

1 **REFERENCE: Elenchus report, page ii.**

2

3 **PREAMBLE:**

4 The Elenchus report states that "While it is not possible to forecast either the timing or the impact of
5 grid parity, it is reasonable to expect that ... the cost of self-generation technologies will be lower for
6 large consumers than for small consumers.

7

8 **QUESTION:**

9 Please explain your reasoning for this statement. Would MH have a similar benefit from new technology
10 to put in service for customers rather than larger consumers making similar investments?

11

12 **RESPONSE:**

13 Existing self-generation technologies exhibit economies of scale. Assuming the further evolution of these
14 technologies result in grid parity, it is reasonable to expect that the cost per kW and per kWh of self-
15 generation will be lower for large consumers than small consumers. For example, larger scale solar and
16 wind farms have unit cost that are lower than rooftop solar and wind installations, as do existing storage
17 technologies, when full life cycle costs are considered. In addition, some technologies, such as gas-fired
18 cogeneration, are only practical on a larger scale and are unlikely to be adopted by any customers other
19 than large industrials.

20

21 At the same time, given that rates for small volume customers (e.g., residential) tend to be higher than
22 rates for larger customers (e.g., large commercial and industrial) grid parity could be achieved for both
23 large and small scale customers. Furthermore, many commentators anticipate the development of
24 micro-grids which would facilitate the aggregation of cluster of small volume customers (e.g., a
25 residential or commercial development) that could serve customers on a cost-effective basis "in
26 competition" with the grid.

27

28 It can be anticipated that once grid parity becomes a reality, electricity distributors will face an evolution
29 of the electricity market that is similar to the evolution of the telecommunications market with the
30 evolution of cellular phones, deregulation and more recently VOIP technologies. Although grid parity is
31 not currently a threat to grid power in Manitoba, innovation and developments in other markets could
32 result in a "tipping point" that triggers rapid change.

33

34 The risk of grid parity does also present an opportunity for distributors/generators such as Manitoba
35 Hydro to take the lead in bringing new technologies to the market. Again, telecommunications provides
36 an example where the traditional telephone monopolies adapted to become the leaders in the provision
37 of cellular and internet service. By adapting, the telcos have profited from the new competitive
38 environment.

1 **REFERENCE:** Elenchus report, page 4.

2

3 **PREAMBLE:**

4

5 **QUESTION:**

6 Please file, or require Manitoba Hydro to file, the 2009 residential survey on the record.

7

8 **RESPONSE:**

9 Please refer to the attached 2009 Residential Energy Use Survey by Manitoba Hydro below.

2009 Residential Energy Use Survey

Dear Customer:

You have been randomly selected to participate in the Manitoba Hydro, Residential Energy Use Survey. Your response may represent up to two hundred other similar households in the province, so it is very important that each selected customer complete and return their questionnaire. Please invest your time so that we can better serve you and effectively plan for the future. All responses will be treated in the strictest confidence.



Please answer the survey for the address shown BELOW. Return the completed questionnaire within the next TWO WEEKS, in the postage paid envelope provided.

123 MAIN AVE
WINNIPEG MB
412345602



*Manitoba Hydro is a licensee of the Trademark and Official Mark.

All responses will be treated in the strictest confidence.
Personal information requested in this form is collected for the purposes of administration of this program pursuant to section 36(1)(b) of The Freedom of Information and Protection of Privacy Act of Manitoba. For inquiries concerning the collection of personal information contained in this form or if you have any questions concerning this survey please contact:

**RESIDENTIAL ENERGY USE SURVEY
MARKET FORECAST DEPARTMENT**
Manitoba Hydro
P.O. Box 815, Station Main
Winnipeg, Manitoba R3C 2P4

204.360.4629
204.360.3447
(Weekdays 8:00 a.m. to 3:00 p.m.)

Outside Winnipeg, call collect.

A postage paid envelope is provided for your convenience.
Please return the completed questionnaire within the next **two weeks**.

THANK YOU FOR YOUR TIME AND COOPERATION

Section 1

Your Residence

Please answer all the questions by marking an “x” in the box(es) beside the appropriate answer OR print your answer in the space provided. If you are unsure of a particular answer, mark the “Do not know” box.

1 What best describes your residence ?

- ¹ Single Family House (Detached) ⁶ Mobile Home/Trailer
² Side by Side (Two Attached Units) ⁷ Rowhouse/Townhouse (Exterior Entrance)
³ Duplex (Upper Unit) ⁸ Apartment Suite or Condominium unit
⁴ Duplex (Lower Unit) ⁹ Cottage or Seasonal Home
⁵ Triplex/Fourplex ¹⁰ Other: _____

2 Do you OWN or RENT this residence ?

- ¹ Own/Buying ² Rent/Lease ³ Other

3 Do you live at this residence year round?

- ¹ Yes, all year ² No, only part of the year

4 What type of DWELLING STRUCTURE do you live in?

- ¹ 1 storey ⁴ 2 storey ⁷ Bi-level ¹⁰ Cab - Over
² 1 1/2 storey ⁵ 2 1/2 storey ⁸ 2 level split ¹¹ Suite
³ 1 3/4 storey ⁶ 3 storey ⁹ 4 level split ¹² Other: _____

5 How many walls in your residence are ATTACHED to other residences or heated structures?

- ¹ None ² One ³ Two ⁴ Three

6 When was your residence originally BUILT?

- ¹ 2000 - present ⁵ 1960 - 1969 ⁹ 1920 - 1929
² 1990 - 1999 ⁶ 1950 - 1959 ¹⁰ 1910 - 1919
³ 1980 - 1989 ⁷ 1940 - 1949 ¹¹ 1900 - 1909
⁴ 1970 - 1979 ⁸ 1930 - 1939 ¹² 1899 or before

7 What is the SIZE of your residence in square feet?

(EXCLUDE BASEMENT AND GARAGE AREAS. ANSWER "7a", IF POSSIBLE.)

a) Specify size if KNOWN: _____ square feet.

b) If UNKNOWN, choose the approximate size range in square feet.

- | | | |
|--|---|---|
| <input type="checkbox"/> 1 Under 500 sq ft | <input type="checkbox"/> 7 1,501-1,700 sq ft | <input type="checkbox"/> 13 2,701-2,900 sq ft |
| <input type="checkbox"/> 2 501-700 sq ft | <input type="checkbox"/> 8 1,701-1,900 sq ft | <input type="checkbox"/> 14 2,901-3,100 sq ft |
| <input type="checkbox"/> 3 701-900 sq ft | <input type="checkbox"/> 9 1,901-2,100 sq ft | <input type="checkbox"/> 15 3,101-3,300 sq ft |
| <input type="checkbox"/> 4 901-1,100 sq ft | <input type="checkbox"/> 10 2,101-2,300 sq ft | <input type="checkbox"/> 16 3,301-3,500 sq ft |
| <input type="checkbox"/> 5 1,101-1,300 sq ft | <input type="checkbox"/> 11 2,301-2,500 sq ft | <input type="checkbox"/> 17 over 3,500 sq ft |
| <input type="checkbox"/> 6 1,301-1,500 sq ft | <input type="checkbox"/> 12 2,501-2,700 sq ft | |

8 What is the ELECTRIC PANEL size servicing your residence?

- | | | | |
|------------------------------------|------------------------------------|---|--|
| <input type="checkbox"/> 1 60 amp | <input type="checkbox"/> 3 150 amp | <input type="checkbox"/> 5 400 amp | <input type="checkbox"/> 7 Do not know |
| <input type="checkbox"/> 2 100 amp | <input type="checkbox"/> 4 200 amp | <input type="checkbox"/> 6 Other: _____ | |

9 What type of WINDOWS are in your residence? (CHECK ALL THAT APPLY)

- 1 Single Pane with Storm Window
- 1 Two Pane Slider
- 1 Dual Pane
- 1 Triple Pane
- 1 Dual Pane with Low E coating(s) or Insulating Spacer Bar(s)
- 1 Triple Pane with Low E coating(s) or Insulating Spacer Bar(s)
- 1 Argon Gas (dual pane)
- 1 Argon Gas (triple pane)
- 1 Other : _____

a) How many exterior DOORS do you have in your residence? (Indicate by door type)

___ Patio Doors ___ Wood Doors ___ Steel Insulated Doors
___ Storm Doors ___ PVC Doors

b) What best describes the quality of WINDOWS in your residence?

- | | | |
|--------------------------------------|------------------------------------|---------------------------------|
| <input type="checkbox"/> 1 Excellent | <input type="checkbox"/> 3 Average | <input type="checkbox"/> 5 Poor |
| <input type="checkbox"/> 2 Very Good | <input type="checkbox"/> 4 Fair | |

c) What best describes the quality of EXTERIOR DOORS in your residence?

- | | | |
|--------------------------------------|------------------------------------|---------------------------------|
| <input type="checkbox"/> 1 Excellent | <input type="checkbox"/> 3 Average | <input type="checkbox"/> 5 Poor |
| <input type="checkbox"/> 2 Very Good | <input type="checkbox"/> 4 Fair | |

10

What best describes the overall level of INSULATION in your residence?

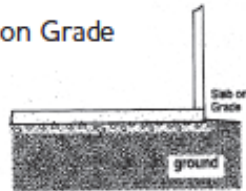
(EXCLUDE BASEMENT)

- | | | |
|--------------------------------------|------------------------------------|---------------------------------|
| <input type="checkbox"/> 1 Excellent | <input type="checkbox"/> 3 Average | <input type="checkbox"/> 5 Poor |
| <input type="checkbox"/> 2 Very Good | <input type="checkbox"/> 4 Fair | |

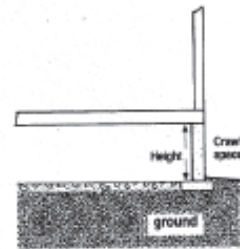
11 Please indicate which of the following best describes the **BASEMENT (foundation)** of your residence:

a) No Basement (foundation) – [Go to Question 12](#)

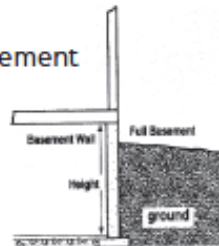
Slab on Grade



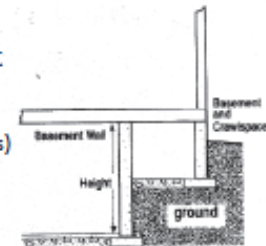
Crawl Space (including cottages and mobile homes)



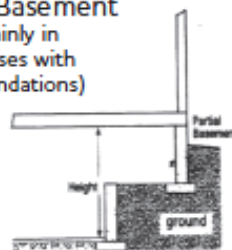
Full Basement



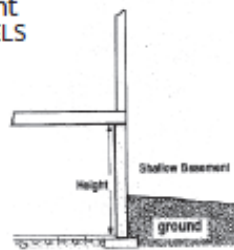
Partial Basement and Crawl Space (includes houses with ground level additions)



Partial Basement (found mainly in older houses with stone foundations)



Shallow Basement (includes SPLIT LEVELS and BI-LEVELS)



Other: _____

Do Not Know

b) What percentage of your home's **BASEMENT (foundation)** walls are insulated?

No Insulation – [Go to Question 12](#)

40% Insulated

90% Insulated

50% Insulated

100% Insulated

10% Insulated

60% Insulated

2 ft Below Grade Only

20% Insulated

70% Insulated

Other: _____

30% Insulated

80% Insulated

Do not know

c) Main type of **INSULATION**

Fibreglass Batting

Other: _____

Rigid

Do not know

Spray Foam

d) What % of your basement is finished?

No Basement

1 - 20%

41 - 60%

81 - 100%

0%

21 - 40%

61 - 80%

Do not know

12 Does this residence have any of the following PROBLEMS?

(CHECK ALL THAT APPLY.)

- | | |
|--|---|
| <input type="checkbox"/> Odours, cooking smells, stale air | <input type="checkbox"/> Water leakage in basement |
| <input type="checkbox"/> High humidity in winter | <input type="checkbox"/> Cold floor on slab on grade foundation |
| <input type="checkbox"/> Low humidity in winter | <input type="checkbox"/> Difficult to heat rooms |
| <input type="checkbox"/> Window condensation | <input type="checkbox"/> Inadequate supply of hot water |
| <input type="checkbox"/> Condensation in attic | <input type="checkbox"/> Short life of hot water tank
(less than five years) |
| <input type="checkbox"/> Mold and mildew | <input type="checkbox"/> No problems |
| <input type="checkbox"/> Ice dams on roof | |

13 In the last THREE YEARS, have you done any of the following projects at this residence? (CHECK ALL THAT APPLY.)

- Insulated basement or crawlspace
- Re-sided your house or upgraded the exterior walls
- Added insulation to your attic or ceiling
- Caulked the house to reduce air leakage
- Replaced some or all of the windows
- Improved the ventilation system in your home
- Upgraded electrical service/wiring
- Upgraded size of electrical panel
- Built an addition to the house
- Installed a natural gas BBQ hookup
- Replaced incandescent with compact fluorescent lighting
- Replaced heating system
- Replaced air conditioning
- Replaced hot water tank
- No projects done

14 Are any FARMING ACTIVITIES requiring electricity or natural gas conducted at this location?

- Yes, primarily farming Yes, hobby farming No

15 Are any ADDITIONAL BUILDINGS using ELECTRICITY at this location?

(CHECK ALL THAT APPLY.)

