GAC/MH II-1

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08 and GAC/MH I-32**

The response to GAC/MH I-32 refers to the Fuel Switching Report, which does not cover several elements of the question. Please extend the findings of the Fuel Switching Report by including the following two elements:

a) GAC/MH I-32 scenario vi, in which an electric resistance space-heating boiler is replaced by a geothermal system, and

ANSWER:

GAC/MH I-32 requested information on the load, economic and environmental impacts for where electric resistance space-heating is replaced by a geothermal system. For comparison purposes, costs and consumption are based upon the assumptions (e.g. 1,200 sq.ft home) presented within the referenced report filed in Appendix 26, which was provided in Manitoba Hydro's response to GAC/MH I-31. Actual impacts for individual homes will vary due to a range of factors including geographic location, type of heating equipment, size, commissioning of the heating system, insulation levels, air tightness and lifestyle.

- Please refer to pages 10 and 11 of the Fuel Switching report for the installed capital costs of both an electric forced air furnace and a ground source closed loop heat pump.
- Please refer to page 17 of the Fuel Switching report for the annual fuel consumption of both an electric forced air furnace and a ground source closed loop heat pump.
- Please refer to pages 10 and 11 of the Fuel Switching report for the annual operating (fuel) costs of both an electric forced air furnace and a ground source closed loop heat pump. Maintenance costs are not included in the analysis.

	Electric Forced Air Furnace replaced by Geothermal (SCOP 2.5)
Load Impact	
Electric Load Impact (kW.h)	(9,835)
Incremental Capital Costs	
Customer Cost (Existing Home)	($12,500)
Economic Impacts	
Utility Perspective (Electric)	$1,660
Customer Perspective	($5,796)
Integrated Utility / Customer Perspective	($4,136)
Provincial Inflow (Leakage)	
Net Provincial Cash Inflow (Leakage)	$7,332
GHG Impacts	
Manitoba (kg $C0_2e$ / year)	0
US - MISO Region* (kg $C0_2e$ / year)	(7,376) to 0

GAC/MH II-1

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08 and GAC/MH I-32**

The response to GAC/MH I-32 refers to the Fuel Switching Report, which does not cover several elements of the question. Please extend the findings of the Fuel Switching Report by including the following two elements:

b) GAC/MH I-32 sensitivity 4(d) for all scenarios, in which marginal CHGs in the export market displaced by hydro exports are equivalent to CCCT emissions.

ANSWER:

The combined cycle natural gas emission factor is 0.4 kg CO2e/kWh. If this value was to be used under the assumptions in the above mentioned report, the results would be as follows:

Potential Annual GHG Impacts (Attributed by Region due to Energy Use)			
	Gas to Conventional Electric Furnace	**Gas to Geothermal (SCOP 2.5)**	**Conventional Gas to Electric Water Heat**
Manitoba (kg $C0_2e$ / year)	(3,374)	(3,374)	(933)
US - MISO Region CCNG only (kg $C0_2e$ / year)	0 to 6,556	0 to 2,623	0 to 1,396
Net Global (kg $C0_2e$ / year)	(3,374) to 3,182	(3,374) to (2,169)	(933) to 751

GAC/MH II-2

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08**

Please provide all workpapers supporting the report, in Excel spreadsheet form with all formulas intact.

ANSWER:

Please see Manitoba Hydro's response to GAC/MH I-3(a).

GAC/MH II-3

Please include the workpapers for the following tables in Excel spreadsheet form with all formulas intact:

a) "Net Economic Impact – 2011 Energy Forecasts" on page 28,

b) "Net Financial Impact of Fuel Switching (over the life of the equipment) for the Average Residential Home" on page 32,

c) The two tables entitled Portion of "2011 Forecast Attributed to Fuel Switching" for both electric and gas sales in Section 4.2.1,

d) "Potential Annual GHG Impacts (Attributed by Region due to Fuel Use by MB Residential Customer)" on page 21,

e) "Potential Annual GHG Impacts" on page 29,

f) "Net Impact of Fuel Switching to Geothermal (over 25 years) - Average Residential Home (on page 30),

g) "Net Financial Impact of Fuel Switching (over the life of the equipment) - Average Residential Home" under increased natural gas prices, on page 32,

h) "Provincial Inflow (Leakage) Over the Life of the Equipment" on page 33, and

i) "Impact of Fuel Switching – Average Residential Home" on page 37.

ANSWER:

Please see Manitoba Hydro's response to GAC/MH I-3(a).

GAC/MH II-4

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 9**

Please provide the percentage of natural gas residential heating customers who use hot water (boiler) distribution systems.

ANSWER:

In 2011/12, an estimated 9,445 residential natural gas customers were using gas boilers for space heating. This is 4.0% of the 238,261 residential natural gas heating customers in Manitoba.

GAC/MH II-5

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 9**

a) Please provide the basis for the assumption that the operating Seasonal Coefficient of Performance (SCOP) of a heat pump is likely to be in the range of 2.0 to 3.0, with an average of 2.5.

ANSWER:

The 2.5 SCOP used by Manitoba Hydro is intended to represent an average that customers can expect over the projected 20 to 25 year life of a geothermal system. Many factors will affect the long term performance of the geothermal system, including proper design, installation and maintenance of the system. These factors include the design and installation of the earth loop or groundwater heat exchanger, heating and cooling distribution system and maintenance of the heat pumps, filters, coils, pumps, heat exchangers and water well systems.

The following information supports Manitoba Hydro's rationale for using a range of 2.0 to 3.0, with an average of SCOP 2.5 in the Fuel Switching Report. The use of a SCOP of 2.5 is consistent with Manitoba Hydro's analysis of energy savings achieved through its Earth Power Program.

- A two year monitoring study undertaken by Manitoba Hydro of one home retrofitted with a closed loop vertical bore geothermal system near Elie, Manitoba that operated at a SCOP of 2.9 during its first year of operation and 2.2 in its second year of operation. A formal report was not published.
- A one year monitoring study by independent consultant of four Winnipeg homes for Manitoba Housing which operated at SCOPs of 1.4, 1.6, 2.5 and 2.8 for an average of 2.05.
- A one year monitoring study of ten homes undertaken by Manitoba Hydro which demonstrated that these homes operated at an average SCOP of 2.8 but ranged between a low of 1.9 and a high of 3.5. A number of considerations within this study are believed to have resulted in an average SCOP greater than 2.5.

  Manitoba Hydro notes that nine of the study homes were volunteered for the project by established and experienced heat pump contractors. Additionally, Manitoba Hydro

informed the homeowners of all operational efficiency issues that were discovered during the initial set up and ongoing monitoring of the geothermal systems. This allowed customers to have their contractor correct the problems which resulted in higher overall SCOP's.

Nine of the systems were relatively new systems (less than 3 years old). With a five-to-one thermal imbalance where more heat is extracted than rejected to the ground loop (as found in the study homes), it is expected the system performance will decline for several years until the loop reaches a thermal equilibrium.

In order to demonstrate a range of efficiencies and as a sensitivity analysis, Manitoba Hydro included the impacts of a geothermal system achieving an average SCOP of 3.5, which is included in section 5.1 of the Fuel Switching Report.

GAC/MH II-5

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 9**

b) Please provide any data, reports or studies on which MH relied in selecting the 2.5 average SCOP.

ANSWER:

Appendix A of Appendix 38 contains customer specific information that could result in the identification of individual customers, and therefore has been removed.

GAC/MH II-6

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, the two tables on pp. 10-11.**

a) Please specify the seasonal efficiency of the space heating systems in the two tables.

ANSWER:

The efficiencies of the heating systems are provided in Section 3.1 (i.e. Load Impact Assumptions), on page 17 of the Fuel Switching Report.

GAC/MH II-6

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, the two tables on pp. 10-11.**

b) Please provide the basis of the cost to purchase and install heating and a/c equipment, for each of the five types of equipment, and for retrofits and new homes, separately.

i. Include a cost breakdown for each cost estimate.

ANSWER:

The costs to purchase and install equipment are based on data from a number of sources including Manitoba Hydro's Power Smart Residential Loan and Energy Finance Plan databases, input from Manitoba's new homebuilders, and several Manitoba contractors. As noted in the Fuel Switching report, capital costs associated with each system will vary considerably in the marketplace.

The cost to purchase includes the physical equipment, installation, labour and material costs. A break-down of the costs is not available as this information was not available through the sources used.

GAC/MH II-6

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, the two tables on pp. 10-11.**

c) With reference to (b), explain the differences between retrofit and new construction installations.

ANSWER:

The variance between retrofit and new construction is a result of the dynamics of how each market sector operates within a competitive market environment, with each market sector having its own marketing and pricing characteristics. For example, in the new home construction market, most builders offer a standard cost for heating systems whether the customer requests a standard natural gas or electric heating system and regardless of whether the builder can install one system at a lower cost. In the retrofit market, there are less economies of scale and there may be higher costs due to specific home requirements (e.g. upgrade to electric panel).

GAC/MH II-6

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, the two tables on pp. 10-11.**

d) Please estimate the percentage of existing homes that already have a chimney sleeve or side vent.

ANSWER:

The side vent is typically installed at the time the high efficiency natural gas furnace is installed. There are some newer models of mid-efficiency natural gas furnaces which require side venting; however, Manitoba Hydro does not have an estimate of the number of these installations.

A chimney sleeve is not normally installed in the existing chimney until such time as the existing furnace is replaced with a high efficiency natural gas furnace and now only requires the chimney for the venting requirements of a conventional natural gas hot water tank. Manitoba Hydro does not have an estimate of how many homes have a chimney sleeve.

GAC/MH II-6

Subject: **Fuel Switching Report**

Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, the two tables on pp. 10-11.**

e) Please indicate whether the "Existing Homes" table takes into account the portion of homes that already have a chimney sleeve or side vent.

i. If so, explain how and include workpapers.

ii. If not, explain why not.

ANSWER:

Please see Manitoba Hydro's response to GAC/MH II-6(d).

GAC/MH II-6

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, the two tables on pp. 10-11.**

f) Please indicate whether in the "Space Heating: End-of-Life Replacement (Existing Homes)" table, the cost of a replacement gas high efficiency furnace includes the cost of a chimney sleeve, chimney adjustment or a side vent.

i. If so, provide the cost of the chimney sleeve, chimney adjustment or side vent included.
ii. If not, explain why not.

ANSWER:

The cost of the side venting is included in the installation costs of the high efficiency gas furnace.

As not all installations require a chimney sleeve or chimney adjustment to maintain the conventional natural gas hot water tank, the cost of a replacement high efficiency natural gas furnace does not include the cost of a chimney sleeve or chimney adjustment for venting.

GAC/MH II-6

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, the two tables on pp. 10-11.**

g) Please confirm that the cost of an upgrade to 200 amp service is left out of the incremental cost of installing a heat pump in an existing home.

i. If so, explain why.

ANSWER:

Not confirmed. The cost of an upgrade to 200 amp service is included in the incremental cost of installing a heat pump in an existing home, as follows:

	Average Estimated Costs
Heat Pump	+ $17,500
Panel Upgrade	+ $2,500
Natural Gas Furnace	- $4,500
Air Conditioner	- $2,500
Incremental Cost	$13,000

GAC/MH II-6

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, the two tables on pp. 10-11.**

h) Please provide the cost to purchase and install a high efficiency natural gas furnace to replace a forced air electric furnace, if different from the gas furnace cost in the "Space Heating: End-of-Life Replacement (Existing Homes)" table.

i. Explain the difference in cost.
ii. Provide the basis for the cost estimate, including a cost breakdown.

ANSWER:

When installing a high efficiency natural gas furnace to replace an electric furnace, there may be costs associated with bringing natural gas to the home as well as piping from the meter to the furnace. Additional costs associated with serving the home with natural gas would be determined on a case-by-case basis. For example, if a natural gas main exists passing in front of the property, there may be no customer contribution required to connect to the natural gas service. The cost for piping natural gas from the meter to the furnace is estimated to be $500-$1000.

GAC/MH II-7

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, pp. 11-13.**

a) Please specify the energy efficiency of each gas water heater included in the "Existing Homes" table on page 12.

ANSWER:

The efficiencies of the water heating systems are provided in Section 3.1 of the Fuel Switching Report. The efficiency of the Natural Gas Side Vent Type Water Heater is 59%.

GAC/MH II-7

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, pp. 11-13.**

b) Regarding the two tables on page 12, please provide the basis of the cost to purchase and install water heating equipment for each of the five types of equipment, and for retrofits and new homes, separately.

i. Include a cost breakdown, for each cost estimate.

ANSWER:

Please see Manitoba Hydro's response to GAC/MH II-6(b).

GAC/MH II-7

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, pp. 11-13.**

c) With reference to (b), please explain, by type of equipment, the differences between retrofit and new construction installations.

ANSWER:

For water heating equipment, there is a cost difference between retrofit and new construction for the installation of a natural gas side vent tank type water heater. The additional $250 in new home applications is for the cost of gas piping to the appliance as the comparable option is to install an electric water heater which would not require the piping. In a retrofit application, the piping would exist prior to retrofit as the customer would likely have an existing natural gas water tank.

GAC/MH II-7

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, pp. 11-13.**

d) Please explain why the Natural Gas Conventional (Natural Draft) Water Heater is not included as an option in new residential construction (table on page 12).

ANSWER:

The Fuel Switching Report includes an analysis based on the Manitoba market. In the Manitoba new residential construction market, virtually all homes are constructed with electric hot water heaters due to cost considerations.

All new homes using natural gas for space heating are required by code to install a high efficiency natural gas furnace. High efficiency natural gas furnaces are side-venting and do not require a chimney. Conventional natural gas water heaters require a chimney to meet building code requirements to ensure safe venting of flue gases. As observed in the new home construction industry, home builders and home owners install electric hot water tanks and avoid the additional cost of constructing a chimney solely for the purpose of venting the conventional natural gas water heater.

GAC/MH II-7

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, pp. 11-13.**

e) Please provide the portion of new homes that are built with chimneys for fireplaces.

i. For these homes, provide an estimate of the cost of adding a second flue to the chimney.

ANSWER:

Natural gas fireplaces are direct-vented, sealed-combustion appliances and therefore homes with natural gas fireplaces do not require a chimney.

GAC/MH II-7

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, pp. 11-13.**

f) **If Manitoba Hydro omitted conventional gas water heaters as a new-construction option based on an economic analysis, please provide the analysis and all supporting workpapers in Excel spreadsheet form with all formulas intact.**

ANSWER:

Please see Manitoba Hydro's response to GAC/MH II-7(d).

GAC/MH II-7

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, pp. 11-13.**

g) Please provide the simple payback period in the retrofit market for a natural gas side-vent water heater when compared to a conventional natural gas water heater, with and without a chimney sleeve or adjustment.

ANSWER:

The simple payback period for purchasing a side-vent natural gas water heater compared to a conventional natural gas water heater can be calculated using the information presented in the chart on page 12 of the Fuel Switching report, as follows:

- The incremental cost of purchasing a side-vent natural gas water heater compared to a conventional natural gas water heater is $850 (i.e. $1,750-$900).
- The annual savings for operating a side-vent water heater compared to a conventional natural gas water heater is $4 (i.e. $109-$105).
- The payback for purchasing a side-vent natural gas water heater compared to a conventional natural gas water heater would be approximately 212 years (i.e. $850/$4 per year).

The simple payback period for purchasing a side-vent water heater compared to replacing a conventional natural gas water heater when the customer requires installation of a chimney sleeve to ensure proper venting is as follows.

- The savings from purchasing an electric water heater compared to a conventional natural gas water heater including the approximate cost of installing a chimney sleeve is $300 ($1,750 - $1,450).
- The annual incremental cost for operating a side-vent water heater compared to a conventional natural gas water heater remains at $4 ($109-$105).
- The payback for purchasing a side-vent natural gas water heater compared to a conventional natural gas water heater would be approximately 75 years ($300/$4 per year).

A water heater has an average useful life of approximately 10 years.

GAC/MH II-7

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, pp. 11-13.**

h) Please provide the simple payback period in the retrofit market for an electric tank-type water heater when compared to a conventional natural gas water heater, with and without chimney sleeve costs.

ANSWER:

The simple payback period for purchasing an electric water heater compared to purchasing a conventional natural gas water heater can be calculated using the information provided in the Fuel Switching report (i.e. data in the chart on page 12):

- The incremental cost of purchasing an electric water heater compared to a conventional natural gas water heater is $100 (i.e. $1,000 - $900).
- The annual incremental cost for operating an electric water heater compared to a conventional natural gas water heater is $127 (i.e. $236 - $109).
- There is no payback period of purchasing an electric hot water tank compared to purchasing a conventional natural gas water heater as the capital and operating cost associated with an electric hot water tank is higher. The payback period of purchasing a conventional natural gas hot water tank is less than one year.

The simple payback period for purchasing an electric water heater when compared to replacing a conventional natural gas water heater where the customer requires installation of a chimney sleeve to ensure proper venting, is:

- The savings from purchasing an electric water heater compared to a conventional natural gas water heater including the approximate cost of installing a chimney sleeve is $450 (i.e. $1,000 - $1,450).
- The annual incremental cost for operating an electric water heater compared to a conventional natural gas water heater is $127 (i.e. $236 - $109).
- There is no payback period of purchasing an electric hot water tank compared to purchasing a conventional natural gas water heater (with a chimney sleeve requirement) as the operating cost associated with an electric hot water tank is higher. The payback period of purchasing the natural gas hot water tank is approximately 3.5 years.

A water heater has an average useful life of approximately 10 years.

GAC/MH II-7

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, pp. 11-13.**

i) Please explain why, for home builders, the electric water heater is "the equipment of choice." (p. 13)

ANSWER:

Please see Manitoba Hydro's response to GAC/MH II-7(d).

GAC/MH II-8

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08**

Please provide the basis of the following study assumptions:

a) **The average residential home has 1,200 square feet (p. 17), and**

b) **The average residential home has 2.4 occupants (p. 17).**

ANSWER:

The above assumptions are based upon the findings of the 2003 and 2009 Manitoba Hydro Residential Energy Use Surveys.

GAC/MH II-9

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 17**

Please provide Manitoba Hydro's 2012 Marginal Benefits Forecast.

ANSWER:

Please see Manitoba Hydro's response to PUB/MH II-75(a).

GAC/MH II-10

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 17**

Please provide all workpapers supporting Manitoba Hydro's 2012 Marginal Benefits Forecast, in Excel spreadsheet form with all formulas intact.

ANSWER:

Please see Manitoba Hydro's response to GAC/MH I-3(a).

GAC/MH II-11

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 19**

Please explain "the impact on electrical distribution infrastructure is even greater in the scenario where a substantial number of customers shift to using geothermal technology." (as stated on page 19 of the Fuel Switching Report).

