the low rates for long-term debt. BC Hydro has increased its long-term fixed rate debt and has reduced its proportion of variable interest rate exposure."

The fixed versus floating rate debt policy is a measure of an entity's interest rate risk tolerance. The fact that Manitoba Hydro's target range is slightly narrower than NBF's theoretical range under the asset liability framework can be viewed as a measure of Manitoba Hydro's level of risk tolerance. As evidenced in response to CAC/MSOS/MH II-124(a) REVISED:

"Manitoba Hydro's actual quarter-end range of floating rate debt in recent years has been between 16.6% - 21.9%. This demonstrates the fact that Manitoba Hydro maintained full compliance within its target range and kept the actual quarter end

percentage of floating rate debt safely within the boundaries of the Corporation's risk tolerances. Manitoba Hydro views its existing target range as being appropriate, and sees no basis for the establishment of a new target range. Consequently, the CAC/MSOS request for either NBF or Manitoba Hydro to 'identify what, if any, range would be viewed as being insufficiently close to optimal so as to earn a recommendation that a new range is established' is unnecessary."

Debt Maturities and Refinancing Risk

As stated in the December 2010 *Debt Management Strategy*:

"Short term debt currently carries an asymmetrical risk profile as short term interest rates are more likely to rise than to fall. As short term interest rates are projected to rise faster than the long term interest rates, a financing strategy favouring fixed long term debt versus floating rate debt or shorter dated debt maturities will reduce the risk that the Corporation's future gross interest expense will be higher upon refinancing the debt stream.

*During the past number of years, Manitoba Hydro's actual long term financing has included issuance in various terms throughout the curve, including the issuance of floating rate notes. However, careful consideration is given to the debt maturity schedule and the total level of annual borrowings. In order to mitigate refinancing risk, to maintain financing flexibility during the upcoming decade, and in keeping with the concept of matching the Corporation's long-lived assets with long term debt, Manitoba Hydro will continue to favour long term financings with maturities of 10 years+, while maintain*ing floating rate debt within policy limits."

As stated in the DBRS Rating Report on the Manitoba Hydro-Electric Board dated November 10, 2010 (Appendix 75, Attachment 1):

"Manitoba Hydro maintains a relatively smooth maturity profile, no unhedged foreign currency debt and a moderate level of floating-rate debt, which adds stability to debt servicing costs and minimizes interest rate risk."

USD Financing and Cost Effectiveness

Manitoba Hydro stated in PUB/MH/Risk 6 (c) that:

> *"US dollar issuance typically needs to be at least $500+ million in size. In addition, although provincial borrowers frequently issue long bonds in the Canadian capital markets, due to financial market conditions, provincial issuance of US dollar debt with terms greater than 10 years is unusual because the long end of the US curve has not been cost effective compared to Canada for many years."*

The aforementioned quote is correct. The arithmetic performed by Mr. McCormick on pages 16 - 17 of his written evidence (wherein he derives a conclusion that a long US dollar issue is forecasted to be 70 basis points favorable to a long Canadian issue) erroneously led Mr. McCormick to opine that *"it appears that there is the potential for a further reduction of the revenue requirement if the PUB were to direct that the revenue requirement be based on the assumption of some US debt financing in 2011/12."* Mr. McCormick's analysis ignores the effect of swap transactions and foreign currency exchange.

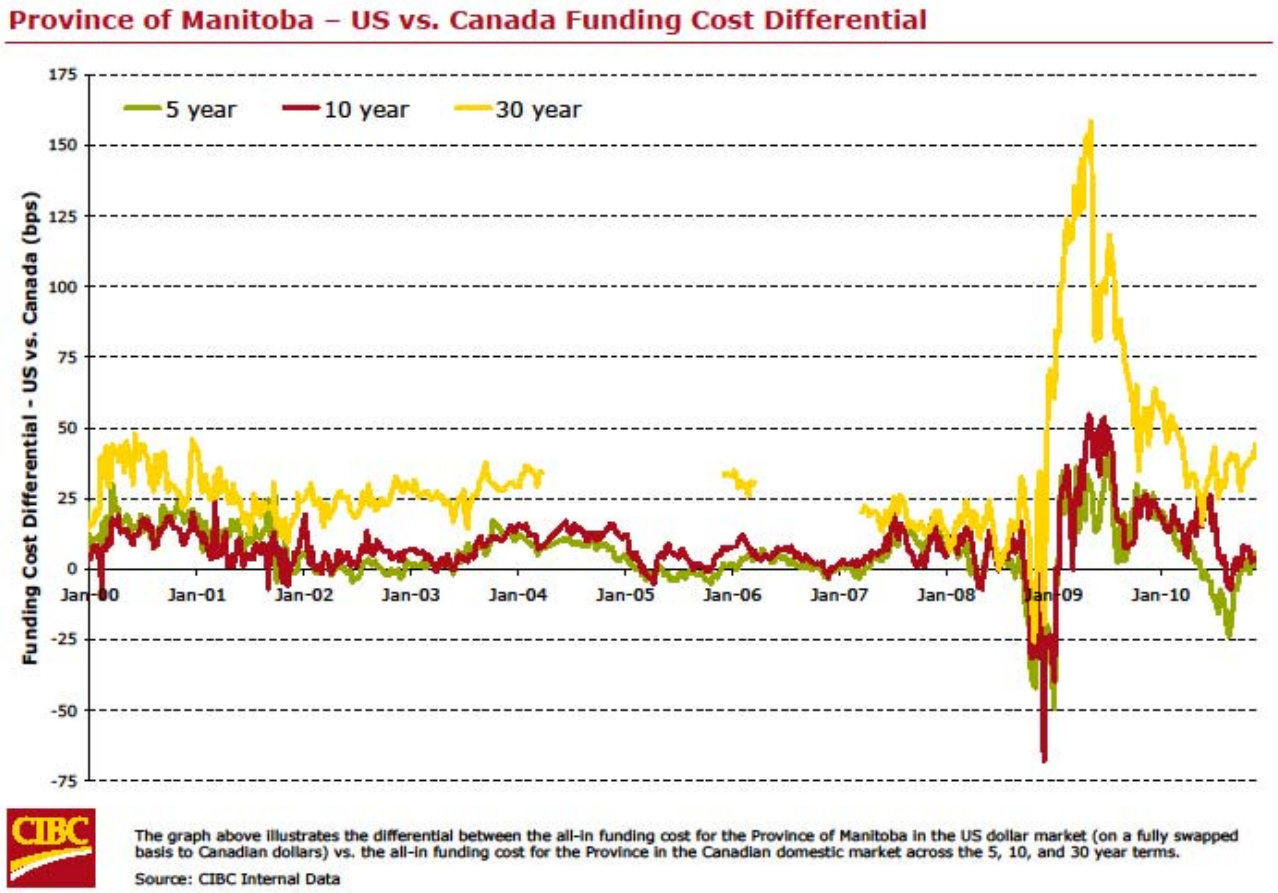
With the exception of strategic borrowings that are retained in US dollars as part of Manitoba Hydro's foreign exchange hedges with US dollar revenues, the Province of Manitoba and Manitoba Hydro do not have any unhedged foreign currency positions within their debt portfolio. Any borrowings that may have originated in a foreign currency are swapped back to Canada so that the debt portfolio is not exposed to foreign currency risk. This represents best practice among government finance issuers.

In assessing the cost effectiveness of potential international debt issuance for a particular term, an evaluation is conducted to compare the cost of international funding (converted to a domestic Canadian interest rate) with the cost of funding the same term in the domestic Canadian capital markets. See the attached graph produced by CIBC that illustrates the differential between the indicative all-in funding cost for the Province of Manitoba in the US dollar market (on a fully swapped basis to Canadian dollars) versus the indicative all-in funding cost for the Province in the Canadian domestic market across the 5, 10, and 30 year terms. Note that the data points for the 30 year differential from 2004-07 were not calculated

by CIBC during this period as there was limited market appetite for provincial borrowers to issue 30 year US debt at that time due to the differentials that made such issuance cost ineffective. Also note that the favorable differentials (negative values on the funding cost differential axis) depicted during the apex of the financial crisis were unrealizable as there was limited investor appetite to transact at that time. Therefore, as depicted on the chart, as a practical matter, the long end of the US curve (30 year term) has not been cost effective compared to Canada for many years.

Manitoba Hydro will continue to monitor the indicative funding cost differentials and remains interested in securing cost-effective US dollar financing.

2


Province of Manitoba – US vs. Canada Funding Cost Differential
5 year
10 year
30 year
Funding Cost Differential - US vs. Canada (bps)
175
150
125
100
75
50
25
0
-25
-50
-75
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
CIBC
The graph above illustrates the differential between the all-in funding cost for the Province of Manitoba in the US dollar market (on a fully swapped basis to Canadian dollars) vs. the all-in funding cost for the Province in the Canadian domestic market across the 5, 10, and 30 year terms.
Source: CIBC Internal Data

Conclusion

Interest Deferral Account

Manitoba Hydro's rates are set under a rigorous cost of service methodology (and not a rate-base rate of return approach). Retained earnings and net income of Manitoba Hydro are held for the benefit of ratepayers. Accordingly, Manitoba Hydro's position, consistent with Order 128/09, remains that interest or finance expense deferral accounts are neither necessary nor appropriate.

Interest Rate Forecasts

The Corporation continues to enhance its forecasting methodology. Accordingly, Manitoba Hydro has implemented methodological enhancements to its interest rate forecasting process since the receipt of Order 128/09. The Corporation now utilizes current date forecasts, interest rate forecasts are based upon statistically independent forecast inputs, and Manitoba Hydro undertakes an adjustment to third party forecast data to reference comparable time periods.

Fixed versus Floating Rate Debt

Manitoba Hydro asserts that the *NBF Report* is fully responsive to the PUB Directive pertaining to an independent assessment of the Corporation's relative weighting of fixed vs. floating debt. Manitoba Hydro's current ratio of fixed vs. floating rate debt is within its approved risk tolerance and is appropriate to the current market environment.

Financing Considerations and Financial Risk

In order to mitigate refinancing risk, to maintain financing flexibility during the upcoming decade, and in keeping with the concept of matching the Corporation's long-lived assets with long-term debt, Manitoba Hydro will continue to favour long-term financing with maturities of 10+ years, while maintaining floating rate debt within policy limits.

COST OF SERVICE STUDY

This section of Rebuttal deals with the cost of service study evidence provided by Paul Chernick on behalf of Resource Conservation Manitoba / Time to Respect Earth's Ecosystems ("RCM/TREE") and Patrick Bowman and Andrew McLaren on behalf of the Manitoba Industrial Power Users Group ("MIPUG"). Manitoba Hydro's general response to the assessments and recommendations of these witnesses is that the Cost of Service Study is under a wide ranging external review, that both the 2009/10 and 2010/11 PCOSS's have been provided for information only in this proceeding, and that it is appropriate for Manitoba Hydro to propose and for the Board to approve the across-the-board increases proposed in this Application.

Evidence of Mr. Chernick

Mr. Chernick's Evidence with respect to the Cost of Service Study is that there are a number of inappropriate classifications and/or allocations affecting the Subtransmission and Distribution functions and that the overall effect of these is to overstate the cost of serving Residential customers.

Mr. Chernick wants the PUB to *"instruct Hydro to address and correct these problems in its ongoing redesign of its cost-of-service methodology."*

Manitoba Hydro asserts that it is premature for the PUB to provide any instructions on these matters. Manitoba Hydro does not concede any of the specific points raised by Mr. Chernick, but advises that each of them is being assessed and reviewed as part of the current external review of cost of service methodology and recommendations will be forwarded in due course with respect to these points.

Evidence of Messrs. Bowman and McLaren

Unlike Mr. Chernick, Messrs. Bowman and McLaren generally accept the results of Manitoba Hydro's PCOSS10 and PCOSS11 and take only minor exception to the methods employed. They review the methodology used in these studies on pages 53 through 56 of

their Evidence and quibble only with one of the approaches taken in these studies, while acknowledging that the likely effect on the results is small.

> *"Natural gas resources form a component of Hydro's dependable energy serving the overall load, and permit an enhanced quantity of the exports being marketed as dependable resources, rather than opportunity, and as such are a relevant component of the cost to serve exports. The appropriate approach to modeling natural gas related generation and costs is to allocate the cost to all firm loads. Although this change would improve the cost analysis in the cost of service study, the likely effect is small and this one factor alone does not undermine the overall conclusions arising from PCOSS11."* (Evidence of Bowman and McLaren, page 55: 4-11.)

Bowman and McLaren go on to conclude that PCOSS10 and PCOSS11 are largely consistent with cost causation principles and the PUB's previous directives, and can be relied upon to support rate design and rate making objectives (page 62: 14-16). They conclude further that classes who show RCC levels at or above unity merit class rate increases close to the core benchmark targeted in the IFF forecasts. For the remaining classes:

> *"Classes that remain below this level (notably GSL 0-30 kV and Residential) merit rate adjustments in excess of the benchmark level. Manitoba Hydro's requested across-the-board rate increase for 2011/12 should be modified so as to target modestly differential rate increases by class, as these can be accommodated within Hydro's rate policy guidelines, focused primarily on upward adjustment to the proposed rates for classes for classes with RCC ratios…well below unity."* (Evidence of Bowman and McLaren, page 62: 20-24.)

Manitoba Hydro agrees with much of the assessment of Bowman and McLaren in respect of the PCOSS but disagrees with their conclusions and recommendations. Manitoba Hydro has commissioned an external review of the Cost of Service Study methods and that review is currently under way. The MIPUG witnesses appear not to believe that the external review would result in any significant change from the results of PCOSS11, but Manitoba Hydro does not have that degree of certainty. Key issues that may lead to changing results are:

1) There is a major outstanding directive in respect of the PCOSS; Directive 20 from Order 116/08. Directive 20 specifically includes a requirement for *"specific demonstrations of how alternative MC adjustments could be applied to an embedded COSS. Among the scenarios to be explored, MH should consider the addition or blending of marginal costs to embedded costs prior to comparison to class revenues"*. Bowman and McLaren dismiss the potential impact of this directive by noting:

> *"…past evidence before this Board indicated that adoption of marginal cost approaches consistent with the basis used in other jurisdictions (in the limited examples that exist)would in most cases not have a material impact on the results of the cost of service study as compared to embedded methods."* (Evidence of Bowman and McLaren, page 54: 18-21.)