- | | | |
|---------------------------------------|---------------------------------------|---------------------------------------|
| <input type="checkbox"/> None | <input type="checkbox"/> Storage Shed | <input type="checkbox"/> Grain Dryer |
| <input type="checkbox"/> Workshop | <input type="checkbox"/> Barn | <input type="checkbox"/> Grain Bin(s) |
| <input type="checkbox"/> Garage | <input type="checkbox"/> Pumphouse | <input type="checkbox"/> Greenhouse |
| <input type="checkbox"/> Other: _____ | | |

16 Are any ADDITIONAL BUILDINGS using NATURAL GAS at this location?

(CHECK ALL THAT APPLY.)

- | | | |
|---------------------------------------|---------------------------------------|---------------------------------------|
| <input type="checkbox"/> None | <input type="checkbox"/> Storage Shed | <input type="checkbox"/> Grain Dryer |
| <input type="checkbox"/> Workshop | <input type="checkbox"/> Barn | <input type="checkbox"/> Grain Bin(s) |
| <input type="checkbox"/> Garage | <input type="checkbox"/> Pumphouse | <input type="checkbox"/> Greenhouse |
| <input type="checkbox"/> Other: _____ | | |

Section 2

Heating System

1 How do you pay for your SPACE HEATING costs?

- 1 Payment is made directly to Manitoba Hydro (part of utility bill)
- 2 Cost is included in rent or common service fees
- 3 Other: _____
- 4 Do not know

2 What is the MAIN HEATING FUEL used to heat your residence? (CHECK ONLY ONE.)

- 1 Electricity
- 2 Natural Gas
- 3 Fuel Oil
- 4 Wood
- 5 Propane
- 6 Other: _____
- 7 Do not know

3 What is the MAIN HEATING SYSTEM used to heat your residence? (CHECK ONLY ONE.)

- 1 Hi-efficiency Gas (+ 90%)
Central Forced Air Furnace
- 2 Mid-efficiency Gas (80-85%)
Central Forced Air Furnace
- 3 Standard-efficiency Gas (65%)
Central Forced Air Furnace
- 4 Gravity Air Furnace (no fan)
- 5 Electric Baseboards
- 6 Electric Forced Air Furnace
- 7 Radiant Cables/Panels
- 8 Heat Pump - Geothermal
(Ground Source)
- 9 Heat Pump - Air Source
- 10 Wood Stove
- 11 Outside Wood Boiler
- 12 Hot Water Boiler - with Pump
- 13 Hot Water Boiler - no Pump
- 14 Space Heater (Oil/Kerosene)
- 15 Dual Fuel - Wood/Electric Furnace
- 16 Dual Fuel - Wood/Oil Furnace
- 17 Other: _____
- 18 Do not know

4 What is the AGE of the main heating system?

- 1 0 - 3 years
- 2 4 - 6 years
- 3 7 - 9 years
- 4 10 - 12 years
- 5 13 - 15 years
- 6 16 - 20 years
- 7 21 - 25 years
- 8 Over 25 years
- 9 Do Not Know

5 What SUPPLEMENTAL heating fuel is used to heat your residence?

- 1 None
- 2 Electricity
- 3 Natural Gas
- 4 Fuel Oil
- 5 Wood
- 6 Propane
- 7 Other: _____
- 8 Do not know

6 What other HEATING SYSTEMS are used in your home?

(CHECK ALL THAT APPLY)

- | | |
|---|--|
| <input type="checkbox"/> None | <input type="checkbox"/> Wood Fireplace (with glass doors) |
| <input type="checkbox"/> Forced Air Furnace | <input type="checkbox"/> Wood Fireplace (no glass doors) |
| <input type="checkbox"/> Electric Baseboards | <input type="checkbox"/> Outside Wood Boiler |
| <input type="checkbox"/> Electric Portable Heater | <input type="checkbox"/> Pellet Stove |
| <input type="checkbox"/> Stove/Spaceheater | <input type="checkbox"/> Heat Pump |
| <input type="checkbox"/> Gas Fireplace (not decorative) | <input type="checkbox"/> Other: _____ |
| <input type="checkbox"/> Wood Stove | <input type="checkbox"/> Do not know |

7 How is the central forced air furnace fan motor normally operated?

- | | |
|--|--|
| <input type="checkbox"/> No Central Forced Air Furnace | <input type="checkbox"/> Continuous Variable Direct Current Motor (on select hi-efficiency furnaces) |
| <input type="checkbox"/> Comes on only when furnace is running | <input type="checkbox"/> Do not know |
| <input type="checkbox"/> Two speed (high, low) - continuous | |
| <input type="checkbox"/> Continuous - one speed on | |

8 Do you perform annual maintenance checks on your heating system?

- | | | |
|---|---|--|
| <input type="checkbox"/> Not applicable | <input type="checkbox"/> Once a year | <input type="checkbox"/> Every 4 or more years |
| <input type="checkbox"/> No, never | <input type="checkbox"/> Every 2 to 3 years | <input type="checkbox"/> Do not know |

9 Do you regularly change or clean your furnace filter?

- | | | |
|---|---|--------------------------------------|
| <input type="checkbox"/> Not applicable | <input type="checkbox"/> Yes, every 3 to 4 months | <input type="checkbox"/> Do not know |
| <input type="checkbox"/> No, never | <input type="checkbox"/> Yes, every year or more | |

10 If you use WOOD to provide heat for your home, how many FULL CORDS were burned in the past 12 months?

(A FULL CORD OF WOOD IS 4 FT X 4 FT X 8 FT.)

- | | | | |
|---------------------------------------|--------------------------------|--------------------------------|--------------------------------------|
| <input type="checkbox"/> No wood used | <input type="checkbox"/> 1 - 2 | <input type="checkbox"/> 5 - 6 | <input type="checkbox"/> 9+ |
| <input type="checkbox"/> Under 1 | <input type="checkbox"/> 3 - 4 | <input type="checkbox"/> 7 - 8 | <input type="checkbox"/> Do not know |

11 What type of THERMOSTAT controls the main heating system?

- | | |
|--|---|
| <input type="checkbox"/> No Thermostat | <input type="checkbox"/> Flue Gauge (located on a wood stove chimney) |
| <input type="checkbox"/> Individual Unit or Room Control | <input type="checkbox"/> Other: _____ |
| <input type="checkbox"/> Manual Central Control | <input type="checkbox"/> Do not know |
| <input type="checkbox"/> Programmable Thermostat | |

12 How often do you TURN DOWN the temperature at night during the heating season?

- | | | |
|--------------------------------------|---------------------------------------|--|
| <input type="checkbox"/> Every Night | <input type="checkbox"/> Occasionally | <input type="checkbox"/> No Thermostat |
| <input type="checkbox"/> Most Nights | <input type="checkbox"/> Never | <input type="checkbox"/> Do not know |

13 What is the average TEMPERATURE set for heating?

(CHECK ONE FOR EACH TIME PERIOD.)

°C	°F	Day	Evening	Night
17° or less	64° or less	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
18°-19°	65°-67°	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
20°-21°	68°-70°	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
22°-23°	71°-73°	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
24°-25°	74°-77°	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
26° plus	78° plus	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
Do not know		1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>

14 Do you use a dehumidifier?

1 Yes 2 No 3 Do not know

15 Do you use a humidifier?

1 Yes 2 No 3 Do not know

Section 3

Ventilation & Air Quality

1 What type of VENTILATION SYSTEM(s) is/are used to control the air quality in your home? (CHECK ALL THAT APPLY.)

- | | |
|---|--|
| 1 <input type="checkbox"/> Central Exhaust System | 3 <input type="checkbox"/> Roof Turbine Vent |
| 1 <input type="checkbox"/> Heat Recovery Ventilator | 3 <input type="checkbox"/> Windows/Doors |
| 1 <input type="checkbox"/> Furnace Fan | 3 <input type="checkbox"/> Other: _____ |
| 1 <input type="checkbox"/> Kitchen/Bathroom Fans | 3 <input type="checkbox"/> No Ventilation System |
| 1 <input type="checkbox"/> Ceiling Fans | 3 <input type="checkbox"/> Do not know |
| 1 <input type="checkbox"/> Portable Fans | |

2 What type of AIR FILTRATION system is used?

- | | |
|--|--|
| 1 <input type="checkbox"/> None | 4 <input type="checkbox"/> Electrostatic (Electronic) Air Filter/Cleaner |
| 2 <input type="checkbox"/> Standard Furnace Air Filter | 5 <input type="checkbox"/> Other: _____ |
| 3 <input type="checkbox"/> Room Air Filter(s) | 6 <input type="checkbox"/> Do not know |

3 Is there a FRESH AIR INTAKE to your central forced air furnace?

- | | |
|--------------------------------|--|
| 1 <input type="checkbox"/> Yes | 3 <input type="checkbox"/> No Central Forced Air Furnace |
| 2 <input type="checkbox"/> No | 4 <input type="checkbox"/> Do not know |

4 What best describes the air quality in your home during the winter months?

- | | | |
|------------------------------------|--------------------------------------|--|
| 1 <input type="checkbox"/> Too Dry | 2 <input type="checkbox"/> Too Humid | 3 <input type="checkbox"/> Comfortable |
|------------------------------------|--------------------------------------|--|

Section 4

Air Conditioning

1 What type of AIR CONDITIONER is used to COOL your residence?

- No Air Conditioner – Go to SECTION 5
- Heat Pump
- Window or Wall Air Conditioner: How many?
 One Two Three or More
- Central Air Conditioner: How many?
 One Two Three or More

2 How do you pay for your AIR CONDITIONING costs?

- Payment is made directly to Manitoba Hydro (part of utility bill) Other: _____
- Cost is included in rent or common service fee Do not know

3 What is the age of the MAIN air conditioning system?

- 0 - 3 years 10 - 12 years 21 - 25 years
- 4 - 6 years 13 - 15 years Over 25 years
- 7 - 9 years 16 - 20 years Do not know

4 What is the AVERAGE TEMPERATURE set for cooling?

(CHECK ONE FOR EACH TIME PERIOD.)

°C	°F	Day	Evening	Night
17° or less	64° or less	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18°-19°	65°-67°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20°-21°	68°-70°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22°-23°	71°-73°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24°-25°	74°-77°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26° plus	78° plus	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do not know		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section 5

Hot Water

1 Is there a **HOT WATER TANK** used at your residence?

- ¹ No Hot Water Tank – Go to **SECTION 6**
 ² Shared Central Supply (Serving two or more residences.) – Go to **SECTION 6**
 ³ Private Individual Hot Water Tank (Used solely by your household.)
 ⁴ Instantaneous tankless water heater

2 How do you pay for your water heating costs?

- ¹ Payment is made directly to Manitoba Hydro (part of utility bill) ³ Other: _____
 ² Cost is included in rent or common service fee ⁴ Do not know

3 What is the temperature setting of your hot water?

- ¹ less than 120°F (warm) ⁴ 140°F to 150°F (very hot)
 ² 120°F to 130°F (very warm) ⁵ More than 150°F (scalding)
 ³ 130°F to 140°F (hot) ⁶ Do not know

4 What type of fuel is used to **HEAT** your **WATER**?

- ¹ Electricity ⁴ Fuel Oil ⁷ Other: _____
 ² Natural Gas ⁵ Wood ⁸ Do not know
 ³ Propane ⁶ Solar

5 Have you always heated the water with the **HEATING FUEL** mentioned in **Question #4**?

- ¹ Yes, Always ² No, Previously Heated ³ Do not know
With: _____
Year Converted: _____ (e.g., 1992)

6 What is the **AGE** of your hot water tank?

- ¹ 0 - 3 years ⁴ 10 - 12 years ⁷ 21 - 25 years
 ² 4 - 6 years ⁵ 13 - 15 years ⁸ Over 25 years
 ³ 7 - 9 years ⁶ 16 - 20 years ⁹ Do not know

7 What is the approximate total size of your hot water tank(s)?

- ¹ Small (under 30 gal.) ⁴ Extra Large (over 90 gal.)
 ² Medium (30-50 gal.) ⁵ Other: _____
 ³ Large (60-90 gal.) ⁶ Do not know

- 8** How many **SHOWERHEADS** are installed in your home?
 1 None 2 One 3 Two 4 Three or more
- 9** On average, how many total showers are taken by your household per day?
 1 None 4 Two 7 Five
 2 Rarely shower 5 Three 8 Six or more
 3 One 6 Four
- 10** On average, how many tub baths are taken by your household per day?
 1 None 4 Two 7 Five
 2 Rarely take tub baths 5 Three 8 Six or more
 3 One 6 Four
- 11** Have you done any of the following been done to **CONSERVE** water?
 (CHECK ALL THAT APPLY.)
 1 Installed Energy Efficient Showerhead(s) (6 gal/min) 1 Installed Pipe Wrap
 1 Installed Energy Efficient Faucet Aerator(s) 1 None
 1 Installed Water Heater Blanket/Insulation 1 Do not know
 1 Installed Energy Efficient Toilets (1.6 or less gal/flush)
 1 Lowered Water Heater Temperature
- 12** Do you have an **ELECTRIC WATER PUMP** installed on your water system?
 (CHECK ALL THAT APPLY.)
 1 No Pump 1 Pressure Pump 1 Sewage Pump
 1 Well Pump 1 Sump Pump 1 Do not know

Section 6

Major Appliances

- 1** Please indicate the **COOKING APPLIANCE(S)** used in your home.
 (CHECK ALL THAT APPLY.)
- | | |
|---|--|
| 1 <input type="checkbox"/> None | 1 <input type="checkbox"/> Gas Cooktop |
| 1 <input type="checkbox"/> Electric Range with Standard Oven | 1 <input type="checkbox"/> Gas Range |
| 1 <input type="checkbox"/> Electric Range with Self-Cleaning Oven | 1 <input type="checkbox"/> Gas Wall Oven |
| 1 <input type="checkbox"/> Electric Range with Convection Oven | 1 <input type="checkbox"/> Wood Stove/Oven |
| 1 <input type="checkbox"/> Electric Counter Cooktop | 1 <input type="checkbox"/> Other: _____ |
| 1 <input type="checkbox"/> Electric Wall Oven | |
- a) **WEEKLY USAGE:** _____ (Average number of cooked meals each week.)