ANSWER:

In areas where Manitoba Hydro's electric infrastructure has been designed for electric loads other than space heating (space heating is supplied primarily by natural gas), issues related to undersized transformers and insufficient cable ratings could arise if a significant number of customers converted to either electric space heat or geothermal systems. If geothermal installations achieve a concentrated market penetration, the nature of the load is different from electric space heat and mitigation measures are required in order to operate the distribution system within the existing voltage and power quality criteria. Factors specific to geothermal installations include: increased motor starting currents, decreased power factor due to increased motor loading, increased cold load pick up due to supplemental heat and motor loads, and an increase in the amount of flicker customers may experience when connected to the same transformer.

GAC/MH II-12

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching residential customers:

a) The number of existing homes in 2011/12, broken out by space heating source;

ANSWER:

The following table indicates the total number of existing homes in gas available areas, by space heating source:

Year	Natural Gas	Electric	Geothermal	Other
2011/12	237,246	153,590	7,940	49,313

GAC/MH II-12

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching residential customers:

b) The incremental number of new homes added in each of the periods 2020/21 and 2030/31, and by year if available;

ANSWER:

The following table presents the total number of new dwellings forecast to be added in Manitoba each year:

Year	New Dwellings
2011/12	4,803
2012/13	5,551
2013/14	6,078
2014/15	6,079
2015/16	6,200
2016/17	6,302
2017/18	6,334
2018/19	6,305
2019/20	6,264
2020/21	6,209
2021/22	6,141
2022/23	6,060
2023/24	5,965
2024/25	5,858
2025/26	5,741
2026/27	5,617
2027/28	5,489
2028/29	5,356
2029/30	5,220
2030/31	5,082

GAC/MH II-12

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching residential customers:

c) The incremental number of new homes with access to gas added in each of the periods 2020/21 and 2030/31, and by year if available;

ANSWER:

The following table presents the total number of new dwellings forecast to be added in gas available areas each year:

Year	Total New Dwellings in Gas Available Areas
2011/12	3,987
2012/13	4,608
2013/14	5,046
2014/15	5,047
2015/16	5,147
2016/17	5,232
2017/18	5,259
2018/19	5,234
2019/20	5,200
2020/21	5,155
2021/22	5,098
2022/23	5,031
2023/24	4,952
2024/25	4,863
2025/26	4,766
2026/27	4,663
2027/28	4,556
2028/29	4,446
2029/30	4,333
2030/31	4,219

GAC/MH II-12

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching residential customers:

d) The basis for the number of residential space heating systems to be replaced, by year,

ANSWER:

On average, approximately 22,000 space heating systems are forecast to be replaced per year across Manitoba.

GAC/MH II-12

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching residential customers:

e) The basis for the number of residential water heating systems to be replaced, by year,

ANSWER:

On average, approximately 37,000 water heating systems are forecast to be replaced per year across Manitoba.

GAC/MH II-12

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching residential customers:

f) The number of existing residential customers with gas space heating converting to electric forced air heating, by year.

ANSWER:

For the 2011 Electric Load Forecast, the number of existing residential dwellings that switch from natural gas space heat to electric space heat was estimated to be zero. As part of the background research undertaken for the Fuel Switching Report, Manitoba Hydro analyzed residential customer billing data and adjusted the projection to 270 residential customers per year switching from natural gas space heat to electric space heat. Future Load Forecasts will incorporate updated estimates of customers switching fuel sources.

GAC/MH II-12

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching residential customers:

g) The average reduction in gas use and increase in electric use for space heat of existing residential gas-heated customers converting from gas to electric forced air heating.

ANSWER:

The estimated average reduction in natural gas use for space heat of existing single detached residential gas-heated customers converting from gas to electric forced air heating is 2,033 m^3 per year. The average annual electricity use is estimated to be 17,046 kWh. The analysis assumed that for existing residential customers, only single detached homes were converting from natural gas to electric space heating.

GAC/MH II-12

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching residential customers:

h) The number of existing residential customers with gas space heating converting to heat-pump heating and cooling, by year.

ANSWER:

The Fuel Switching Report did not include a forecast of existing homes with natural gas space heating converting to geothermal space heating. The economics associated with this change in space heating system do not support such a change and therefore Manitoba Hydro is not expecting many customers to undertake this change.

GAC/MH II-12

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching residential customers:

i) The average reduction in gas use and increase in electric use for space heat of existing residential gas-heated customers converting from gas to heat-pump electricity.

ANSWER:

Please refer to the Fuel Switching Report (page 17) as provided in Appendix 26.

GAC/MH II-12

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching residential customers:

j) The average increase in electric use for cooling of existing gas-heated customers converting from gas space heat to heat-pump heating and cooling.

ANSWER:

Space cooling was not assessed as part of the Fuel Switching Report.

GAC/MH II-12

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching residential customers:

k) The number of existing residential customers with gas water heating converting to electric tank-type water heating, by year.

ANSWER:

The following table presents the number of existing residential customers with natural gas water heating forecast to switch to electric water heating each year.

Year	Existing Gas Homes (single detached, multi-family & apartments) Switching to Electric Water Heat
2011/12	2,581
2012/13	3,956
2013/14	4,985
2014/15	4,536
2015/16	4,379
2016/17	4,228
2017/18	3,899
2018/19	3,691
2019/20	3,511
2020/21	3,303
2021/22	3,133
2022/23	3,023
2023/24	5,078
2024/25	5,646
2025/26	3,800
2026/27	2,866
2027/28	2,447
2028/29	2,279
2029/30	2,195
2030/31	2,177

GAC/MH II-12

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching residential customers:

l) The average reduction in gas use and increase in electric use for water heating of existing residential customers converting from gas to electric tank-type water heaters.

ANSWER:

Please refer to page 17 of Appendix 26 for the estimated energy use of the average home using natural gas and using electric water heating.

GAC/MH II-12

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching residential customers:

m) The number of existing residential with gas water heating converting to heat pump water heating, by year.

ANSWER:

Manitoba Hydro is not forecasting that customers will switch from gas water heaters to geothermal heat pump de-superheaters.

GAC/MH II-12

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching residential customers:

n) The average reduction in gas use and increase in electric use for water heating of existing customers converting from gas to heat pump water heaters.

ANSWER:

Please see page 17 of the Fuel Switching report found in Appendix 26 for the average use for electric and geothermal water heating options.

GAC/MH II-12

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching residential customers:

o) If this computation includes new residential customers that have access to natural gas but select electricity for space and water heating, please provide

- **i. The number and percentage of new residential customers with gas access estimated to select hot air/baseboard electric heating.**
- **ii. The average reduction in gas use and increase in electric use for space heat of new residential customers selecting hot air/baseboard electric heating over gas.**
- **iii. The number and percentage of new residential customers with gas access estimated to select heat-pump heating.**
- **iv. The average reduction in gas use and increase in electric use for space heat of the new residential customers selecting heat-pumps over gas.**
- **v. The number and percentage of new residential customers with gas access estimated to select electric water heating.**
- **vi. The average reduction in gas use and increase in electric use for water heating of the new residential customers selecting electric water heating.**
- **vii. The number and percentage of new residential customers with gas access estimated to select gas space heating and electric water heating.**
- **viii. The average gas use and electric use for water and space heating of residential customers selecting electric water heating and gas space heating.**

ANSWER:

i. The following table presents the number of new residential customers in gas available areas that are forecast to select electric space heating each year:

Year	Number of New Homes in Gas Available Areas Installing Electric Space Heat (single detached, multi-family & apartments)	Percentage of New Homes in Gas Available Areas Installing Electric Space Heat (single detached, multi-family & apartments)
2011/12	1,911	48%
2012/13	2,149	47%
2013/14	2,378	47%
2014/15	2,392	47%
2015/16	2,440	47%
2016/17	2,475	47%
2017/18	2,476	47%
2018/19	2,447	47%
2019/20	2,413	46%
2020/21	2,376	46%
2021/22	2,332	46%
2022/23	2,285	45%
2023/24	2,233	45%
2024/25	2,177	45%
2025/26	2,118	44%
2026/27	2,058	44%
2027/28	1,996	44%
2028/29	1,934	43%
2029/30	1,871	43%
2030/31	1,809	43%

ii. The average reduction in gas use for space heat of new residential customers selecting hot air/baseboard electric heating over gas is 958 m^3 per year. The average increase in electric use is 9,119 kWh per year. This includes single detached homes, multi-family residences and apartments. The average use per year includes a combination of electric furnace and geothermal installations.

iii. For the 2011 Electric Load Forecast, approximately 250 new residential customers with natural gas access were forecast to install geothermal heating each year. This represents approximately 5% of new dwellings constructed in gas available areas.

iv. Energy use for new homes using geothermal space heating was assumed to be similar to existing homes. Please see page 17 of Appendix 26 as filed under Manitoba Hydro's response to GAC/MH I-31.

v. 100% of new homes are forecast to choose electric water heat.

vi. Energy use in new homes for water heating were assumed to be similar to that of existing residences. Please refer to page 17 of Appendix 26 as filed under Manitoba Hydro's response to GAC/MH I-31.

vii. The following table presents the number of new residential customers in gas available areas that are forecast to select gas space heating each year.

Year	Number of New Homes (single detached, multi-family & apartments) in Gas Available Areas Installing Gas Space Heat	Percentage of New Homes (single detached, multi-family & apartments) in Gas Available Areas Installing Gas Space Heat
2011/12	1,922	48%
2012/13	2,285	50%
2013/14	2,478	49%
2014/15	2,466	49%
2015/16	2,514	49%
2016/17	2,561	49%
2017/18	2,586	49%
2018/19	2,591	50%
2019/20	2,592	50%
2020/21	2,586	50%
2021/22	2,575	51%
2022/23	2,557	51%
2023/24	2,533	51%
2024/25	2,502	51%
2025/26	2,467	52%
2026/27	2,429	52%
2027/28	2,387	52%
2028/29	2,343	53%
2029/30	2,297	53%
2030/31	2,248	53%

Note that the percentages in (i) and the percentages in (vii) add to 96%. The remaining 4% are apartment suites and other customers that do not have heat on their bill such as where heat is provided from a common service.

viii. Average natural gas use by new residential dwellings (including single detached and multi-family residences only) with gas space heat is assumed to be 1,599 m^3 per year. Please refer to page 17 of Appendix 26 as filed under Manitoba Hydro's response to GAC/MH I-31 for electric water heating energy use.

GAC/MH II-13

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching commercial customers:

a) The number of existing commercial customers in 2011/12, broken out by space heating source;

ANSWER:

The following table shows the estimated number of commercial customers (meters).

Year	Total Number of Commercial Customers (meters)	
	Electric Meters	Natural Gas Meters
2011/12	65,711	25,298

Please note that 40,931 of the above 65,711 electric meters serve the same buildings as the 25,298 natural gas meters, representing a ratio of 1.6 electric meters to 1 natural gas meter. There are also 15,375 electric meters serving non-buildings that are outdoor structures with no requirement for space heat (e.g. irrigation pumps, etc.).

GAC/MH II-13

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching commercial customers:

b) The incremental number of new commercial customers added in each of the periods 2020/21 and 2030/31, and by year if available;

ANSWER:

The following table presents the forecast number of new commercial customers in Manitoba each year.

Year	Number of New Commercial Customers
2011/12	518
2012/13	580
2013/14	667
2014/15	649
2015/16	649
2016/17	642
2017/18	631
2018/19	598
2019/20	574
2020/21	566
2021/22	557
2022/23	548
2023/24	537
2024/25	524
2025/26	511
2026/27	499
2027/28	485
2028/29	471
2029/30	456
2030/31	443

GAC/MH II-13

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching commercial customers:

c) The incremental number of new commercial customers with access to gas added in each of the periods 2020/21 and 2030/31, and by year if available;

ANSWER:

An estimated 81% of commercial customers are in gas available areas. Applying the 81% to the total growth in Manitoba Hydro's response to GAC/MH II-13(b) provides the following forecast of the number of new commercial customers in natural gas available areas:

Year	Number of New Commercial Customers in Gas Available Areas
2011/12	421
2012/13	472
2013/14	542
2014/15	528
2015/16	528
2016/17	522
2017/18	513
2018/19	486
2019/20	467
2020/21	460
2021/22	453
2022/23	446
2023/24	437
2024/25	426
2025/26	416
2026/27	406
2027/28	394
2028/29	383
2029/30	371
2030/31	360

GAC/MH II-13

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching commercial customers:

d) The basis for the number of commercial space heating systems to be replaced, by year,

ANSWER:

Detailed data on the number of commercial heating systems replaced annually is not available.

Existing customers in the commercial sector were assumed to participate in fuel switching at the same rate as existing natural gas customers in the residential sector (single detached and multi-attached). The number of existing commercial space heating systems converting to electricity per year was assumed to be approximately 20% of the estimated new electrically heated commercial customers in gas available areas.

GAC/MH II-13

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching commercial customers:

e) The basis for the number of commercial water heating systems to be replaced, by year,

ANSWER:

All commercial customers converting from natural gas to electric space heating are assumed to convert their water heating system to electric heating at the same time.

GAC/MH II-13

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching commercial customers:

f) The number of existing commercial customers with gas space heating converting to electric heating, by year.

ANSWER:

On average, approximately eight existing commercial customers with gas space heating are forecast to switch to electric space heating each year.

GAC/MH II-13

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching commercial customers:

g) The average reduction in gas use and increase in electric use for space heat of existing gas-heated commercial customers converting from gas to electric space heating.

ANSWER:

The estimated average reduction in gas use for space heat of existing gas heated commercial customers converting from gas to electric space heating is 16,497 m^3. The estimated average increase in electric use is 138,298 kWh per year.

GAC/MH II-13

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching commercial customers:

h) The number of existing commercial customers with gas water heating converting to electric water heating, by year.

ANSWER:

On average, approximately eight existing commercial customers with gas water heating are forecast to switch to electric water heating each year.

GAC/MH II-13

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching commercial customers:

i) The average reduction in gas use and increase in electric use for water heating of existing commercial customers converting from gas to electric water heating.

ANSWER:

The average reduction in gas use for water heating of existing commercial customers converting from gas to electric water heating is 3,795 m^3 per customer per year. The average increase in electric use is 26,976 kWh per customer per year.

GAC/MH II-13

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching commercial customers:

j) The number of new commercial customers with access to gas estimated to select electric space heating, by year.

ANSWER:

On average, approximately 40 new commercial customers in gas available areas are forecast to select electric space heating each year.

GAC/MH II-13

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching commercial customers:

k) The average reduction in gas use and increase in electric use for space heat of new commercial customers converting from gas to electric space heating.

ANSWER:

The estimated average amount of natural gas consumption avoided by a new commercial customer selecting electricity for space heating over natural gas is 14,524 m^3 per year. The estimated average increase in electric use is 138,298 kWh per year.

The estimated average use for electric space heating is assumed to be the same as for existing commercial customers. However, different efficiency values were used to derive the equivalent natural gas consumption for exiting commercial customers (81% efficient) and new commercial customers (92% efficient). Please see Manitoba Hydro's response to GAC/MH II-13(g).

GAC/MH II-13

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching commercial customers:

l) The number of new commercial customers with access to gas estimated to select electric water heating, by year.

ANSWER:

On average, approximately 40 new commercial customers in gas available areas are forecast to select electric water heating each year.

This is the same as the number selecting electric space heating. Please see Manitoba Hydro's response to GAC/MH II-13(j).

GAC/MH II-13

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Regarding the computation of the fuel-switching-related energy in the two tables in Section 4.2.1, please provide the following information concerning the fuel-switching commercial customers:

m) The average reduction in gas use and increase in electric use for water heating of new commercial customers converting from gas to electric water heating.

ANSWER:

The average amount of natural gas consumption avoided by a new commercial customer selecting electricity for water heating over natural gas is 3,795 m^3 per year. The average increase in electric use is 26,976 kWh per year.

This is the same as for existing commercial customers because data was not available to derive separate values for new and existing. Please see Manitoba Hydro's response to GAC/MH II-13(i).

GAC/MH II-14

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Please provide the sources used to estimate the forecasted fuel switching in Section 4.2.1.

ANSWER:

Sources include the 2009 Manitoba Hydro Residential Energy Use Survey, customer billing data, and the Residential and General Service forecasts of the 2011 Electric Load Forecast and 2011 Natural Gas Volume Forecast.

GAC/MH II-15

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Please provide any available data on

a) The number of new customers with access to natural gas, by class, for each year 2000–2011.

ANSWER:

Based upon the 2009 Manitoba Hydro Residential Energy Use Survey, Manitoba Hydro estimates that between 2005 and 2009, there were 18,271 new residential customers in gas available areas, or an average of 3,654 new residential customers per year.

For the commercial sector, the number of new natural gas customers (meters) has been growing at approximately 80 per year.

GAC/MH II-15

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Please provide any available data on

b) The number of existing customers and GWh of annual load switching from gas to electricity for space and/or water heating, by class, for each year 2000–2011.

ANSWER:

Detailed data on the number of existing customers converting from natural gas to electricity for space and water heating is not readily available for the period of 2000 to 2011.

The estimated number of existing residential customers converting from natural gas to electric space heat was based upon analysis of customer billing data as outlined in Manitoba Hydro's response to GAC/MH II-12(f). The net change of 270 customers switching annually, assuming an average annual use of 17,046 kWh as outlined in Manitoba Hydro's response to GAC/MH II-12(g), represents approximately 4.6 GWh per year.

The estimated number of existing residential customers forecast to convert from natural gas to electric water heating was based upon number and age distribution of existing water heaters from the 2009 Manitoba Hydro Residential Energy Use Survey. The average of 3,377 customers forecast to switch to electric water heaters annually, assuming an average annual use of 3,489 as outlined on page 17 of the Fuel Switching Report, represents approximately11.8 GWh per year.

Detailed information on the number of existing commercial customers converting from natural gas to electricity for space and water heating is not available. As outlined in Manitoba Hydro's response to GAC/MH II-13(d), existing customers in the commercial sector were assumed to participate in fuel switching at the same rate as existing natural gas customers in the residential sector (single detached and multi-attached). Approximately eight commercial customers are forecast to switch annually from natural gas to electric space heat and water heat representing 1.1 GWh and 0.2 GWh respectively.

GAC/MH II-15

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Please provide any available data on

c) The number and percentage of new customers with access to natural gas choosing to use electricity for space and/or water heating, by class, for each year 2000–2011.

ANSWER:

The 2009 Manitoba Hydro Residential Energy Use Survey estimated that, between 2005 and 2009, there were 9,781 new residential customers in gas available areas who installed electricity for space heating, or 1,956 per year. This represents 54% of the 3,654 new customers in natural gas available areas per year as outlined in Manitoba Hydro's response to GAC/MH II-15(a).

In addition, between 2005 and 2009, 15,098 new residential customers in gas available areas were estimated to have installed electricity for water heating, or 3,020 per year. This represents 83% of new customers in natural gas available areas. However, only 2% chose natural gas water heating; the remaining 15% of new residential customers indicated that water heating was provided as a common service (i.e. not reflected on the customer's bill).

For the commercial sector, detailed data was not available. The annual growth of natural gas customers was approximately 80 customers per year; 40 customers per year were assumed to install electricity instead of natural gas for space and water heating. New commercial customers in natural gas available areas were assumed to install electric space and water heating at the same rate as experienced among existing customers in the residential sector, or 33%.