Manitoba Hydro does not want to pre-judge the results of the current external review of this particular aspect of the cost of service study, nor does it wish to pre-judge the PUB's review of any recommendations that may flow from the independent review. It would be premature to conclude, as MIPUG's witnesses appear to do, that this issue will not have material impact on the results of the study. As Manitoba Hydro demonstrated during the 2008 GRA (Exhibit MH-68) the impact on cost of service results is potentially considerable.

2) Manitoba Hydro notes that MIPUG agrees with Manitoba Hydro's position on the treatment of Brandon coal-fired generation, DSM costs, export price forecasts and certain costs (Evidence of Bowman and McLaren, page 54: 27 through 55: 9) which are not consistent with Order 116/08. Manitoba Hydro believes that its treatment of these items in PCOSS10 and PCOSS11 is correct, but also notes that the PUB has not completed its review of these studies or issued any updated directives.

3) There may be other aspects of the cost of service methodology for which new recommendations may be proposed by the external consultants and which have potential impacts on the cost of service results.

In short, Manitoba Hydro does believe that cost of service results may vary from those presented in PCOSS11 once the external review is completed and some or all of its recommendations are incorporated into future cost of service studies, and reviewed by the PUB. Until that happens, it is premature to propose differential rate increases for the major classes of service.

Reviewability of Manitoba Hydro's Work Product

In his evidence on pages 4 to 9, Mr. Chernick alleges that Manitoba Hydro's Application, specifically the COSS and rate design calculations, are limited in detail as all data output was provided in PDF format only. Mr. Chernick further notes on page 9 that ATCO Electric and three American utilities provide their working COSS-related files and studies in live spreadsheet formats.

Mr. Chernick asserts (p. 8 of his evidence) that, "*Without access to the underlying spreadsheets, the Board cannot confirm that the rates it approves are actually designed to collect the allowed revenues.*" Manitoba Hydro strongly disputes Mr. Chernick's assertion; standard practice in this jurisdiction has involved the examination of evidence filed in the manner undertaken during the current Application. The filing of evidence for this Application is consistent with that followed in all past rate hearings, and should present no undue impediment to the PUB and its advisors in arriving at a determination of the reasonableness of the applied-for rates.

The topic of the provision of electronic spreadsheets was raised during the public review of Manitoba Hydro's Application for New Electric Rates in Remote Communities served by Diesel Generation to be Effective September 1, 2010. In rebuttal evidence for that proceeding, Manitoba Hydro informed the PUB that it is currently undertaking an assessment of the state of electronic filing used to support the regulatory process in other jurisdictions and that upon a review and assessment of the findings, the Corporation intends to develop an electronic filing solution later in 2011. The Corporation also advised that this work must proceed independently and apart from any specific ongoing regulatory hearing process.

Research efforts are currently examining the state of electronic filing in Canada with regards to the roles and responsibilities for development, implementation and operation of such systems. This research is also investigating the related information technology requirements, as well as the benefits, risks and associated costs of such processes. In terms of the development of a proposed solution, consideration will be given to the intellectual property rights and third party proprietary rights related to the Corporation's data and electronic spreadsheet models.

To be clear, the filing of live electronic spreadsheets in utility rate regulatory proceedings is not a uniform practice across Canadian jurisdictions. It is the exception, instead of the rule. Overall, the implementation of electronic filing in other jurisdictions, such as Ontario, resulted from years of effort on the part of regulatory tribunals, applicants and other stakeholders of the regulatory process. Even with the implementation of electronic filing processes in Ontario the two major natural gas utilities, Union Gas and Enbridge Gas Distribution, continue to file their rate application materials electronically in PDF format and live spreadsheets are not generally filed.

The Corporation is of the view that it will take a collaborative process with industry stakeholders in Manitoba to successfully implement more advanced forms of electronic filing. In order to initiate this collaborative process, Manitoba Hydro will first complete its research and policy development on an electronic filing solution later in 2011.

RATE DESIGN; GENERAL SERVICE CLASSES

This section deals with the rate design evidence provided by Paul Chernick on behalf of Resource Conservation Manitoba / Time to Respect Earth's Ecosystems ("RCM/TREE") in his Pre-filed Evidence on pages 33 through 42. Specifically, it will deal with his evidence on the following matters:

– Inverted rates for General Service classes
– Revenue Increases from Marginal-Cost based rates.

Inverted Rates for General Service Classes

Mr. Chernick's Evidence notes that Order 116/08 *"extended the inverted-rate initiative to all classes"* and quotes from page 306 of that Order. To be precise the PUB recommendation appearing at page 306 is not a specific directive of the Board. Nevertheless, Manitoba Hydro understands that the PUB is interested in rate design as a support to conservation and the use of marginal cost as a price signal. Manitoba Hydro is currently exploring with its largest customers how best to incorporate marginal cost related price signals into rate design affecting these customers.

Extension of inverted rate pricing to General Service customers is not an easy matter for implementation because of the wide range in usage amounts and profiles of customers involved in similar businesses. This characteristic of General Service customers usually leads to suggested approaches involving creating individual customer baselines, and Mr. Chernick's evidence offers one such suggestion (pages 34 through 36) and even goes so far as to recommend a 10-year rolling baseline (page 35, line 19).

The problems associated with development and administration of customer baselines have been discussed at previous hearings, and Mr. Chernick does appear to recognize a few of them in his list on pages 35 and 36. Baselines are notoriously difficult to develop and manage even when discussing only a relatively small number of customers. There has been and will continue to be controversy as to how baselines are calculated. If baseline development and administration are difficult with only a handful of customers, it verges on the impossible to do this for tens of thousands of individual customers.

In addition to the normal difficulties associated with baseline development, there are practical impediments as well. Due to the large number of General Service customers, Manitoba Hydro only stores two years of billing data on its live billing database. Extracting historical data to calculate a rolling baseline would add significant costs to the system in terms of data storage. No doubt customers would also want to see how these calculations were derived and shown on their monthly bills, which in itself would significantly increase costs.

Currently Manitoba Hydro is focused on the development of industrial rates that would apply to approximately 45 of its largest customers. The development of new rate structures for the remainder of its General Service customers will benefit from lessons learned in the process of arriving at workable rates for the industrial customers.

Revenue Increases from Marginal-Cost based rates.

Mr. Chernick also appears to be recommending that marginal cost based rates be set such as to provide Manitoba Hydro with revenue over and above its embedded costs.

> *"Since Hydro's rates are well below marginal costs, raising the tail-block energy rates towards marginal costs would increase revenues, all else equal. Similarly, charging marginal costs for the energy used by new large General Service loads and for net increases in sales to other General Service customers would increase revenues."* (Evidence of Paul Chernick, page 41: 12-16.)

Mr. Chernick then provides a list of priorities on which the additional revenue could be spent, i.e. additional costs that could be incurred in order to absorb the additional revenue. Some of these priorities involve reducing other elements in the rate structure; these are at least consistent with the idea of providing appropriate price signals while setting rates to return embedded cost (e.g. reducing demand or basic monthly charges). Some would require complementary decision making with respect to Manitoba Hydro's revenue requirement (e.g. further improving Hydro's financial structure). Some of his suggested priorities go beyond the mandates of Manitoba Hydro and the Public Utilities Board and would require action by the Government of Manitoba (e.g. assistance to low income customers and aboriginal communities; funding economic development; reducing tax burdens).

In any event, Manitoba Hydro would not consider it appropriate to propose increased Revenue Requirement for a whole class of service or for domestic customers generally, if changes in rate structure can be accommodated within the historic rate relationships and overall revenue requirement based on cost causation.

DEMAND SIDE MANAGEMENT

In this section of Rebuttal, Manitoba Hydro addresses the evidence of Mr. Paul Chernick with respect to Manitoba Hydro's Demand Side Management (DSM) activities. Mr. Chernick's evidence suggests that Manitoba Hydro's DSM efforts are modest compared to those of many other North American jurisdictions (p. 44). Mr. Chernick's comments appear to be based on a simple analysis comparing Manitoba Hydro's DSM savings and spending rates against those of other utilities. Mr. Chernick also comments that Manitoba Hydro should start by adopting the recommendations of Dunsky et al, including expanding program coverage, improving program designs, and abandoning the use of the RIM in program design or screening (Page 49).

Manitoba Hydro asserts that Mr. Chernick's assessment of its DSM efforts is based on simplistic and misleading analysis. Comparing savings and spending rates between utilities in different regions with varying load and regional differences can and does lead to misleading and ambiguous results. This issue was discussed with Dunsky et al. and the Dunsky report recognizes the potential misleading and ambiguous results. Specifically, Dunsky provides a similar analysis and includes some other metric comparisons such as electric percent of revenues. The electric percent of revenues metric suggests the opposite of what the saving and spending rate metrics suggest in terms of Manitoba Hydro's leadership position. In Dunsky's comprehensive report, these metrics are provided with a cautionary note informing the reader against drawing conclusions based solely on this information. The Dunsky report notes that: *"Manitoba Hydro has long been considered among Canada's leaders in energy efficiency incentive programs, thanks in large part to both a strong corporate commitment and a stable, long-term planning perspective."*

As part of Manitoba Hydro's continued efforts to be a leader in pursuing energy efficient opportunities, the Corporation contracted Dunsky Energy Consulting to conduct a strategic review and comparison of its Power Smart portfolio of programs. The primary objective of this assessment was to identify opportunities for incremental energy efficiency savings. The recommendations provided in the Dunsky report have been addressed in detail under *"Manitoba Hydro's Action Plan to the Dunsky Energy Consulting Power Smart Portfolio*

Review", which was filed with the PUB and Intervenors as Appendix 71 in the current proceeding on October 29, 2010.

Manitoba Hydro's leadership role in energy conservation is also evidenced by the:

- A+ rating on the 2009 Canadian Energy Efficiency Alliance's National Report Card. This is the 4th consecutive report card covering 8 years of assessment that Manitoba has either led or been tied for first place in the national rating.
- 2010 Energy Star Participant of the Year Award. Manitoba Hydro also received the Energy Star Utility of the Year Award in 2006 recognizing Manitoba Hydro as a national leader for transforming the market towards increased energy efficiency.

To further clarify the concern with using generic and high level metrics in comparing the efforts of various utilities and how misleading the resultant information can be, the following table demonstrates some of the significant regional differences that exist in some of the areas referred to in the Dunsky report and by Mr. Chernick. Any region having a higher concentration of industrial load and/or space and heating load will generally have a lower savings and spending rates or any other metric using total load in the denominator of the calculation. In general, Manitoba has a higher concentration of industrial, space heating and water heating load.

Table 1 – Comparison of Energy Sales and Degree Days Heating

Sector Comparisons	Vermont		Connecticut		California		Minnesota		Manitoba	
Domestic Sales (GW.h) [9]		%		%		%		%		%
Residential	2,122	38.6%	12,578	42.6%	89,799	34.7%	22,034	34.4%	6,899	33.7%
Commercial	1,991	36.2%	13,257	44.9%	121,105	46.8%	22,311	34.9%	5,966	29.1%
Industrial	1,383	25.2%	3,692	12.5%	47,835	18.5%	19,637	30.7%	7,621	37.2%
Number of Customers [10]		%		%		%		%		%
Residential	306,919	85.9%	1,447,250	90.4%	12,910,856	87.3%	2,290,881	89.0%	463,089	87.4%
Commercial	50,081	14.0%	148,175	9.3%	1,801,936	12.2%	273,429	10.6%	57,492	10.8%
Industrial	225	0.1%	4,881	0.3%	76,223	0.5%	9,425	0.4%	9,519	1.8%
Average Energy Use by Customer (kW.h/year) [11]										
Residential	6,914		8,691		6,955		9,618		14,989	
Commercial	39,756		89,469		67,208		81,597		103,771	
Industrial	6,146,667		756,402		627,566		2,083,501		800,609	
Annual Degree Days Heating (DDH) [12]	3087 DDH (Burlington)		2331 DDH (Hartford)		104 DDH (Los Angeles)		3259 DDH (Minneapolis)		4645 DDH (Winnipeg)	

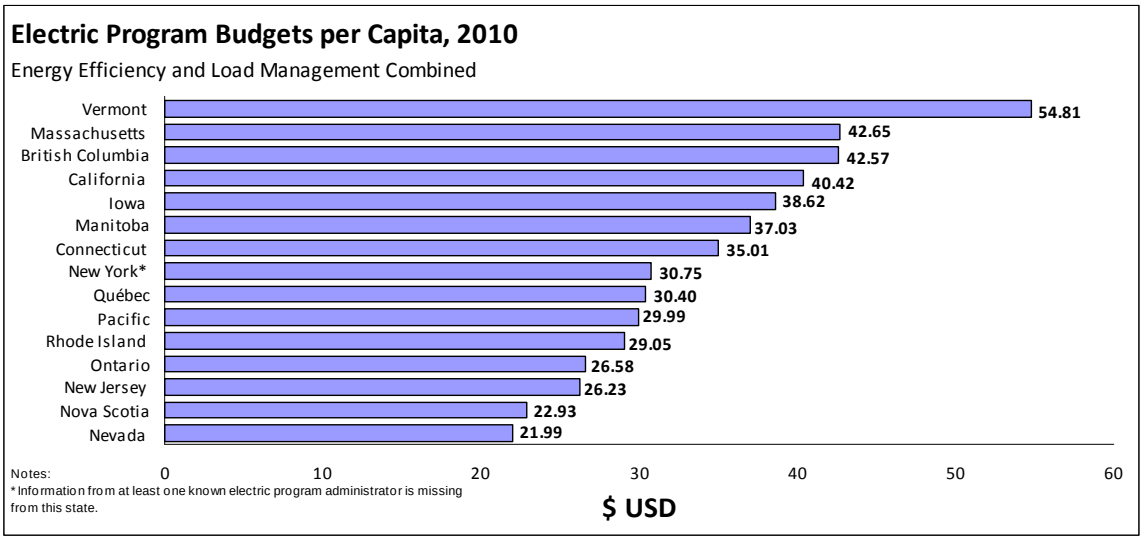
[9] From http://www.eia.gov/cneaf/electricity/esr/esr_sum.html, Table 2. Sales to Bundled and Unbundled Consumers by Sector, Census Division, and State, 2009.