2 Is a MICROWAVE OVEN used in your home?

- ¹ No ² Yes

a) Daily usage _____ (average minutes per day)

3 How many REFRIGERATORS are used in your home?

- ¹ None – [Go to Question 4](#) ² One ³ Two ⁴ Three or More

a) Please describe the **MAIN REFRIGERATOR** that is used in your home.

- TYPE: ¹ Frost-Free ² Manual Defrost
 - DOORS: ¹ Single Door ⁴ French Door, Bottom Freezer
² Two Door, Top Freezer ⁵ Side-By-Side
³ Two Door, Bottom Freezer
 - SIZE: ¹ Small (12 cu. ft. or less) ³ Large (16.1 to 20 cu. ft.)
² Medium (12.1 to 16 cu. ft.) ⁴ Extra Large (Over 20 cu. ft.)
 - AUTOMATIC WATER DISPENSER: ¹ yes ² no
 - AUTOMATIC ICE DISPENSER: ¹ yes ² no
- AGE: (years) ¹ 0 - 3 years ⁴ 10 - 12 years ⁷ 21 - 25 years
² 4 - 6 years ⁵ 13 - 15 years ⁸ Over 25 years
³ 7 - 9 years ⁶ 16 - 20 years ⁹ Do not know

b) Please describe the **SECOND REFRIGERATOR** that is used in your home.

- ¹ None – [Go to Question 4](#)

- TYPE: ¹ Frost-Free ² Manual Defrost
 - DOORS: ¹ Single Door ⁴ French Door, Bottom Freezer
² Two Door, Top Freezer ⁵ Side-By-Side
³ Two Door, Bottom Freezer
 - SIZE: ¹ Small (12 cu. ft. or less) ³ Large (16.1 to 20 cu. ft.)
² Medium (12.1 to 16 cu. ft.) ⁴ Extra Large (Over 20 cu. ft.)
- AGE: (years) ¹ 0 - 3 years ⁴ 10 - 12 years ⁷ 21 - 25 years
² 4 - 6 years ⁵ 13 - 15 years ⁸ Over 25 years
³ 7 - 9 years ⁶ 16 - 20 years ⁹ Do not know

c) Is the second fridge operating all year?

- ¹ Yes, all year ² No, only part of the year.

d) Location of second refrigerator?

- ¹ Garage ³ Porch ⁵ Other: _____
² Basement ⁴ Main floor or above

4 How many stand-alone FREEZERS are used in your home?

(DO NOT INCLUDE FREEZER COMPARTMENT OF YOUR REFRIGERATOR)

- None - Go to Question 5 One Two Three or More

a) Please describe the **MAIN** stand-alone FREEZER that is used.

- TYPE: Frost-Free Manual Defrost
- STYLE: Upright Chest
- SIZE: Small (12 cu. ft. or less) Large (16.1 to 20 cu. ft.)
 Medium (12.1 to 16 cu. ft.) Extra Large (Over 20 cu. ft.)

- AGE: (years) 0 - 3 years 10 - 12 years 21 - 25 years
 4 - 6 years 13 - 15 years Over 25 years
 7 - 9 years 16 - 20 years Do not know

b) Location of main freezer?

- Garage Porch Other: _____
 Basement Main floor or above

c) Please describe the **SECOND** stand-alone FREEZER that is used.

- None - Go to Question 5
- TYPE: Frost-Free Manual Defrost
 - STYLE: Upright Chest
 - SIZE: Small (12 cu. ft. or less) Large (16.1 to 20 cu. ft.)
 Medium (12.1 to 16 cu. ft.) Extra Large (Over 20 cu. ft.)

- AGE: (years) 0 - 3 years 10 - 12 years 21 - 25 years
 4 - 6 years 13 - 15 years Over 25 years
 7 - 9 years 16 - 20 years Do not know

d) Is the second freezer operating all year?

- Yes, all year No, only part of the year.

e) Location of second freezer?

- Garage Porch Other: _____
 Basement Main floor or above

5 Is there an automatic DISHWASHER used in your home?

- No Dishwasher - Go to Question 6 Yes

- LOADS PER WEEK: ____ (loads/week)
(Average number of times the dishwasher is operating each week.)

- AGE: (years) 0 - 3 years 10 - 12 years 21 - 25 years
 4 - 6 years 13 - 15 years Over 25 years
 7 - 9 years 16 - 20 years Do not know

a) What type of DRYING CYCLE do you use most often:

- Heat Dry (Sanitizing Cycle) Air Dry (Econo) Do not know

b) Do you use the Water Heat Temperature Boost option?

- 1 Not available 3 Available, but choose not to use it
2 Available, and used always 4 Available, and use occasionally

6 Is there a CLOTHES WASHER used in your home? (CHECK TYPE USED MOST OFTEN)

- 1 Do not have a Clothes Washer – Go to Question 7
2 Hand Washing – Go to Question 7
3 Use laundry facility outside the home (e.g., apartment block or laundromat)
(Serving two or more residences.) – Go to Question 7
4 Top Load Automatic Clothes Washer (Used solely by this residence.)
5 Front Load Automatic Clothes Washer (Used solely by this residence.)
6 Compact/Spinner Washer
7 Wringer Washer

a) WATER TEMPERATURE for the WASH/RINSE CYCLE:

(Setting used most often, choose only one.)

- 1 Hot/Hot 4 Warm/Warm 7 Do not know
2 Hot/Warm 5 Warm/Cold
3 Hot/Cold 6 Cold/Cold

• LOADS PER WEEK: _____ (loads/week)

(Average number of times the clothes washer is operating each week.)

- AGE: (years) 1 0 - 3 years 4 10 - 12 years 7 21 - 25 years
2 4 - 6 years 5 13 - 15 years 8 Over 25 years
3 7 - 9 years 6 16 - 20 years 9 Do not know

7 Is there a CLOTHES DRYER used in your home? (CHECK TYPE USED MOST OFTEN.)

- 1 No Clothes Dryer – Go to Section 7
2 Clothes Line/Rack – Go to Section 7
3 Use laundry facility outside the home (e.g., apartment block or laundromat)
(Serving two or more residences.) – Go to Section 7
4 Automatic Clothes Dryer (Used solely by this residence.)
- DRYER FUEL: 1 Electricity 3 Propane
2 Natural Gas 4 Other: _____
 - DRYER TEMP: 1 Cold (Low) 3 Warm (Medium) 5 Hot (High)
(Used most often.) 2 Delicate 4 Permanent Press 6 Automatic
 - LOADS/WEEK: _____ (loads/week) (Average number of times the dryer is operating each week.)
 - MINUTES/LOAD: _____ (minutes/load) 1 Automatic
(Average number of minutes the dryer is operating for each load.)
- AGE: (years) 1 0 - 3 years 4 10 - 12 years 7 21 - 25 years
2 4 - 6 years 5 13 - 15 years 8 Over 25 years
3 7 - 9 years 6 16 - 20 years 9 Do not know

Section 7 Home Electronics and Lighting

- 1 For the top 3 most frequently used television sets in your home, please check the most appropriate boxes below:

a) Please describe the **MAIN TELEVISION** that is used in your home.

Do not have a television set – [Go to Question 3](#)

- TYPE: Tube (CRT) LCD Projection
 Plasma LED Do not know
- SIZE: Under 21" 30" - 39" Over 49"
 21" - 29" 40" - 49" Do not know

- AGE: (years) 0 - 3 years 7 - 9 years Over 12 years
 4 - 6 years 10 - 12 years Do not know

- USAGE: 0 hours 4 - 6 hours Over 9 hours
 1 - 3 hours 7 - 9 hours Do not know

b) Please describe the **SECOND TELEVISION** that is used in your home.

Do not have a second television set – [Go to Question 2](#)

- TYPE: Tube (CRT) LCD Projection
 Plasma LED Do not know
- SIZE: Under 21" 30" - 39" Over 49"
 21" - 29" 40" - 49" Do not know

- AGE: (years) 0 - 3 years 7 - 9 years Over 12 years
 4 - 6 years 10 - 12 years Do not know

- USAGE: 0 hours 4 - 6 hours Over 9 hours
 1 - 3 hours 7 - 9 hours Do not know

c) Please describe the **THIRD TELEVISION** that is used in your home.

Do not have a third television set – [Go to Question 2](#)

- TYPE: Tube (CRT) LCD Projection
 Plasma LED Do not know
- SIZE: Under 21" 30" - 39" Over 49"
 21" - 29" 40" - 49" Do not know

- AGE: (years) 0 - 3 years 7 - 9 years Over 12 years
 4 - 6 years 10 - 12 years Do not know

- USAGE: 0 hours 4 - 6 hours Over 9 hours
 1 - 3 hours 7 - 9 hours Do not know

2 For the top 3 most frequently used set top box or cable converter box in your home, please check the most appropriate boxes below.

a) Please describe the **MAIN SET-TOP OR CABLE CONVERTER BOX** that is used in your home.

Do not have a set-top or cable converter box – [Go to Question 3](#)

- SERVICE PROVIDER: Cable company Telephone company Satellite Do not know
- FEATURES: Digital Digital PVR HD HD PVR Do not know

- AGE: (years) 0 - 3 years 4 - 6 years 7 - 9 years 10 - 12 years Over 12 years Do not know

b) Please describe the **SECOND MAIN SET-TOP OR CABLE CONVERTER BOX** that is used in your home.

Do not have a second set-top or cable converter box – [Go to Question 3](#)

- SERVICE PROVIDER: Cable company Telephone company Satellite Do not know
- FEATURES: Digital Digital PVR HD HD PVR Do not know

- AGE: (years) 0 - 3 years 4 - 6 years 7 - 9 years 10 - 12 years Over 12 years Do not know

c) Please describe the **THIRD MAIN SET-TOP OR CABLE CONVERTER BOX** that is used in your home.

Do not have a third set-top or cable converter box – [Go to Question 3](#)

- SERVICE PROVIDER: Cable company Telephone company Satellite Do not know
- FEATURES: Digital Digital PVR HD HD PVR Do not know

- AGE: (years) 0 - 3 years 4 - 6 years 7 - 9 years 10 - 12 years Over 12 years Do not know

3 For the top 3 most frequently used computers in your home, please check the most appropriate boxes.

a) Please describe the **MAIN COMPUTER** that is used in your home.

Do not have a computer – [Go to Question 5](#)

- TYPE: Desktop Laptop Do not know
- SCREEN: Tube (CRT) LCD

- AGE: (years) 0 - 3 years 4 - 6 years 7 - 9 years 10 - 12 years Over 12 years Do not know

- USAGE: On 24 hours On when necessary Do not know

b) Please describe the **SECOND COMPUTER** that is used in your home.

¹ Do not have a second computer – [Go to Question 4](#)

• TYPE: ¹ Desktop ² Laptop ³ Do not know

• SCREEN: ¹ Tube (CRT) ² LCD

• AGE: (years) ¹ 0 - 3 years ³ 7 - 9 years ⁵ Over 12 years

² 4 - 6 years ⁴ 10 - 12 years ⁶ Do not know

• USAGE: ¹ On 24 hours ² On when necessary ³ Do not know

c) Please describe the **THIRD COMPUTER** that is used in your home.