GAC/MH II-15

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Please provide any available data on

d) The GWh of annual electric load added by class, for each year 2000–2011, due to new customers with access to natural gas choosing to use electricity for space and/or water heating.

ANSWER:

Detailed data on the number of new customers with access to natural gas choosing to use electricity for space and water heating and associated GWh of electric load is not available for the period of 2000 to 2011.

The annual GWh impact of 1,956 new residential dwellings in gas available areas installing electric space heat, assuming an average annual use of 9,119 kWh per residence (single detached, multi-attached and apartments) is estimated to be 17.8 GWh.

The annual GWh impact of 3,020 new residential dwellings installing electric water heating, assuming an average annual use of 3,489 kWh per water heater, is estimated to be 10.5 GWh.

The annual GWh impact of 40 new commercial dwellings installing electric space and water heat, assuming an annual average energy use of 138,298 kWh per space heating system and 26,976 kWh per water heating system, is estimated to be 5.5 GWh and 1.1 GWh respectively.

GAC/MH II-15

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08, p. 27.**

Please provide any available data on

e) The number of existing customers switching from electricity to gas for space and/or water heating and the resulting electric GWh annual load reduction, by class, for each year 2000–2011.

ANSWER:

The number of customers converting from electricity to natural gas heating is estimated to be negligible.

GAC/MH II-16

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08.**

Please indicate whether Manitoba Hydro expects customers to switch to electric water/space heating when the net benefits to the customer are negative.

a) If so, explain why customers would opt for a more costly heating system.

ANSWER:

Customer choice may be influenced by a variety of factors which may impact a customer's decision on fuel use for water/space heating, including the customer's expectations with regards to future prices for electricity and natural gas, estimated or quoted capital cost of implementing the options, expected maintenance costs, and a customer's values related to the environmental impacts of the decision. Further, a customer may not make a decision based on an economic assessment over the life of the system (e.g. the customer may be considering moving and therefore may not expect to realize the payback of an investment).

GAC/MH II-17

Subject: **Fuel Switching Report**
Reference: **Tab 8 of Manitoba Hydro's GRA filing**

Please indicate whether MH's load forecast takes into account fuel switching by existing customers from electric to gas space and/or water heating.

a) **If so, provide documentation of this component of MH's load forecast.**

b) **If not, explain why not.**

ANSWER:

For the 2011 Electric Forecast, the number of existing residential dwellings that switch from electric space heat to natural gas space heat was estimated to be zero. As part of the background research undertaken for the Fuel Switching Report, Manitoba Hydro analyzed residential customer billing data and adjusted the projection of customers switching between heating fuel sources. The net change is presented in Manitoba Hydro's response to GAC/MH II-12(f). The number of existing residential customers converting from electric to gas space and water heating is not significant. Future Load Forecasts will incorporate updated estimates of customers switching fuel sources.

GAC/MH II-18

Subject: **Fuel Switching Report**
Reference: **Response to Directive 17 Board Orders 116/08 and 150/08**

Please indicate whether MH has analyzed or projected the level of fuel switching by existing customers from electric to gas space and/or water heating.

a) **If so, provide all documentation of the analysis, including reports, studies, and workpapers.**

b) **If workpapers are available, provide them in spreadsheet form with formulas intact.**

ANSWER:

Please see Manitoba Hydro's responses to GAC/MH II-12(f), GAC/MH II-12(k), GAC/MH II-13(f), and GAC/MH II-13(h) for projections of fuel switching by existing customers.

Please see Manitoba Hydro's response to GAC/MH I-3(a) regarding provision of Microsoft Excel spreadsheets.

GAC/MH II-19

Subject: **Rate Design**
Reference: **Appendix 10.6 – Surplus Energy Program (SEP) Proposed Terms and Conditions**

Regarding the statement on page 8 that

> **An adder will be applied to each of the three TOU periods to account for market volatility or unforeseen supply costs. The adders will be adjusted as required to ensure a balance is maintained over the long-term between actual energy costs and revenues from SEP energy.**

a) **Please specify the adders by week and TOU period for the period November 1, 2010 to October 31, 2011.**

ANSWER:

The table below indicates the on peak, shoulder and off peak volatility adders for the weekly periods starting November 1, 2010 to October 31, 2011.

Week beginning	Volitility Adders ($/MWh)		
	On Peak	Shoulder	Off Peak
1-Nov-10	0.85	1.35	0.48
8-Nov-10	0.70	1.65	0.59
15-Nov-10	0.85	1.30	0.54
22-Nov-10	1.01	1.46	0.65
29-Nov-10	1.06	1.41	0.68
6-Dec-10	0.87	1.30	0.62
13-Dec-10	1.16	1.50	0.79
20-Dec-10	1.24	1.62	0.89
27-Dec-10	0.63	1.72	0.66
3-Jan-11	0.90	1.65	0.83
10-Jan-11	1.27	1.74	0.94
17-Jan-11	1.21	1.70	0.95
24-Jan-11	1.03	1.50	0.82
31-Jan-11	1.05	1.67	0.88
7-Feb-11	1.08	1.59	0.90
14-Feb-11	0.86	1.24	0.67
21-Feb-11	0.78	1.48	0.66
28-Feb-11	0.84	1.25	0.60
7-Mar-11	0.96	1.37	0.68
14-Mar-11	0.94	1.34	0.65
21-Mar-11	0.88	1.21	0.53
28-Mar-11	0.87	1.15	0.54
4-Apr-11	0.80	1.16	0.46
11-Apr-11	0.84	1.34	0.50
18-Apr-11	0.61	1.27	0.48
25-Apr-11	0.65	1.38	0.62

Week beginning	Volitility Adders ($/MWh)		
	On Peak	Shoulder	Off Peak
2-May-11	0.90	1.25	0.51
9-May-11	0.79	1.36	0.59
16-May-11	0.70	1.15	0.21
23-May-11	0.80	1.55	0.15
30-May-11	0.95	1.48	0.15
6-Jun-11	1.01	1.60	0.15
13-Jun-11	0.94	1.36	0.15
20-Jun-11	0.94	1.38	0.15
27-Jun-11	0.73	1.17	0.15
4-Jul-11	0.93	1.16	0.15
11-Jul-11	0.95	1.04	0.14
18-Jul-11	1.08	1.58	0.35
25-Jul-11	1.09	1.45	0.33
1-Aug-11	1.09	1.68	0.41
8-Aug-11	1.07	1.39	0.34
15-Aug-11	1.03	1.46	0.33
22-Aug-11	0.93	1.23	0.36
29-Aug-11	0.93	1.23	0.38
5-Sep-11	0.73	1.41	0.39
12-Sep-11	0.84	1.20	0.40
19-Sep-11	0.81	1.23	0.42
26-Sep-11	0.68	0.64	0.30
3-Oct-11	0.72	1.19	0.43
10-Oct-11	0.61	1.35	0.30
17-Oct-11	0.86	1.24	0.44
24-Oct-11	0.80	1.30	0.48
31-Oct-11	1.08	1.08	0.47

GAC/MH II-19

Subject: **Rate Design**
Reference: **Appendix 10.6 – Surplus Energy Program (SEP) Proposed Terms and Conditions**

Regarding the statement on page 8 that

> **An adder will be applied to each of the three TOU periods to account for market volatility or unforeseen supply costs. The adders will be adjusted as required to ensure a balance is maintained over the long-term between actual energy costs and revenues from SEP energy.**

b) Provide the basis for adjustments to the adders, including all workpapers in spreadsheet form with formulas intact.

ANSWER:

The volatility adder is calculated based on the product of a possible price spike and the probability of occurrence. These values are determined weekly based upon recent market history and power trader judgment. A probability of 10% with possible spike prices ranging between $15 and $40, off peak to on peak respectively, was used for the period referenced in part (a) of this question.

Manitoba Hydro respectfully declines to provide its working files.

GAC/MH II-20

Subject: **Rate Design**
Reference: **Appendix 10.7 – Surplus Energy Program (SEP), p. yy**

a) Please provide the cost basis for MH's expectation that more heating customers will join the SEP rate when burning coal for water and space heating is prohibited. (p. 4)

ANSWER:

Alternative energy sources for space heating are generally priced at levels above recent price histories for interruptible Surplus Energy Program supplies. The table below provides the historical average, maximum and minimum SEP rates for the General Service Medium class since the inception of the program.

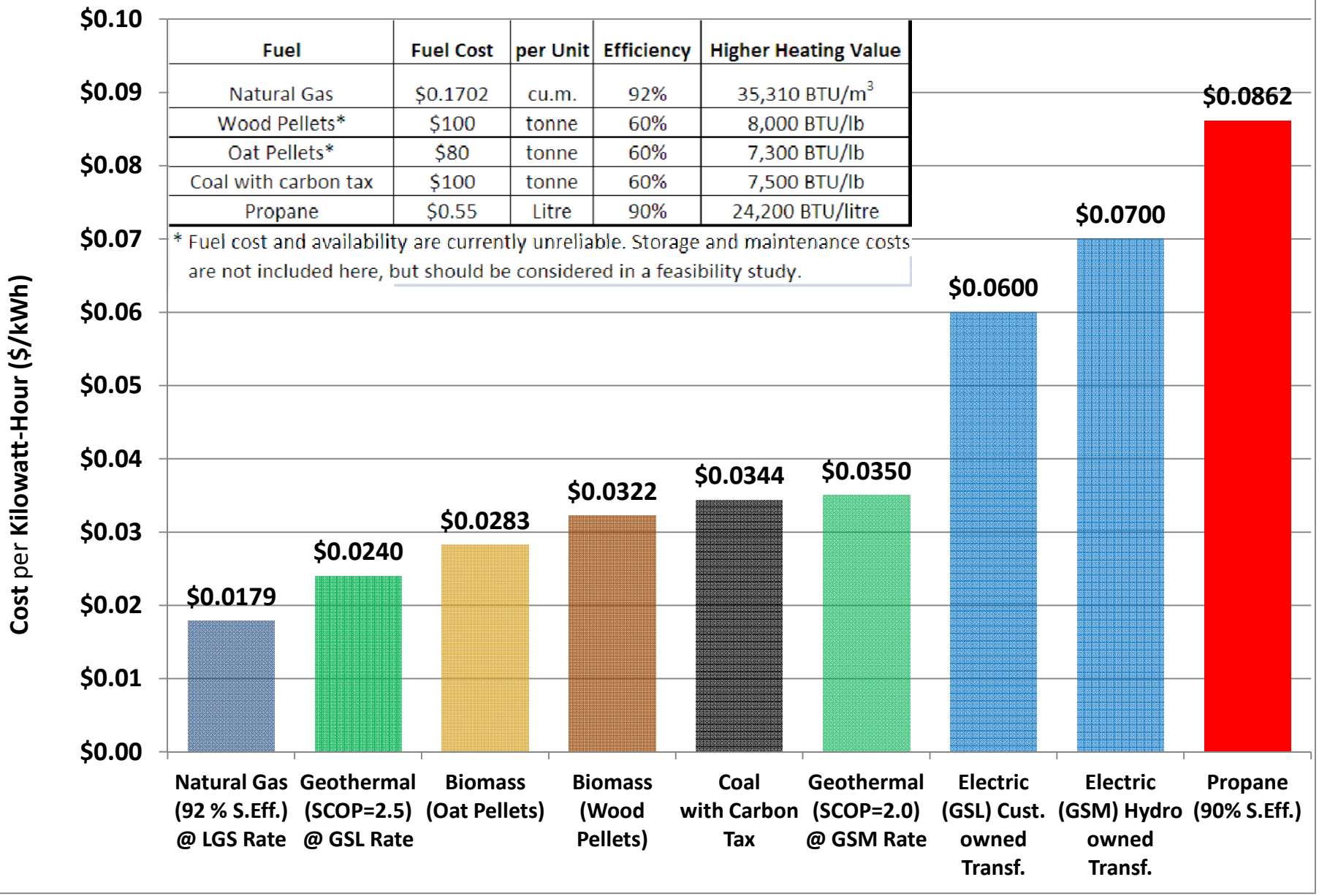
The attachment to this response provides the current prices for fuels commonly associated with space heating. In many instances, customers already have a back-up energy source in place, and are therefore willing to accept the risk of an interruption under the Surplus Energy Program.

	SEP - GSM								
	Average Rate			Maximum Rate			Minimum Rate		
	Peak	Shoulder	Off-Peak	Peak	Shoulder	Off-Peak	Peak	Shoulder	Off-Peak
2001	8.890	4.886	2.284	16.659	8.653	3.702	3.526	2.509	1.149
2002	5.091	3.444	2.340	7.653	5.729	2.976	4.063	2.674	1.830
2003	8.085	5.995	5.665	12.535	12.425	12.425	4.041	2.795	2.270
2004	7.569	5.899	4.884	12.994	12.994	12.994	4.952	2.902	1.447
2005	8.987	5.512	2.302	12.141	8.210	4.344	5.445	3.524	0.693
2006	8.008	5.195	2.833	19.245	9.831	9.831	0.740	0.740	0.645
2007	8.655	5.664	4.159	11.453	9.831	9.831	2.151	1.344	0.759
2008	7.819	5.167	2.609	11.058	7.622	4.527	5.112	3.846	1.136
2009	4.873	3.402	1.922	10.173	6.853	4.928	2.334	1.731	0.596
2010	4.140	3.142	1.824	5.916	4.444	3.056	2.769	1.865	0.834
2011	3.615	2.753	1.187	5.154	3.798	2.535	2.621	1.377	0.457

Heating Fuel Cost Comparison ($/kWh)

Fuel	Fuel Cost	per Unit	Efficiency	Higher Heating Value
Natural Gas	$0.1702	cu.m.	92%	35,310 BTU/m^3
Wood Pellets*	$100	tonne	60%	8,000 BTU/lb
Oat Pellets*	$80	tonne	60%	7,300 BTU/lb
Coal with carbon tax	$100	tonne	60%	7,500 BTU/lb
Propane	$0.55	Litre	90%	24,200 BTU/litre

* Fuel cost and availability are currently unreliable. Storage and maintenance costs are not included here, but should be considered in a feasibility study.



GAC/MH II-20

Subject: **Rate Design**
Reference: **Appendix 10.7 – Surplus Energy Program (SEP), p. yy**

b) Please explain why the SEP rate has been attractive to customers eligible for Option 2 and 3 customers but not to customers eligible for Option 1. (p. 3)

ANSWER:

In general, the potential benefits available to Option 1 customers from the use of a Surplus Energy Program supply are lower than those available to Option 2 and 3 customers as the available firm energy options for Option 1 customers are lower priced by comparison to those available to Option 2 and 3 customers.

The primary impediments for industrial customers considering Option 1 of the Surplus Energy Program are the non-firm, interruptible nature of this option and the associated investment and higher operating costs incurred to provide back-up in the event of an interruption.

Industrial customers typically invest considerable capital in facilities and generally secure firm contracts for the output of the goods and/or services produced from these facilities. Their anticipation of a reasonable return on this investment for shareholders is based on a firm supply of energy required to ensure that commitments to their customers are met. The resulting revenue stream provides for an acceptable return on capital investments that may be jeopardized by an interruption of supply.

The incremental capital required to add additional production capacity or provide for an alternate back-up for existing load in anticipation of an interruption, along with the associated business risk of such an interruption, appears to exceed the benefits that industrial customers have determined to be available from Option 1 of the Surplus Energy Program.

GAC/MH II-21

Subject: **Rate Design**
Reference: **Appendix 10.7 – Surplus Energy Program (SEP)**

Please provide all workpapers supporting the SEP rates filed in the period November 1, 2010 to October 31, 2011, in Excel spreadsheet form with all formulas intact.

ANSWER:

Please see Manitoba Hydro's response to GAC/MH I-3(a).

GAC/MH II-22

Subject: Rate Design

Please provide the following information:

a) the Company's distribution planning guidelines,
b) the percentage of transmission, subtransmission, and distribution plant that is driven by the customer's individual maximum demand (that is, the billing units for demand charges).
c) the load diversity assumptions used by Manitoba Hydro in designing its distribution system additions,
d) for each distribution substation, available data on the mix of load on that substation, by class, and
e) the most recent study of load diversity on Manitoba Hydro's:

i. Subtransmission lines
ii. Substations
iii. Primary distribution lines
iv. Secondary lines
v. Line transformers.

ANSWER:

As noted in Manitoba Hydro's response to GAC/MH I-1(a), The Public Utilities Board of Manitoba intends to review Manitoba Hydro's Cost of Service Study methodology in a separate proceeding from the current General Rate Application hearing. The information sought in this request is generally relevant to an examination of cost of service studies. Given that a separate proceeding is anticipated for this review, Manitoba Hydro respectfully declines to provide this information in the current proceeding.

GAC/MH II-23

Subject: **DSM Avoided Costs**
Reference: **MH response to CAC-GAC/MH I-4(a)**

Regarding the marginal cost estimates provided in response to CAC-GAC/MH I-4(a), please provide the following information:

a) the derivation the marginal T&D cost estimates, including all reports, workpapers, and Excel spreadsheets (with formulas intact)

ANSWER:

The derivation of the current estimates of transmission and distribution marginal costs provided in response to CAC/GAC/MH I-4(a) are based on the same methodology that is provided in the report "Marginal Transmission and Distribution Cost Estimates. SPD 04/05" Manitoba Hydro, September 23, 2004. This report was provided in GRA_2010-11 in the response to RCM/TREE/MH I-7(f) and is included as Appendix 35.

GAC/MH II-23

Subject: **DSM Avoided Costs**
Reference: **MH response to CAC-GAC/MH I-4(a)**

Regarding the marginal cost estimates provided in response to CAC-GAC/MH I-4(a), please provide the following information:

b) Manitoba Hydro's justification for excluding T&D O&M from its estimate of marginal T&D cost

ANSWER:

T&D marginal cost is derived primarily from the cost of infrastructure since there is virtually no incremental operation and maintenance cost associated with an increment of load on the transmission or distribution system.

GAC/MH II-23

Subject: **DSM Avoided Costs**
Reference: **MH response to CAC-GAC/MH I-4(a)**

Regarding the marginal cost estimates provided in response to CAC-GAC/MH I-4(a), please provide the following information:

c) the estimate of marginal transmission costs per kW/yr restated as costs per kW.h

i. Include all workpapers and Excel spreadsheets (with formulas intact) supporting this restatement of marginal transmission cost.

ANSWER:

The current estimates of Transmission and Distribution marginal costs provided in CAC-GAC/MH I-4(a) were transcribed in error. The appropriate values in 2011 dollars are as follows:

- Transmission: $60.46/kW/yr
- Distribution: $63.83/kW/yr

The marginal transmission costs expressed as $60.46 per kW/yr are restated as 0.69 cents per kWh when averaged over the 8766 hours in a planning year.