[10] From http://www.eia.gov/cneaf/electricity/esr/esr_sum.html, Table 1. Number of Consumers (Bundled and Unbundled) by Sector, Census - Division, and State, 2009

[11] Calculated.

[12] From http://www.nahbrc.com/evha/HDD.pdf; based upon 30 year 1971-2000 Normals; Degree Days Heating Base 57 ºF = 14 ºC; original values given in ºF converted to ºC (multiplied by 5/9).

As shown in the following chart, when examining electric energy efficiency investment on a per capita basis, Manitoba is 6th across Canada and the U.S.[13].



Aggressive DSM Targets

Manitoba Hydro agrees with establishing aggressive energy conservation targets; however, the Corporation believes that it is more appropriate to base the targets on identifiable and realizable energy efficient potential rather than basing targets on arbitrary percentages. In the latter case, arbitrary targets based on load are especially concerning if the targets are established based on total load and based on similar percentage targets established in other regions which have completely different load profiles (i.e. low overall industrial load, low saturation of electric space and water heating, etc.).

Manitoba Hydro's preferred approach is to establish aggressive targets based on realizable and identifiable energy efficient potential (a bottom up approach). This approach is generally

[13] Consortium for Energy Efficiency (CEE) - State of the Efficiency Program Industry - 2009 Expenditures, Impacts & 2010 Budgets, Table 6 and Table 15, December 10, 2010.

supported by detailed market potential studies of energy efficient opportunities and detailed research on individual opportunities.

Manitoba Hydro, along with some other leaders in energy conservation, recognize that as end-use products are converted to more energy efficient products and as industrial processes are realigned to improve energy efficiency, the opportunities for capturing additional energy efficiency will diminish over time. For example, as homeowners replace more of their existing incandescent lighting with energy efficient compact fluorescents bulbs and fixtures, the customer reduces their energy consumption by approximately 75% (i.e. a 100 watt incandescent replacing a 23 watt compact fluorescent). As the next generation of energy efficient lighting technology (i.e. LEDs), becomes available, the incremental energy savings are much lower (e.g. potentially 20% with a 23 watt compact fluorescent lamp being replaced with an 18 watt LED). This diminishing effect or availability of economic energy efficiency opportunities is not unique to lighting technologies and in fact, is common to most end uses or energy efficient opportunities (e.g. fridges, motors, insulation ((attics going from R50 to R60)), etc.). This diminishing effect leads to questions of the long term achievability of percentage of load targets into the future.

Manitoba Hydro uses an integrated resource planning process and the Corporation makes significant long lead time capital investment decisions based on this process. The planning process relies on a forecast of energy demand which is adjusted for expected energy savings realized through DSM investments. The use of an arbitrary target for DSM would impact the integrity of Manitoba Hydro's long term planning process and the timing of significant investment decisions by Manitoba Hydro could be made inappropriately.

To ensure Manitoba Hydro's approach to setting targets is aligned with available opportunities, the Corporation monitors leading edge utilities and the programs being offered by these utilities throughout North America. Through these comparisons, Manitoba Hydro is confident that it has a comprehensive and aggressive energy conservation effort. For example, a recent review of a number of leading US utilities has found numerous similarities within the DSM portfolios offered in the residential, commercial and industrial sectors.

The following table compares DSM offerings for residential markets.

Table 2 - Residential Sector Offerings

Residential Programs/Offerings	Manitoba Hydro	Efficiency Vermont	Connecticut Light & Power	Pacific Gas & Electric (California)	Minnesota Power	Xcel Energy (Minnesota)
Building Envelope	Yes	No	No	Yes	No	Yes
Water heat/cons	Yes	No	No	Yes	Yes	Yes
Lighting	Yes	Yes	Yes	No	Yes	Yes
New Construction	Yes	Yes	Yes	Yes	Yes	Yes
Appliances	Ended	Yes	Yes	Yes	Yes	Yes
Financing	Yes	No	Yes	No	No	No
Energy Audits	Yes	Yes	Yes	No	Yes	Yes
HVAC	No*	Yes	Yes	Yes	Yes	Yes
Lower Income	Yes	No	Yes	No	Yes	Yes
Geothermal	Yes	No	Yes	No	No	Yes
Solar	Financing	No	Yes	No	No	Yes

* HVAC measures are included within the financing offering.

Overall, Manitoba Hydro offers a comprehensive list of offerings to its residential customers and continues to explore and evaluate additional opportunities to be added to the portfolio, such as Fridge & Freezer Recycling Program which is scheduled to be launched in the spring of 2011 and LED lighting which is being assessed for future opportunities.

The following table compares DSM offerings for commercial markets.

Table 3 - Commercial Sector Offerings

Commercial Programs/Offerings	Manitoba Hydro	Efficiency Vermont	Connecticut Light & Power	Pacific Gas & Electric (California)	Minnesota Power	Xcel Energy (Minnesota)
New Construction	Yes	Yes	Technology Based	Yes	Technology Based	Yes
Lighting	Yes	Yes	Yes	Yes	Yes	Yes
HVAC	Yes	Yes	Yes	Yes	Yes	Yes
Building Envelope	Yes	No	New Construction Only	Yes	Yes	No
Appliances	Yes	One	Yes	Yes	No	No
Refrigeration	Yes	Yes	Yes	Yes	Yes	Recommission Only

Commercial Programs/Offerings	Manitoba Hydro	Efficiency Vermont	Connecticut Light & Power	Pacific Gas & Electric (California)	Minnesota Power	Xcel Energy (Minnesota)
Custom Opportunities	Yes	No	No	Yes	Yes	Yes
Heat Pumps	Yes	No	Yes	Yes	No	Yes
Information Technology	Yes	No	No	Yes	No	Yes
Retrocommissioning & Recommissioning	Yes	No	Yes	Yes	No	Yes
Energy Management	Yes	No	No	No	No	No
Targeting Small Business	Yes	No	No	No	No	Yes
Financing	Limited	Yes	Yes	No	Yes	No
Energy Audits	Limited	Yes	No	No	Yes	Yes
Building Certifications	Yes	No	No	No	No	Yes
Variable Speed Drives, Efficiency Controls	Custom	No	No	Yes	Yes	Yes
Solar	Custom	No	No	No	Yes	No

Manitoba Hydro also offers a comprehensive list of offerings for its commercial customers. Manitoba Hydro continues to explore and evaluate additional opportunities to add to the portfolio, such as commercial water heaters. Manitoba Hydro also regularly assesses existing programs to realign and better reach targeted market sectors (e.g. Power Smart Shops).

For the industrial sector, a broad comparison indicates that Manitoba Hydro's program targets similar opportunities to those being pursued by the five utilities/entities referenced in the previous table. Manitoba Hydro provides financial incentives for Feasibility Studies and for project implementation in industrial and manufacturing facilities under its Optimization Programs. The Programs support all technologies that contribute verifiable electric and natural gas savings. Technologies that have been supported to date include; variable frequency drives, compressed air systems upgrades, refrigeration, HVAC, heat pumps, energy recovery, boilers, hi-efficiency motors, building envelope upgrades, steam trap assessments, process equipment and pipe insulation.

Program Coverage & Design:

Mr. Chernick recommends that Manitoba Hydro should expand program coverage specifically for small commercial and low-income multi-family residential housing, and new construction, and improve program designs through the use of upstream strategies, turnkey installation, market outreach and industrial-process programs.

Manitoba Hydro's Power Smart initiative has been and continues to target cost effective energy efficient opportunities within the multifamily residential housing sector. The following Power Smart programs target opportunities in multi-family customers classified as commercial buildings (large apartments; taller than 3 stories with a floor plate larger than 600 m^2):

- Commercial Building Envelope Program (windows and insulation)
- Commercial Heating Ventilation and Air Conditioning Program
- Commercial Parking Lot Controller Program
- Commercial Lighting Program
- Commercial Clothes Washer Program
- Commercial New Building Program
- Commercial Earth Power Program
- Water and Energy Saver Program - Multifamily Residences

The following Power Smart Programs target opportunities in multi-family buildings classified as residential buildings (less than 3 stories with individual entrances, condominiums and townhouses):

- Residential Lighting Program
- Residential Insulation Program
- Residential New Home Program
- Power Smart Residential Loan (owner as applicant)
- Residential Earth Power Program
- Water and Energy Saver Program

Since the Dunsky review, Manitoba Hydro has reviewed its penetration within the multifamily residential housing sector to assess the success of the Corporation's efforts in this market sector. Based on this data, to date over 2,700 multi-family residential buildings, representing approximately 60% of multifamily residential buildings in Manitoba, have participated in at least one of the many Power Smart offerings. Multifamily residential building customers have participated in Manitoba Hydro's Lighting (46%), Parking Lot Controller (18%), Windows (19%), Insulation (8%), Clothes Washer (7%), CFL Bulk Purchase (10%), Water & Energy Saver (7%), Boilers (4%) and Energy Star Appliance programs (4%). In addition, 185 multifamily residential buildings are awaiting the delivery of approximately 6,100 No-Charge Water & Energy Saving kits for installation within resident's suites. The latter is part of the Corporation's Water and Energy Saver program which is specifically targeting multi-family residential buildings in addition to single detached residential buildings.

The success of Manitoba Hydro's efforts within the multi-family residential sector is primarily attributed to the Power Smart sales staff, who are dedicated to pursuing energy efficient opportunities with commercial customers, including property managers and landlords. As a direct result of this dedicated sales force, multifamily housing has been one of the more active market sectors within the commercial market to engage in energy efficiency upgrades. To facilitate additional participation within this market sector, the Corporation is enhancing its marketing efforts and has recently developed a customized marketing package for property managers and owners. In addition, Manitoba Hydro is currently finalizing a brochure targeted specifically to renters and targeting low cost/no cost energy efficiency opportunities (i.e. opportunities via the Water & Energy Saver Program).

With respect to small commercial retrofits, this market opportunity is addressed through Manitoba Hydro's Power Smart Shops Program which was launched in 2009. This program was in the process of being finalized during the Dunsky review. Under the program, dedicated Power Smart staff actively solicit companies and pursue energy efficiency opportunities in this market sector and, while on-site, directly install low cost/no cost measures such as compact fluorescent lights, pre-rinse spray valves, faucet aerators and hot water tank pipe wrap, and set back temperature on water heaters,. Customers are also provided with predictable energy savings associated with a broader range of opportunities.

Manitoba Hydro launched its Power Smart New Buildings Program in April 2009, to provide technical guidance and financial incentives for designing, constructing, and operating new, energy efficient buildings in Manitoba. Program goals include advancing the local building design industry in the areas of Integrated Design, Energy Modeling, Building Commissioning and Energy Management. The program offers two approaches; a prescriptive approach offering incentives for buildings constructed to defined design standards and a custom approach which offers additional incentives to encourage design levels exceeding those achieved in the prescriptive path. The custom approach also provides an additional incentive for proven performance post-occupancy. This program was also in the design stage during the Dunsky review.

When designing a new program or reviewing an existing program, Manitoba Hydro recognizes the need to explore a variety of possible market intervention strategies, such as downstream, mid-stream, and up-stream incentives, direct install and turnkey offerings, design support and market outreach, in order to design a program that best leverages market opportunities. Examples of these market intervention strategies are demonstrated as follows.

- Upstream incentives, used to encourage and incent retailers to provide energy efficient products, are just one of the market intervention strategies that Manitoba Hydro evaluates as part of the design process for all programs and are offered when considered an effective option. For example, sales staff incentives were utilized as part of the Energy Star Appliance Program and stocking incentives are currently being considered as part of the redesign of the Energy Efficient Light Fixtures Program.

- Point-of-purchase discounts are another mechanism used by Manitoba Hydro. For example, point-of-purchase discounts were introduced in the fall of 2008 for Compact Fluorescent Light rebates and in the fall of 2010 for Energy Star Light Fixture rebates to simplify the process for customers and successfully encourage adoption.

- Manitoba Hydro has implemented a direct install approach under the Lower Income, WISE and Power Smart Shops programs. The newly launched Water & Energy Saver program also includes a direct install strategy.

- On the industrial side, Manitoba Hydro also works actively with retailers, designers, and contractors and works to influence national market suppliers and stakeholder associations to overcome market barriers to promotion and adoption of energy efficient products. When appropriate, Manitoba Hydro has used stocking incentives for retailers and contractors to ensure an available supply of energy efficient products is in the marketplace. Another example of upstream incentives involves co-funding feasibility studies for implementation of energy efficient technologies which reduces the costs for designers and increased their willingness to consider examining these options.

- Manitoba Hydro has a number of outreach initiatives that it offers to commercial and industrial customers and supporting industry (e.g. engineering consultants, architects, contractors, etc.) with a focus on both energy and non-energy benefits. Current offerings include both face-to-face presentations, program training sessions, as well as specific technology and program information sheets that are discussed one-on-one with customers and industry. For example, Manitoba Hydro recently developed a comprehensive energy efficiency guide for restaurants. The guide provides low-cost/no-cost energy saving tips, customer success story profiles, and payback periods for applicable technologies. Although already discussed in the existing technology and program information sheets, the guide will reinforce the significant non-energy benefits of efficiency upgrades, including: more uniform cooking through fewer temperature variations, extended food holding times, higher food production rates, quicker heat recovery for equipment, and reduced water consumption. The Power Smart Sales representative for this sector also reinforces all energy and non-energy benefits of retrofits with customers on a regular basis.