¹ Do not have a third computer – [Go to Question 4](#)

• TYPE: ¹ Desktop ² Laptop ³ Do not know

• SCREEN: ¹ Tube (CRT) ² LCD

• AGE: (years) ¹ 0 - 3 years ³ 7 - 9 years ⁵ Over 12 years

² 4 - 6 years ⁴ 10 - 12 years ⁶ Do not know

• USAGE: ¹ On 24 hours ² On when necessary ³ Do not know

4 Do you have internet access at your residence?

¹ No ² Yes

5 What **LIGHT FIXTURES** listed below are used in your home? ([CHECK ALL THAT APPLY.](#))

a) **Bedrooms**

¹ Compact Fluorescent ¹ LED ¹ Tube Fluorescent

¹ Incandescent ¹ Halogen

b) **Kitchen**

¹ Compact Fluorescent ¹ LED ¹ Tube Fluorescent

¹ Incandescent ¹ Halogen

c) **Hallway**

¹ Compact Fluorescent ¹ LED ¹ Tube Fluorescent

¹ Incandescent ¹ Halogen

d) **Living/Family Room / Dining Room**

¹ Compact Fluorescent ¹ LED ¹ Tube Fluorescent

¹ Incandescent ¹ Halogen

e) **Laundry Area**

¹ Compact Fluorescent ¹ LED ¹ Tube Fluorescent

¹ Incandescent ¹ Halogen ¹ No laundry area

f) **Basement area**

¹ Compact Fluorescent ¹ LED ¹ Tube Fluorescent

¹ Incandescent ¹ Halogen ¹ No basement area

6 How many **HALOGEN TORCHIERE LAMPS** are used at your residence?

¹ None ² One ³ Two or more

7 Are there any strings of **OUTDOOR SEASONAL LIGHTS** hung at your residence?

¹ No ³ Yes, Incandescent lights

² Yes, LED lights ⁴ Yes, both LED and Incandescent lights

Section 8

Hot Tub, Pool & Sauna

EXCLUDING HOT TUBS, POOLS AND SAUNAS IN APARTMENT/TOWNHOUSE COMPLEXES

- 1 Is there a **HOT TUB/JACUZZI** installed in your home?
 No Yes, total seating capacity _____
- 2 Is there a **SAUNA** installed in your home?
 No Yes
- 3 Does your home have a **SWIMMING POOL**?
 No - Go to SECTION 9 Yes, Indoor Yes, Outdoor
d) **SIZE OF PUMP MOTOR**:
 No Pump 1 hp Do not know
 3/4 hp or less 1 1/4 hp
b) **HEATING FUEL**:
 Not Heated Natural Gas Solar
 Electric Propane Do not know

Section 9

Your Vehicle

- 1 How many **VEHICLES** are usually plugged in by your household during the winter months? (NOVEMBER - MARCH)
 None - Go to SECTION 10 Two Four or More
 One Three
- 2 For your most **COMMONLY** used vehicle, please indicate your normal routine during the winter months. (NOVEMBER - MARCH)
a) **PARKED IN**: Detached Garage Carport/Shelter Outside
 Attached Garage Underground Parkade
b) **CAR TIMER FOR BLOCKHEATER**: Yes No
c) **INTERIOR CAR WARMER**: Yes No
d) What best describes the routine for plugging in your vehicle(s)?
(CHOOSE ONLY ONE)
 Do not plug-in
 Plug-in every day
 Plug-in occasionally - # of DAYS PER WEEK: _____ (1 to 7)
 Dependent on the overnight temperature: _____ (Celsius) OR _____ (Fahrenheit)
e) When you do plug-in your vehicle(s), how many HOURS PER DAY ON AVERAGE is the block heater operating? ON A WEEKDAY (MON. TO FRI.)
 None 3 - 4 hours 7 to 8 hours
 1 - 2 hours 5 - 6 hours Over 8 hours

Section 10

Services and Programs

- 1** Please indicate how you or anyone in your household **USUALLY** pays the Manitoba Hydro bill? **(CHECK ONLY ONE)**
- ¹ In-Person - at a Manitoba Hydro office ⁵ Pre-Authorized Payment Plan
 ² In-Person - at a designated agency ⁶ Other: _____
 ³ By Mail ⁷ Do not know
 ⁴ On-Line
- 2** Are you aware of Manitoba Hydro's MYBILL method of receiving bills by email?
 ¹ Yes ² No
- 3** Would you be interested in receiving your Manitoba Hydro bill by email?
 ¹ Yes ³ Not sure ⁵ Have no internet access
 ² No ⁴ Already receive monthly Hydro bill by email
- 4** In the last year, how many times did you access the Manitoba Hydro website?
 ¹ Zero ² 1 to 5 ³ 6 to 10 ⁴ Over 10 ⁵ Have no internet access
- 5** Do you read the monthly Energy Matters news bulletin that comes with your bill?
 ¹ Yes, Always ² Yes, Occasionally ³ No, Never
- 6** Do you read the special bill inserts describing new Power Smart programs Manitoba Hydro is offering?
 ¹ Yes, Always ² Yes, Occasionally ³ No, Never
- 7** Have you participated in any programs as a result of reading the special bill insert?
 ¹ Yes ² No
- 8** Please check all the programs you have **PARTICIPATED** in while at your **PRESENT RESIDENCE?** **(CHECK AS MANY AS APPLY)**
- ¹ Have participated in no programs at this point
 ¹ Power Smart Natural Gas Furnace Replacement Program
 ¹ Power Smart Natural Gas Boiler Replacement Program
 ¹ Power Smart New Home Program
 ¹ Power Smart Residential Loan
 ¹ WISE Program - Seniors Helping Seniors
 ¹ Earth Power (Geothermal) Loan
 ¹ Home Evaluation Program On-line
 ¹ Power Smart Home Insulation Program
 ¹ Power Smart Energy Efficient Appliance Program
 ¹ Power Smart Compact Fluorescent Lighting Promotions
 ¹ Seasonal LED Lights Turn-in Program
 ¹ Torchiere Lamp - Turn-In Halogen Program
 ¹ ENERGY STAR Light Fixtures - Mail-In Rebate
 ¹ Home Evaluation Program - Mail-in
 ¹ Power Smart In-Home Energy Evaluation program
 ¹ Lower Income Energy Efficiency Program

Section 11 Household Demographics

The following questions are of a personal nature, but are very important in explaining energy usage. Please try to answer these questions. If you are uncomfortable in answering any of them, just mark the 'Choose not to answer' box. All responses are kept strictly confidential.

1 Including yourself, how many persons usually live in your home?

- One (myself) Three Five Seven or more
 Two Four Six Choose not to answer

2 Please indicate the number of people usually living in your home, within each AGE GROUP.

_____ Under 6 years _____ 25-34 years _____ 55-64 years
 _____ 6-18 years _____ 35-44 years _____ 65 and older
 _____ 19-24 years _____ 45-54 years Choose not to answer

3 How many people who live in your home are EMPLOYED either FULL-TIME or PART-TIME?

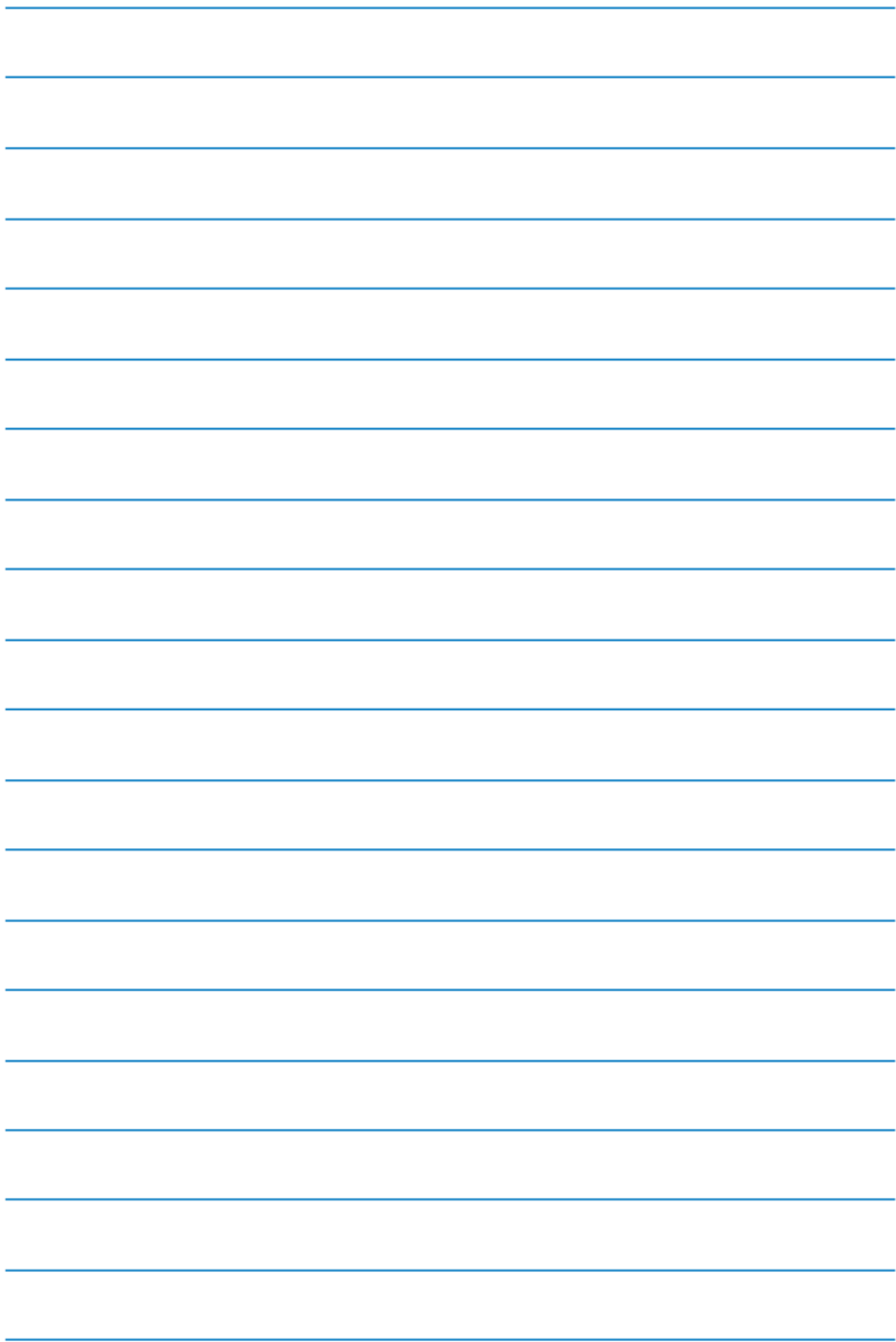
a) _____ Full-Time b) _____ Part-Time c) _____ Choose not to answer

4 What is your approximate total annual household INCOME? (ALL SOURCES BEFORE TAXES)

- Under \$20,000 \$50,000-\$54,999 \$80,000-\$89,999
 \$20,000-\$24,999 \$55,000-\$59,999 \$90,000-\$99,999
 \$25,000-\$29,999 \$60,000-\$64,999 \$100,000-\$124,999
 \$30,000-\$34,999 \$65,000-\$69,999 \$125,000-\$149,999
 \$35,000-\$39,999 \$70,000-\$74,999 \$150,000 or over
 \$40,000-\$49,999 \$75,000-\$79,999 Choose not to answer

5 Please indicate the highest EDUCATION LEVEL attained by each head of household?

	Person 1	Person 2
No Formal Education	<input type="checkbox"/>	<input type="checkbox"/>
Elementary (Grades 1-6)	<input type="checkbox"/>	<input type="checkbox"/>
Junior High (Grades 7-9)	<input type="checkbox"/>	<input type="checkbox"/>
Senior High (Grades 10-12)	<input type="checkbox"/>	<input type="checkbox"/>
Trade School	<input type="checkbox"/>	<input type="checkbox"/>
Community College	<input type="checkbox"/>	<input type="checkbox"/>
University (Bachelor)	<input type="checkbox"/>	<input type="checkbox"/>
Graduate (Master's or PHD)	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>
Choose not to answer	<input type="checkbox"/>	<input type="checkbox"/>



Please mail this completed form in the postage
paid self-addressed envelope to:

**RESIDENTIAL ENERGY USE SURVEY
MARKET FORECAST DEPARTMENT**

Manitoba Hydro
P.O. Box 815, Station Main
Winnipeg, Manitoba R3C 2P4

**THANK YOU
FOR YOUR TIME AND COOPERATION**

Please answer the survey for the address shown on the **FRONT COVER**.
Return the completed questionnaire within the next **TWO WEEKS**, in
the postage paid envelope provided.

LARRY & BEV SIMPSON
PO BOX 6 STN MAIN
ARNAUD MB R0A 0B0



1 **REFERENCE:** Elenchus report, page 5.

2

3 **PREAMBLE:**

4 Manitoba Hydro's 2013 Electric Load Forecast assumes 24,000 electric vehicles by 2032/33.

5

6 **QUESTION:**

7 How does this projection compare to other Canadian jurisdictions?

8

9 **RESPONSE:**

10 Elenchus is of the opinion that this forecast is a conservatively reasonable projection at this time.
 11 Numerous sources are available to support a growth in the sale of electric vehicles. Recently Ontario
 12 released its 2013 Long Term Energy Plan which highlighted the following assumptions for growth in the
 13 Electric Vehicles in Ontario.

Electric Vehicle Demand Assumptions

Average Annual Driving Distance (km)	16,000		
Energy/km/EV	0.19kWh/km		
Average Annual Energy/EV	3 MWh		
Charger Type	20% level-1		
	60% level-2		
	20% level-3		
Charging Pattern	50% night		
	30% evening		
	20% daytime		
	2010	2020	2031
# of Cars (million)	7.3	8.1	9
# of EVs (million)	~0	0.4	1
%EVs	~0	5%	11%
Total EV Energy Consumption	~0	1.3 TWh	3.1 TWh
Total EV Peak Contribution (coincident)	~0	72 MW	171 MW

- 14 [Towards an Ontario Action Plan for Plug-In-Electric Vehicles \(PEVs\)](#)
 15 [Navigant forecasts 18.6% CAGR for plug-ins in North America to 2022](#)
 16 [Ontario Long-Term Energy Plan 2013](#)

1 **REFERENCE: Elenchus report, page 8.**

2

3 **PREAMBLE:**

4 The Elenchus report states that "It also appears that this model has exhibited a declining ability to
5 predict the change in number of all electric customers going forward, based on reported R2 values."

6

7 **QUESTION:**

8 Please provide a high-level explanation of the concept of R2 values / coefficients of determination and
9 their acceptable ranges for load forecasting purposes.

10

11 **RESPONSE:**

12 In statistics, the coefficient of determination denoted R2 and pronounced R-squared, indicates how well
13 data points fit a statistical model. The R2 is a measure of the explanatory power of an equation. The
14 equation may then be used to predict of future outcomes and the R2 serves as a measure of how well
15 the equation is expected to predict the future outcome based on the past performance of the equation.

16 In many instances where R2 is used, the predictors are calculated by ordinary least-squares regression.
17 In this case, R2 will tend to increase as we increase the number of variables in the model. This illustrates
18 a drawback to one possible use of R2, where one might keep adding variables to increase the R2 value.
19 The R2 will never decrease as variables are added and will probably experience an increase due to
20 chance alone.