GAC/MH II-23

Subject: **DSM Avoided Costs**
Reference: **MH response to CAC-GAC/MH I-4(a)**

Regarding the marginal cost estimates provided in response to CAC-GAC/MH I-4(a), please provide the following information:

d) the estimate of marginal distribution costs per kW/yr restated as costs per kW.h

i. Include all workpapers and Excel spreadsheets (with formulas intact) supporting this restatement of marginal distribution cost.

ANSWER:

The current estimates of Transmission and Distribution marginal costs provided in CAC-GAC/MH I-4(a) were transcribed in error. The appropriate values in 2011 dollars are as follows:

- Transmission: $60.46/kW/yr
- Distribution: $63.83/kW/yr

The marginal distribution costs expressed as $63.83 per kW/yr are restated as 0.73 cents per kWh when averaged over the 8766 hours in a planning year.

GAC/MH II-24

Subject: **DSM Avoided Costs**
Reference: **MH response to CAC-GAC/MH I-4(a)**

Please provide the demand and energy loss factors applied to the generation, transmission and distribution marginal cost estimates.

ANSWER:

Please refer to Manitoba Hydro's response to CAC/MH II-27(b) which states that the generation component cost is derived at the generation level and a 14% adjustment has been incorporated to arrive at the estimate that is applicable to load savings at the distribution level.

GAC/MH II-25

Subject: **DSM Avoided Costs**
Reference: **MH response to CAC-GAC/MH I-4(a)**

Regarding the marginal cost estimates provided in response to CAC-GAC/MH I-4(a), please provide the following information

a) The derivation of the marginal generation cost estimates, including all reports, workpapers, and Excel spreadsheets (with formulas intact).

ANSWER:

The detailed spreadsheets used in deriving the marginal cost contain the expected value of electricity exports which is commercially sensitive. Therefore, Manitoba Hydro respectfully declines to provide the requested information.

GAC/MH II-25

Subject: **DSM Avoided Costs**
Reference: **MH response to CAC-GAC/MH I-4(a)**

Regarding the marginal cost estimates provided in response to CAC-GAC/MH I-4(a), please provide the following information

b) The reserve margin requirements reflected in the marginal generation cost estimates provided in response to CAC-GAC/MH I-4(a).

ANSWER:

Manitoba Hydro's minimum planning reserve margin is 12%, as provided on page 6 of Attachment 3 of this application.

GAC/MH II-25

Subject: **DSM Avoided Costs**
Reference: **MH response to CAC-GAC/MH I-4(a)**

Regarding the marginal cost estimates provided in response to CAC-GAC/MH I-4(a), please provide the following information

c) The minimum reserve margin requirements that Manitoba Hydro actually uses for capacity planning purposes.

ANSWER:

Please see Manitoba Hydro's response to GAC/MH II-25(b).

GAC/MH II-25

Subject: **DSM Avoided Costs**
Reference: **MH response to CAC-GAC/MH I-4(a)**

d) The marginal fixed and non-fuel variable O&M included in the marginal generation cost estimates.

i. If this cost component is not included, provide an estimate of marginal generation O&M and the basis for this estimate, including Excel spreadsheets with formulas intact.

ANSWER:

The marginal generation cost estimates do include components for an allocation of fixed costs, fuel costs and non-fuel variable O&M. These components are based on the marginal units used by the electricity export price forecast consultants to determine the expected value of electricity exports.

The detailed spreadsheets used in deriving the marginal cost contain the expected value of electricity exports which is commercially sensitive. Therefore, Manitoba Hydro respectfully declines to provide the detailed information on the derivation of the generation marginal costs.

GAC/MH II-26

Subject: **Load Forecast**
Reference: **Reference: Appendix 8.1, Table 2, p. 4**

Please provide the monthly GW.h corresponding to the annual General Consumers GW.h in Table 2, for each customer group separately.

ANSWER:

Please see the following tables.

Forecast Table 2
Residential Monthly Sales (GW.h)

Fiscal Yr	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
2000/01	492	376	303	331	360	355	419	457	664	771	705	598
2001/02	529	380	315	354	380	347	422	456	558	710	690	624
2002/03	589	448	323	385	375	359	490	551	602	740	789	711
2003/04	545	404	316	368	402	390	445	533	619	803	803	636
2004/05	577	452	329	376	361	373	445	497	667	887	745	660
2005/06	577	438	361	413	390	375	447	522	647	712	707	676
2006/07	552	401	381	402	405	390	475	551	662	779	849	693
2007/08	617	411	380	392	428	388	441	539	738	856	871	778
2008/09	619	466	372	378	399	392	446	541	743	1,004	829	765
2009/10	695	476	431	393	374	385	515	528	697	930	795	681
2010/11	594	441	384	450	470	379	434	539	764	957	830	816
2011/12	686	487	414	462	457	412	447	532	679	967	876	777
2012/13	670	475	408	414	421	395	494	611	740	979	886	786
2013/14	685	486	417	423	431	404	505	624	757	999	904	732
2014/15	696	493	423	429	436	410	513	634	769	1,015	918	733
2015/16	707	501	429	435	442	416	521	644	781	1,031	933	740
2016/17	719	509	436	441	448	422	530	654	794	1,048	949	742
2017/18	731	516	442	447	455	428	538	664	807	1,065	964	748
2018/19	743	524	449	453	461	434	547	675	819	1,083	980	754
2019/20	755	532	455	460	467	440	555	685	832	1,100	995	761
2020/21	767	540	462	466	474	446	564	696	845	1,117	1,011	768
2021/22	779	548	468	472	481	453	573	706	858	1,134	1,027	780
2022/23	791	556	475	479	487	459	582	717	871	1,152	1,042	793
2023/24	803	564	481	485	494	465	590	727	884	1,169	1,058	810
2024/25	816	572	488	492	500	472	599	738	897	1,186	1,074	833
2025/26	828	580	495	499	507	478	608	748	910	1,203	1,089	856
2026/27	840	588	501	505	514	484	617	759	923	1,220	1,104	902
2027/28	852	596	508	512	521	491	626	769	936	1,237	1,120	921
2028/29	864	604	515	518	527	497	635	780	949	1,254	1,135	940
2029/30	876	612	522	525	534	504	643	790	961	1,271	1,150	958
2030/31	888	620	528	532	541	510	652	800	974	1,288	1,166	971

Forecast Table 2
General Service Monthly Sales (GW.h)

Fiscal Yr	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
2000/01	952	911	875	861	903	889	897	986	1,080	1,155	1,096	1,070
2001/02	982	943	918	914	964	929	942	988	1,023	1,147	1,064	1,136
2002/03	1,080	1,006	961	981	978	982	1,038	1,092	1,116	1,207	1,176	1,180
2003/04	1,027	1,028	954	967	1,035	1,011	1,032	1,092	1,144	1,259	1,225	1,149
2004/05	1,091	1,061	984	1,004	1,023	1,005	1,045	1,103	1,209	1,365	1,192	1,192
2005/06	1,141	1,061	1,062	1,087	1,038	1,040	1,077	1,151	1,208	1,261	1,199	1,253
2006/07	1,118	1,053	1,069	1,137	1,107	1,069	1,097	1,151	1,222	1,318	1,278	1,250
2007/08	1,158	1,084	1,073	1,101	1,148	1,055	1,100	1,161	1,241	1,376	1,310	1,317
2008/09	1,176	1,113	1,084	1,114	1,130	1,097	1,124	1,189	1,211	1,427	1,215	1,275
2009/10	1,188	1,056	1,076	1,071	1,024	1,026	1,087	1,069	1,187	1,337	1,184	1,180
2010/11	1,104	1,051	1,013	1,082	1,038	1,039	1,028	1,125	1,227	1,378	1,228	1,311
2011/12	1,153	1,105	1,017	1,088	1,041	1,097	1,075	1,135	1,212	1,377	1,272	1,274
2012/13	1,183	1,100	1,115	1,154	1,122	1,110	1,128	1,198	1,248	1,406	1,298	1,302
2013/14	1,240	1,153	1,170	1,214	1,181	1,166	1,185	1,257	1,308	1,471	1,357	1,088
2014/15	1,255	1,168	1,188	1,233	1,199	1,182	1,200	1,271	1,323	1,488	1,374	1,031
2015/16	1,254	1,167	1,191	1,238	1,209	1,184	1,199	1,269	1,319	1,487	1,374	945
2016/17	1,272	1,184	1,211	1,260	1,231	1,203	1,216	1,286	1,337	1,508	1,394	896
2017/18	1,293	1,204	1,233	1,283	1,251	1,223	1,236	1,307	1,358	1,531	1,417	924
2018/19	1,303	1,213	1,244	1,294	1,261	1,233	1,245	1,315	1,367	1,543	1,429	875
2019/20	1,328	1,237	1,269	1,320	1,285	1,258	1,269	1,339	1,392	1,570	1,455	857
2020/21	1,353	1,262	1,296	1,347	1,311	1,283	1,293	1,364	1,418	1,599	1,482	843
2021/22	1,373	1,282	1,317	1,369	1,331	1,303	1,313	1,384	1,438	1,622	1,504	840
2022/23	1,393	1,301	1,338	1,391	1,351	1,323	1,333	1,404	1,458	1,644	1,526	833
2023/24	1,413	1,321	1,359	1,413	1,371	1,343	1,352	1,423	1,478	1,667	1,548	825
2024/25	1,433	1,340	1,381	1,434	1,391	1,363	1,371	1,442	1,498	1,689	1,570	814
2025/26	1,453	1,359	1,401	1,455	1,410	1,383	1,390	1,461	1,518	1,712	1,591	813
2026/27	1,472	1,378	1,422	1,476	1,430	1,403	1,409	1,480	1,537	1,734	1,612	837
2027/28	1,492	1,397	1,443	1,497	1,449	1,422	1,428	1,499	1,556	1,755	1,633	870
2028/29	1,511	1,416	1,463	1,518	1,468	1,441	1,446	1,517	1,575	1,777	1,654	904
2029/30	1,529	1,434	1,482	1,538	1,487	1,460	1,464	1,535	1,594	1,798	1,674	930
2030/31	1,548	1,452	1,502	1,558	1,505	1,478	1,482	1,553	1,612	1,819	1,694	964

Forecast Table 2
Area & Roadway Lighting Monthly Sales (GW.h)

Fiscal Yr	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
2000/01	5	6	5	5	6	7	8	9	10	10	8	8
2001/02	7	6	5	5	6	7	8	9	10	10	9	7
2002/03	7	5	5	7	3	7	6	13	10	10	8	8
2003/04	7	6	5	5	6	7	8	10	10	10	8	8
2004/05	7	6	5	5	6	7	9	10	10	10	8	8
2005/06	7	6	5	5	6	7	9	10	10	10	9	8
2006/07	8	7	6	6	7	8	9	10	11	11	9	9
2007/08	8	6	6	6	7	8	9	10	11	11	9	9
2008/09	8	7	6	6	7	8	9	11	11	11	9	9
2009/10	8	7	6	6	7	8	10	11	11	11	9	9
2010/11	8	7	6	6	7	8	10	11	11	11	9	9
2011/12	8	7	6	6	7	8	10	11	11	11	9	9
2012/13	8	7	6	6	7	8	10	11	12	11	10	9
2013/14	8	7	6	6	7	9	10	11	12	11	10	9
2014/15	8	7	6	6	7	9	10	11	12	11	10	9
2015/16	8	7	6	6	8	9	10	11	12	12	10	9
2016/17	8	7	6	7	8	9	10	11	12	12	10	9
2017/18	8	7	6	7	8	9	10	11	12	12	10	10
2018/19	8	7	6	7	8	9	10	11	12	12	10	10
2019/20	8	7	6	7	8	9	10	12	12	12	10	10
2020/21	8	7	6	7	8	9	10	12	12	12	10	10
2021/22	8	7	6	7	8	9	11	12	12	12	10	10
2022/23	9	7	6	7	8	9	11	12	13	12	10	10
2023/24	9	7	6	7	8	9	11	12	13	12	10	10
2024/25	9	7	7	7	8	9	11	12	13	12	11	10
2025/26	9	8	7	7	8	9	11	12	13	13	11	10
2026/27	9	8	7	7	8	9	11	12	13	13	11	10
2027/28	9	8	7	7	8	10	11	12	13	13	11	10
2028/29	9	8	7	7	8	10	11	12	13	13	11	10
2029/30	9	8	7	7	8	10	11	12	13	13	11	11
2030/31	9	8	7	7	9	10	11	13	13	13	11	11

Forecast Table 2
Diesel Monthly Sales (GW.h)

Fiscal Yr	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
2000/01	1	1	1	1	1	1	1	1	1	1	1	1
2001/02	1	1	1	1	1	1	1	1	1	1	1	1
2002/03	1	1	1	1	1	1	1	1	1	1	1	1
2003/04	1	1	1	1	1	1	1	1	1	1	1	1
2004/05	1	1	1	1	1	1	1	1	1	1	1	1
2005/06	1	1	1	1	1	1	1	1	1	1	1	1
2006/07	1	1	1	1	1	1	1	1	1	1	1	1
2007/08	1	1	1	1	1	1	1	1	1	1	1	1
2008/09	1	1	1	1	1	1	1	1	1	2	1	1
2009/10	1	1	1	1	1	1	1	1	1	1	1	1
2010/11	1	1	1	1	1	1	1	1	1	1	1	1
2011/12	1	1	1	1	1	1	1	1	1	1	1	1
2012/13	1	1	1	1	1	1	1	1	1	1	1	1
2013/14	1	1	1	1	1	1	1	1	1	1	1	1
2014/15	1	1	1	1	1	1	1	1	1	1	1	1
2015/16	1	1	1	1	1	1	1	1	1	1	1	1
2016/17	1	1	1	1	1	1	1	1	1	1	1	1
2017/18	1	1	1	1	1	1	1	1	1	2	1	1
2018/19	1	1	1	1	1	1	1	1	1	2	1	1
2019/20	1	1	1	1	1	1	1	1	1	2	1	1
2020/21	1	1	1	1	1	1	1	1	1	2	1	1
2021/22	1	1	1	1	1	1	1	1	1	2	1	1
2022/23	1	1	1	1	1	1	1	1	1	2	1	1
2023/24	1	1	1	1	1	1	1	1	1	2	1	1
2024/25	1	1	1	1	1	1	1	1	1	2	1	1
2025/26	1	1	1	1	1	1	1	2	1	2	1	2
2026/27	1	1	1	1	1	1	1	2	2	2	1	2
2027/28	1	1	1	1	1	1	1	2	2	2	1	2
2028/29	1	1	1	1	1	1	1	2	2	2	1	2
2029/30	1	1	1	1	1	1	1	2	2	2	2	2
2030/31	1	1	1	1	1	1	1	2	2	2	2	2

GAC/MH II-27

Subject: Residential Late Payments

Please provide by month for each month since October 2007:

a) The average arrears of residential accounts in arrears,

ANSWER:

The following table represents the average arrears for all residential accounts in arrears by month beginning September 2009. Manitoba Hydro is unable to provide this data prior to September 2009.

*Average arrears of residential accounts in arrears by month***				
Month	*2012*	*2011*	*2010*	*2009*
December		$275.78	$270.51	$272.00
November		$261.65	$261.24	$260.29
October		$265.52	$269.89	$255.37
September	$271.00	$284.31	$279.72	$279.42
August	$285.55	$287.08	$284.57	
July	$290.07	$295.65	$296.21	
June	$303.70	$312.32	$314.03	
May	$325.65	$339.89	$328.24	
April	$337.28	$352.88	$351.88	
March	$340.40	$351.48	$351.03	
February	$320.23	$329.59	$329.94	
January	$300.26	$302.69	$299.49	

**Data includes active and inactive, residential, electric, 30, 60 & 90 day arrears and excludes EPP.

GAC/MH II-27

Subject: Residential Late Payments

Please provide by month for each month since October 2007:

b) The average bill of residential accounts in arrears,

ANSWER:

The following table represents the average bill for all residential accounts in arrears by month beginning September 2009. Manitoba Hydro is unable to collect this data prior to September 2009.

*Average bill of residential accounts in arrears by month***				
Month	2012	2011	2010	2009
December		$389.41	$395.39	$387.45
November		$351.61	$354.35	$345.87
October		$337.39	$343.31	$333.40
September	$344.70	$357.58	$351.83	$346.32
August	$362.12	$362.80	$363.87	
July	$371.30	$373.98	$372.77	
June	$380.43	$392.93	$388.62	
May	$414.34	$433.77	$413.09	
April	$447.69	$475.47	$465.16	
March	$469.42	$498.96	$474.55	
February	$462.05	$474.98	$467.30	
January	$443.19	$462.73	$449.71	

**Data includes active and inactive, residential, electric, 30, 60 & 90 day arrears and excludes EPP.

GAC/MH II-27

Subject: Residential Late Payments

Please provide by month for each month since October 2007:

c) The total dollars of residential arrears, and

ANSWER:

Please see Manitoba Hydro's response to GAC/MH I-13(a) (v).

GAC/MH II-27

Subject: Residential Late Payments

Please provide by month for each month since October 2007:

d) The number of residential billed accounts that are in arrears.

ANSWER:

The following table represents the number of residential accounts in arrears by month beginning September 2009. Manitoba Hydro is unable to provide this data prior to September 2009.

Total number of residential accounts in arrears by month.				
Month	*2012*	*2011*	*2010*	*2009*
December		63,921	65,958	66,509
November		61,434	61,383	66,230
October		61,601	60,586	67,090
September	60,881	61,741	63,285	65,387
August	58,433	63,955	64,137	
July	60,761	66,665	64,752	
June	62,730	68,595	67,074	
May	64,034	67,385	71,740	
April	66,355	68,213	69,225	
March	64,974	67,259	72,378	
February	67,677	74,228	74,917	
January	64,023	67,063	69,253	

**Data includes active and inactive, residential, electric, 30, 60 & 90 day arrears and excludes EPP.

GAC/MH II-28

Subject: General Service Late Payments

Please provide by month for each month since October 2007:

a) The average arrears of General Service accounts in arrears,

ANSWER:

The following table represents the average arrears of General Service accounts in arrears by month beginning September 2009. This data is not available prior to September 2009.

*Average arrears of general service accounts in arrears by month***				
Month	*2012*	*2011*	*2010*	*2009*
December		$1,067	$1,000	$917
November		$933	$852	$945
October		$891	$866	$976
September	$701	$873	$1,130	$873
August	$837	$1,028	$957	
July	$725	$901	$971	
June	$749	$1,012	$979	
May	$915	$995	$1,043	
April	$1,195	$1,098	$1,136	
March	$1,050	$1,052	$1,138	
February	$1,037	$1,101	$1,151	
January	$1,057	$976	$1,022	

**Data includes active and inactive, commercial, electric, 30, 60, & 90 day arrears and excludes EPP.

GAC/MH II-28

Subject: General Service Late Payments

Please provide by month for each month since October 2007:

b) The average bill of General Service accounts in arrears,

ANSWER:

The following table represents the average bill of General Service accounts in arrears by month beginning September 2009. This data is not available prior to September 2009.