Program Cost Effectiveness

Mr. Chernick recommends that Manitoba Hydro should abandon the use of the Rate Impact Measure (RIM) cost effectiveness test for program design and screening.

Manitoba Hydro uses a number of cost effective tests to assess energy efficiency opportunities, including whether to pursue an opportunity, how aggressively to pursue an

opportunity, the effectiveness of program design options and the relative investment between ratepayers (via utility incentives and other costs) and participants. In addition to quantitative assessments, Manitoba Hydro also considers various qualitative factors, including equity (i.e. reasonable participation by various ratepayer sectors such as lower income) and overall contribution toward having a balanced energy conservation strategy and plan.

Manitoba Hydro prefers using the Levelized Utility Cost as the Levelized Utility Cost provides a specific cost on a per unit of energy basis; however, all tests are used in aggregate in determining which opportunities to pursue and which program design is best suited to meeting the Corporation's energy conservation efforts. With respect to using the TRC (Total Resource Cost) or SCT (Societal Cost Test), Manitoba Hydro uses a more inclusive version of the TRC which includes the value of emission reduction impacts.

Manitoba Hydro does not agree that the use of the RIM test is restricting its ability to pursue energy efficient opportunities. Manitoba Hydro has implemented a number of programs which do not pass the RIM test, such as the Energy Efficient Light Fixtures, Fridge Recycling and Power Smart Shops Program presented in the 2010 Power Smart Plan. Manitoba Hydro intends to continue using a broad range of quantitative metrics to assess program designs for pursing energy efficient opportunities, including using the following cost effective tests:

- Marginal Resource Cost (MRC) test;
- Total Resource Cost (TRC) test;
- Rate Impact Cost (RIM) test;
- Levelized Utility Cost (LUC);
- Simple Customer Payback calculation; and
- Participating Customer (PC) test.

Mr. Chernick also incorrectly assumes that Manitoba applies the levelized 8.26 cents per kW.h (at meter) marginal value without consideration of the load shapes and load impacts of the end use technologies and their coincidence with Manitoba Hydro's system load shape. All energy efficiency measures and individual program designs are valued based upon their contributions to on and off-peak energy during winter and summer seasons, in addition to

their contribution to both winter and summer system peaks. The levelized overall marginal value of 8.26 cents per kW.h (at meter) was provided to provide a reference point for discussion purposes.

Conclusion

- Based on a more detailed analysis and recognizing regional differences, Manitoba Hydro is a leader in pursuing DSM opportunities. Manitoba Hydro's targets are reassessed each year and these targets are based upon achievable and reasonable market opportunities. Manitoba Hydro recognizes the diminishing availability of energy efficiency opportunities with existing technologies and the Corporation is continuously searching for new opportunities as well as increased participation with existing targeted opportunities.
- Where appropriate, Manitoba Hydro has adopted the recommendations within the Dunsky report. Specific to the multi-family residential market sector, Manitoba Hydro's Power Smart effort has been and continues targeting opportunities within the multi-family residential market. To date, Manitoba Hydro has achieved reasonable participation within this market sector and specifically with the energy efficient programs offered.
- Manitoba Hydro does not use the Rate Impact Measure cost effectiveness test as the primary screening tool in screening technologies or programs. In addition, the use of this test is not limiting economic opportunities from being pursued through the Corporation's Power Smart efforts. Manitoba Hydro uses a broad range of quantitative tools in assessing the program design that best fits the market and Manitoba Hydro's Power Smart goals.

POWER SUPPLY

Energy Planning and Computer Modeling Practices

This section of Rebuttal will respond to the evidence of the PUB's Independent Consultants Dr Atif Kubursi and Dr. Lonnie Magee (KM) and RCM/TREE's witness Jonathon Wallach, related to Manitoba Hydro's energy planning and computer modeling practices.

Maximizing Net Revenues versus Minimizing Costs

In the KM Report and again in response to a CAC/MSOS interrogatory, KM argue that

> *"the last thing the citizen shareholder would like to see is the utility using its market power to maximize its rents, especially given the inherent concern about the implicit trade off between domestic load and exports"* (KM Report, Page 65),

and

> *"It would be more reasonable and more consistent with its mandate for MH to minimize the cost of the given volume it has to deliver."* (CAC/MSOS/KM-30),

and

> *"Seventh, we would like to formulate the objective function to minimize cost of generation and delivery rather than maximizing net revenues."* (KM Report, Page 65).

Manitoba Hydro disagrees with KM on these issues. Manitoba Hydro's first obligation in all of its activities, consistent with its legislative authority established in *The Manitoba Hydro Act*, is *"to provide for the continuance of a supply of energy to meet the needs of the province…."* Given this mandate, there is no risk that Manitoba Hydro power traders may trade off service to Manitobans to maximize rents in the export market. To ensure against that possibility, Manitoba Hydro has separated its merchant function (profit maximization) from its transmission and system operation function (reliability). This separation is prescribed in the Corporation's "Standard of Conducts for Providing Open Access Transmission and Interconnection Service."

Further, all Manitoba Hydro export contracts subordinate exports to deliveries to firm Manitoba customers through appropriate curtailment rights. In real-time the availability of surplus electricity to the export market is determined by Manitoba Hydro's System Control

Department, having first satisfied itself that the needs of the Province have been met. Manitoba Hydro has never curtailed firm load in Manitoba in order to continue to serve any export obligation.

Manitoba Hydro disagrees with KM that efficiency should be pursued rather than profit maximization in order to protect its domestic customers. This is unnecessary as the protection of domestic customers is enshrined in legislation, Manitoba Hydro policy, and Manitoba Hydro's export contracts. Manitoba Hydro's inability to tradeoff domestic firm load versus export load is represented in all its models where Manitoba load is not a decision variable that could be subject to curtailment.

Manitoba Hydro believes that its practices of optimizing net export revenues in its water management and market activities, benefits its ratepayers. Having done that, it dispatches its generation resources in the most efficient manner. To do otherwise (i.e. to formulate the objective function in its models to maximize efficiency and minimize generation and purchase costs) would cost Manitoba Hydro customers millions in lost profits from foregone hourly, daily, weekly and seasonal arbitrage activities and result in higher domestic electricity rates.

Drought is Not an Emergency at Manitoba Hydro

In the KM Report and in response to interrogatories from the PUB (PUB/KM-11; PUB/KM-50; and PUB/KM-53), KM suggests that Manitoba Hydro does not have Risk Preparedness Plans, especially one for drought.

> *"Risk Preparedness Plans and manuals are needed for all costly risks. A Drought Preparedness Plan is a critical necessity. It must be completed and instituted in the working mechanisms of the organization immediately. The preparedness plans should not stop at the Drought Plan. There are many other emergencies and drastic events that may occur that need to be expected and plans made to deal with them. A broad preparedness plan can make substantial contributions to the effectiveness of risk management services and plans at MH."* (KM Report, Page 194)

Manitoba Hydro disagrees with these suggestions especially with regard to the treatment of drought as an emergency event.

Manitoba Hydro corporate policy states:

> *"Manitoba Hydro will have emergency response plans in place for foreseeable emergencies arising from natural or man-made events that pose a real or potential threat to*
>
> - *the health and safety of employees, contractors, and the general public;*
> - *the assets of the Corporation and related environmental protection;*
> - *the ability to generate, transmit and distribute electricity, transmit and distribute natural gas, and provide related services; and*
> - *the ability of the Corporation to conduct business in the normal course."*

Manitoba Hydro develops Emergency Response Plans to ensure the Corporation meets these requirements. Emergency Response Plans are built to address all hazards and risks to which the Corporation may be exposed, such as fire, flood, gas/electric supply interruption, dam failure, hazardous materials, explosions and emissions, disease and workforce disruption.

With regard to a drought, Manitoba Hydro considers it to be a normal event, although the financial consequences for its customers can be serious and significant. Depending upon the definition adopted for drought, Manitoba Hydro could be considered to be in drought 50% of the time, equivalent to the frequency that the water supply is below median. To ensure that drought is not an emergency and that the Corporation is able to conduct its business in a normal fashion, Manitoba Hydro's generation, transmission, export sales, operating and financial planning processes are all designed with the worst historical drought in mind. Manitoba Hydro updates these plans annually and all plans are developed consistent with the Corporation's generation, transmission and financial planning criteria and targets.

In planning its future, Manitoba Hydro assumes that severe drought is a foreseeable event and can occur in each and every year. As a consequence drought preparedness planning is an ongoing process and is embedded in the day to day operation of the system.

The onset of drought is not foreseeable, however it is not a surprise event such as emergencies, for example a dam failure or tornado damage to the transmission grid. Drought develops gradually over time. As a consequence the onset of drought is detected by the Corporation through its constant monitoring of precipitation and water flows across all its watersheds in western Canada. Based upon weekly updated water supply forecasts and worst case scenario planning, the Corporation adjusts its operations plan accordingly.

Manitoba Hydro has an Export Power Risk Management Committee (EPRMC) that consists of the President and CEO and other Senior Executive. The EPRMC meets at a minimum once quarterly to review the Corporation's risks associated with its export market activities and system operations. Included in this review is a quantitative assessment of the current water supply conditions and any potential financial impacts resulting from variations in market prices and water supplies including the consequences of extreme drought. During periods of increased risk, the EPRMC increases the frequency of its meetings to review and approve risk tolerances, risk mitigation strategies and significant operational decisions. The Corporation's response to drought will depend upon its current financial strength, water storage conditions, market prices, and other factors. The Manitoba Hydro Electric Board is also kept updated in periods of increased drought risk.

Manitoba Hydro's Dependable Resources are Adequate

KM state on page 214 that *"The inclusion of wind and out of the money thermal energy in dependable energy is a stretch but they represent such a small portion of the total generation that their inclusion or exclusion is not a material concern."* Manitoba Hydro does not agree with this conclusion since KM seem to confuse cost with availability. Under Manitoba Hydro's Generation Planning criteria Manitoba Hydro is required to supply sufficient dependable energy resources to meet firm energy demand in the event of a repeat of the lowest historic system flows on record. The dependable energy available in the Manitoba Hydro system is the total of energy supplied from hydro-electric stations, thermal stations, contracted wind purchases, projected Demand Side Management savings not already accounted for in the load forecast and contracted imports from neighbouring utilities.

Manitoba Hydro operates an integrated system in which all available resources are operated as required to meet the total of the Manitoba load and firm export obligations on a least cost basis while observing operational limitations. Manitoba Hydro may call on energy from imports in order to optimize operations and maximize revenue for the benefit of Manitobans. In addition, because Manitoba Hydro operates an integrated system it is not appropriate to allocate the delivery of energy from a specific generation source, such as imports or thermal, to a specific requirement, such as export sales or domestic load.

Supply/demand balances change over the study years as domestic load grows, firm contracts are terminated or initiated, and supply resources are added or retired. This results in varying quantities of imports and thermal generation to meet domestic and firm contract obligations. Based on projected annual generation corresponding to historical flow records, Manitoba Hydro can expect that energy from all resources will be adequate to meet Manitoba Hydro's firm obligations, with the use of thermal and import energy needed in only about 10% of the flow years to meet the total of all firm commitments as provided in response to PUB/MH/RISK-13(c). These energy purchases would be made primarily during the off-peak period when prices are considerably less than the on-peak market prices. In the remaining 90% of the flow years, the Manitoba Hydro system is able to generate revenue from surplus energy. In any given year, but, in particular, in the low flow years, there may be additional import capability for non-firm purchases which could reduce the requirement to operate Manitoba Hydro's less efficient thermal resources.

Peaking resources, such as low capital cost, high operating cost gas turbines, provide a cost effective resource when a system expects to rely on them infrequently, as is the case in the Manitoba Hydro system.

Manitoba Hydro's Estimate of the Financial Impact of Drought is Reasonable

The impact of drought on Manitoba Hydro's net revenue is evaluated using the SPLASH model. The KPMG report (pages 113-114) raises the issue that the *"SPLASH outputs tend to underestimate the financial impacts of drought."* On page 97 of the KM report, KM state that they believe that *"the actual costs of a drought would be seriously understated"* by the methodology used by the SPLASH model. On page 15 of his Direct Testimony dated

December 13, 2010, Mr. Jonathan Wallach further raises the issue that *"the extent to which drought-related costs are understated is unknown at this time" and that "as soon as feasible"… "it is critical that Manitoba Hydro determine the effect of perfect foresight on its drought-related financial losses"*. The following discussion provides an order of magnitude estimate of this potential understatement in order to put the issue into the appropriate perspective.

In order to determine the financial cost of drought, the first step is to determine the expected revenues and costs by utilizing a SPLASH simulation of all 94 flow conditions. The average of the 94 possible consequences is the expected value of revenues and costs that form the basis of the projections for the IFF. The simulated revenues and costs for a specific drought period are then compared to the expected case to determine the increased costs of thermal generation and import energy as well as the reduced revenues. The claim that the SPLASH methodology utilizes perfect foresight in making operating decisions on reservoir releases and energy purchases arises because this methodology assumes a repeat of the worst historical drought forcing a draw of reservoirs to minimum levels. Manitoba Hydro acknowledges that there may be some understatement in drought-related costs if alternative non-firm purchases ultimately prove to be available.

Should non-firm purchases prove to be available then there is the potential that this non-firm energy will also be available to displace expensive combustion turbine energy in Manitoba. Therefore, as acknowledged by KPMG on page 114 of their report, SPLASH modeling also has the potential to overestimate the cost of drought as follows *"To meet drought conditions, SPLASH will generally therefore assume that more use is made of MH's relatively inefficient thermal generating plants. In practice, less costly power is generally available from MISO and this tends to reduce the costs of the generation needed to cover the shortfall in energy from hydroelectric sources."* This was the situation in the drought of 2003 where the gas-fired generation was not operated significantly due to the availability of lower cost non-contracted imports. In order to estimate the magnitude of this potential offset, an assumption of 3,000 GWh of displaced Manitoba Hydro gas-fired generation over the 5-year drought period is reasonable which would produce a saving of $30/MWh as a conservative estimate. This results in a potential overestimate by SPLASH of about $90 million for the financial impact of a 5-year drought.