21

22 R2 is often interpreted as the proportion of response variation "explained" by the regressors in the
23 model. Thus, $R2 = 1.0$ indicates that the fitted model explains all variability, while $R2 = 0$ indicates no
24 explanatory relationship. An interior value such as $R2 = 0.7$ may be interpreted as follows: "Seventy
25 percent of the variation in the response variable can be explained by the explanatory variables. The
26 remaining thirty percent can be attributed to unknown, lurking variables or inherent variability."

27

28 This leads to the alternative approach of looking at the adjusted R2. The explanation of this statistic is
29 almost the same as R2 but it penalizes the statistic as extra variables are included in the model. The use
30 of an adjusted R2 is an attempt to take account of the phenomenon of the R2 automatically and
31 spuriously increasing when extra explanatory variables are added to the model. It is a modification due
32 to Theil of R2 that adjusts for the number of explanatory terms in a model relative to the number of
33 data points. The adjusted R2 value will always be less than or equal to that of R2. Unlike R2, the adjusted
34 R2 increases when a new explanator is included only if the new explanator improves the R2 more than
35 would be expected in the absence of any explanatory value being added by the new explanator. If a set
36 of explanatory variables with a predetermined hierarchy of importance are introduced into a regression
37 one at a time, with the adjusted R2 computed each time, the level at which adjusted R2 reaches a
38 maximum, and decreases afterward, would be the regression with the ideal combination of having the
39 best fit without excess/unnecessary terms. Hence, when alternate models are being tested the model
40 with the highest adjusted R2 is generally deemed to be the best" model.

41

42 Note that neither the R2 nor the adjusted R2 serves as a good indicator of the predictive power of an
43 equation in cases where there is a structural change in the relationship being modelled.

1 **REFERENCE:** Elenchus report, page 10.

2

3 **PREAMBLE:**

4 Elenchus suggests that it may be more appropriate to use regression and time series techniques to
5 develop a forecast of Residential customers than to use a "people per household" factor.

6

7 **QUESTION:**

8 Please explain your reasoning as to why this suggestion would lead to greater accuracy with respect to
9 Residential load forecasting. In your view, would this remove periodic over- or under-estimating as
10 suggested by Chart 2?

11

12 **RESPONSE:**

13 Elenchus reasons that regression and time series techniques are time honoured tools that allow history
14 to project the future. The tools provide measures of correlation to test the explanatory power of the
15 model without any embedded assumed relationship.

16

17 Reliance on the "people per household" factor embeds the assumption that there is a stable relationship
18 between the number of people per households and household electricity consumption. This relationship
19 can be reflected in a regression equation along with other explanatory variables.

1 **REFERENCE:** Elenchus report, pages 11-12.

2
3 **PREAMBLE:**

4 The Elenchus report states that "Another potential issue is the timeliness of the population forecast
5 given recent trends in immigration to Manitoba."
6

7 Elenchus calculates that a reduction in average annual immigration from 15,100 to 13,100 would Result
8 in reduced load growth of 258 GWh by 2032/33, and reliance on Spatial Economics' projection would
9 reduce load growth by 666.5 GWh.
10

11 **a) QUESTION:**

12 Is Elenchus aware of any changes to the Provincial Nominee Program or other immigration initiatives
13 that would suggest a permanent downward trend in Manitoba Immigration or is Elenchus merely
14 identifying population projections as a risk factor.
15

16 **RESPONSE:**

17 Elenchus remarks are identifying the risk of a downward trend in immigration according to the various
18 reports available on the [Citizenship and Immigration Canada](#) web site. As shown below immigrant
19 receiving permanent status in Manitoba in 2012 declined by 2,651 from 2011. Further, in the first two
20 quarters of 2013 immigrants receiving permanent status in Manitoba declined by 655 compared to the
21 same two quarters in 2012. While this is not an empirical study it shows that a slowing down of
22 migration is expected by Citizenship and Immigration Canada.

Canada – Permanent residents by province or territory and category

Number										
Category	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Economic immigrants	4,079	4,999	5,724	7,376	8,328	8,694	10,905	13,274	13,152	10,337
Refugees	1,234	1,252	1,094	1,238	1,170	972	1,098	1,032	1,303	1,140
Other immigrants	147	57	86	101	134	167	159	124	108	96
Manitoba	6,503	7,426	8,096	10,048	10,954	11,218	13,521	15,807	15,963	13,312

[Canada – Permanent residents by province or territory and category](#)

Canada - Permanent residents by province or territory and urban area										
Urban area	2012						2013			
	Q1	Q2	YTD	Q3	Q4	Total	Q1	Q2	YTD	
Manitoba	3,246	3,581	6,827	3,234	3,251	13,312	2,610	3,562	6,172	

[Canada - Permanent residents by province or territory and urban area](#)

23 **b) QUESTION:**

24 Confirm that population fertility analysis was not undertaken by MH and that changes in assumed
25 immigration indicated by the most current forecast should be a factor considered.
26

27 **RESPONSE:**

28 Elenchus confirmed that population fertility analysis was not undertaken by MH.

-
- 1 Manitoba Hydro advised Elenchus that it does not perform analysis on population fertility when
 - 2 producing their consensus forecast. MH's population estimates are generated annually by performing a
 - 3 simple average of several independent forecasts.

1 **REFERENCE: Elenchus report, executive summary page i.**

2

3 **PREAMBLE:**

4 One type of uncertainty associated with Manitoba Hydro's forecast over the long run is the possibility of
5 significant on anticipated changes in the demographic and/or economic trends that are currently
6 expected based on historical trends. This type of risk is addressed by Manitoba Hydro using sensitivity
7 analysis.

8

9 **QUESTION:**

10 Please elaborate on the sensitivity analysis undertaken by Manitoba Hydro which addresses
11 unanticipated changes in demographic or economic trends and comment on the adequacy of the
12 analysis.

13

14 **RESPONSE:**

15 Elenchus notes that Manitoba Hydro addresses unanticipated changes on a large scale by utilizing
16 sensitivity analysis to address potential risks to the forecast. This is shown on page ii of the executive
17 summary of the 2013 Electric Load Forecast. Elenchus notes that Manitoba Hydro would have the
18 opportunity to raise the issues resulting from the potential of changes in demographic trends but has
19 not chosen to do so.

20

21 Sensitivity analysis is most appropriate when preceded by careful analysis of the scale of the potential
22 variance that could lead to forecast errors.

1 **REFERENCE: Elenchus report, page 13.**

2

3 **PREAMBLE:**

4 Elenchus describes the three different approaches used by Manitoba Hydro to predict new customers by
5 heating type over time.

6

7 **QUESTION:**

8 Which of the three approaches, if any, does Elenchus recommend? On what basis?

9

10 **RESPONSE:**

11 Elenchus reported that three models have been utilized by Manitoba Hydro in predicting electric heat
12 customers. These were:

- 13 • Pre 2009 use of a logistic regression (LOGIT) model
- 14 • 2009 to 2012 use of a linear regression model using change in residential customers and the
15 price of electricity and gas
- 16 • 2013 use of 2009 Residential Survey

17 Manitoba Hydro is challenged in this area of forecasting. Electric space heating is recognized as a very
18 sizable driver of energy consumption and demand for the utility worthy of isolated analysis. However,
19 customers billing record information make this extremely challenging to identify affected customers
20 upon which to apply statistical modeling tools. Compounding the challenge is the changing landscape of
21 the gas sector with respect to supply and prices. The spread in the difference in annual costs between
22 heating with electricity versus gas have widened over the last few years, making the switch to gas
23 heating attractive to home owners.

24

25 Elenchus is a strong proponent of the use of linear regression models to prepare forecasts. Elenchus
26 realises that Manitoba Hydro's previous use of this model failed due to use of incorrect hypothesis data
27 and limitations on available data. Using the 2009 residential survey was a reasonable approach but the
28 currency of the data adds error risk to the forecast. As suggested by Elenchus the residential survey
29 should be updated as an initial step.

1 **REFERENCE: Elenchus report, page 13.**

2

3 **PREAMBLE:**

4 The Elenchus report states that "While Manitoba Hydro analyzed the effect of Residential customers
5 "switching to" electric heat, it did not specifically address a "switch away" from electric heat. For
6 modelling purposes, the effect should be assumed to be "at least" symmetrical.

7

8 **QUESTION:**

9 Please explain your reasoning that the effect would be at least symmetrical.

10

11 **RESPONSE:**

12 Manitoba Hydro suggests that it expects 10% of residential customers will switch to electric space
13 heating. This implies conversions of about 45,600 customers based on 2012/13 residential customers to
14 56,500 customers in 2032/33. In an informal response to Elenchus IR's Manitoba Hydro noted that the
15 2009 residential survey determined that there were potentially 11,400 customers using wood, propane
16 or fuel oils as their primary source of space heating. This represents only 2.5% of the potential number
17 of customers that MH expects to convert to electricity.

18

19 Based on the cost comparison charts reproduced below (obtained from Manitoba Hydro's web site)
20 there is a financial incentive for customers to convert from fuel oil and propane to electricity. However,
21 to achieve the projected number of conversions to electric space heating it will be necessary for a
22 significant number of customers currently using natural gas to convert to electricity. The cost charts
23 suggest that there would need to be a significant increase in gas prices relative to electricity for the
24 implied conversion from natural gas to occur over the next twenty years.

25

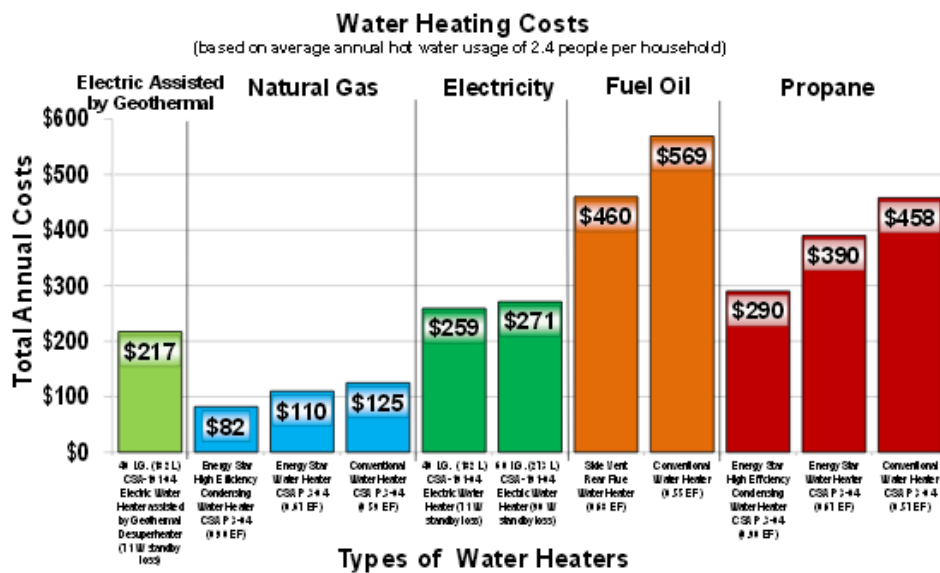
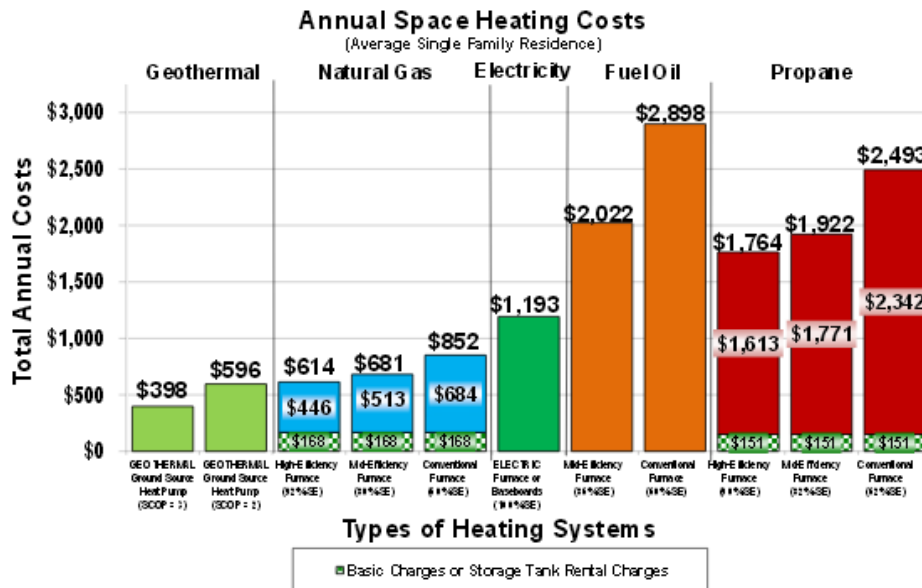
26 Conversely customer demand for gas space heating could result in areas where gas is available but
27 presently under-served. There is also the potential for public demand for service in areas where gas is
28 not available that could be economically feasible for service. If the disparity in prices between the two
29 commodities continues then there could be added demand from areas that not economically feasible
30 but accessible with modification in rate structure.

31

32 Political action could also affect conversion rates. For example, the promotion of green energy over
33 fossil fuels, perhaps by way of a carbon tax could discourage use of natural gas. On the other hand, the
34 promotion of natural gas use by government recognising the benefit of reduced heating costs, including
35 the potential increase in disposable income could lead to the promotion of natural gas space heating.
36 Natural gas is being actively promoted in many US states.