*Average bill of general service accounts in arrears by month***				
Month	*2012*	*2011*	*2010*	*2009*
December		$12,463	$11,952	$10,657
November		$12,681	$11,355	$9,632
October		$12,008	$10,653	$9,552
September	$11,982	$11,876	$10,844	$9,724
August	$12,407	$11,143	$10,581	
July	$12,900	$10,110	$10,490	
June	$12,026	$9,979	$9,870	
May	$11,948	$11,301	$9,810	
April	$12,578	$11,259	$10,021	
March	$12,701	$12,026	$9,896	
February	$12,111	$11,453	$9,751	
January	$14,246	$12,200	$11,190	

** Data includes active and inactive, commercial, electric, 30, 60, & 90 day arrears and excludes EPP.

GAC/MH II-28

Subject: General Service Late Payments

Please provide by month for each month since October 2007:

c) The total dollars of General Service arrears, and

ANSWER:

The following table represents the total dollars of General Service arrears by month beginning September 2009. This data is not available prior to September 2009.

Total dollars of general service arrears by month ($000s)				
Month	*2012*	*2011*	*2010*	*2009*
December		$3,592	$3,648	$3,645
November		$3,107	$3,183	$3,937
October		$3,077	$3,231	$4,326
September	$2,429	$3,036	$4,362	$3,574
August	$2,632	$3,812	$3,623	
July	$2,341	$3,819	$3,818	
June	$2,478	$4,390	$3,865	
May	$3,113	$3,770	$4,342	
April	$4,308	$4,284	$4,789	
March	$3,678	$3,904	$4,866	
February	$3,898	$4,616	$5,324	
January	$3,474	$3,941	$4,221	

** Data includes active and inactive, commercial, electric, 30, 60 & 90 day arrears and excludes EPP.

GAC/MH II-28

Subject: General Service Late Payments

Please provide by month for each month since October 2007:

d) The number of General Service billed accounts that are in arrears.

ANSWER:

The following table represents the number of General Service accounts in arrears by month beginning September 2009. This data is not available prior to September 2009.

Total number of general service accounts in arrears by month.				
Month	*2012*	*2011*	*2010*	*2009*
December		3,367	3,647	3,973
November		3,330	3,738	4,168
October		3,452	3,729	4,430
September	3,465	3,477	3,861	4,096
August	3,143	3,707	3,786	
July	3,229	4,238	3,933	
June	3,307	4,338	3,948	
May	3,400	3,791	4,162	
April	3,606	3,903	4,217	
March	3,504	3,711	4,277	
February	3,758	4,191	4,625	
January	3,286	4,036	4,132	

** Data includes active and inactive, commercial, electric, 30, 60 & 90 day arrears and excludes EPP.

GAC/MH II-29

Subject: **Avoided Costs**
Reference: **CAC-GAC/MH I-4 and CAC-GAC/MH I-10**

Using Manitoba Hydro's established methodology, the forecast marginal cost to serve a domestic customer, levelized over the next 30 years is 8.52 cents per kWh. in 2011 dollars. This includes all generation costs and all capital costs associated with transmission and distribution.

a) Please confirm that the total avoided cost of DSM measures for both the utility and the customer in an increasing rate environment is over 15 cents/kWh (8.52 utility cost + 6.94 cents/kWh customer energy cost). If not confirmed, please provide a corrected figure with an explanation of the computation.

b) Please confirm that, at the 15 cents/kWh threshold, both the utility (through a DSM grant) and the customer (through on-metre financing) can jointly fund the measure cost-effectively. If disconfirmed, please explain why not and what alternative value represents the threshold of cost-effective DSM measures funded jointly by the utility and the customer, with explanatory computations.

c) Please confirm that the new DSM Potential Study underway will determine both the economic potential and achievable potential of DSM measures in terms of their combined value to both the utility and the customer. If not, why not? In any case, please provide the threshold value chosen for the economic analysis and why it was chosen.

ANSWER:

The 8.52 cents/kWh is the total marginal value of the energy. This levelized value is used to assess the marginal resource cost effectiveness of an energy efficient measure. The cost/benefit analysis assesses this value against the cost of installing the measure from a combined utility/customer perspective (i.e. regardless of who pays, who benefits and any cash flows between the utility and the customer). Any utility revenue losses due to lower customer bills are netted to zero against customer cost savings due to lower customer bills.

The 6.94 cents/kWh customer energy cost represents both a direct benefit to the customer in the form of avoided energy bills and a direct cost to the utility in the form of foregone revenue from the customer.

From the customer's perspective, a cost/benefit analysis should consider the 6.94 cents per kWh reduced energy cost and this value should be compared to any cost incurred by the customer to realize the associated benefits.

From a utility's perspective, the cost/benefit analysis should consider both the 8.52 cents/kWh levelized marginal cost (economic benefit) and the offsetting 6.94 cents/kWh foregone electricity revenue (economic cost).

It would be inappropriate to add the total marginal value of the energy (i.e. 8.52 cents/kWh) with the customer's avoided bill impacts (6.94 cents/kWh) without also considering the lost revenue to the utility (i.e. 6.94 cents/kWh).

GAC/MH II-30

Subject: Rate Design—Proof of Revenue
Reference: Appendix 10.12

a) For each rate and sub-rate and for both the Interim 2012 rates and Proposed 2013 rates, please provide:

i) The number of billing units,
ii) The per unit charges, and
iii) Revenues from each unit charge.

ANSWER:

Please see Manitoba Hydro's response to MIPUG/MH I-20(b) which was filed on October 3, 2012, along with Appendices 10.12, 10.13 and 10.14.

Manitoba Hydro inadvertently neglected to include the billing units, charges and revenues for the TOU rates applicable to the GS Large >30 customer groups, which are therefore provided below.

Sub Class	Non-Winter On-Peak kWh	Non-Winter Off-Peak kWh	Winter On-Peak kWh	Winter Off-Peak kWh	On-Peak Demand
Billing Units:					
Large 30-100	352,683,998	443,107,138	187,332,089	235,650,009	2,510,286
Large >100	1,450,448,644	1,777,700,279	842,241,245	1,013,789,832	8,867,577
Unit Charges:					
Large 30-100	$0.0448	$0.0285	$0.0548	$0.0285	$3.10
Large >100	$0.0417	$0.0255	$0.0517	$0.0255	$2.76
Revenues:					
Large 30-100	$15,800,243	$12,628,553	$10,265,798	$6,716,025	$7,781,887
Large >100	$60,483,708	$45,331,357	$43,543,872	$25,851,641	$24,474,513

GAC/MH II-30

Subject: **Rate Design—Proof of Revenue**
Reference: **Appendix 10.12**

b) For each rate and sub-rate class and for both the Interim 2012 rates and Proposed 2013 rates, please provide the number of billing demand units that are attributable to the demand ratchets.

ANSWER:

Manitoba Hydro does not aggregate forecasted billing demand units into ratchet/non-ratchet components. Forecasted billing demands are estimated based on historical aggregated class load factors for Mass Consumers and individual historical load factors for Top Consumers. The total forecasted billing demand units used in deriving class revenue for the 2013/14 test year (Appendix 10.12) are the same regardless of which rates were applied. The billing demand units forecasted are as follows (as provided in response to MIPUG/MH I-20(b) page 4):

Large 30-100 = 2,545,857 kVA
Large >100 = 8,890,008 kVA

The portion of these units attributable to demand ratchets would be relatively insignificant based on analysis of the 25% ratchets versus 50% ratchets on actual billing demand units for 2011/12. Based on this data, the table below provides the billing demand units (kVA) attributable to the 25% and 50% ratchets split between the "% of highest recorded demand in the previous 12 months" and "% of contracted demand".

	25% Ratchets			**50% Ratchets**		
	Highest	Contract	Total	Highest	Contract	Total
Large30-100	813	35,290	36,103	9,377	215,946	225,323
Large >100	0	23,310	23,310	6,545	96,504	103,049

The customers most impacted by the ratchets tend to be those who have over-contracted their loads. It is expected that these customers will revise their contract to more closely represent their actual usage. It is also important to recognize that with TOU rates, customers will be billed based on their highest recorded on-peak demand rather than their highest maximum demand (on or off peak). Based on the 2011/12 data, on-peak demand was 43,211 kVA lower than maximum demand for the Large 30-100 kV customers, and 53,040 kVA lower for

the Large >100 kV customers. This may offset some of the effects of the higher ratchets for some customers.

GAC/MH II-30

Subject: **Rate Design—Proof of Revenue**
Reference: **Appendix 10.12**

c) Please provide all spreadsheets supporting the Proof of Revenue calculation for every rate class, in Excel format with all formulas intact.

ANSWER:

Please see Manitoba Hydro's responses to GAC/MH I-3(a) and GAC/MH II-34(a).

GAC/MH II-30

Subject: **Rate Design—Proof of Revenue**
Reference: **Appendix 10.12**

d) If Manitoba Hydro refuses to provide the Excel spreadsheets in response to this question (as it did in the response to GAC/MH I-7(a)), please specify the actual contents of each cell of MH's calculation spreadsheet for every rate.

i) If the contents are a formula used in MH's calculation, please provide the formula, identifying the values in any cells referred to by address.

ii) If the contents are an input value, such as a unit charge or a billing determinant, please provide the actual input value.

ANSWER:

To disclose the formulaic contents of the cells would involve disclosing formulae developed by third parties. Please see Manitoba Hydro's response to GAC/MH II-34(d).

GAC/MH II-31

Subject: **Rate Design—Proof of Revenue**
Reference: **Appendix 10.12**

a) **Please add to the Proof of Revenues table in Appendix 10.12 a column for Calculated Revenues, assuming the April 2012 rates are in effect and that the billing determinants are the same as they are for the Interim 2012 and Proposed 2013 rates.**

ANSWER:

Please see the table on the following page for the requested information.

PROOF OF REVENUE

Interim Approved September 1, 2012 Rates versus Proposed April 1, 2013 Rates

for year ended March 31, 2014

	Calculated Revenue Apr 2012 Rates	Calculated Revenue Sept 2012 Rates	Calculated Revenue April 2013 Rates	Diff. in Revenue Dollars	Diff. in Revenue Percent
Basic	533,565,300	546,005,529	565,031,761	19,026,232	3.5%
Diesel	584,469	598,001	618,697	20,696	3.5%
Seasonal	7,380,786	7,522,059	7,738,124	216,065	2.9%
FRWH	1,110,336	1,137,702	1,177,411	39,709	3.5%
Total Residential	**$542,640,891**	**$555,263,291**	**$574,565,993**	**$19,302,702**	**3.5%**
Small Non-Demand	127,536,256	130,588,658	134,563,726	3,975,068	3.0%
Small Demand	128,834,230	132,049,062	136,517,560	4,468,497	3.4%
Seasonal	532,285	541,375	558,171	16,796	3.1%
FRWH	484,226	496,570	513,956	17,386	3.5%
Total Small	257,386,997	263,675,665	272,153,413	8,477,748	3.2%
Total Medium	178,964,781	183,034,939	189,538,310	6,503,371	3.6%
Large 750V-30kV	87,169,978	89,239,183	93,256,328	4,017,145	4.5%
Large 30 - 100 kV	49,893,771	51,122,166	53,192,507	2,070,341	4.0%
Large > 100 kV	188,434,439	193,151,023	199,793,602	6,642,579	3.4%
Total Large	325,498,188	333,512,372	346,242,437	12,730,065	3.8%
Diesel GS & Gov.	5,876,898	5,879,313	5,883,387	4,074	0.1%
SEP	0	0	0	0	0.0%
Total GS	**$767,726,864**	**$786,102,289**	**$813,817,547**	**$27,715,258**	**3.5%**
Area & Roadway	**$20,967,730**	**$21,537,415**	**$22,289,337**	**$751,922**	**3.5%**
DSM Reduction	(18,356,391)	(18,824,793)	(19,496,031)	(671,238)	3.6%
Misc. Rev & Adjs.	7,513,136	7,670,747	7,938,973	268,226	3.5%
General Consumers	**$1,320,492,23024**	**$1,351,748,9477**	**$1,399,115,818**	**$47,366,870**	**3.5%**

GAC/MH II-31

Subject: **Rate Design—Proof of Revenue**
Reference: **Appendix 10.12**

b) For the April 2012 revenue calculation and for each class, please provide:

i) The number of billing units,
ii) The per unit charges, and
iii) Revenues from each unit charge.

ANSWER:

Please see response to MIPUG/MH I-20(b), specifically pages 2, 4, 5 and 6.

GAC/MH II-31

Subject: **Rate Design—Proof of Revenue**
Reference: **Appendix 10.12**

c) Regarding the April 2012 revenue calculation, for each class, please provide the number of billing demand units that are attributable to the demand ratchets and explain how Hydro estimated the effect of the ratchets.

ANSWER:

Please see Manitoba Hydro's response to GAC/MH II-30(b).

GAC/MH II-31

Subject: **Rate Design—Proof of Revenue**
Reference: **Appendix 10.12**

d) Please provide all spreadsheets supporting the April 2012 revenue calculation for every rate class, in Excel format with all formulas intact.

ANSWER:

Please see Manitoba Hydro's responses to GAC/MH I-3(a) and GAC/MH II-34(a).

GAC/MH II-31

Subject: **Rate Design—Proof of Revenue**
Reference: **Appendix 10.12**

e) If Manitoba Hydro refuses to provide the Excel spreadsheets (as in the response to GAC/MH I-7(a)), please specify the actual contents of each cell of MH's spreadsheet for every rate, whether it is:

a. If the contents are a formula used in MH's calculation, please provide the formula, identifying the values in any cells referred to by address.
b. If the contents are an input value, such as a unit charge or a billing determinant, please provide the actual input value.

ANSWER:

Please see Manitoba Hydro's response to GAC/MH II-30(d).

GAC/MH II-32

Subject: **Rate Design—Proof of Revenue**
Reference: **Appendix 10.12**

Regarding the Proof of Revenue for the proposed Large General Service TOU rate, please provide documentation of the following:

a) the calculation of the billing demand before and after the increase in the ratchet to 50%, and

ANSWER:

Please see Manitoba Hydro's response to GAC/MH II-30(b).

GAC/MH II-32

Subject: **Rate Design—Proof of Revenue**
Reference: **Appendix 10.12**

Regarding the Proof of Revenue for the proposed Large General Service TOU rate, please provide documentation of the following:

b) the calculation of the billed on-peak winter energy, on-peak non-winter energy and off-peak energy.

ANSWER:

Historical billing data was used in determining the percentage of on-peak / off-peak / winter / non-winter energy usage for each of the classes. These percentages (as shown below) were then applied to the forecasted energy for each class to determine the TOU energy values for each test year.

Large >100 kV:	On-Peak Winter	16.6%
	On-Peak Non-Winter	28.5%
	Off-Peak	54.9%
	Total	100.0%
Large 30-100 kV:	On-Peak Winter	15.4%
	On-Peak Non-Winter	28.9%
	Off-Peak	55.7%
	Total	100.0%

GAC/MH II-32

Subject: **Rate Design—Proof of Revenue**
Reference: **Appendix 10.12**

Regarding the Proof of Revenue for the proposed Large General Service TOU rate, please provide documentation of the following:

c) Include all data and assumptions relied upon for the calculations provided in (a) and (b), the basis of the assumptions, and all workpapers used, as Excel spreadsheets with formulas intact.

i. If the contents are a formula used in MH's calculation, please provide the formula, identifying the values in any cells referred to by address.

ii. If the contents are an input value, such as a unit charge or a billing determinant, please provide the actual input value.

ANSWER:

Please see Manitoba Hydro's responses to GAC/MH I-3(a) and GAC/MH II-34(d).

GAC/MH II-33

Subject: **Rate Design—Bill Comparisons**
Reference: **Response to GAC/MH I-3**

Regarding the MH's Bill Comparison electronic spreadsheet, please:

a) Quantify the size and complexity of the bill comparison spreadsheet, measured in kilobytes of file size, the number of cells containing data and computations, the number of computations involving operations more complex that arithmetic, and any other measures of size or complexity that Hydro believes demonstrate that the spreadsheet cannot be released to the parties,

ANSWER:

The Bill Comparisons workbook is 609 kilobytes and contains 5 worksheets:

- Worksheet 1 contains data or formulas in columns A to N and rows 1 to 79;
- Worksheet 2 contains data or formulas in columns A to M and rows 1 to 140;
- Worksheet 3 contains data or formulas in columns A to X and rows 1 to 1, 068;
- Worksheet 4 contains data or formulas in columns A to K and rows 1 to 294; and,
- Worksheet 5 contains data or formulas in columns A to K and rows 1 to 292.

The formulas used in the Bill Comparison spreadsheets include VLOOKUP and nested IF functions, in addition to traditional arithmetic functions.

Please also see Manitoba Hydro's responses to GAC/MH II-33(b) and (g).

GAC/MH II-33

Subject: **Rate Design—Bill Comparisons**
Reference: **Response to GAC/MH I-3**

Regarding the MH's Bill Comparison electronic spreadsheet, please:

b) Explain why the bill comparison spreadsheet needs to be so large and complex,

ANSWER:

Bill comparison spreadsheets need to be reasonably sophisticated to calculate bill comparisons for block rates. While the bill comparison spreadsheets may not be as complex as other models used by the Corporation, for the reasons outlined in GAC/MH I-3(a), Manitoba Hydro is not prepared to file live spreadsheets with formulas intact, but will consider providing data only spreadsheets upon request.

GAC/MH II-33

Subject: **Rate Design—Bill Comparisons**
Reference: **Response to GAC/MH I-3**

Regarding the MH's Bill Comparison electronic spreadsheet, please:

c) Provide the number of cells in the spreadsheet that contain metadata, and the form of the metadata (comments, text in the cell),

ANSWER:

Please see Manitoba Hydro's response to GAC/MH II-34(b).

GAC/MH II-33

Subject: **Rate Design—Bill Comparisons**
Reference: **Response to GAC/MH I-3**

Regarding the MH's Bill Comparison electronic spreadsheet, please:

d) Estimate the amount of time per cell that it would take to delete the metadata,

ANSWER:

Please see Manitoba Hydro's response to GAC/MH II-34(b).

GAC/MH II-33

Subject: **Rate Design—Bill Comparisons**
Reference: **Response to GAC/MH I-3**

Regarding the MH's Bill Comparison electronic spreadsheet, please:

e) Identify any third-party intellectual property rights associated with the bill comparison spreadsheet.

i) If this problem exists, explain the nature of the intellectual property necessary to compute bills from rates and billing determinants.

ii) If this problem exists, explain why MH is unable to create its own bill comparison spreadsheet without the third-party intellectual property.

ANSWER:

There are no third-party intellectual property rights associated with Manitoba Hydro's Bill Comparison spreadsheets. For the reasons outlined in GAC/MH I-3(a), Manitoba Hydro is not prepared to file live spreadsheets with formulas intact, but will consider providing data only spreadsheets upon request.

GAC/MH II-33

Subject: **Rate Design—Bill Comparisons**
Reference: **Response to GAC/MH I-3**

Regarding the MH's Bill Comparison electronic spreadsheet, please:

f) Identify any elements of the bill comparison spreadsheet, such as commercially sensitive data or complex algorithms, that make the spreadsheet "not appropriate to be disclosed."