Conversely, using the same assumption regarding the availability of non-firm purchased energy to avoid the forced draw of reservoir storage, there is the potential that drought costs are underestimated by SPLASH because it fully draws storages to the minimum level. In actual operations it is likely that reservoirs will not be drawn to this minimum level because additional non-firm purchased energy may be available. Therefore, some storage could be maintained by purchasing energy instead of utilizing stored energy. This additional purchase would add to the cost of a drought as estimated by SPLASH. As an order of magnitude estimate associated with retaining water in storage, it is assumed that a storage buffer of 1.0 feet would be retained in Lake Winnipeg requiring an additional 2000 GWh of energy at an estimated cost of $50/MWh. This would translate into an additional drought cost of $100 million. When considered in combination with the $90 million reduction in cost that would likely occur in the operational time frame, the overstatement approximately offsets the underestimation. Therefore, the statement made by KM that the SPLASH estimate of drought cost is "seriously understated" is an overstatement of the issue.

There is an additional factor that must be considered in assessing the overall impact to the finances of Manitoba Hydro due to maintaining a storage buffer rather than using perfect foresight of when drought will end. The potential increase in drought cost resulting from maintaining a storage buffer is likely not a loss since the water that remains in storage has value in the period following the drought. This value would at least partially offset the additional cost of purchases during the drought period. This value of water in storage was acknowledged by KPMG on page 114 where they make the statement that *"The period following the drought will have more water in storage than assumed by SPLASH reducing future costs for imports and thermal generation"*. In most flow conditions that occur after the drought this water in storage will have value. There is only a small probability that water flows subsequent to the drought period reach near maximum values. In this rare case the value of the water in storage from the buffer would be negligible because it could not be utilized and would have to be spilled.

Manitoba Hydro's Suite of Computer Models Serve Their Purposes Well

KM have devoted many pages in their report to the review of computer models that are utilized by Manitoba Hydro, and have provided many suggestions of where models may be improved. However, it is difficult to determine what KM's overall position is on the adequacy in Manitoba Hydro's models. With reference to MOST on page 63, KM state *"VISTA is undoubtedly a powerful tool and thoroughly tested system.*" Regarding HERMES and SPLASH, KM state on page 180 *"On the whole, we felt strongly that HERMES is a valid model, it serves MH well..."…"SPLASH is an equally relevant and useful system…"*. In addition on page 95 in a reference to the SPLASH model, KM state that *"We are happy with the simulation structure of the system and the insights that this can add to its utility."* However, in numerous locations in the report recommendations are made to make changes to these models without a comprehensive review and understanding of the issues and considerations faced by Manitoba Hydro's in adopting such changes.

Manitoba Hydro believes that its models adequately meet current requirements but continuously invests in them as conditions warrant. Manitoba Hydro acknowledges that every model can be improved, but that the costs of improvements must be justified. KM acknowledge that no model is ever a perfect representation of reality on page 54 with the statement that *"It is impossible to include and represent the entire complex reality"* in models. They also state that *"Simplification is particularly important given the enormous complexity of reality. In the case of hydro generation the three subsystems of hydrology, power and finance are complex and involve a large number of variables and relationships."* KM further state on page 54 that *"Even with the largest and fastest computers there are limitations on what can be included in the focus set"* of models.

KM have provided a set of findings and recommendations based on their review of Manitoba Hydro's models and compared them to those of other utilities. As KM acknowledge in the reference provided above, the models are very complex and there are many relationships that must be considered in formulating the mathematical model in order to represent reality.

The KM review involved a broad range of issues and it was not possible for them to become completely familiar with all of the complexities of the modeling process in the short time that

was available. Given the time constraints on their review and its broad scope, KM were not in a position to assess the practicality of their suggestions and recommendations that would result in increased complexity and challenges related to computer processing limits. As a result, in many cases KM suggested that Manitoba Hydro may want to investigate alternative approaches to the modeling function but these suggestions were not definitive recommendations. The areas of investigation that were suggested include the following: non-linear instead of linear programming, stochastic instead of deterministic variables, dynamic instead of static formulation as well as placing models on a common platform. KM also suggest that the objective function in all the models should be minimization of cost as opposed to maximization of net revenues. While Manitoba Hydro takes all suggestions and recommendations seriously, Manitoba Hydro believes that, although many of these suggestions are of theoretical benefit, most are not practical.

Manitoba Hydro is providing the following clarification on its models used to operate and plan its hydroelectric system as a response to the adequacy of the models, recognizing that each model fulfills a specific requirement. In addition, this material provides context when addressing some of the specific suggestions that KM provided relative to improving the modeling process.

Manitoba Hydro has a suite of computer models (MOST, HERMES and SPLASH) used in operating and planning the Manitoba Hydro generating system. Each of these models has a different function and each fits into a hierarchy of time horizons. Consequently, each model considers factors that are important in that time horizon. Each of these models utilize a linear programming formulation to optimize the operation of the system within the corresponding time horizon. Each model resides on different computer platforms within different divisions of the Corporation.

The MOST model is a decision support tool that is utilized for hourly energy and capacity planning. This model optimizes system operation for a time horizon of up to two weeks. As a result the MOST model incorporates characteristics of individual system components, such as individual generating units, the HVDC system and other portions of the transmission system to appropriately represent upcoming system operations on an hourly basis necessary to meet the forecast of Manitoba load, and committed and potential exports. The model

considers capacity issues such as unit outages and operating reserves. This model does not determine major reservoir releases which are outside the time horizon of this model.

HERMES is a decision support system that is used for energy and capacity planning including reservoir release schedules. Output from HERMES is used to assist in making operating decisions on reservoir releases for a time horizon of up to 18 months. HERMES considers additional factors compared to MOST such as water routing times, licence and regulatory constraints on MH reservoirs and the likely operation of upstream reservoirs in Manitoba, Ontario, Alberta and Saskatchewan, controlled by others. Consequently, inflow forecasts for many locations in each major watershed are prepared in HERMES.

HERMES is used daily in preparation of the weekly operating plan. Each run formulates a single linear programming problem that covers the operating planning horizon with discrete time steps (weekly or monthly). The algorithm in HERMES solves the linear programming formulation iteratively until convergence of the production coefficients is reached to deal with the non-linear nature of the problem. Single solutions are completed within minutes but multi-flow HERMES solutions may require an hour to solve.

In addition to the energy management model in HERMES, there are several models (load forecasting, hydraulic performance forecasting, flow forecasting, market forecasting, capacity planning, generation estimate) that either pre-process data needed as input or process the results from the energy management model.

The SPLASH computer model is used for energy planning in order to meet future electrical energy requirements in the long term. This model is used to determine the hydraulic dependable capability of the system, to assess the economics of various alternatives for system expansion and, consequently, to determine the recommended power resource plan that is utilized in the IFF. The SPLASH model has no operational role. Due to the hydroelectric nature of the Manitoba Hydro system and the long lead time of new resources, Manitoba Hydro uses a 35 year planning horizon. The SPLASH model simulates the operation of the Manitoba Hydro system with a monthly time step into the future for up to 35 years under a specific power resource development plan.

Since water conditions are the most significant factor that influences the availability of energy, the range of 94 historic water flow conditions since 1912 are utilized to represent a range of possible water conditions in the future. Similar to HERMES, the SPLASH model formulates a linear programming problem that encompasses a period of one year which it solves approximately 10,000 times. This results from a 35 year planning horizon, considering 94 water flow conditions and iteration on production coefficients until convergence. Solution times of six hours are normal.

Given the long solution times, the detail in SPLASH is much reduced compared to HERMES, through aggregation of generating stations on common river reaches and through a simpler on-peak off-peak representation of the load and the markets. No consideration is given to reservoirs upstream of Manitoba. This formulation reduces the size of the linear programming formulation while maintaining the integrity of the representation of the system. In spite of aggregation, production coefficient representation in SPLASH compares favourably to HERMES as described below.

The Role of PRISM at Manitoba Hydro

In the KM Report (page xxviii), KM states:

> *"Manitoba Hydro supports, uses and relies on three major models (HERMES, SPLASH and PRISM) in its planning of operations, investment planning, financial forecasting and budgeting."*

In addition, in response to RCM/TREE/Independent Experts-9b, KM states:

> *"The estimated costs of a five year drought cited above does not come only from SPLASH. While SPLASH data is used to generate the autocorrelations in flow, PRISM uses a number of stochastic assumptions to derive the $2.4 billion."*

Manitoba Hydro disagrees with KM statements with regard to the role of the PRISM model at Manitoba Hydro in its planning of operations, investment planning, financial forecasting

and budgeting processes and its role in the derivation of the $2.4 billion drought financial impact.

The PRISM model is currently under development, it is a prototype and does not presently form part of Manitoba Hydro's planning of operations, investment planning, financial forecasting and budgeting processes.

The primary purpose for the current development effort is to produce a screening tool for developing financial hedging strategies involving managing drought risk. Screened strategies shown to have merit would be subject to more detailed study by other detailed models. PRISM has had no role to date in the derivation of the $2.4 billion drought financial impact estimate.

Hydrological Modeling at Manitoba Hydro

The KM Report (KM Report p. 79) suggests that a *"serious alternative"* to Manitoba Hydro's use of statistical flow forecasting (antecedent forecasts) is *"full-blown hydrological models with full accounting of precipitation, evaporation and flows"* in both its HERMES and SPLASH models and states that *"the expected benefits from such models and systems cannot be exaggerated."* Manitoba Hydro notes that KM provides no detail or study to substantiate these statements.

Although Manitoba Hydro is developing a comprehensive hydrological model of all its watersheds as part of its studies into the effects of climate change on water supply, Manitoba Hydro disagrees that it should abandon its reliance on the historical streamflow as the basis for its operations (HERMES) or generation planning (SPLASH) and replace it with the outputs from a hydrological model.

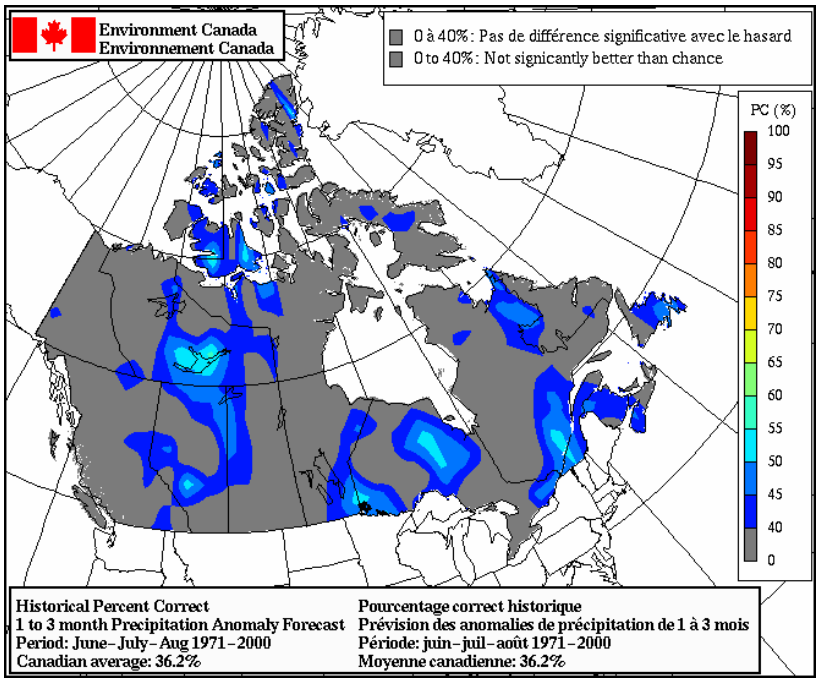
Unlike many other hydro-electric utilities, Manitoba Hydro is fortunate to have a relatively long (almost 100 years) comprehensive streamflow record of its main river flows. Hydrological modeling may eventually be useful to the Corporation to provide a means of adjusting its historical streamflow record based on various climate change scenarios. However, given model bias and calibration issues, the lack of long-term historical

meteorological data and long-term meteorological forecasts, it is unlikely that hydrological model outputs will ever replace the historical flow record completely.

For the operational time frame, Manitoba Hydro expects the development of its hydrological models to be of some benefit for shorter-term flow forecasting in areas such as predicting snow melt and storm event runoff volumes for certain watersheds. Manitoba Hydro already incorporates hydrological model forecasts into HERMES where available from other water management agencies. However, as operations planning requires water supply forecasts up to 18 months into the future, the output from hydrological models is of limited value in these time frames given the lack of accurate long range meteorological forecasts.

As indicated in the following Figure 1, Environment Canada demonstrates an example of current forecasting accuracy for long-term precipitation, which is the primary parameter in hydrological modeling. The figure indicates the ability to forecast above, below or near normal precipitation for the respective periods. The grey areas indicate forecasts that are not statistically better than a random "chance" forecast (*i.e.*, a guess of either above, below or near normal precipitation).

Figure 1
Historical Percent Correct Precipitation
(June to August period for 1-3 month lead time forecast)



http://www.weatheroffice.gc.ca/saisons/image_e.html?months=010203&season=jja&type=pcpn&product=skill)

Given Manitoba Hydro's need for certainty in being able to supply electricity to its customers, the level of predictive skill available at this time for the meteorological inputs into any hydrological model is inadequate. As a result Manitoba Hydro will continue to rely on its long-term streamflow record as the basis for its operational planning.