37

38 Elenchus would suggest that if Manitoba Hydro facilitates the economic fuel choices by residential
39 customers, it should result in at least symmetrical conversion away from electrical space heating as
40 there will be away from natural gas.



1 **REFERENCE: Elenchus report, pp. 20-21.**

2

3 **PREAMBLE:**

4 The Elenchus report states that "A key driver of the forecast is the annual forecast change in Residential
5 Basic customers. Therefore, the concerns about the long-term forecast for Manitoba's population,
6 immigration and assumed persons per household that are of concern in the Residential customer
7 forecast are also of concern for the GS Mass Market forecast."

8

9 **QUESTION:**

10 Given Elenchus' comments, does Elenchus agree with Manitoba Hydro having switched to a forecasting
11 approach for General Service customers that places increased reliance on the Residential forecast?

12

13 **RESPONSE:**

14 Elenchus would agree with Manitoba Hydro changing the forecasting approach for this class as previous
15 models were not very robust. Elenchus could agree that using the residential class may be a reasonable
16 driver to assume in the model as growth in population allows for growth in small commercial services
17 and potential attraction for larger commercial industry with a growing labour force.

18

19 Elenchus notes however that by using this approach our concerns about the formulation of the
20 residential forecast extend to the forecast for the mass market sector which depends on the residential
21 forecast. The lack of transparency by Manitoba Hydro with respect to its review of alternatives to using
22 this model, as noted in the evidence, is a related concern.

1 REFERENCE: Elenchus report, page 29.

2

3 PREAMBLE:

4 Page 28 of the Elenchus report provides a chart of degree-day sensitivity coefficients.

5

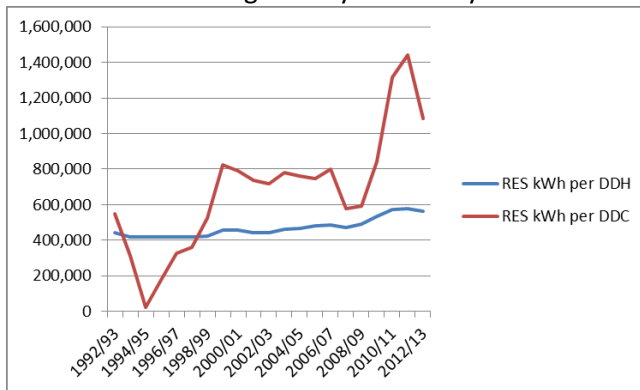
6 a) QUESTION:

7 Please provide a graph listing the calendar year in the x-axis and the sensitivity coefficients on the y-axis
8 for each of the customer classes.

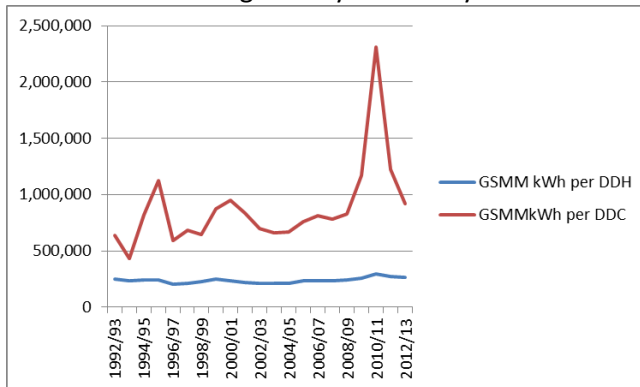
9

10 RESPONSE:

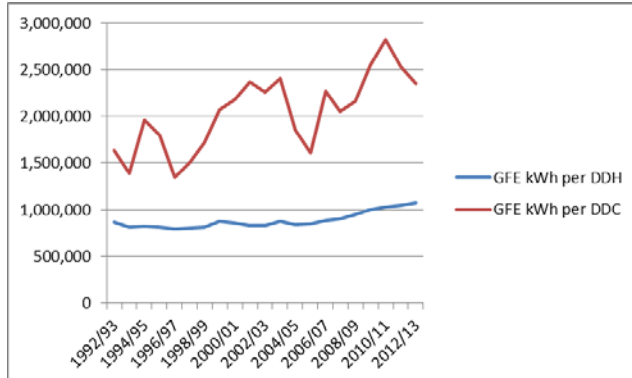
Residential Basic Degree-Day Sensitivity Coefficients



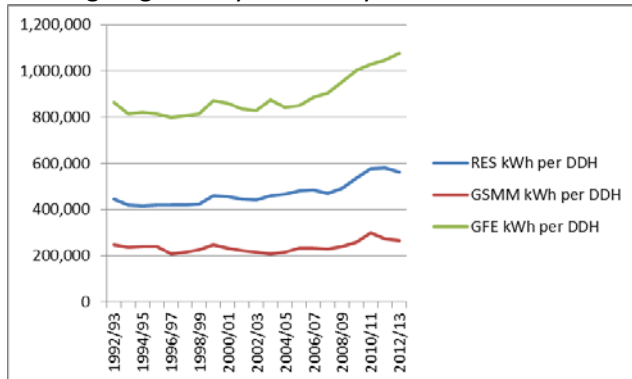
GS Mass Market Degree-Day Sensitivity Coefficients



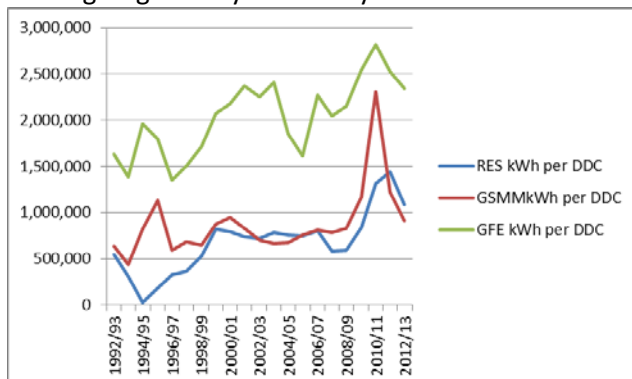
Gross Firm Energy Degree-Day Sensitivity Coefficients



Heating Degree-Day Sensitivity Coefficients



Cooling Degree-Day Sensitivity Coefficients



- 1 **b) QUESTION:**
- 2 There appears to be a general increase in the sensitivity coefficients for all customer classes, but in
- 3 particular to the residential class. Can Elenchus comment on the likely reasons for this increase? In
- 4 particular, please comment on the likely impact of fuel switching on DDH sensitivity and the
- 5 pervasiveness of air conditioning on DDC sensitivity. Would it be reasonable to expect such trends to
- 6 continue?

1 **RESPONSE:**

2 Elenchus would agree that there is a trending increase in sensitivity coefficients for all customer classes.

3

4 Elenchus has no empirical support for any particular explanation for the observed increase in sensitivity;
5 however, we would agree that hypothesized reasons appear reasonable.

6

7 **c) QUESTION:**

8 To the extent that the changes are the result of short-term variability rather than general trends, what
9 timeframe would Elenchus suggest to calculate sensitivity coefficients? Is a 10-year timeframe
10 sufficient? Conversely, is a 25-year timeframe too long to capture shorter-term trends?

11

12 **RESPONSE:**

13 Elenchus is of the opinion that a 10 year timeframe, versus a 25 year timeframe, would allow for the
14 incorporation of shorter term variability effects. This can have some undue influence over the future
15 projections. Statistically a longer time's series makes for higher degrees of freedom improving the
16 accuracy of estimates going forward. Thus Elenchus believes using a 25 year timeframe is reasonable in
17 the absence of evidence that there have been structural changes that cannot be captured through the
18 inclusion of appropriate variables in the regression.

1 **REFERENCE: Elenchus report executive summary page (iv).**

2

3 **PREAMBLE:**

4 Elenchus states that "In summary, it is our view that the NFAT process would be enhanced if Manitoba
5 Hydro prepared a more thorough Electric Load Forecast with alternative economic and weather
6 scenarios. A more thorough description of the forecasting methodology with full documentation of
7 processes and any methodological changes, as well as within sample forecast accuracy would also allow
8 for a more thorough assessment of the forecast reasonableness. A description of potential assumptions
9 around the economic factors affecting Top Consumers and a range of scenarios would also allow
10 stakeholders to more appropriately assess the risks around the forecast for that sector. Ideally, in
11 addition to the five scenarios suggested above (and used until 2009 by Manitoba Hydro), scenarios that
12 demonstrate the impact of selected market transformation scenarios, such as grid parity for small scale
13 generation, would impact on future loads."

14

15 **QUESTION:**

16 In light of the observations and recommendations made, please indicate to what extent the current load
17 forecast is appropriate for the NFAT economic analysis and comment on the implications to that analysis
18 given the limitations raised?

19

20 **RESPONSE:**

21 Elenchus believes the current load forecast is overly optimistic of future growth and therefore not
22 appropriate for the NFAT economic analysis. Elenchus has identified passed practices that have been
23 discarded in favour of more simplistic approaches. Lack of transparency in reasons for change is cause
24 for concern.

25

26 The implication is that the financial risks associated with actual future demand falling below the current
27 forecast of demand should be carefully considered. Certainly, there is an opportunity for Manitoba
28 Hydro to address the identified concerns with it current forecasting methodology before committing to
29 a significant investment in the development of Conawapa.

30

31 Most important the risk and financial consequences of grid parity which could depress the value of grid
32 power in both the domestic and export markets should be carefully assessed before committing to
33 major investments that may be unsustainable in a grid parity scenario. Again, this issue could be
34 thoroughly addressed and subjected to careful scrutiny in a future Conawapa NFAT.

1 **REFERENCE: Elenchus report, page 34.**

2

3 **PREAMBLE:**

4

5 **a) QUESTION:**

6 Explain the implications of weather-adjusted load being under forecast pre-2005 and being over forecast
7 post-2005.

8

9 **RESPONSE:**

10 Elenchus identified the trends of over and under estimating load forecasts as being cyclical and
11 pronounced over a long period of time. Twenty year forecasts are a useful tool especially in a capital
12 intensive market that Manitoba Hydro is dealing with. Development of hydro generation and
13 transmission plant necessary for consumer consumption requires years of planning and development in
14 order to have the power available when and where it is needed. Under estimation of need may lead to
15 high cost short term solutions, or shortages. Over estimation of need can potentially result in long term
16 idle plant. Both have potential unnecessary financial impact on ratepayers.

17

18 **b) QUESTION:**

19 Explain how this affects the domestic rates going forward to 2032.

20

21 **RESPONSE:**

22 Reason would suggest that both under and over forecasting would have an increasing effect on
23 domestic rates over time as a result of potential investment decision made assuming inaccurate
24 information.

1 **REFERENCE:** Elenchus report, pp. 37-38.

2

3 **PREAMBLE:**

4

5 **QUESTION:**

6 Please provide an overview of Manitoba Hydro's 2012 load forecast and indicate whether the following
7 are over- or under-estimated for each of 2022 and 2032:

8

9 - Residential

10 - Mass Market

11 - Distribution Losses

12 - Transmission Losses

13 - Total Domestic Load.

14

15 **RESPONSE:**

16 Elenchus cannot perform this request as it requires comparison of actual results.

1 **REFERENCE: Appendix 11.3, p. 271 and 272.**

2

3 **PREAMBLE:**

4

5 **QUESTION:**

6 Please provide your opinion on Manitoba Hydro's projected domestic load out to 2042 and 2062. Are
7 these realistic projections?

8

9 **RESPONSE:**

10 Given the concerns raised by Elenchus in the evidence related to Manitoba Hydro's current load
11 forecasting methodology and the risk of structural changes such as grid parity, Elenchus believe that
12 very little weight should be given to any specific load forecast. Elenchus is of the view that any 30 to 50
13 year forecast of electricity consumption, and especially any forecast of the consumption of grid power,
14 is essentially speculative. Decisions should be based on the acceptability of extreme variances from
15 forecast in consumption recognizing that Manitoba Hydro may have to alter its plans radically in
16 response to changing market conditions.

17

18 See attached table below.

1 **REFERENCE: Elenchus report, page 25.**

2

3 **PREAMBLE:**

4

5 **a) QUESTION:**

6 Please advise whether in your view, Manitoba Hydro's assumption of a 100 GWh/yr PLIL level is realistic.

7

8 **RESPONSE:**

9 As discussed on page 23 of the Elenchus report the assumption of 100 GWh/per year is consistent with
10 the growth trends seen in the last 20 years or so. Elenchus is of the opinion that past growth is not
11 necessarily a good indicator of future growth. The cyclical nature of economics for growth and recession
12 may need to be factored in. This customer group in general is highly capitalized and has a higher
13 potential to invest in the emerging technologies that are expected to result in grid parity. Elenchus
14 proposes that a high-medium-low scenario approach be considered for this customer group.

15

16 **b) QUESTION:**

17 If the answer to a) is no, would a 20-GWh/yr PLIL level be a more realistic projection to 2032 and 2062?

18 If not, what amount would you suggest?

19

20 **RESPONSE:**

21 While 100 GWh/year appears to be potentially too high, 20 GWh/year may be potentially too low in the
22 scheme of things. That is why Elenchus recommends using a high-medium-low scenario approach.

23

24 See also the response to PUB/Elenchus-15.

25

26 **c) QUESTION:**

27 Please confirm that Manitoba Hydro's industry sector load forecasts for 2013/14, 2014/15, and 2015/16
28 do not use a PLIL, but rather define specific industry sector load increases.