ANSWER:

The bill comparison spreadsheets do not contain commercially sensitive data. For the reasons outlined in GAC/MH I-3(a), Manitoba Hydro is not prepared to file live spreadsheets with formulas intact, but will consider providing data only spreadsheets upon request. Please also see Manitoba Hydro's response to GAC/MH II-33(g).

GAC/MH II-33

Subject: **Rate Design—Bill Comparisons**
Reference: **Response to GAC/MH I-3**

Regarding the MH's Bill Comparison electronic spreadsheet, please:

g) Explain why a complex algorithms would make the spreadsheet "not appropriate to be disclosed."

ANSWER:

Manitoba Hydro is concerned with the potentially significant amount of time and effort that would be required to prepare the models to be placed in the public domain, to educate other parties in the use of these models, and to verify alternative scenarios developed by third parties using the models. Should intervenors wish to have various assumptions tested, they should request such analysis in the interrogatory process.

For the reasons outline in GAC/MH I-3(a), Manitoba Hydro is not prepared to file live spreadsheets with formulas intact, but will consider providing data only spreadsheets upon request.

GAC/MH II-34

Subject: **Rate Design—Proof of Revenue**
Reference: **Response to GAC/MH I-3 and I-7**

Regarding the MH's Proof of Revenue electronic spreadsheet, please provide:

a) An explanation of the large size and complexity of the Proof of Revenue spreadsheet,

ANSWER:

The Proof of Revenue spreadsheet is interlinked with approximately twenty other spreadsheets that may themselves be large and complex. The Proof of Revenue spreadsheet represents data relevant to the test year. The numerous spreadsheets that the Proof of Revenue is linked to generally contain twenty to thirty years of data that serve other purposes besides producing a Proof of Revenue schedule.

Of the approximately 20 spreadsheets needed to produce the Proof of Revenue, each is segregated into various classes and sub-classes. Some of these spreadsheets contain strictly raw data, such as actual billing data (bills, kWh, revenue), forecast data (bills, kWh), bill frequency data, and DSM program data. However, the majority of spreadsheets include the actual revenue calculations which contain hundreds of formulas. Some spreadsheets include individual customer load data (both on a historical and forecast basis), which may be commercially sensitive customer information, or personal information protected by the Freedom of Information and Protection of Privacy Act.

These spreadsheets also contain varying degrees of visible and hidden information or "metadata" that would need to be removed if the model is to be placed in the public domain. Visible information includes analyst annotations and documentation in the form of notes, comments, and statements of assumptions, which are critical to retain when having to revisit these spreadsheets. "Metadata" refers to information that is retained and present in all electronic documents and is discussed in Manitoba Hydro's response to GAC/MH II-34(b).

Manitoba Hydro also notes that external consultants were the original authors of many of the formulae embedded within the model, and as such the model may be subject to intellectual property rights. Please see Manitoba Hydro's response to GAC/MH II-34(d) for a further discussion.

To provide spreadsheets specific to the Proof of Revenue for the test years in question, would require Manitoba Hydro to either remove all additional data from these working files, or to sever the Proof of Revenue model from these data files and create redundant input tables for the Proof of Revenue model. Removal of this data would not only be time consuming, but could result in formula errors if pertinent information for the test years was inadvertently removed. The alternative of replicating data input tables to the Proof of Revenue model would be duplicative effort and could result in discrepancies between the Proof of Revenue and other spreadsheets used by the Corporation.

Manitoba Hydro is concerned with the potentially significant amount of time and effort that would be required to prepare the models to be placed in the public domain, to educate other parties in the use of these models, and to verify alternative scenarios developed by third parties using the models. Should intervenors wish to have various assumptions tested, they should request such analysis in the interrogatory process.

GAC/MH II-34

Subject: **Rate Design—Proof of Revenue**
Reference: **Response to GAC/MH I-3 and I-7**

Regarding the MH's Proof of Revenue electronic spreadsheet, please provide:

b) The number of cells in the spreadsheet that contain metadata,

ANSWER:

Metadata can add functionality to the editing, viewing, filing and retrieving capabilities of Excel documents. Some metadata is readily accessible through the user interface, while other metadata is only accessible through extraordinary means, such as opening a document in a low-level, binary file editor. Metadata include items such as the name and initials of the author, the company name, the name of the computer, the name of the server where the document is saved, non-visual portions of embedded objects, document revisions and versions, hidden text or cells and comments. Metadata is not limited to cell locations.

While certain information can be removed using the Excel Document Inspector or third party programs which provides functionality for removing some types of metadata, these tools do not provide certainty that all metadata has been removed. The metadata that cannot be removed automatically or through a third party tool has to be removed manually. It is not possible for Manitoba Hydro to determine the number of cells that contain metadata, without examining each cell in its spreadsheets to verify the presence or absence of metadata. Manitoba Hydro respectfully declines to do so, as this would require a significant amount of time and effort, with little resulting value to the regulatory process.

Furthermore, embedded objects (e.g. charts or tables from other documents) can contain their own metadata which in turn has to be reviewed. Removing some types of metadata can also lead to undesirable results which can impact functionality. For example, removing references in formulas can lead to errors or incorrect results.

Manitoba Hydro would be required to dedicate time and resources to examine, locate and remove metadata including embedded comments, notes, and other documentation in order to prepare these materials for submission in the public domain. Manitoba Hydro estimates that it could take several minutes per cell to identify and remove any type of metadata. This effort would then require additional time to be scheduled for the response to information requests, which would extend the duration of the public hearing process.

This incremental effort is wasteful in several regards. First, analyst effort must be undertaken to purge the spreadsheet using metadata removal software. Then, the analyst must thoroughly inspect the cells of the model to examine and remove personal notes, comments and revision information. This treatment would impair the functionality of the model for subsequent internal use, and therefore redundant models would be required to duplicate the working model with a "filing" model.

This effort would need to be replicated with each model that would be required to be filed in the public domain, and would be incremental effort that would be undertaken at each subsequent General Rate Application, which would result in incremental costs associated with preparation of each regulatory filing.

GAC/MH II-34

Subject: **Rate Design—Proof of Revenue**
Reference: **Response to GAC/MH I-3 and I-7**

Regarding the MH's Proof of Revenue electronic spreadsheet, please provide:

c) The amount of time per cell that it would take to delete the metadata,

ANSWER:

Please see Manitoba Hydro's response to GAC/MH II-34(b).

GAC/MH II-34

Subject: **Rate Design—Proof of Revenue**
Reference: **Response to GAC/MH I-3 and I-7**

Regarding the MH's Proof of Revenue electronic spreadsheet, please provide:

d) Third party intellectual property rights associated with the Proof of Revenue spreadsheet.

i) If this problem exists, explain why MH is unable to create its own Proof of Revenue spreadsheet.

ANSWER:

Manitoba Hydro notes that external consultants were the original authors of many of the formulae embedded within the model. Since that time and over many years, the model has undergone numerous evolutions of improvement as Manitoba Hydro staff continuously revised and updated the inherent formulae and their organization and interactions. As noted in Manitoba Hydro's response to GAC/MH II-34(a), the operation of the Proof of Revenue model relies on interdependencies with data variables and formulae from other spreadsheets. As such, it would not be meaningful for one to try to pinpoint which formulae were written originally by external consultants and which other ones were written by Manitoba Hydro staff, as any set of formulae in isolation would not work without the other formulae sets.

It would not be in the best interest of ratepayers or the Corporation for Manitoba Hydro to develop a new Proof of Revenue model as Manitoba Hydro already has a tool that meets its requirements. It has taken Manitoba Hydro many years to evolve this model to the advanced state that it is in today, and to create an entirely new Proof of Revenue model would be an unnecessary and wasteful use of significant resources to replicate this existing asset.

For the reasons outlined in GAC/MH I-3(a), Manitoba Hydro is prepared to consider provision of data-only spreadsheets; however, live spreadsheets with formulas intact will have to remain confidential.

GAC/MH II-34

Subject: **Rate Design—Proof of Revenue**
Reference: **Response to GAC/MH I-3 and I-7**

Regarding the MH's Proof of Revenue electronic spreadsheet, please provide:

e) Elements of the Proof of Revenue spreadsheet, such as commercially sensitive data or complex algorithms, that make the spreadsheet "not appropriate to be disclosed."

ANSWER:

As noted in Manitoba Hydro's response to GAC/MH II-34(a), the Proof of Revenue schedule is linked to spreadsheets that contain individual customer consumption information that is considered to be commercially sensitive. The response to GAC/MH II-34(a) also outlines a number of reasons that Manitoba Hydro is not able to disclose the Proof of Revenue spreadsheet.

GAC/MH II-35

Subject: **Rate Design—Bill Comparisons**
Reference: **Response to GAC/MH I-3**

Please provide a complete list of the "certain models" that were requested in discovery that have each of the following characteristics:

a) are "large and complex," and for each, quantify the size or complexity of concern to Hydro,

ANSWER:

The following spreadsheets were requested by GAC in the first round of Information Requests in this GRA proceeding:

- Bill comparison spreadsheets – GAC/MH I-3(a) & GAC/MH I-3(c);
- Bill frequency spreadsheets – GAC/MH I-4(a), (c) & (d);
- Proof of Revenue spreadsheets – GAC/MH I-7(a).

As demonstrated by the example provided in response to GAC/MH II-34(a), a schedule that may appear to be simple, such as the Proof of Revenue schedule, may be linked to various other spreadsheets that contain large amounts of information. The "complexity" not only describes the features of the spreadsheet in question, but includes the linkage and integration with numerous other spreadsheets and models that the Corporation uses.

Manitoba Hydro notes that the proliferation and deployment of information technology tools such as spreadsheets and analytical models has significantly evolved such that a high degree of integration exists throughout the Corporation. It is not uncommon to have numerous models related to each other such that the output of one model forms the inputs to the next model. Furthermore, some of these models and data repositories serve multiple functions beyond the support of the rate calculation processes. As a consequence of the advancement of data integration, it is time-consuming and difficult to disaggregate spreadsheets for regulatory filing purposes.

As noted in Manitoba Hydro's response to GAC/MH II-33(b), Manitoba Hydro is prepared to provide data only spreadsheets in the regulatory process to allow intervenors to conduct analysis without reentering lines of data. Manitoba Hydro provided data only spreadsheets in response to GAC/MH I-4(a), GAC/MH I-8(f), and GAC/MH I-26(a).

For the reasons outlined in the response to GAC/MH I-3(a), Manitoba Hydro has declined to provide its Bill Comparison and Proof of Revenue spreadsheets in the regulatory process.

GAC/MH II-35

Subject: **Rate Design—Bill Comparisons**
Reference: **Response to GAC/MH I-3**

Please provide a complete list of the "certain models" that were requested in discovery that have each of the following characteristics:

b) contain "significant metadata," and for each, quantify the number of locations with metadata that Hydro believes are not subject to discovery and describe the nature of the privileged metadata ,

ANSWER:

With respect to metadata, please see Manitoba Hydro's response to GAC/MH II-34(b).

GAC/MH II-35

Subject: **Rate Design—Bill Comparisons**
Reference: **Response to GAC/MH I-3**

Please provide a complete list of the "certain models" that were requested in discovery that have each of the following characteristics:

c) are "subject to intellectual property rights reserved by third parties," and describe those rights and those parties,

ANSWER:

With respect to the Bill Comparison spreadsheets, please see Manitoba Hydro's response to GAC/MH II-33(e).

With respect to the Proof of Revenue spreadsheets, please see Manitoba Hydro's response to GAC/MH II-34(d).

GAC/MH II-35

Subject: **Rate Design—Bill Comparisons**
Reference: **Response to GAC/MH I-3**

Please provide a complete list of the "certain models" that were requested in discovery that have each of the following characteristics:

d) contain "competitive or commercially sensitive information," and describe the type of information (e.g., customer-specific identifiable data, Hydro procurement or sales strategies).

ANSWER:

As noted in Manitoba Hydro's response to GAC/MH II-34(a), the Proof of Revenue schedule is linked to spreadsheets that contain individual customer consumption information that is considered to be commercially sensitive.

GAC/MH II-36

Subject: **Rate Design—Proposed TOU Rate for the Large GS Class**
Reference: **Appendix 10.11 and 10.12**

Please provide the following information for each of the two Large General Service sub-rates, separately:

a) The percentage and number of customers that are contract-demand customers.

ANSWER:

100% of the Large >100 kV accounts have contracts (12 customers, 15 accounts) and 86% of the Large 30-100 kV accounts have contracts (23 customers, 37 accounts).

If a customer is without a contract, it is typically because its requirements are changing and these have not yet been reflected in a new contract. Manitoba Hydro's intent is that all GS large customers have a contract; however, all customers, with or without a current contract are subject to the demand billing provisions approved by the Public Utilities Board.

GAC/MH II-36

Subject: **Rate Design—Proposed TOU Rate for the Large GS Class**
Reference: **Appendix 10.11 and 10.12**

Please provide the following information for each of the two Large General Service sub-rates, separately:

b) For the contract customers and for each month in the period December 2006 through September 2012, the frequency distribution of on-peak measured demands in that month as a percentage of contract load, i.e,

- **i) the percentage of customers with monthly demands below 25% of contract demand,**
- **ii) the percentage of customers with monthly demands between 25% and 30% of contract demand,**
- **iii) the percentage of customers with monthly demands between 30% and 35% of contract demand,**
- **iv) the percentage of customers with monthly demands between 35% and 40% of contract demand,**
- **v) the percentage of customers with monthly demands between 45% and 50% of contract demand, and**
- **vi) the percentage of customers with monthly demands over 50% of contract demand.**

ANSWER:

Due to the time and resources needed to provide monthly data back to December 2006, Manitoba Hydro has only provided monthly data for the 2011/12 fiscal year. It is expected that data for prior years would not yield significantly different results.

The summary tables on the following page show the aggregated percentage of customers whose monthly recorded demand falls within the percentage range of the specified contracted demand levels referenced in the question. In determining these monthly percentages, each customer was counted only once based on the first occurrence in which their recorded demand fell below the contract demand percentage range specified, even though all ranges above that would be impacted as well. An example of this is shown in following table using a customer with a recorded demand of 430 kVA and a total contracted demand of 1,000 kVA. The first occurrence where this customer's recorded demand falls below their

contract demand is at the 40% - 45% range and is therefore only reported in this range, even though the customer's recorded demand would also fall below their contract demand at the >50% range.

Customer Example:

Date	Monthly On Peak kVA	% of Total Contracted Demand					
		<25%	30%	35%	40%	**45%**	50%
September/11	430	250	300	350	400	**450**	500
Range in which customer counted:		0	0	0	0	**1**	0

GSL 30 to 100 kV Monthly On-Peak Demand vs Contract Demand								
Fiscal 2011/12	< 25%	25% - 30%	30% - 35%	35% - 40%	40% - 45%	45% - 50%	> 50%	Total Customers
April	9%	0%	0%	6%	13%	9%	63%	100%
May	13%	0%	6%	3%	16%	3%	59%	100%
June	13%	3%	0%	6%	9%	13%	56%	100%
July	9%	3%	0%	9%	9%	13%	56%	100%
August	13%	0%	6%	3%	6%	9%	63%	100%
September	9%	3%	0%	9%	3%	13%	63%	100%
October	9%	0%	6%	0%	9%	6%	69%	100%
November	6%	3%	3%	3%	6%	13%	66%	100%
December	13%	0%	0%	6%	3%	13%	66%	100%
January	9%	0%	0%	6%	6%	6%	72%	100%
February	9%	0%	3%	3%	3%	13%	69%	100%
March	9%	0%	0%	6%	3%	6%	75%	100%

GSL > 100 kV
Monthly On-Peak Demand vs
Contract Demand

Fiscal 2011/12	< 25%	25% - 30%	30% - 35%	35% - 40%	40% - 45%	45% - 50%	> 50%	Total Customers
April	8%	0%	0%	0%	8%	8%	75%	100%
May	8%	0%	0%	0%	8%	17%	67%	100%
June	8%	0%	0%	8%	8%	0%	75%	100%
July	17%	0%	0%	0%	8%	0%	75%	100%
August	17%	0%	0%	0%	8%	0%	75%	100%
September	17%	0%	0%	0%	8%	0%	75%	100%
October	17%	0%	8%	0%	0%	0%	75%	100%
November	8%	0%	0%	0%	8%	0%	83%	100%
December	8%	0%	0%	8%	0%	0%	83%	100%
January	8%	0%	0%	8%	0%	0%	83%	100%
February	8%	0%	0%	0%	8%	0%	83%	100%
March	8%	0%	0%	8%	0%	8%	75%	100%

GAC/MH II-36

Subject: **Rate Design—Proposed TOU Rate for the Large GS Class**
Reference: **Appendix 10.11 and 10.12**

Please provide the following information for each of the two Large General Service sub-rates, separately:

c) For each month in the period December 2006 through September 2012, the frequency distribution of on-peak measured demands in that month as a percentage of the highest measured on-peak demand in the previous 12 months, i.e,

- **i) the percentage of customers in that month with monthly demands below 25% of their highest 12-month measured demand,**
- **ii) the percentage of customers with monthly demands between 25% and 30% of their highest 12-month measured demand,**
- **iii) the percentage of customers with monthly demands between 30% and 35% of their highest 12-month measured demand,**
- **iv) the percentage of customers with monthly demands between 35% and 40% of their highest 12-month measured demand,**
- **v) the percentage of customers with monthly demands between 45% and 50% of their highest 12-month measured demand, and**
- **vi) the percentage of customers with monthly demands over 50% of their highest 12-month measured demand.**

ANSWER:

The same methodology used in response to GAC/MH II-36(b) was used in this response, with the exception that this response pertains to the customer's previous 12 months data rather than their contract demand.