Use of Linear Programming Instead of Non-linear Programming

KM make the suggestion a number of times that nonlinear programming should be considered for Manitoba Hydro's models. They state on page 124 that *"Since the underlying structure is nonlinear and new solvers (GAMS or AIMMS) can easily solve large nonlinear and stochastic systems, it is worth considering these upgrades."* However, on page 180 they

state *"EMMA is a linear programming system and similar systems constitute the standard operational planning tools in almost all large utilities in North America and abroad."*

Most hydro-electric systems have unique characteristics, due to the geography, topography, or climatic conditions, among other factors. Manitoba Hydro's system has small, gradual changes in elevation, coupled with a large drainage basin which results in low-head, run-of-river facilities designed for high flows with relatively constant forebay levels. As a result, the relationships between river flows and generation can be well represented with linear functions in an iterative process to converge on an optimal solution. Thus the need for a complex non-linear programming solution is eliminated. Even in MOST where unit dispatch is involved, a non-linear formulation is avoided through an appropriate linear solution.

Value of Dynamic Programming is Limited

KM make the following comments related to the incorporation of dynamic programming into Manitoba Hydro models on page *xxxi* of the Executive Summary *"HERMES and SPLASH are static models and do not handle time in a manner consistent with dynamic programming. MH may wish to consider some of the existing dynamic programming systems in use at similar utilities in North America."* However, on page 57 KM acknowledge that *"HERMES is dynamic in a special way in that the HERMES variables have different time coordinates and are treated as different variables."* This would also apply to SPLASH since it utilizes a similar problem formulation. The use of dynamic programming incorporates time as an additional dimension and thus as a variable in the problem formulation. This increases the problem size exponentially and consequently increases computer time exponentially as the number of reservoirs and states of system configuration increases. This exponential increase in the size of the problem when utilizing dynamic programming is well known in the water resources field as "the curse of dimensionality" and this limits the usefulness of this optimization technique.

Manitoba Hydro is familiar with applying dynamic programming since this optimization technique was utilized in an expansion screening model (MOSES) that was developed in the 1980s by Manitoba Hydro. This model is no longer used or maintained. Dynamic programming has been considered and was found to be impractical for a problem as large as

operation of the Manitoba Hydro system. In addition, due to the lack of annual storage carryover capability, the impact of any reservoir operating decision is insignificant after two years. This limits the potential for benefits in the Manitoba Hydro system that may be associated with dynamic programming compared to other jurisdictions that may have the capability to carry water in reservoir storage for many years.

HERMES Errors are Not Large

In the KM Report (p. 71) and in response to interrogatories from CAC/MSOS (CAC/MSOS/KM-30), KM suggest there are errors in HERMES and that they are significant and avoidable.

KM acknowledges that there are generally two sources of error that manifest themselves in a forecast produced using a decision support model – *"errors in the data used or in the structure (logic) of the model."* (KM Report, page 71) KM attributes differences between actual results and forecasts results to these errors (KM Report, page 85).

Manitoba Hydro disagrees with the KM conclusion that identifies these differences as errors. Rather Manitoba Hydro attributes the majority of these differences to uncertainty associated with the major inputs that are highly dependant on weather and market conditions. Variation in weather affects the water supply, upstream regulation, market prices and temperature sensitive Manitoba load demand and ice processes. Local and global market conditions affect electricity and fuel prices, exchange rates and market sensitive Manitoba load, and accurate long range forecasts of these variables are unavailable.

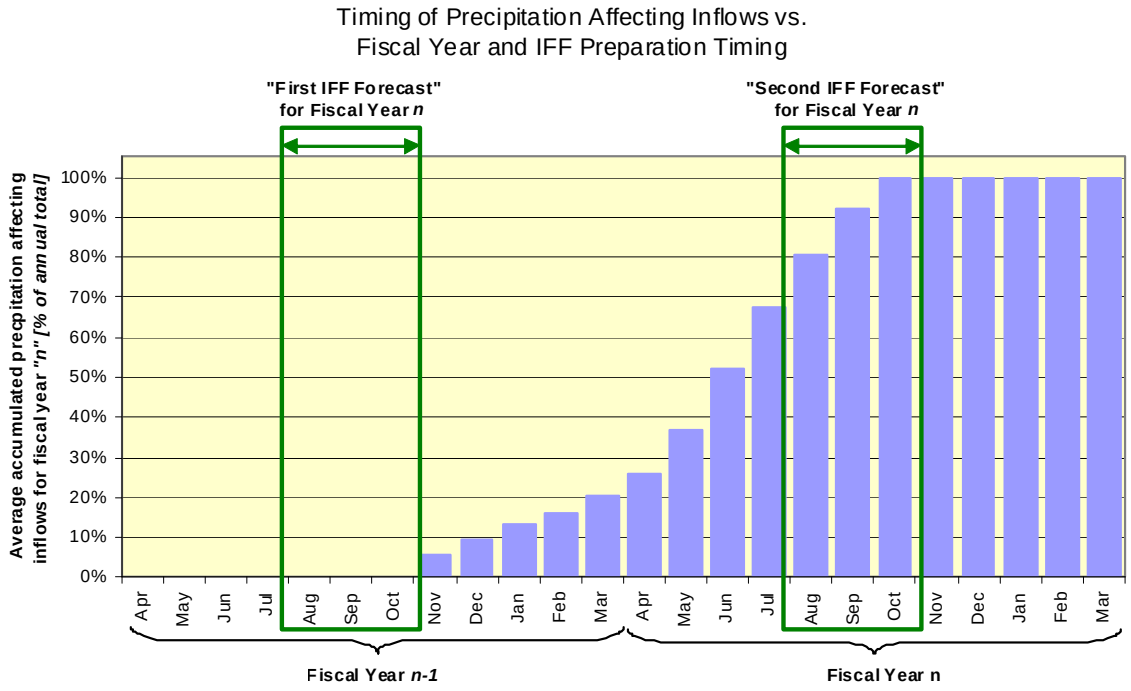
The greatest input uncertainty faced by Manitoba Hydro is that associated with future water supplies. The state of meteorological science is such that accurate precipitation forecasts are only available for a lead time of two to three days. Long-term seasonal forecasts as discussed previously have a predictive ability only slightly better than chance. However, Manitoba Hydro requires water supply forecasts up to 18 months into the future in order to ensure the adequate and reliable supply of electricity to its customers with a high level of confidence. As a result it relies on the historical record in preparing its water supply forecasts that far into the future.

KM notes that the 'second forecast' produced using HERMES is far more accurate than the 'first forecast'. As explained in CAC/MSOS/MH I-107(b) and CAC/MSOS/MH II-104(a) the first forecast is not based on any actual precipitation forecast, rather it is based on an assumption of median inflows plus projected reservoir carryover storage from the prior year.

In contrast the second forecast accuracy improves because it is produced between July and October when over 70% of the annual water year precipitation has already occurred (see the Figure 2) and has created runoff into rivers and reservoirs. Conversely as much as 30% of the annual water year precipitation has yet to materialize and lacking accurate precipitation forecasts, there is inherent uncertainty associated with the ultimate water supply. By the end of the annual water cycle at the end of October, the uncertainty around the water supply forecast for the balance of the fiscal year is low.

Therefore the variations associated from actual results are not "HERMES errors" as reported in the KM Report but are variations from forecasts reflecting the uncertainty of the weather and markets.

Figure 2



HERMES and SPLASH Results do Not Include Forecasts of Domestic Revenues

In response to RCM/TREE/Independent Experts-7(b) and 8 KM has stated:

> *"Yes, the net flow-related revenue calculation includes a forecast of revenues from domestic firm load."*
>
> *"Revenues are generated by the sale of firm energy and opportunity energy, domestically and outside the province. Costs include all operation costs including depreciation but in this case excludes interest on debt."*

Manitoba Hydro disagrees with KM's responses. Neither HERMES nor SPLASH calculate domestic revenues or consider cost of depreciation or any other fixed costs in the objective function. Domestic load (both firm and interruptible) is satisfied in the models as a given

based on the approved energy demand forecast in Manitoba Hydro's Corporate Load Forecast. Domestic load is not a variable in the objective functions. The forecast of domestic revenue is produced separately by Manitoba Hydro's Rates Department for inclusion in the IFF.

Variations in domestic load as a result of weather or load growth variation contribute to the inaccuracy of HERMES forecasts. For example if actual domestic energy consumption is above forecast in one month by 100 GWh due to cold weather, this will lead to less surplus available for export and will be reported as a negative variance on the HERMES net export forecast. This is another reason why the analysis on variations from HERMES forecasts as highlighted in on p. 71 of the KM Report is misleading in attributing them to errors in HERMES modeling.

In both HERMES and SPLASH the net flow-related revenue calculation refers to flow related revenues (such as opportunity market sales) less system generation and power purchase costs. These cost items include water rentals, oil, gas and coal costs, and energy purchase costs. These revenues and cost are included in the IFF. In addition Manitoba Hydro forecasts non-flow related revenues and costs. These revenues include fixed export contract sales revenues, transmission service and other miscellaneous revenues. These fixed costs include items such as contract costs, transmission reservations costs, and fixed coal contract costs.

Production Coefficients are Not Different in HERMES and SPLASH

In the KM Report (p. 179 Finding 3) and again in the response to PUB/KM-24, KM state that different production coefficients in HERMES and SPLASH are a problem.

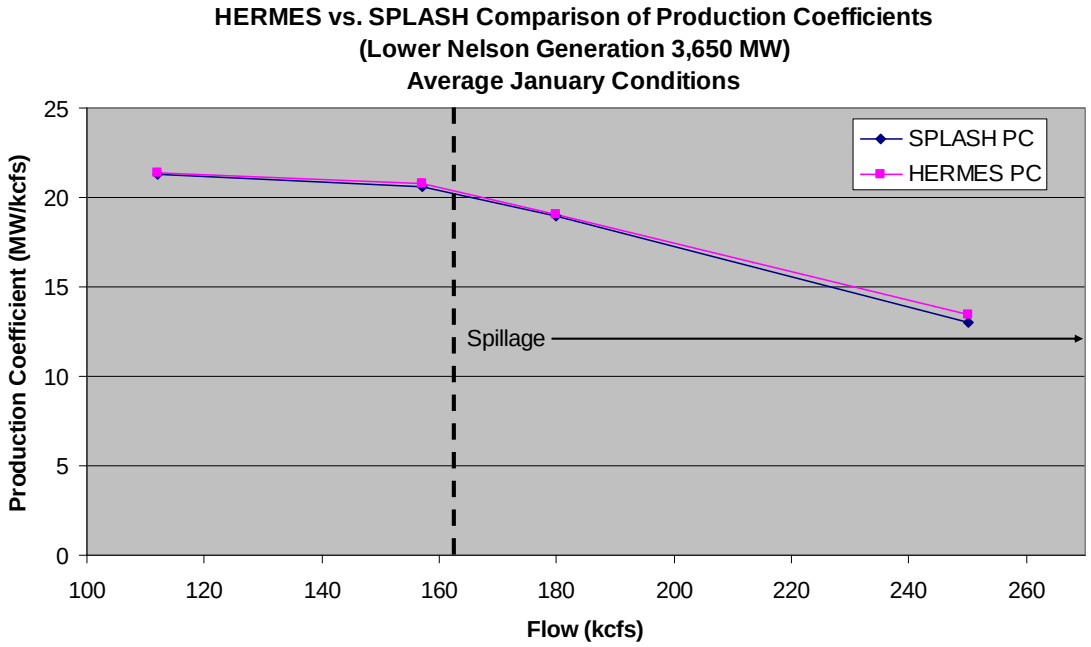
"NYC had raised questions about different energy production coefficients between HERMES and SPLASH. KM have noted and agreed with NYC's concern but not her calculations" (PUB/KM-24).

Manitoba Hydro disagrees that there is a problem with different production coefficient representations in Manitoba Hydro's models. To the extent that there are differences they are

very minor and are a result of different levels of aggregation. In HERMES the characteristics of individual units are represented and are then aggregated to the station level, with all stations being represented uniquely. In SPLASH, where less detail is necessary, stations may be further aggregated into groups. For both models the basic building block is the identical plant performance and operating data that resides in a common Manitoba Hydro database. For example in HERMES each of the three lower Nelson River stations (Kettle, Long Spruce and Limestone) are modeled separately. In SPLASH these three plants are aggregated into one station with equivalent characteristics.

Figure 3 compares the production coefficients as a function of total river flow between HERMES and SPLASH for the month of January for average forebay conditions. The individual performance characteristics used in HERMES have been aggregated to match the aggregation used in SPLASH. As indicated in Figure 3 the differences are not significant, in the order of 0.3% to 0.8%.

Figure 3



A similar situation of different levels of aggregation occurs for modeling generation on the Winnipeg River where HERMES models each of the six stations and SPLASH represents the six stations as one.

Placing Models on a Common Platform is Unwarranted

KM state on page 96 that *"SPLASH is and is not an extension of HERMES but the two need to be reconciled and situated on a common platform."* In the Executive Summary on page xx they make the following slightly different statement *"SPLASH is an extension of HERMES and the two could sit on the same platform."* As described in the model descriptions above, each of the models solves a different problem and serves different functions and it should not be concluded that SPLASH is an extension of HERMES. To the extent practical, common data and techniques, such as streamflows, reservoir and generating station characteristics and linear programming formulation are shared among MOST, HERMES, and SPLASH. KM acknowledge that perhaps they may not have gathered sufficient information to make an informed recommendation in this area by stating on page 84 that *"…a deeper analysis is perhaps needed to reveal and highlight the difference between SPLASH and HERMES that can justify the use of different systems with different solvers and resources."*

In response to MIPUG/KM-4, KM states *"The top priority in KM's opinion is to integrate the models on a common platform separating the time periods to reflect the different uses of these."* Manitoba Hydro disagrees with KM's assessment that it is a priority for Manitoba Hydro to integrate its hydro system planning and operations models on a common platform. On the contrary, Manitoba Hydro believes that having independent models that have some overlap in capability is beneficial and reduces risk.