29

30 **RESPONSE:**

31 Confirmed. This is shown in Table 16 on page 21 of the 2013 Electric Load Forecast.

1 **REFERENCE: Elenchus report, page 18.**

2

3 **PREAMBLE:**

4

5 **a) QUESTION:**

6 Please quantify the significance/impact on Manitoba Hydro's 20-year Mass Market load forecast of the
7 change from using GDP to using population as the primary driving factor.

8

9 **RESPONSE:**

10 Elenchus is unable to quantify the significance/impact on Manitoba Hydro's 20-year Mass Market load
11 forecast of the change from using GDP to using population as the primary driving factor. Elenchus does
12 not have access to the data required to perform this calculation.

13

14 **b) QUESTION:**

15 Please confirm that Manitoba Hydro does not see Top Consumer load growth as impacting Mass Market
16 load growth. Is that a valid assumption?

17

18 **RESPONSE:**

19 Elenchus is not aware of any way in which the Manitoba Hydro Top Consumer load growth forecast
20 would impact the Mass Market load growth forecast.

1 **REFERENCE: Elenchus report, pp. 30-31; 2013 Load Forecast.**

2

3 **PREAMBLE:**

4 The Elenchus report states that "It is important to test the sensitivity of the load forecast to changes in
5 the economic and demographic assumptions used to derive it, since these assumptions have a greater
6 likelihood of changing the farther away from the present the forecast horizon is."

7

8 It further states that "Manitoba Hydro also indicated that the alternative scenarios involved lower or
9 higher population growth, housing formation rates, economic growth, oil and natural gas price
10 increases, electric space heat saturation rates, business formation rates, business electricity usage,
11 shutdowns/closures of existing large customers and probabilities of large electrical-intensive industries
12 locating in the province."

13

14 At page 44 of the 2013 Load Forecast, Manitoba Hydro provides its probabilistic points to a 99.99%
15 confidence level.

16

17 **a) QUESTION:**

18 Please further explain how reliance on low, medium-low, medium-high, and high-growth scenarios
19 would allow the determination of sensitivities regarding economic and demographic assumptions that
20 cannot be captured by the probabilistic analysis.

21

22 **RESPONSE:**

23 Elenchus believes that consideration for the various scenarios allows for understanding of the
24 quantification of economic impacts on the results and gives a broader scope of results that could drive
25 investment decisions. In particular, Elenchus recommends that the scenarios should be based on
26 specific assumptions related to economic and population growth as well as market factors (e.g., major
27 move to electric vehicles in the transportation market on the high side and grid parity on the low side)
28 as a basis for defining the most extreme scenarios considered.

29

30 **b) QUESTION:**

31 Which of the variables reflected in the alternate scenarios previously used would Elenchus like to
32 isolate? Can they be isolated?

33

34 **RESPONSE:**

35 Elenchus would suggest using the same scenarios as determined in earlier economic outlooks as being
36 reasonable first step for defining the alternate scenarios. However, it is noted that those scenarios were
37 used primarily for setting rates which implies that it was the short run forecasts that were most critical.
38 Given the purpose of the NFAT, which is considering the sustainability of significant capital investments
39 in the long run, the range of scenarios would need to be expanded to take into account the kinds of
40 structural changes noted in the response to PUB/Elenchus-18 a).

1 **REFERENCE: Elenchus Report, page 40.**

2

3 **PREAMBLE:**

4 Manitoba Hydro's development scenarios all assume a linear ± 400 GWh growth in domestic load until
5 2047. After that, Manitoba Hydro assumes zero domestic load growth.

6

7 **a) QUESTION:**

8 Confirm that Manitoba Hydro's PDP and alternative scenarios all assume zero domestic load growth
9 after 2047, with domestic load remaining at a constant 35,330 GWh from 2048 to 2062, and export sales
10 remaining at a constant 5,806 GWh.

11

12 **RESPONSE:**

13 Elenchus would confirm that Appendix 11.3, p. 271 and 272 referenced in PUB/Elenchus 15 does assume
14 zero domestic load growth after 2047, with domestic load remaining at a constant 35,330 GWh from
15 2048 to 2062, and export sales remaining at a constant 5,806 GWh.

16

17 **b) QUESTION:**

18 How would Manitoba Hydro achieve such a situation?

19

20 **RESPONSE:**

21 Elenchus is not able to advise how Manitoba Hydro would achieve such a situation.

22

23 **c) QUESTION:**

24 Did this approach result in higher export revenues for the PDP compared to all other scenarios?

25

26 **RESPONSE:**

27 Elenchus is not in the position to determine if this approach results in higher export revenues for the
28 PDP compared to all other scenarios.

1 **REFERENCE: Elenchus Report, page 14; Manitoba Hydro Brochures (2005-2013); Attached charts.**

2

3 **PREAMBLE:**

4 Manitoba Hydro owns both electric and gas utilities in Manitoba. This may influence customer choices
5 with respect to their source of space heating.

6

7 **a) QUESTION:**

8 Does Elenchus agree with Manitoba Hydro's statement that "the differential in fuel prices does not
9 appear to be the primary factor influencing homebuilders to install electric or natural as heat"?

10

11 **RESPONSE:**

12 Elenchus can neither agree with Manitoba Hydro's statement that "the differential in fuel prices does
13 not appear to be the primary factor influencing homebuilders to install electric or natural as heat."

14

15 It should be noted, however, that in other jurisdictions where the natural gas utilities compete with
16 electric utilities for customers, any cost advantage for natural gas is aggressively exploited to attract
17 customers and expand the natural gas infrastructure. One of the common strategies is to work closely
18 with homebuilders and to promote gas space heating as an attractive feature for new homes. This
19 competition for customers results in consumer benefits. It appears that Manitoba Hydro is less
20 motivated to promote natural gas than the natural gas utilities in other jurisdictions.

21

22 **b) QUESTION:**

23 Confirm that since 2009, prices for natural gas and electricity have diverged substantially, so that in 2013
24 natural gas home heating costs at \$600/yr compare with \$1,200/yr for electric home heating costs. How
25 reasonable is MH's electric heat growth rate assumption in these circumstances.

26

27 **RESPONSE:**

28 As discussed on page 14 of our report Elenchus believes that prices for natural gas and electricity have
29 diverged substantially. Please reference PUB/Elenchus 9 for discussion on switch-away.

30

31 **REFERENCE: Attached charts.**

32

33 **PREAMBLE:**

34 Manitoba Hydro owns both electric and gas utilities in Manitoba. This may influence customer choices
35 with respect to their source of space heating.

36

37 **c) QUESTION:**

38 Is this differential as publicly portrayed by MH's brochures likely to move more customers to natural
39 gas? Is there response lag?

40

41 **RESPONSE:**

42 Elenchus observes that in other jurisdictions the cost advantage of natural gas does not result in
43 significant fuel switching in the absence of marketing campaigns target at infill customers and unserved
44 communities where system expansion is economically feasible. In addition, homebuilders find it cheaper
45 to install electric heating than natural gas; hence, marketing of the benefits of natural gas to both

1 homebuilders and potential home buyers is needed to penetrate the new home market even in areas
2 where natural gas is available.

3

4 **QUESTION:**

5 Is the projected annual space heating cost as visualized in the attached chart consistent with the
6 continuing trend toward electrical heat portrayed in Manitoba Hydro's 2013 Load Forecast?

7

8 **RESPONSE:**

9 It is probably consistent in the absence of effective marketing efforts to encourage the adoption of
10 natural gas for space and water heating.

1 **REFERENCE: Executive Summary Page 1, Lines 11-14 Pages 42 & 43.**

2

3 **PREAMBLE:**

4 One type of uncertainty associated with Manitoba Hydro's forecast over the long run is the possibility of
5 significant unanticipated changes in the demographic and/or economic trends that are currently
6 expected based on historical trends. This type of risk is addressed by Manitoba Hydro using sensitivity
7 analysis.

8

9 **a) QUESTION:**

10 Please elaborate and explain the sensitivity analysis undertaken by Manitoba Hydro which addresses
11 unanticipated changes in demographic or economic trends on the load forecast. Reconcile with
12 Elenchus' concluding comments on page 42, Line 27, which state that the analysis undertaken by
13 Manitoba Hydro in the NFAT does not test these assumptions.

14

15 **RESPONSE:**

16 To clarify, the point being made by Elenchus is that "This type of risk is addressed by Manitoba Hydro
17 using [its generic] sensitivity analysis." These risks are not specifically quantified in determining the
18 range of sensitivities to consider. Hence, the assumptions are not explicitly tested, although it is
19 assumed that Manitoba Hydro's sensitivity analysis is intended to implicitly accommodate all risk
20 factors. As noted elsewhere, Elenchus does not consider the sensitivity analysis to be an appropriate
21 approach to testing these assumptions.

22

23 **b) QUESTION:**

24 Please file a copy of the referenced sensitivity analysis.

25

26 **RESPONSE:**

27 Elenchus was referring to the sensitivity analysis provided by Manitoba Hydro's "quilt".

28

29 **c) QUESTION:**

30 Please provide a summary table detailing each of the specific concerns with the current load forecast
31 methodology and indicate directionally the impact on the load forecast used in the NFAT analysis. Please
32 indicate whether any of the further analysis should be undertaken before proceeding with development
33 plans.

34

35 **RESPONSE:**

36 See Table below.

Elenchus Suggestion	Impact on Load Forecast	Need for further analysis
1. Alternative economic and population scenarios	MH is using a simplistic residential growth model as the main driver for both residential and GS Mass Market projections. This is of concern as it has the potential to overstate sector growth.	Updating the residential survey would assist in addressing this concern.
2. Financial risk related to potential market transformation	Elenchus believes that some high level consideration should be addressed in the forecast document identifying the potential of upside and downside risks. Grid parity, impact of political interference (i.e. carbon pricing, the economics of natural gas heating), economic recession cycles, natural resource exploration activity, etc.	Should be addressed on high level.
3. Additional transparency about choice of models and model accuracy	Elenchus has noted that pre-2008 models and methods have been summarily dismissed without transparency and therefore should be discussed in the report for clarity.	Not a burning issue.
4. Updated Residential Survey	As this is the major driver for overall growth and the survey is relied both Residential and GS Mass Market, Elenchus is of the opinion that the current survey is outdated and open to contest.	More than anything else this should be completed.
5. Alternate model for projecting Residential customers	Given the weight this result carries to the final forecast this should be reviewed.	Goes in line with completing the residential survey.
6. Alternative model for GS Mass Market forecast	Elenchus believes that reliance on residential growth to project the growth in this sector appears reasonable but may over project growth potential.	As this group is of good size a complementary survey could be completed at the same time.
7. Alternative economic growth scenarios for Top consumers.	Elenchus believes 100 GWh/year as a growth value is too simplistic for this large use group.	Not a burning issue.
8. Longer time series to estimate weather sensitivity	Statistically two years does not allow for reliable results. Elenchus suggests that a longer time period would temper some volatility in the results.	Not a burning issue.

1 **REFERENCE: Elenchus Report Page 42.**

2

3 **PREAMBLE:**

4 Elenchus states that "In summary, it is our view that the NFAT process would be enhanced if Manitoba
5 Hydro prepared a more thorough Electric Load Forecast with alternative economic and weather
6 scenarios. A more thorough description of the forecasting methodology with full documentation of
7 processes and any methodological changes, as well as within sample forecast accuracy would also allow
8 for a more thorough assessment of the forecast reasonableness. A description of potential assumptions
9 around the economic factors affecting Top Consumers and a range of scenarios would also allow
10 stakeholders to more appropriately assess the risks around the forecast for that sector. Ideally, in
11 addition to the five scenarios suggested above (and used until 2009 by Manitoba Hydro), scenarios that
12 demonstrate the impact of selected market transformation scenarios, such as grid parity for small scale
13 generation, would impact on future loads."

14

15 **QUESTION:**

16 Please indicate to what extent the limitations indicated would have an impact on the 78 year Net
17 Present Value Analysis.

18

19 **RESPONSE:**

20 Commenting on the quantitative impact on the Net Present Value Analysis is beyond the scope of our
21 engagement. At a non-quantitative level, Elenchus would note that to the extent that the net revenue
22 earned on incremental exports is above, equal to, or below the domestic revenue for that power, any
23 negative variances in the forecast (i.e., actual below forecast hence increased exports) will result in
24 higher, equal, or below projected NPVs, all else being equal. Conversely, to the extent that the net
25 revenue earned on incremental exports is above, equal to, or below the domestic revenue for that
26 power, any positive variances in the forecast (i.e., actual above forecast hence reduced exports) will
27 result in lower, equal, or higher than projected NPVs, all else being equal.