GSL 30 to 100 kV

Monthly On-Peak Demand vs

Highest On-Peak Demand Ratchet in Previous 12 months

Fiscal 2011/12	< 25%	25% - 30%	30% - 35%	35% - 40%	40% - 45%	45% - 50%	> 50%	Total Customers
April	3%	0%	3%	0%	0%	3%	92%	100%
May	6%	0%	0%	0%	3%	8%	83%	100%
June	6%	0%	0%	3%	3%	3%	86%	100%
July	3%	3%	0%	0%	3%	0%	92%	100%
August	3%	3%	0%	3%	0%	0%	92%	100%
September	0%	0%	6%	3%	3%	0%	89%	100%
October	0%	0%	0%	3%	3%	0%	94%	100%
November	3%	0%	0%	0%	0%	3%	94%	100%
December	6%	0%	0%	3%	0%	3%	89%	100%
January	0%	0%	3%	0%	0%	0%	97%	100%
February	3%	0%	0%	0%	0%	0%	97%	100%
March	3%	0%	0%	0%	0%	0%	97%	100%

GSL > 100 kV

Monthly On-Peak Demand vs

Highest On-Peak Demand Ratchet in Previous 12 months

Fiscal 2011/12	< 25%	25% - 30%	30% - 35%	35% - 40%	40% - 45%	45% - 50%	> 50%	Total Customers
April	0%	0%	0%	0%	0%	0%	100%	100%
May	0%	0%	0%	0%	0%	0%	100%	100%
June	0%	0%	0%	0%	8%	0%	92%	100%
July	0%	8%	0%	8%	0%	0%	83%	100%
August	0%	0%	0%	8%	8%	0%	83%	100%
September	0%	0%	17%	0%	0%	0%	83%	100%
October	0%	0%	8%	0%	0%	0%	92%	100%
November	0%	0%	0%	0%	0%	8%	92%	100%
December	0%	0%	0%	0%	0%	0%	100%	100%
January	0%	0%	0%	0%	0%	0%	100%	100%
February	0%	0%	0%	0%	0%	0%	100%	100%
March	0%	0%	0%	0%	0%	0%	100%	100%

GAC/MH II-36

Subject: **Rate Design—Proposed TOU Rate for the Large GS Class**
Reference: **Appendix 10.11 and 10.12**

Please provide the following information for each of the two Large General Service sub-rates, separately:

d) For the contract demand customers and for each month in the ten-year period December 2012 – December 2022, please provide MH's projection of the percentage of these customers in that month that will use between 25% and 50% of their contract demand.

i) Provide the basis of this projection including customer surveys and analyses.

ANSWER:

Please see Manitoba Hydro's response to GAC/MH II-30(b).

GAC/MH II-36

Subject: **Rate Design—Proposed TOU Rate for the Large GS Class**
Reference: **Appendix 10.11 and 10.12**

Please provide the following information for each of the two Large General Service sub-rates, separately:

e) For each month in the ten-year period December 2012 – December 2022, please provide MH's projection of the percentage of customers in that month that will use between 25% and 50% of their contract demand.

i) Provide the basis of this projection including customer surveys and analyses.

ANSWER:

Please see Manitoba Hydro's response to GAC/MH II-30(b).

GAC/MH II-37

Subject: **Rate Design—Proposed TOU Rate for the Large GS Class**
Reference: **Appendix 10.11**

Regarding Manitoba Hydro's justification of its 50% ratchet proposal as a way to "encourage customers to make efficient decisions regarding the transmission and sub-transmission resources that they wish to reserve," please provide the following:

a) Provide analyses, reports, internal memoranda and other documentation that indicate that in the past the Corporation has been impeded from making export sales because of unused but reserved transmission capacity.

ANSWER:

The intent of the minimum demand bill component of the Time-of-Use rate application is not explicitly directed towards opportunities for export sales. The minimum demand bill is intended to address the contribution of unused contracted capacity to regional transmission and sub-transmission constraints that impact costs for serving new domestic load.

GAC/MH II-37

Subject: **Rate Design—Proposed TOU Rate for the Large GS Class**
Reference: **Appendix 10.11**

Regarding Manitoba Hydro's justification of its 50% ratchet proposal as a way to "encourage customers to make efficient decisions regarding the transmission and sub-transmission resources that they wish to reserve," please provide the following:

b) Explain how MH takes the contract demand of Large General Service customers into account in deciding whether it has energy and capacity available to serve "new and/or expanding load with existing transmission infrastructure."

ANSWER:

Contract demand is an important consideration in determining the available capacity on regional transmission stations and lines, which are constrained by their design and contingency limitations. Capacity reserved for a specific customer cannot be used to serve new or expanding load in the same regional transmission system, potentially causing a requirement for upgrades and expansion of the regional transmission system in order to serve other customers.

GAC/MH II-37

Subject: Rate Design—Proposed TOU Rate for the Large GS Class
Reference: Appendix 10.11

Regarding Manitoba Hydro's justification of its 50% ratchet proposal as a way to "encourage customers to make efficient decisions regarding the transmission and sub-transmission resources that they wish to reserve," please provide the following:

c) Provide planning analyses, reports, internal memoranda and other documentation that show how MH takes into account the contract demands of large customers in determining its need for additional generation, transmission and distribution resources.

ANSWER:

Planning analyses, reports and internal memoranda related to the consideration of contract demands by large customers as they may impact Manitoba Hydro's ability to serve new or expanding load typically include sensitive commercial information related to customer names, loads and future requirements for capacity. In some cases, these studies are funded by customers and are subject to confidentiality agreements that prevent release of information specific to their operations. As such, these documents are not available for review.

The types of planning analysis and reports referenced in the question are typically initiated when customers (new or existing) approach Manitoba Hydro to request capacity for a new or expanding load. These studies review the regional transmission capacity available to serve the additional load and quantify improvements that will be required to serve this load if it comes to fruition.

Requirements for new generation and major transmission are typically addressed through the Power Resource Planning process, which considers forecasted load growth by all customers, including large transmission and sub-transmission customers that may impact capacity requirements for generation and major transmission.

GAC/MH II-37

Subject: **Rate Design—Proposed TOU Rate for the Large GS Class**
Reference: **Appendix 10.11**

Regarding Manitoba Hydro's justification of its 50% ratchet proposal as a way to "encourage customers to make efficient decisions regarding the transmission and sub-transmission resources that they wish to reserve," please provide the following:

d) Provide analyses, reports, internal memoranda and other documentation that indicate that the current 25% ratchet will no longer provide an adequate efficiency incentive for the Large General Service customers on the proposed TOU rate.

ANSWER:

The minimum demand bill component of Manitoba Hydro's Time-of-Use rate application is not intended to address the end-use efficiency of customer loads. The measure is directed towards capacity that is contracted by customers but unused. Unused capacity in the regional transmission system impacts Manitoba Hydro's ability to serve new and expanding customers with existing resources, causing the Corporation to expend resources to enhance the capability of the regional transmission system in order to serve such load. Raising the threshold will result in more customers contributing towards the costs of providing capacity that is unused, sending a price signal that unused capacity on the regional transmission system has a cost to ratepayers, particularly if new transmission capacity must be provided to serve new or expanding load.

GAC/MH II-37

Subject: **Rate Design—Proposed TOU Rate for the Large GS Class**
Reference: **Appendix 10.11**

Regarding Manitoba Hydro's justification of its 50% ratchet proposal as a way to "encourage customers to make efficient decisions regarding the transmission and sub-transmission resources that they wish to reserve," please provide the following:

e) Specify MH's contractual supply obligations to Large General Service customers with contract demands.

ANSWER:

Manitoba Hydro's ongoing obligations extend to the provision of sufficient capacity and energy to serve the customer load up to the limitations specified by the contract demand. Customers seeking supply for new or expanding load are addressed in accordance with customer service policy, which specifies how Manitoba Hydro may allocate costs for providing this capacity to the customer.

Manitoba Hydro's contractual supply obligations to Large General Service customers in the rate classes impacted by the proposed Time-of-Use rate application are approximately 1,200 MVA.

GAC/MH II-37

Subject: **Rate Design—Proposed TOU Rate for the Large GS Class**
Reference: **Appendix 10.11**

Regarding Manitoba Hydro's justification of its 50% ratchet proposal as a way to "encourage customers to make efficient decisions regarding the transmission and sub-transmission resources that they wish to reserve," please provide the following:

f) Explain whether the MH's peak load forecasts used for planning purposes reflects:

i) The projected peak demands of Large General Service customers;
ii) The projected sum of the greater of each Large General Service customer's peak demand or ratchet percentage of contract demand;
iii) The sum of the greater of each customer's peak demand or 100% of contract demand; or
iv) Something else. If something else, please explain.

ANSWER:

Manitoba Hydro's peak forecast reflects the estimated peak load of the Large General Service Sector. The peak forecast considers the customer's actual peak demand. It does not consider ratchet percentage or contract demand.

GAC/MH II-37

Subject: **Rate Design—Proposed TOU Rate for the Large GS Class**
Reference: **Appendix 10.11**

Regarding Manitoba Hydro's justification of its 50% ratchet proposal as a way to "encourage customers to make efficient decisions regarding the transmission and sub-transmission resources that they wish to reserve," please provide the following:

g) In MH's Cost-of-Service-Study estimate of the costs imposed by the Large General Service customers, please explain whether the load data MH uses reflects:

- **i) The projected peak demands of Large General Service customers;**
- **ii) The projected sum of the greater of each Large General Service customer's peak demand or ratchet percentage of contract demand;**
- **iii) The sum of the greater of each customer's peak demand or 100% of contract demand; or**
- **iv) Something else. If something else, please explain.**

ANSWER:

Load data used in the Cost of Service Study to allocate demand-related costs to GSL customers is based on forecast class coincident peak demands for transmission costs, and the class non-coincident peak demands for sub transmission costs. Contractual demand values are not considered in the study.

GAC/MH II-37

Subject: Rate Design—Proposed TOU Rate for the Large GS Class
Reference: Appendix 10.11

Regarding Manitoba Hydro's justification of its 50% ratchet proposal as a way to "encourage customers to make efficient decisions regarding the transmission and sub-transmission resources that they wish to reserve," please provide the following:

h) Explain whether MH holds back energy from export sales based on contract demand levels.

ANSWER:

Manitoba Hydro does not hold back energy from export sales based upon contract demand levels.

On a day-ahead basis Manitoba Hydro forecasts the expected hourly energy needs of all domestic customers using statistical analysis. These forecasts are then adjusted to reflect any expected changes in the demand pattern for large industrial customers using information that has been provided by them. Using this forecast and after having made allowances for reserves, Manitoba Hydro participates in the MISO Day Ahead market to sell any surplus it anticipates, or to buy any shortage.

In real time, Manitoba Hydro updates is system load forecast continuously based upon actual usage in Manitoba and participates in the MISO Real Time market to balance its supply to demand.

GAC/MH II-37

Subject: Rate Design—Proposed TOU Rate for the Large GS Class
Reference: Appendix 10.11

Regarding Manitoba Hydro's justification of its 50% ratchet proposal as a way to "encourage customers to make efficient decisions regarding the transmission and sub-transmission resources that they wish to reserve," please provide the following:

i) Indicate whether MH sells firm capacity to the United States or other provinces.

i) If so, specify the contractual supply obligations of MH to these customers.
ii) If so, explain how the rates for this firm capacity are structured.

ANSWER:

Manitoba Hydro confirms that it sells capacity to wholesale customers outside of Manitoba.

Please see Manitoba Hydro's response to CAC/MH I-115(a) for the list of export contracts Manitoba Hydro is currently committed to. The capacity provided under these contracts is not firm capacity (i.e. backed by Manitoba Hydro capacity reserves) but rather it is system participation power. With this type of power the export customer is exposed to certain curtailment risks associated with higher priority loads and system conditions specified in the contract.

The rates for capacity are structured as a dollar amount per MW-month which apply to the contracted amount of capacity.

GAC/MH II-38

Subject: **Rate Design—Proposed TOU Rate for the Large GS Class**
Reference: **MH response to GAC/MH I-28**

Please provide a complete copy of Manitoba Hydro's Supply Agreement with large customers. If that agreement varies among customers, please provide the variations.

ANSWER:

The attached Power Supply Agreement is presented to all General Service Large customers seeking electric service from Manitoba Hydro. These terms and conditions have been in place since March, 2011. Manitoba Hydro cannot confirm that all customers in this class have executed Power Supply Agreements which are identical to the current version. The form of agreement has been in use for many years and changes have been made to respond to customer/industry demands which changes have not been formally tracked. For information regarding the March, 2011 change please see MIPUG/MH II-22(g).

THIS AGREEMENT made this _____ day of _____, _____.
BETWEEN:

THE MANITOBA HYDRO-ELECTRIC BOARD
(hereinafter referred to as
"Manitoba Hydro"),

OF THE FIRST PART,

- and -

_____
(hereinafter referred to as
"the Customer"),

OF THE SECOND PART,

WHEREAS the Customer has applied to Manitoba Hydro for a supply of up to but not more than _____ kilovolt-amperes (kVA) of power and energy to be used for the operation of a _____ at or near _____, Manitoba (hereinafter referred to as "the plant");

AND WHEREAS Manitoba Hydro has agreed to supply power and energy for the purpose aforesaid on the terms and conditions hereinafter set forth;

NOW THEREFORE THIS AGREEMENT WITNESSETH that in consideration of the premises and of the Agreements herein contained, the parties hereto agree as follows:

1. Except where the context otherwise requires, the following expressions when used in this Agreement shall have the following meanings: DEFINITIONS

(a) billing year: A period of 12 monthly billing periods commencing with the 1st day of December and ending the 30th day of November of the following year.

(b) month: A billing period of not more than 33 or less than 27 consecutive days between meter readings.

(c) day: A period of 24 consecutive hours commencing at 00:00 hours.

(d) power: The rate of transferring or transforming electric energy, measured or expressed in kVA.

(e) energy: Power integrated with time and measured or expressed in kilowatt-hours (kWh).

(f) demand: The maximum use of power within a specified period, as measured in kVA by means of a 15 minute integrating demand meter.

(g) load: The term used to measure electric power that may be real power or apparent power. The real power is expressed in kilowatts (kW) while the apparent power is expressed in kilovolt amperes (kVA).

AGREEMENT TO SUPPLY

2. From and after _____ (hereinafter called the "commencement date"), Manitoba Hydro shall make available to the Customer up to but not more than _____ kVA of power (hereinafter called the "contracted power") together with the energy supplied with the contracted power for and in connection with the operation of the plant.

INCREASE IN CONTRACTED AMOUNT OF POWER

3. The Customer may by notice to Manitoba Hydro request an increase in the amount of Contracted Power together with the energy supplied with such excess power, at any time, and Manitoba Hydro will use its best endeavours to supply the increased amount of power and energy requested by the date it is required by the Customer, on terms and conditions applicable to Customers in the rate classification in which the Customer will be following such increase.

DECREASE IN CONTRACTED AMOUNT OF POWER

4. (a) The Customer may at any time after a date which is _____ billing year(s) calculated from the 30th day of November next following the commencement date, by notice to Manitoba Hydro, decrease the amount of contracted power. The effective date of the decrease shall be the 1st day of December of the billing year next following the date of the notice, provided that notice is given to Manitoba Hydro at least 60 days prior to the start of the billing year, otherwise the effective date shall be the 1st day of December of the second billing year following the date of the notice.

(b) Manitoba Hydro shall have the right to decrease the amount of contracted power to reflect the customer's recorded demand at any time after a date which is _____ billing year(s) calculated from the 30th day of November next following the commencement date. Manitoba Hydro shall provide notice to the Customer prior to decreasing the amount of contracted power. The effective date of the decrease shall be the 1st day of December of the billing year next following the date of the notice, provided that notice is given to the Customer at least 60 days prior to the start of the billing year, otherwise the effective date shall be the 1st day of December of the second billing year following the date of the notice.

AGREEMENT TO PAY

5. Beginning with the commencement date and thereafter during the term of this Agreement and any continuation thereof, the Customer shall pay for all power and energy made available or supplied by Manitoba Hydro pursuant to this Agreement at the rates and charges set forth in Schedule 'A' which is attached hereto and forms part hereof.

SWITCH

6. The Customer shall supply, operate and maintain at the Customer's expense during the term of this Agreement a _____ volt (V) disconnecting facility (hereinafter called the "switch") at or near the Customer's plant.

POINT OF DELIVERY

7. (a) The point of delivery for the power and energy made available or supplied to the Customer by Manitoba Hydro pursuant to this Agreement shall be the _____ as shown on Manitoba Hydro Drawing No. _____ which is attached hereto as Schedule 'B' and forms part hereof.

(b) If Manitoba Hydro supplies and installs primary voltage wires and facilities on the Customer's property to accommodate the Customer's preferred location for the point of delivery, all costs associated with the repair or replacement of those wires and facilities between the point of delivery and the Customer's property line shall be paid by the Customer.

8. All power and energy supplied to the Customer by Manitoba Hydro shall be measured at or near the point of delivery using metering equipment of commercial accuracy approved by Measurement Canada. Such metering equipment shall be supplied and maintained by Manitoba Hydro.

METER READINGS

9. The Customer shall provide, and maintain without charge, convenient, accessible, and safe space at or near the point of delivery for Manitoba Hydro's metering equipment, which shall be in the care and at the risk of the Customer and if lost, destroyed, or damaged (other than by ordinary wear and tear), the Customer shall pay Manitoba Hydro on demand an amount equal to the cost of repairing or replacing it, as determined by Manitoba Hydro.

METER LOCATION

10. Authorized employees of Manitoba Hydro shall at all reasonable times have free and uninterrupted access to the Customer's premises for the purposes of reading Manitoba Hydro's meters.

ACCESS TO METERS

11. (a) Manitoba Hydro may test, calibrate, remove and replace its metering equipment at any time.

METER TESTING

(b) If Manitoba Hydro receives notice from the Customer to test any metering equipment used for the purposes of this Agreement, Manitoba Hydro shall perform testing of such metering equipment at the Customer's location. If the Customer is not satisfied with the results, the Customer may request testing of the metering equipment by Measurement Canada, upon payment of a fee to Manitoba Hydro. The Customer shall be notified in advance by Measurement Canada of the time and place of all tests and shall be entitled to be present or represented at such tests. If the tests prove or indicate the metering equipment is within commercial accuracy, as required by *The Electricity and Gas Inspection Act*, R.S.C. 1985, c. E-4, as revised from time to time, the fee will be forfeited by the Customer. If such tests prove or indicate that the metering equipment is not within commercial accuracy, then Manitoba Hydro shall refund the fee paid by the Customer and the Customer's account shall be adjusted in accordance with Measurement Canada's findings.

12. If Manitoba Hydro's metering equipment fails to register, or fails to register correctly, or if for any reason the meter readings are unobtainable, the amount of power and energy supplied to the Customer will be estimated by Manitoba Hydro from the best information available based on the Customer's operations during the period in question, and such estimate shall have the same force and effect as a metering reading.

FAULTY METERING EQUIPMENT

13. All power and energy supplied to the Customer at the point of delivery shall be in the form of three phase, 60 Hertz alternating current, at a nominal _____ V, and shall be maintained in accordance with Power Quality Specification: PQS2000, rev. 02 attached to and forming part of this Agreement.

CHARACTERISTICS OF POWER AND ENERGY

14. (a) The Customer shall operate its electrical equipment in a manner that will not cause Manitoba Hydro's power supply to vary in voltage, frequency or wave form in accordance with Power Quality Specification: PQS2000, rev. 02, attached to and forming part of this Agreement.

CONTROL OF EQUIPMENT

(b) Where Manitoba Hydro becomes aware that the Customer's electrical equipment is causing interference to other Manitoba Hydro Customers, Manitoba Hydro shall advise the Customer of same and the Customer, at its own expense, shall take all necessary action to correct the problem to Manitoba Hydro's satisfaction.

(c) When the interference is caused by more than one Customer, Manitoba Hydro will determine the cause of the interference and will determine the responsibility of each of the Customers involved. The Customers involved maybe responsible for the costs and mitigation.