As opposed to KM's opinion that *"The real danger lies in the fact that they can and have produced different results,"* Manitoba Hydro is confident that HERMES and SPLASH produce very similar results as the different groups use the same fundamental input data, compare model outcomes and annually explain the variances as part of the IFF process. As shown above, when the detailed hydraulic relationships used to determine the production coefficients in HERMES are aggregated to the level of detail modeled in SPLASH, the differences are minor.

Manitoba Hydro Open to Demonstration of SPLASH

KM state on page 126 that *"…we have not seen a real demonstration of the SPLASH model and did not have the opportunity to get a look at the gear work of the model, its forecasts and their accuracy. This was not offered despite our interest in seeing an actual demonstration. We were readily and openly allowed to examine and see the guts of HERMES and its forecasts but not SPLASH."*

Manitoba Hydro acknowledges that in the time frame allowed KM did not see a demonstration of the SPLASH model. This is in no way indicative of reluctance on the part of Manitoba Hydro to demonstrate the SPLASH model to KM, contrary to the impression created by the language used in the KM report.

It is relatively easy to demonstrate an application of the HERMES model which has the capability to be able to provide a solution in a matter of minutes. However, the SPLASH model is more complex because it has thousands of linear programming solutions and a run time of up to six hours. Its output is placed in a database for later extraction and analysis as opposed to the relatively small set of HERMES reports. Consequently, it is not as easy to demonstrate its operation, especially when KM did not specify what they wished to see. Nevertheless, if KM did not see something they wished to see, it was due to a misunderstanding, which Manitoba Hydro has offered to correct, and should not detract from the capabilities of the model.

KM also stated that they did not receive a demonstration of the SPIGOT model. Manitoba Hydro is not in a position to provide a demonstration of the SPIGOT model to KM as it is not owned or utilized by Manitoba Hydro. It was utilized several years ago by a researcher who worked on a project that required the generation of synthetic streamflow records.

Benefits of Additional Reservoir Storage Already Effectively Captured

In the KM Report (p. 245) KM states:

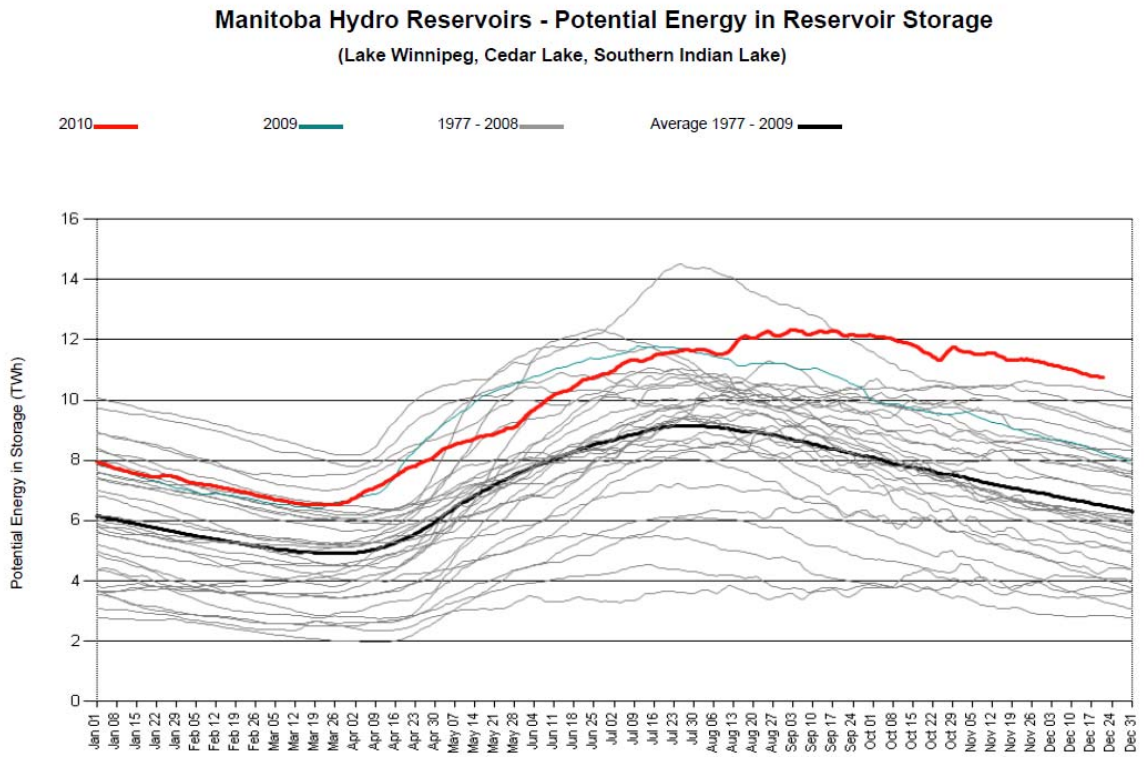
> *"MH should think of keeping a storage level each year as a hedge against a major drought. This amount can be thought of an "insurance premium payment." There is a minimum level that should remain in storage consistent with dependable energy targets; the level above that minimum should be part of the mitigation strategy and should be adjusted in proportion to deviation of retained earnings from their targeted minimum. The closer the retained earnings are to their minimum desirable value, the higher the water that should be left in storage for drought mitigation purposes."*

Manitoba Hydro disagrees with KM that it should change its current practice of managing minimum reservoir storages and keep additional storage as a drought buffer as an additional hedge for low flows.

Manitoba Hydro's storage operating practice is reflected in Figure 4 which indicates the history of Manitoba Hydro controlled reservoir storage for the period since it began regulating Lake Winnipeg and the Churchill River Diversion in 1977. The aggregated storage indicated include Lake Winnipeg, Cedar Lake and Southern Indian Lake, reservoirs over which Manitoba Hydro has complete control.

Figure 4 demonstrates that Manitoba Hydro is already doing what KM is recommending. At the end of each fiscal year, Manitoba Hydro has retained 5 TWh in storage on average, with a range between 2 TWh and 8.1 TWh. Depending upon current circumstances (firm load obligations, upstream storage conditions, thermal availability, in-service dates for new hydro generation), Manitoba Hydro calculates the minimum storage reserves needed to maintain a dependable supply for the upcoming year. For the current year that amount is approximately 3 TWh which is typical for the recent past.

Figure 4



As indicated on Figure 4, in the majority of the years, reservoir storage is not drawn to the minimum. This may have been because it was uneconomic to do so or it was physically impossible to draw reservoir storage to the minimum reserve amount, which are both impacted by the inefficiency of Lake Winnipeg as a reservoir. It may be uneconomic because at low levels of Lake Winnipeg, maximum outflows from the lake in the winter are insufficient to meet load demands without expensive thermal or imports. It may be physically impossible to draw reservoir storage to minimum storage reserve levels because winter inflows to the lake exceed maximum outflow capacity, with Lake Winnipeg going up in level rather than being drawn down.

When it is an economic issue, Manitoba Hydro manages the storage on its reservoirs to maximize net revenues. This optimization normally results in a combination of Lake Winnipeg and Churchill River Diversion regulation involving maximum outflows in the winter and carry-over storage. The amount of storage carry-over varies from year to year

depending upon inflows during the winter season. In situations where the economic management of storage results in carryover storage above the minimum storage reserves, the hedge against drought created by the additional storage is achieved at no cost.

In its financial planning process, Manitoba Hydro's cost of drought calculations recognize the issues and costs associated with the winter inefficiencies of Lake Winnipeg as a reservoir.

The Value of Seasonal Diversity Contracts

Reference PUB/KM-56

a) "Please confirm that in low flow years, MH's energy shortages could relate to:

- *Firm contract sales commitments in the summer and winter.*
- *Diversity sales in the summer.*
- *Short-term summer sales.*
- *Day-ahead and real time sales in the summer.*

b) Please confirm that the above sales may, at times, result in winter energy shortages and that MH may face high import prices.

c) Please confirm that the decision to undertake the above sales commitments may well predate MHs anticipation of a drought situation."

Manitoba Hydro disagrees with KM's response to part a) that *"Diversity sales in the summer are not firm obligations;..."*. Manitoba Hydro's Seasonal Diversity contracts are firm obligations which require both Manitoba Hydro and its counterparties to provide accredited capacity and associated energy according to the terms and conditions established in the contracts. Diversity contracts do not create energy shortages; rather they are at least energy neutral, with each party having the equivalent right to call on energy. In addition Manitoba Hydro's diversity contracts provide for additional energy over firm transmission paths, which, rather than create shortages, enhance the dependable energy supply allowing Manitoba Hydro to avoid the construction of other dependable resources in Manitoba.

Manitoba Hydro is in partial agreement with KM's responses to a) *"Short term opportunity sales [whether monthly, day ahead or real time] "in the summer if water conditions do not warrant them would indeed affect the availability in the winter," and b) "…to the extent that water conditions do not support winter requirements …"* .However this wasn't the case in 2006/07 when the high spring snowmelt runoff season was followed by low flows, especially on the Winnipeg River. Neither Manitoba Hydro's summer opportunity sales activities nor its ability to regulate its own reservoirs could influence the need for replacement on-peak energy purchases in early 2007 necessary as a result of low flows on the Winnipeg River.

On all its river systems with the exception of the Winnipeg River, Manitoba Hydro has the ability to regulate its reservoirs to ensure that minimum flows are available, sufficient to allow for full output of its hydro stations in the on-peak winter season. However on the Winnipeg River (with almost 600 MW of generation) the reservoirs are in Ontario and are not controlled by Manitoba Hydro. During the winter of 2006/07, Winnipeg River flows dropped to near record lows, resulting in a significant loss of on-peak winter energy production and subsequent on-peak winter replacement energy purchases. During this winter period the firm capacity available under the diversity contracts provided much needed support to the Manitoba Hydro system.

The Accuracy of Data in KM Table 6.1

In the KM Report, KM have developed a financial risk model using the @RISK model based upon published Statistics Canada data (KM Report, Table 6.1, p. 227). Manitoba Hydro disagrees with the information published in the table, nor does it accept this information as being representative of Manitoba Hydro's financial or operating history. The table contains significant errors. The following Table 1 compares Manitoba Hydro calendar year actual results to the line items in KM Report, Table 6.1 relating to domestic load, energy production and exports.

Table 1

Manitoba Hydro Calendar Year Results vs. Select Table 6.1 Items

		2001	2002	2003	2004	2005	2006	2007
Manitoba Hydro	Load (GWh)	21,736	22,374	22,049	22,882	24,129	23,922	24,684
Stats Canada	Load (GWh)	21,450	22,470	19,455	20,309	21,918	21,068	22,235
	Variance	286	-96	2,594	2,573	2,211	2,854	2,449
Manitoba Hydro	Exports (GWh)	12,705	9,491	5,714	7,768	13,227	11,316	10,543
Stats Canada	Exports (GWh)	12,648	9,836	7,907	10,166	15,400	14,511	12,845
	Variance	57	-345	-2,193	-2,398	-2,173	-3,195	-2,302
Manitoba Hydro	Dependable (U.S.)	4,757	4,339	3,560	4,286	4,080	3,372	3,750
Stats Canada	Firm	5,380	4,678	3,655	4,223	3,808	3,427	3,538
	Variance	-623	-339	-95	63	272	-55	212
Manitoba Hydro	Opportunity (U.S.)	5,318	3,228	705	2,298	7,488	7,189	6,208
Stats Canada	Non-Firm	4,378	2,732	587	2,494	8,291	8,886	7,525
	Variance	940	496	118	-196	-803	-1,697	-1,317
Manitoba Hydro	Provinical Exports Dependable	1,493	1,458	834	89	81	151	100
Stats Canada	Provinical Exports Firm	1,750	1,999	3,665	2,923	1,896	1,392	1,232
	Variance	-257	-541	-2,831	-2,834	-1,815	-1,241	-1,132
Manitoba Hydro	Provincial Exports Opportunity	1,137	466	615	1,095	1,578	604	485
Stats Canada	Provincial Exports Non-Firm	1,140	427	0	526	1,405	806	550
	Variance	-3	39	615	569	173	-202	-65
Manitoba Hydro	Generation	33,511	29,571	21,225	27,746	37,042	34,137	34,113
Stats Canada	Generation	34,098	32,306	27,362	30,475	37,318	35,579	35,080
	Variance	-587	-2,735	-6,137	-2,729	-276	-1,442	-967

		2001	2002	2003	2004	2005	2006	2007
Manitoba Hydro	Revenues from US Exports	399,688,078	390,852,416	310,611,437	403,104,732	609,744,784	545,346,866	490,887,757
Stats Canada	Revenues from US Exports	535,439,197	387,288,907	263,583,469	387,027,445	624,689,571	644,733,114	906,531,354
	Variance	-135,751,119	3,563,509	47,027,968	16,077,287	-14,944,787	-99,386,248	-415,643,597
Manitoba Hydro	Revenues from Other Provinces	85,943,749	82,260,781	65,576,062	55,394,840	114,450,951	40,199,101	34,930,143
Stats Canada	Revenues from Other Provinces	160,688,000	133,231,700	231,261,500	197,914,000	177,008,400	122,069,000	219,245,400
	Variance	-74,744,251	-50,970,919	-165,685,438	-142,519,160	-62,557,449	-81,869,899	-184,315,257
Manitoba Hydro	Electricity Purchased	48,352,624	69,138,853	404,096,675	256,682,269	45,363,017	82,201,188	66,948,203
Stats Canada	Electricity Purchased	108,338,000	129,171,000	515,570,000	119,659,000	162,398,000	203,648,000	115,224,000
	Variance	-59,985,376	-60,032,147	-111,473,325	137,023,269	-117,034,983	-121,446,812	-48,275,797

Table 1 indicates significant variances in Manitoba Hydro Load, Generation, total Exports, US Firm and Non-Firm Exports, Canadian Firm and Non-Firm Exports, and Revenues from Canadian and US Exports. The following significant examples are noted:

a) Actual Manitoba Hydro load in 2006 was 23,922 GWh, 13.5% higher than shown in Table 6.1

b) Actual Manitoba Hydro Exports in 2006 were 11,316 GWh, 22% lower than shown in Table 6.1

c) Actual Manitoba Hydro US Dependable Exports in 2002 were 4,339 GWh, 7.2% lower than shown in Table 6.1

d) Actual Manitoba Hydro US Opportunity Exports in 2006 were 7,189 GWh, 19.1% lower than shown in Table 6.1

e) Actual Manitoba Hydro Provincial Dependable Exports in 2004 were 89 GWh, 97% lower than shown in Table 6.1

f) Actual Manitoba Hydro Provincial Opportunity Exports in 2004 were 1,095 GWh, 208% higher than shown in Table 6.1

g) Actual Manitoba Hydro generation in 2003 was 21,225 GWh, 22.4% lower than shown in Table 6.1

h) Actual Manitoba Hydro Revenues from US Exports in 2007 were $490.9 million, 45.8% lower than shown in Table 6.1

i) Actual Manitoba Hydro Revenues from Other Provinces in 2007 were $34.9 million, 84.1% lower than shown in Table 6.1

KM Quantification of Risks Is Not Reliable

Manitoba Hydro does not accept that the quantification of risk undertaken by KM in Chapter 6 is a reliable indicator for a number of reasons. Not only is the underlying data incorrect by a wide margin, but the methodology that was selected is not representative of the physical and financial processes under which Manitoba Hydro operates.