(d) Manitoba Hydro, in its discretion, will assist the Customer in making necessary corrections to the Customer's electrical equipment to correct electrical interference problems upon the Customer's request and following receipt of the Customer's payment for all materials and services to be provided by Manitoba Hydro in making the corrections. Such assistance will normally be by way of Manitoba Hydro providing:

i) upgraded transformer capacity; or

ii) a dedicated transformer; or

iii) an additional point of delivery.

INTERRUPTIONS

15. Manitoba Hydro shall have the right to interrupt the supply of power and energy to the Customer at any time for the purpose of safeguarding life and property, and/or for the purpose of inspecting, maintaining, repairing, replacing, improving and adding to Manitoba Hydro's facilities or equipment. All such interruptions shall be of the minimum durations practicable and, whenever possible, shall be made after reasonable notice has been given to the Customer and at a time least inconvenient to the Customer.

LIABILITY

16. Manitoba Hydro shall not be liable to the Customer or to any other person, whether in contract, tort, equity, or otherwise, for any losses, costs, damages or expenses, directly or indirectly resulting from any fluctuation, interruption, reduction or failure in the supply of power to the Customer.

ADJUSTMENT FOR INTERRUPTIONS

17. If, for any reason whatsoever, Manitoba Hydro is unable to make power and energy available to the Customer for a period in excess of one day during any month, then the billing demand for that month shall be adjusted by multiplying the monthly billing demand determined in accordance with Schedule 'A' by the ratio which the actual number of days when power and energy were made available in that month bears to the total number of days in that month. Fractions of less than a half-day shall be disregarded and a half-day or more shall be taken as a full day. The bill for the month in which an interruption occurs shall be the total of:

(a) the adjusted monthly billing demand multiplied by the demand charge, and

(b) the energy charge.

ADJUSTMENT FOR MAJOR CALAMITY

18. If by reason of fire, flood, lightning, windstorm, earthquake, explosion, riot, malicious mischief, war, or the lawful orders of civil or military authorities, but no other event or occurrence, (hereinafter called a "major calamity"), the Customer is unable to operate the plant for a period of more than one day, then the monthly billing demand for the period when the plant did not operate up to but not exceeding 60 days in any billing year shall be adjusted by multiplying the monthly billing demand, determined in accordance with Schedule 'A', by the ratio which

the actual number of days when power and energy were provided in that month bears to the total number of days in that month. Fractions of less than a half-day shall be disregarded and a half-day or more shall be taken as a full day. The bill for the month in which a major calamity occurs shall be the total of:

(a) the adjusted monthly billing demand multiplied by the demand charge, and

(b) the energy charge;

provided, however, that the monthly bill for the period during which the plant did not operate shall not normally be less than an amount determined by multiplying _____ kVA by the demand charge. If by reason of a major calamity, the Customer is unable to operate the plant for a period of more than 60 days in any billing year, the Customer shall pay Manitoba Hydro commencing on the 61st day after the major calamity, a monthly amount calculated in accordance with Schedule 'A'.

19. Bills for power and energy submitted by Manitoba Hydro to the Customer shall be due and payable by 12:00 Noon Winnipeg time 14 days from the date thereon, at such location as Manitoba Hydro may from time to time designate by notice to the Customer.

TERMS OF PAYMENT

Manitoba Hydro may, in its sole discretion, assign the account to weekly billing if payment or payment arrangements have not been made by the due date. Weekly billing will thereafter continue at Manitoba Hydro's discretion.

20. Overdue bills shall bear interest until paid at such rate as may from time to time be established by Manitoba Hydro as applicable to all its Customers. If any bill remains unpaid after the due date thereof, Manitoba Hydro may, without prejudice to any other remedy it may have, and after giving the Customer not less than 20 days notice, discontinue the supply of power and energy until such time as the said bill, as well as all further charges accruing up to and including the date on which the supply of power and energy were discontinued, together with interest computed as aforesaid, have been paid in full. No such discontinuation of the supply of power and energy by Manitoba Hydro shall relieve the Customer of its obligation to pay for power and energy under the terms of this Agreement.

LATE PAYMENT PENALTY

21. If during the term of this Agreement, Manitoba Hydro makes a general revision of its rates for power and energy affecting Customers in the same rate classification as the Customer, the rates and charges for power and energy set forth in Schedule 'A' attached hereto shall be deemed to be revised as of the effective date of the rate revision to conform with the revised rates.

RATE REVISION

22. All bills for power and energy and all notices which Manitoba Hydro may be required to give the Customer pursuant to this Agreement shall be in writing sent by mail or written telecommunication addressed to _____
_____.
The Customer may from time to time change the address to which such bills and notices are to be sent by giving notice to Manitoba Hydro.

NOTICE TO CUSTOMER

23. All notices to Manitoba Hydro shall be in writing sent by mail or written telecommunication addressed to the Manager - _____, Manitoba Hydro at _____
_____.

NOTICE TO MANITOBA HYDRO

24. This Agreement is subject to *The Manitoba Hydro Act*, R.S.M. 1987, c. H190, as amended from time to time, and Regulations made thereunder.

THE MANITOBA HYDRO ACT

25. This Agreement shall be effective on the date hereof and shall continue in full force and effect for a period of _____ billing year(s), calculated from the 30th day of November next following the commencement date, and if not then terminated by not less than 60 days written notice by one party to the other party, shall continue in force from month to month until so terminated.

TERM OF AGREEMENT

26. On the commencement date, this Agreement shall supersede any and all previous Agreements between Manitoba Hydro and the Customer for the supply of power and energy to the plant.

TERMINATION OF PRIOR AGREEMENT

27. Except as provided in paragraph 21, every amendment or supplement to this Agreement shall be in writing, dated and executed by the proper officers on behalf of each of the parties.

AMENDMENTS

28. This Agreement shall enure to the benefit of and be binding upon the parties hereto, their successors and assigns.

ENUREMENT

IN WITNESS WHEREOF Manitoba Hydro and the Customer have caused this Agreement to be executed on the date first above written.

APPROVED AS TO	CONTENT Manager _____ _____
	FORM Manager Rates & Policies

THE MANITOBA HYDRO-ELECTRIC BOARD
Per:

_____
Authorized Signing Officer

_____
Per:

_____	_____	_____
Witness	Authorized Signing Officer	Print Name
_____	_____	_____
Witness	Authorized Signing Officer	Print Name

SCHEDULE 'A'

This is Schedule 'A' referred to in an Agreement between The Manitoba Hydro-Electric Board and _____ made on the _____ day of _____, _____.

The following rates and charges shall apply to all power and energy made available or supplied to the Customer pursuant to this Agreement.

GENERAL SERVICE - LARGE - _____ V

Energy Charge - _____ per kWh

Demand Charge - _____ per kVA of the monthly billing demand

Monthly Billing Demand

The greatest of the following (expressed in kVA):

(a) measured demand

OR

(b) _____ kVA (25% of contract demand)

OR

(c) 25% of the highest measured demand in the previous 12 months

Monthly Bill

The monthly bill shall be the total of the amounts payable for the demand charge and the energy charge.

Rate effective on and after: September 1, 2012.

GAC/MH II-39

Subject: **Rate Design—Inverted Rates**
Reference: **Response to PUB/MH I-149**

Please document Manitoba Hydro's ongoing efforts to compile data that would be useful to determine the adverse effects of inverted pricing on low-income heating customers and on customers without access to natural gas.

ANSWER:

Manitoba Hydro is not proposing an inverted rate design for residential customers in this Application, and apart from the 2009 Residential End Use Survey, no other data has been collected.

GAC/MH II-40

Subject: **Rate Design—Inverted Rates**
Reference: **Response to PUB/MH I-149**

Please document Manitoba Hydro's ongoing efforts to compile the following data:

a) bill frequency tables, for the winter and non-winter periods separately,

ANSWER:

The most current seasonal bill frequency data available is based on 2007/08 billing data, and is provided below.

SUMMER (May, Jun, Jul, Aug, Sep, Oct)			WINTER (Nov, Dec, Jan, Feb, Mar, Apr)		
Block	kWh's	Bills	Block	kWh's	Bills
0	-23,176	26	0	-128,654	29
100	14,897,507	131,519	100	4,131,384	79,356
200	33,730,073	164,501	200	16,595,312	107,993
300	55,113,199	185,592	300	31,342,993	123,830
400	76,851,461	196,426	400	47,689,234	134,874
500	95,194,478	195,529	500	66,960,290	147,601
600	108,884,399	186,756	600	83,935,432	151,639
700	119,195,631	175,555	700	99,192,552	151,858
800	123,456,992	159,077	800	108,190,325	143,688
900	124,680,846	142,638	900	111,259,440	130,501
1000	121,880,869	125,337	1000	109,829,970	115,314
1100	117,729,080	109,921	1100	105,055,452	99,830
1200	111,231,122	95,088	1200	98,780,709	85,725
1300	105,454,482	83,114	1300	92,206,254	73,629
1400	98,372,472	71,887	1400	86,419,589	63,890
1500	92,463,028	62,986	1500	80,788,013	55,609
1600	84,459,824	53,898	1600	76,228,110	49,085
1700	78,995,717	47,399	1700	72,921,576	44,110
1800	71,951,932	40,731	1800	70,089,550	39,974
1900	65,368,915	35,028	1900	68,272,905	36,839
2000	60,271,918	30,658	2000	66,251,621	33,907
2100	53,841,920	26,073	2100	65,502,733	31,896
2200	48,194,844	22,251	2200	63,792,143	29,619
2300	42,937,130	18,952	2300	63,476,348	28,165
2400	38,758,207	16,380	2400	63,651,678	27,038
2500	34,865,967	14,142	2500	63,144,952	25,730
2600	31,901,756	12,435	2600	63,679,157	24,936
2700	28,395,063	10,653	2700	64,305,265	24,231
2800	29,107,291	10,310	2800	64,330,860	23,357
2900	24,104,287	8,199	2900	63,932,898	22,400
3000	21,568,339	7,090	3000	65,804,090	22,270
3500	71,411,135	21,958	3500	328,006,013	100,963
4000	43,134,704	11,499	4000	319,807,207	85,335
4500	28,771,628	6,747	4500	289,382,290	68,186
5000	21,593,194	4,525	5000	250,203,293	52,736

GAC/MH II-40

Subject: **Rate Design—Inverted Rates**
Reference: **Response to PUB/MH I-149**

Please document Manitoba Hydro's ongoing efforts to compile the following data:

b) winter and non-winter bill frequency tables for low-income residential customers, and

ANSWER:

Manitoba Hydro is unable to provide bill frequency data for low-income residential customers as income is not coded on the billing system.

GAC/MH II-40

Subject: **Rate Design—Inverted Rates**
Reference: **Response to PUB/MH I-149**

Please document Manitoba Hydro's ongoing efforts to compile the following data:

c) winter and non-winter bill frequency tables for customers without access to natural gas.

ANSWER:

The most current seasonal bill frequency data available is based on 2007/08 billing data, and is provided below.

BILL FREQUENCY DATA FOR CUSTOMERS CODED AS ALL-ELECTRIC

SUMMER (May, Jun, Jul, Aug, Sep, Oct)			WINTER (Nov, Dec, Jan, Feb, Mar, Apr)		
Block	kWh	Bills	Block	kWh	Bills
0	-15,660	6	0	-54,320	9
100	1,254,991	24,200	100	419,814	9,430
200	4,684,028	30,110	200	1,131,232	7,364
300	9,620,266	37,778	300	2,364,135	9,307
400	14,989,947	42,435	400	3,852,268	10,902
500	19,003,290	41,909	500	5,442,909	12,012
600	23,031,976	41,582	600	6,929,374	12,516
700	26,986,213	41,269	700	8,619,242	13,196
800	31,266,040	41,452	800	10,441,744	13,847
900	35,855,447	41,969	900	12,235,078	14,337
1000	39,991,766	41,900	1000	13,983,192	14,660
1100	43,262,284	41,053	1100	15,717,146	14,917
1200	45,450,191	39,380	1200	17,208,324	14,915
1300	45,964,586	36,655	1300	18,781,378	14,985
1400	45,750,382	33,798	1400	20,572,433	15,192
1500	45,522,516	31,304	1500	21,834,042	15,016
1600	43,088,204	27,737	1600	23,842,689	15,340
1700	41,851,330	25,310	1700	25,590,153	15,470
1800	38,893,962	22,177	1800	27,334,833	15,580
1900	35,841,109	19,334	1900	29,350,983	15,827
2000	34,335,798	17,572	2000	31,788,868	16,259
2100	30,683,022	14,948	2100	33,711,349	16,409
2200	27,682,810	12,854	2200	34,565,126	16,042
2300	24,701,764	10,962	2300	36,652,454	16,258
2400	22,291,225	9,471	2400	38,942,074	16,538
2500	20,498,363	8,354	2500	40,440,559	16,476
2600	18,729,357	7,336	2600	42,129,657	16,493
2700	16,751,777	6,313	2700	44,062,520	16,601
2800	14,598,734	5,303	2800	45,717,042	16,597
2900	12,923,602	4,528	2900	46,283,045	16,215
3000	12,001,079	4,063	3000	48,902,069	16,547
3500	43,283,650	13,397	3500	255,316,335	78,518
4000	25,981,299	6,969	4000	260,693,316	69,534
4500	17,388,216	4,109	4500	241,886,115	56,983
5000	13,266,659	2,801	5000	211,369,364	44,546

BILL FREQUENCY DATA FOR CUSTOMERS CODED AS NOT ALL-ELECTRIC

SUMMER (May, Jun, Jul, Aug, Sep, Oct)			WINTER (Nov, Dec, Jan, Feb, Mar, Apr)		
Block	kWh	Bills	Block	kWh	Bills
0	-7,516	20	0	-74,334	20
100	13,642,516	107,319	100	3,711,570	69,926
200	29,046,045	134,391	200	15,464,080	100,629
300	45,492,933	147,813	300	28,978,858	114,523
400	61,861,514	153,991	400	43,836,966	123,972
500	76,191,188	153,619	500	61,517,381	135,589
600	85,852,423	145,174	600	77,006,058	139,123
700	92,209,418	134,286	700	90,573,310	138,663
800	92,190,952	117,625	800	97,748,581	129,842
900	88,825,399	100,669	900	99,024,362	116,163
1000	81,889,103	83,436	1000	95,846,778	100,654
1100	74,466,796	68,868	1100	89,338,306	84,913
1200	65,780,931	55,709	1200	81,572,385	70,810
1300	59,489,896	46,459	1300	73,424,876	58,644
1400	52,622,090	38,089	1400	65,847,156	48,698
1500	46,940,512	31,683	1500	58,953,971	40,593
1600	41,371,620	26,161	1600	52,385,421	33,746
1700	37,144,387	22,089	1700	47,331,423	28,640
1800	33,057,970	18,554	1800	42,754,717	24,395
1900	29,527,806	15,694	1900	38,921,922	21,012
2000	25,936,120	13,086	2000	34,462,753	17,649
2100	23,158,898	11,126	2100	31,791,384	15,488
2200	20,512,034	9,397	2200	29,227,017	13,577
2300	18,235,366	7,990	2300	26,823,894	11,907
2400	16,466,982	6,909	2400	24,709,604	10,501
2500	14,367,604	5,788	2500	22,704,393	9,254
2600	13,172,399	5,099	2600	21,549,500	8,444
2700	11,643,286	4,340	2700	20,242,745	7,630
2800	14,508,557	5,007	2800	18,613,818	6,760
2900	11,180,685	3,671	2900	17,649,853	6,185
3000	9,567,260	3,027	3000	16,902,021	5,723
3500	28,127,485	8,560	3500	72,689,678	22,445
4000	17,153,405	4,530	4000	59,113,891	15,802
4500	11,383,412	2,638	4500	47,496,175	11,203
5000	8,326,535	1,724	5000	38,833,929	8,190

GAC/MH II-41

Subject: **Rate Design—Inverted Rates**
Reference: **Response to PUB/MH I-149**

Please provide all analyses, reports and other documents performed by or for Manitoba Hydro of the effect of inverted rates on the bills of low-income electric heating customers with low incomes and/or with no access to natural gas.

ANSWER:

Please see Manitoba Hydro's response to GAC/MH II-39.

GAC/MH II-42

Subject: **Rate Design—Inverted Rates**
Reference: **Response to PUB/MH I-149 and GAC/MH I-4(c)**

Please provide the low-income-customer data that MH has derived through survey data.

ANSWER:

Please see Manitoba Hydro's response to PUB/MH I-109(a).

GAC/MH II-43

Subject: **Targetted DSM**
Reference: **GAC-CAC I-11 (c)**

The response indicates a global approach to interest low-income customers in LIEEP without targeting high consumers by offering feedback either on how their consumption compares with that of other customers in similar dwelling types or on the potential impact on their bills of projected rate increases over the next decade.

a) Please confirm that neither low-income nor other customers are provided feedback on how their consumption compares with other customers in similar dwelling types, accompanied by available remedies either through Power Smart or LIEEP.

ANSWER:

Confirmed. Individual consumption comparisons are one possible approach which may be used to encourage customers to participate in energy efficient opportunities. Manitoba Hydro is aware of this approach; however the Corporation has decided a more effective approach is to focus communications on available energy efficiency opportunities and their associated anticipated average bill savings.

GAC/MH II-43

Subject: **Targetted DSM**
Reference: **GAC-CAC I-11 (c)**

The response indicates a global approach to interest low-income customers in LIEEP without targeting high consumers by offering feedback either on how their consumption compares with that of other customers in similar dwelling types or on the potential impact on their bills of projected rate increases over the next decade.

b) Please confirm that customer bills only provide information on current rates and do not provide information on the potential impact of anticipated rate increases during the decade of investment, accompanied by available remedies either through Power Smart or LIEEP.

ANSWER:

Confirmed. Manitoba Hydro regularly communicates energy efficiency opportunities and associated supporting Power Smart programs, including LIEEP, through on-bill messaging and through promotional inserts included with the monthly bill.

GAC/MH II-43

Subject: **Targetted DSM**
Reference: **GAC-CAC I-11 (c)**

The response indicates a global approach to interest low-income customers in LIEEP without targeting high consumers by offering feedback either on how their consumption compares with that of other customers in similar dwelling types or on the potential impact on their bills of projected rate increases over the next decade.

c) If either or both of (a) and (b) is confirmed, please explain why customers were not offered this relevant information regarding their decisions about whether to participate in Power Smart or LIEEP or not.

ANSWER:

Manitoba Hydro cannot provide speculative information on future energy rates as these rates would in time be subject to approval by the Manitoba Hydro-Electric Board and the Public Utilities Board.

GAC/MH II-43

Subject: **Targeted DSM**
Reference: **GAC-CAC I-11 (c)**

The response indicates a global approach to interest low-income customers in LIEEP without targeting high consumers by offering feedback either on how their consumption compares with that of other customers in similar dwelling types or on the potential impact on their bills of projected rate increases over the next decade.

d) If either or both of (a) or (b) is disconfirmed, please file the information that is provided to the customer.

ANSWER:

Please see the attached for examples of past bill inserts promoting energy efficiency upgrades included with customers' energy bills.

Home Insulation Program | Bill Insert

Lower Income Energy Efficiency Program | Bill Insert