KM utilized the data in Table 6.1 (KM Report page 227) to derive a set of annual import and export prices by utilizing revenues and costs as well as energy volumes that were derived from the Statistics Canada data for the seven years. Since much of data in KM's Table 6.1 is not correct (in some cases in error by up to 208%) as summarized above, the calculation of energy prices are also greatly in error. For example the energy price for firm US exports in 2007 was calculated to be 14.63 cents/kWh while the actual price is less than 6.0 cents/kWh. KM used the erroneous data in Table 6.1 to derive probability distribution functions for various quantities that have an impact on determination of net revenues. These probability distribution functions were then used in Monte Carlo simulations to calculate a distribution of net revenue. KM derived the results in Table 6.2 (KM Report page 229) from the mean value for a number of scenarios in which various input factors were adjusted.

Even if KM had used the correct Manitoba Hydro data, results would still be unreliable due to flawed methodology. First of all it is not appropriate to utilize a short period of seven years in order to derive a representative probability distribution function. These are not representative of the full range of possibilities since they are relatively high flow years for the most part and this would bias the results. Secondly KM have fit probability distribution functions to factors that are not random variables but that are outputs from a complex process that has random variables as an input. An example of such outputs is the quantity of opportunity export energy which is not a random variable but is dependent on water flows and firm load demand. The sample of seven Manitoba domestic loads is not the product of a stationary process since there is inherent load growth during the period. Furthermore the quantities of export and import energy are not random variables and there is a correlation between these quantities due to flow conditions and load demands. For example, high flows result in large quantities of opportunity energy which results in a lower average price because more of the energy must be sold at lower off-peak prices. Similarly, high flows result in lower quantities of import energy at low prices because they can be purchased during off-peak periods.

Manitoba Hydro accepts as reasonable the concept and process outlined in the KM Report as being indicative of how a tool such as @Risk could be used to quantify financial risks when combined with a model that accurately represents the physical aspects of Manitoba Hydro's system and the interdependencies and correlations. However given the great inaccuracies demonstrated in the Table 6.1 data, any definitive conclusion given in the KM Report based upon this analysis is flawed and should be set aside.

Such an analysis, to be reliable, would require verified Manitoba Hydro data and would be required to take into consideration all relevant factors, including, for example, physical system capabilities (e.g. tie-lines, generation capacity), the effects of load growth, new contracts, new generation, changes in market rules, the effects of regulatory changes on operations (e.g. Brandon Unit #5), and correlations between parameters. These examples are not an exhaustive list, but are illustrative of the wide range of variables which must be considered to undertake a fulsome analysis and from which definitive conclusions could be drawn.

LOW INCOME AFFORDABILITY PROGRAM

In this section of Rebuttal, Manitoba Hydro addresses the evidence of Roger Colton and the Low Income Affordability Program advocated by Mr. Colton. The evidence provided by Mr. Colton, on behalf of RCM/TREE, raises issues about *"home energy affordability"* and the *"social problems of home energy affordability"*. At page 69 of his evidence, Mr. Colton states:

> *"Manitoba Hydro objects to providing low-income affordability assistance as a matter of principle. According to Manitoba Hydro, "the issue of whether energy is affordable is outside the scope of Manitoba Hydro's mandate and is a matter of policy for legislators and government agencies responsible for these matters."* (RCM/TREE/MH-I-94).

His evidence goes on to criticize Manitoba Hydro's Affordable Energy Program and its design. He also asserts that Manitoba Hydro should establish an electric low-income affordability program that incorporates a fixed credit component to provide a subsidy to certain customers.

Manitoba Hydro's mandate flows from *The Manitoba Hydro Act*, which states:

> *"The purposes and objects of this Act are to provide for the continuance of a supply of power adequate for the needs of the province, and to engage in and to promote economy and efficiency in the development, generation, transmission, distribution, supply and end-use of power and, in addition, are*
> *(a) to provide and market products, services and expertise related to the development, generation, transmission, distribution, supply and end-use of power, within and outside the province; and*
> *(b) to market and supply power to persons outside the province on terms and conditions acceptable to the board."*[14]

[14] R.S.M. 1987, c. H190, s.2

The Manitoba Hydro Act also speaks to the requirement of the utility to recover the full cost of supplying power, including operating expenses, interest and debt service costs, working capital and reserves in Section 39(1).

The Manitoba Hydro Act also prohibits the funds of the Corporation being employed for the purposes of the government or any agency of the government in section 43(3) of the Act.

Manitoba Hydro's mandate does not extend to issues associated with the "affordability" of electricity. *The Manitoba Hydro Act* provides clear context that the Corporation's mandate to promote economy refers to the production and provision of electricity to customers at a cost reflective of least cost planning considerations and to promote efficiency in the end-use of power.

Comparisons to U.S. Jurisdictions are Invalid

Rate affordability programs of the type proposed by Mr. Colton have not been implemented in any Canadian jurisdiction. Mr. Colton's evidence relies exclusively on the experience of some select jurisdictions in the United States that have implemented rate affordability programs. However, such comparisons with U.S. jurisdictions in order to justify the implementation of such a program in Manitoba are not appropriate. There is a significant difference between Canadian and U.S. jurisdictions with regards to the income assistance offered from state to state and when compared with the income assistance offered in Manitoba, and the distinct legislation governing each utility, and variation between the utilities' mandates makes the comparison between regions inappropriate.

Shortcoming of Colton's Evidence and Approach

In addition to the concerns noted above, Manitoba Hydro also notes that Mr. Colton's proposal for Manitoba is flawed and that his evidence contains several serious misinterpretations:

An Electric-Only Program

Mr. Colton's proposal is acknowledged to be an electric-only program, and he has provided a rough cost estimate only for electric customers. This is an incomplete assessment of the full and future costs of any such program, as Manitoba Hydro is also the major distributor of natural gas in Manitoba, and the cost of expansion of this program to provide comparable treatment for natural gas customers is not considered or quantified in Mr. Colton's evidence. Given the integrated nature of electric and natural gas operations, Manitoba Hydro's current Affordable Energy Program is designed to accommodate customers consuming electricity and/or natural gas. However, Mr. Colton's proposed program cost estimates do not consider the cost of providing such relief to natural gas users, and it is expected that the costs of extending his proposed program would be significantly greater than those identified in Table 17 on page 56 of his evidence.

Errors in Interpretation Result in a Flawed Cost Analysis

In Mr. Colton's evidence, comments are made with regards to Manitoba Hydro's calculation of energy burden and Manitoba Hydro's comment within the Affordable Energy Program report, that *"it has been determined the energy burden is not a crisis level"*. Specifically, Mr. Colton states that *"The Manitoba Hydro calculations supporting its conclusion that none of its low-income customers live in a "crisis" situation are seriously flawed."* Mr. Colton also attempts to assess the energy burden in Manitoba by using the average electric bill and various income levels.

The objective of Manitoba Hydro's Affordable Energy Program was not to address or solve the energy burden within Manitoba. The objective of the Affordable Energy Program was to develop a program to assist customers with managing their energy bills. As a result of energy efficiency improvement, energy affordability within the Province is improved for participating customers. This program was developed within and is consistent with the legislated mandate for the Corporation.

In assessing Manitoba Hydro's lower income market, Manitoba Hydro undertook a high level assessment of the energy burden in Manitoba. In the report, the assessment is

characterized as a high level assessment and the report clearly states that the energy burden for those making $17,000 may be overstated as the "energy cost" numbers includes usage for single detached homes. The intent of the high level assessment of energy burden within the Affordable Energy Program Report was to get a sense of the general energy burden within Manitoba. Contrary to Mr. Colton's statements, Manitoba Hydro did not conclude that no customers had energy burdens that were higher than the average energy burden calculated in the report. Manitoba Hydro recognizes that there are many customers with various energy burdens, including both higher and lower than the averages calculated with Manitoba Hydro's high level assessment.

Manitoba Hydro notes that Mr. Colton's calculations using average electricity bills are also flawed and the energy burdens provided in Table 1 of his evidence are inaccurate and misleading. For example, for a customer earning less than $10,000, living in an apartment in which heat in included in the rent, and assuming an estimated energy bill of $325, the energy burden would be 4.3% based on an income of $7,500. Assuming an estimated energy bill of $1000, the energy burden would be 13.3%. Further, Mr. Colton's analysis does not take into account customers with incomes in this range would likely be eligible for social assistance to some degree and their incomes could be supplemented or the basic living needs (i.e. food, shelter, etc.) could be paid in part or in full by a social assistance agency.

Mr. Colton's analysis and interpretation of Arrearage data is also flawed. In Table 3 on page 18 of his evidence, he indicates numbers of residential customers and amounts in arrears. However, the arrears data that he references is the Corporation's total amounts in arrears. These amounts reflect arrears not only from residential customers, but also inactive accounts (those that have been finalized for any reason but have not been settled), seasonal residence accounts, commercial accounts and industrial accounts. It is incorrect to infer that the arrears identified in this table are all residential, as to do so would grossly overstate the arrears responsibility of residential customers.

In conclusion, Manitoba Hydro recognizes that there are some customers that will have high energy burdens as well as other high living cost metrics (e.g. food burdens, shelter burdens, etc.). Manitoba Hydro also recognizes that there are social programs available to Manitobans which are designed to address these issues and further, that these social issues are the

responsibility of government and it would be inappropriate and outside of its legislative authority for Manitoba Hydro to use its funds for addressing these government responsibilities.

Evidence on Social Problems of Home Energy Affordability Ignores Local Realities

Mr. Colton's evidence on the social problems flowing from *"home energy affordability"* states several serious consequences, many of which ignore the reality of the existing social environment in Manitoba and the prevalence of Manitoba Hydro's customer service policies that are designed to avoid such outcomes. For example, Mr. Colton discusses possible health and safety issues and specifically those which might arise due to customers not having heat. This argument is flawed as Manitoba Hydro has a winter moratorium on the disconnection of residential natural gas services from October to May 14th and a weather based voluntary winter moratorium on the disconnection of residential electric services with electric heating. As such, customers in Manitoba do not experience a loss of heat due to disconnections during the colder winter season.

In addition, customers on Social Assistance can either have their bills directly paid by the social agency or can receive a cash supplement to assist in utility bill payment. In such cases, the implementation of an affordable energy program such as proposed by Mr. Colton would have no impact on the energy burden for those customers.

Manitoba Hydro's Justification for Lower Income Programs

Mr. Colton's evidence suggests that Manitoba Hydro (along with most other utilities) offer lower income programs based on a foundation grounded in three principles: that energy efficiency serves not only a business objective, but also a social goal; that without special programs, low-income customers would be excluded from participation; and that low-income customers who do not participate in the program would pay higher costs as a result of efficiency programs. These grounding principles are inaccurate.

First, although Manitoba Hydro uses the Total Resource Cost (TRC) Test in evaluating its DSM initiatives, the test is not used for determining expenditures towards pursuing DSM

objectives. The TRC test is primarily for determining which energy efficient opportunities to pursue and how aggressively to pursue these opportunities. In general, although not a rule, the utility pursues opportunities where the overall benefits exceed the costs (i.e. TRC > 1.0). Manitoba Hydro uses other cost effective tests (e.g. Rate Impact Test, Utility Cost, Payback Period) to determine the level of expenditures and overall program design that would be appropriate for the utility in pursuing energy efficient opportunities. Manitoba Hydro does not include the all encompassing benefits (public health) within the TRC calculation as suggested by Mr. Colton.

Mr. Colton also suggests that Manitoba Hydro's lower income customers pay higher costs due to Manitoba Hydro's DSM expenditures. This is not accurate. Manitoba Hydro's electric DSM programs have been evaluated with the RIM test. As the Corporation's residential DSM programs in aggregate have a RIM that is greater or equal to 1.0, no customer (regardless of whether they are lower income customers or not) have been or will be negatively impacted as a result of Manitoba Hydro's DSM efforts.

In summary, Manitoba Hydro's Affordable Energy Program offers energy efficiency (DSM) assistance, bill management options and emergency financial assistance to promote economy and efficiency in the development, generation, transmission, distribution, supply and end-use of power as set out in its mandate. DSM provides an alternative to resource options and DSM expenditures should be aligned with least cost resource planning principles. Mr. Colton's proposal goes beyond the legislative mandate of the Corporation, and would require Manitoba Hydro to take responsibility for issues which are the responsibility of the Federal and Provincial Governments. Mr. Colton's premise that his Affordable Energy Program is supported by a corporate business case is flawed and unsupported. Finally, offering a program as proposed by Mr. Colton would involve Manitoba Hydro using its funds for addressing government responsibilities (i.e. directly addressing social issues) which would be inappropriate and outside of the Corporation's legislative authority.