1 **REFERENCE: Elenchus Report Page 42.**

2

3 **PREAMBLE:**

4 Elenchus states that "Grid parity implies that it is only a matter of time until grid power will face price
5 competition. Once built, high-capital-cost, low-operating-cost technologies such as large-scale hydro
6 generation which the associated extensive transmission and distribution networks may always be able
7 to under-price the alternatives, but that ability to compete does not ensure full recovery of sunk costs.
8 The implication is that if forecast demand can only be realized by setting a price below fully embedded
9 cost, Manitoba Hydro may not be able to recover all of the sunken capital costs associated with major
10 projects such as Keeyask and Conawapa. It is our view therefore that it would be prudent to take into
11 account the ability of Manitoba Hydro and/or the Province to absorb any resulting cost recovery
12 shortfall in assessing the prudence of the Preferred Plan."
13

13

14 **a) QUESTION:**

15 Please explain the ramifications to MH and to its ratepayers under grid parity in the domestic and export
16 markets and comment on the certainty of such an outcome over the time frames used in the economic
17 and financial analysis.
18

18

19 **RESPONSE:**

20 Elenchus believes that there is a strong potential for grid parity to be realized globally in the next
21 decade. Technology advances are discussed openly over the internet allowing consumers to keep
22 knowledgeable of approaching opportunities. We have been witness to how new technology enters our
23 markets. One case-in-point is flat screen television sets. When introduced it was hugely expensive and a
24 rarity to own, today they are in most homes and retailers are practically giving them away.
25

25

26 The nearest example we have for electricity might be telecommunications. With the introduction of
27 competition options and deregulated the telecom wires business was undermined. The CRTC
28 approved the accelerated write-off of copper to reflect the comparatively short economics of existing
29 copper as compared to its physical life.
30

30

31 Globally electricity generation and distribution is gaining consumer attention. Rising fuels costs,
32 decaying infrastructure, demand for green energy solutions, carbon emission abatement laws; etc. are
33 adding to the consumer price at the same time as global price competition is leading to declines in the
34 cost of off-grid solutions. Like telecommunications, the day can be envisioned when the capital
35 investment in grid generation, transmission and distribution infrastructure may have to be recovered
36 through accelerated depreciation (higher rates), if feasible, or through write-offs if higher rates are not
37 feasible. The potential risk for both the remaining captive domestic customers (as long as they are
38 captive) and for taxpayers who guarantee the debt of Manitoba Hydro merits consideration before
39 committing capital that is economic only if its economic life is comparable to its physical life.
40

40

41 **b) QUESTION:**

42 Please explain how MH should incorporate in its NFAT analysis the ability of Manitoba Hydro/ and or the
43 Province to absorb a cost recovery shortfall and indicate whether such information is required in the
44 Economic and Financial Analysis to make recommendations on the preferred development plan.

- 1 **RESPONSE:**
2 Elenchus recommends a scenario based load forecast that explicitly recognizes the extremes of potential
3 structural changes in the electricity market, including grid parity. Presumably, if this recommendation,
4 which is within the scope of Elenchus' mandate were adopted, it could be complemented with
5 consistent assumptions about export prices and any other factors that would be impacted by the
6 changes considered in the scenarios. For example, grid parity would affect the value of grid power in
7 export markets since the marginal cost of grid generation could be expected to be dramatically lower in
8 a scenario with significant continental oversupply. While Manitoba Hydro, with the benefit of low
9 marginal cost hydro generation would almost certainly be able to export its surplus at the prevailing
10 market price, that price could be significantly below the price required for full cost recovery.

1 **REFERENCE: Elenchus Report Page 43, recommendation 2.**

2

3 **PREAMBLE:**

4 On page 41 Elenchus states "Given the time frame of the NFAT analysis, it is our view that it is more
5 reasonable to anticipate that there will be significant structural changes that could result in dramatically
6 different domestic demand (and presumably export prices) in the coming decades."

7

8 **a) QUESTION:**

9 Please elaborate on how the financial risks related to market transformation should be incorporated in
10 the economic and financial analysis and whether it could materially impact the results of the 78 year
11 NPV analysis and 50 year financial analysis.

12

13 **RESPONSE:**

14 Please see the response to PUB /Elenchus 24.

15

16 **b) QUESTION:**

17 Please comment on the appropriateness of using a 35 year linear projection of load growth in the
18 economic (78 years) and financial (50 years) analysis.

19

20 **RESPONSE:**

21 Elenchus is of the opinion that using a 35 year linear projection of load growth in the economic (78
22 years) and financial (50 years) analysis is reasonably appropriate as a base case. It is the only forecast
23 that is not dependent on assumptions about major structural changes that are inherently unpredictable
24 (e.g., technological evolution).

25

26 It is not appropriate to ignore the potential risks since they can be assessed through scenario analysis
27 that explicitly quantifies hypothetical scenarios such as a wholesale conversion to electric vehicles on
28 the one hand and grid parity on the other.

1 **REFERENCE: Elenchus Report Page 41, Line 1.**

2

3 **PREAMBLE:**

4 Elenchus states that the load forecasting methodology is reasonable assuming there are no significant
5 structural changes to the demand drivers that underpin the forecasting methodology. However, given
6 the time frame of the NFAT analysis, it can be expected that there may be significant structural changes
7 that could result in dramatically different domestic demand in the coming decades.

8

9 **QUESTION:**

10 In light of your observations on the load forecasting methodology not incorporating recognition of
11 future structural market change, is the current load forecast information used in the NFAT analysis
12 reasonable for the purposes of evaluating the economic and financial implication of the 15 Plans.
13 Please explain.

14

15 **RESPONSE:**

16 In light of our observations on the load forecasting methodology not incorporating recognition of future
17 structural market change, Elenchus has stated that the current load forecast information used in the
18 NFAT analysis is reasonable for the purposes of base case scenario for evaluating the economic and
19 financial implication of the 15 Plans, subject to the specific identified concerns with the current load
20 forecasting methodology. In particular, Elenchus has a strong concern with use of the 2009 Residential
21 Survey and would recommend that it be updated as it is a major driver for load growth in the residential
22 and GS Mass Market projections. Elenchus emphasises that the change in natural gas costs may have
23 influenced space heating fuel choice over time since 2009 there may be undue reliance on the
24 projection of electric heat customers.

25

26 For purposes of the NFAT, recognition of potential future structural changes in the market can best be
27 addressed by developing alternate load forecast scenarios that are based on those potential structural
28 changes.

1 **REFERENCE:** Elenchus report, page 6, page 14.

2

3 **PREAMBLE:**

4 Elenchus recommends that Manitoba Hydro consider the incorporation of DSM into Integrated Resource
5 Planning (IRP).

6

7 **QUESTION:**

8 Is Elenchus aware whether any other Canadian utilities are currently considering DSM to be part of their
9 Integrated Resource Plans?

10

11 **RESPONSE:**

12 Elenchus is aware that two Canadian utilities are conducting IRPs; BC Hydro, and Nova Scotia Power Inc.
13 (NS Power). Elenchus makes a distinction between DSM and IRP as ways to incorporate energy efficiency
14 into system plans. DSM programs, such as those of MH, aim to deliver certain amounts of “savings”
15 which may then be used to defer supply. IRP is a process of evaluating energy efficiency and supply on
16 the same basis with the choice of the future mix of supply and energy efficiency measures determined
17 by least cost, as defined by the applicable legislation (i.e. the extent to which non-monetary costs are
18 included). Elenchus’ understanding is that BC Hydro’s IRP is an IRP of this kind. The Terms of Reference
19 are not yet available for NS Power.

1 **REFERENCE: Elenchus report, page 18.**

2

3 **PREAMBLE:**

4 Elenchus finds no meaningful correlation between DSM savings and electricity prices.

5

6 **QUESTION:**

7 If possible, please reconcile this situation with Elenchus' comments on the effects of possible future grid
8 parity in its Load Forecasting report. Why would grid parity of self-generation result in decreased
9 demand, but the equivalent of grid parity for DSM (i.e., increased cost-effectiveness compared to grid
10 power) not yield a similar result?

11

12 **RESPONSE:**

13 This statement is in the specific context of evaluating the argument of the expert witness for the
14 Consumers' Association of Canada (CAC) ("Dunsky") that as MH's rates increase there will be more
15 uptake of DSM. As a general proposition Elenchus has no argument against the concept that DSM
16 savings should increase as the price of electricity increases. This is straightforward economics. DSM is a
17 substitute for electricity consumption and the demand for substitutes usually increases when relative
18 prices change to favour the substitute. However, the empirical observation of such effects is not so
19 straightforward. There are invariably other factors that change along with relative prices; i.e., broadly,
20 tastes, technology and income. Both Dunsky's own evidence and Elenchus' extension of that evidence
21 suggest that, notwithstanding the theoretical likelihood of a positive correlation of DSM savings and
22 electricity process, this effect is not observed empirically.

23

24 This is important because the main point Elenchus makes is that not only are the uncertainties
25 associated with how much future capacity needs may be reduced by DSM but also the range of the
26 uncertainty is not well understood. The size as well as the direction of the induced change in load is
27 crucial for system planning purposes.

28

29 The comparison with self-generation is also directly relevant to Elenchus' argument. As DSM measures
30 reach parity with grid prices they may be expected to appeal more to consumers but the extent to which
31 price effects will influence behaviour, in addition to non-price activities, is the key issue. Elenchus argues
32 for explicit modelling of these uncertainties. In order to calculate the impacts of self-generation on
33 needed grid capacity, estimates would be needed of the probable output levels of the self-generation.
34 This would be based on actual experience not nameplate capacity ratings and assumptions. DSM should
35 be treated in the same way.

1 **REFERENCE: Elenchus report, page 18.**

2

3 **PREAMBLE:**

4 Elenchus concludes that "the incorporation of explicit sensitivity analysis of how much dependable DSM
5 may be assumed is of value." In Table 6 of its report, Elenchus illustrates DSM savings with known
6 capacity as compared to DSM savings with known energy.

7

8 **a) QUESTION:**

9 Which current Manitoba Hydro DSM programs, if any, would Elenchus consider to result in dependable
10 DSM?

11

12 **RESPONSE:**

13 Elenchus' point is about the statistical nature of DSM savings estimates; no individual program is more
14 or less dependable than any other from the point of view of ensuring enough system capacity to meet
15 future loads. It is the ensemble of all programs that determines the appropriate amount of capacity
16 deferrals. The contribution of each individual program has an uncertainty range; the range includes
17 positive and negative values (i.e. DSM savings could be more or less than the point estimate for each
18 measure included in MH's projections based on its Power Smart Plan). While averaged over all
19 measures, it may be expected that the total contribution of all DSM programs will be the sum of all of
20 the point estimates. This is not appropriate for system planning. There is an asymmetry between over-
21 achievement and under-achievement. Capacity not built on the expectation of DSM savings cannot be
22 used. It is therefore important to have a good understanding of the degree of uncertainty of all
23 programs on the downside.

24

25 **b) QUESTION:**

26 In Elenchus' view, what, if any, are the limitations of the ENERNOC DSM potential study if no distinction
27 is drawn between dependable and non-dependable DSM? How does this affect Elenchus'
28 recommendation to use DSM in an IRP context?

29

30 **RESPONSE:**

31 See also the previous answer. If all DSM programs are assumed to be 100% dependable, the limitations
32 of the ENERNOC study are: (1) there is a range of uncertainty associated with the tertiary energy
33 consumption values estimated by ENERNOC that stems from the unobservable nature of DSM savings
34 and ENERNOC does not provide an estimate of this range (collectively these values represent technical
35 potential); and (2) there is likewise a range of uncertainty associated with estimates of market and
36 actual potential that arises from the extremely large set of factors that affect these values. Taken
37 together, they result in an uncertainty in the DSM savings estimates that is not explicit.

38

39 IRP differs fundamentally from DSM. DSM puts MH in the position of selling both electricity and its
40 substitute – DSM. IRP treats DSM as another source of supply and evaluates DSM measures on the same
41 basis as supply. There is, therefore, no equivalent in IRP to estimating market potential: comparisons are
42 made on the basis of least cost to the utility. For greater clarity, assessments of market potential assume
43 that consumers behave like system planners in choosing among the energy efficiency implications of
44 their purchases; i.e. they choose the least-cost energy option. Unlike system planners, consumers in
45 general do not have accurate assessments of such costs and their purchases (of such items as
46 dishwashers, TVs etc.) are subject to other considerations, which economists generally refer to as

1 `tastes`, e.g. the visual appeal of the dishwasher. There remains the problem of uncertain technical
2 potential. Elenchus recommends that this be addressed in a manner analogous to intermittent
3 generation and by carrying out retrospective studies that would provide more accurate estimates of
4 tertiary electricity use by end-use category.

5

6 **c) QUESTION:**

7 Can Elenchus offer any examples in which DSM was backstopped by a capacity resource, e.g., an SCCT
8 facility, to allow DSM to be used in an IRP?

9

10 **RESPONSE:**

11 Elenchus knows of no examples.

1 **REFERENCE: Elenchus report, page 30.**

2

3 **PREAMBLE:**

4 One of the advantages of Keeyask and Conawapa compared to fossil fuel generation is avoided CO2
5 emissions.

6

7 **a) QUESTION:**

8 Please explain your reasoning as to why Elenchus suggests that the PUB should consider making it a
9 precondition for setting a Conawapa in-service date, but not Keeyask, to prepare a comprehensive
10 ecological footprint analysis with respect to all options?

11

12 **RESPONSE:**

13 Elenchus' understanding is that there is no leeway to defer the Keeyask decision but there is for
14 Conawapa. For Conawapa, there appears to be time to fill the gap in the current analysis with regard to
15 an assessment of the life-cycle environmental impacts of MH's Power Smart plan on a commensurable
16 basis as the assessment of Conawapa (and other supply alternatives). This could be conducted as a case
17 before the Manitoba Clean Environment Commission (CEC). Alternatively, MH may have the time to
18 prepare a full IRP in advance of seeking approval for a firm Conawapa ISD before the PUB. In either case,
19 a full and commensurable assessment of all alternatives is the only way to evaluate all alternatives on an
20 equal basis. EF is only one way to do this; other equivalent methods are also appropriate.

21

22 **b) QUESTION:**

23 Does Elenchus' recommendation change based on the fact that each of the two projects must be subject
24 to an environmental assessment prior to obtaining approval, with Keeyask currently undergoing the EA
25 process before the Clean Environment Commission?

26

27 **RESPONSE:**

28 Elenchus does not recommend an EF analysis of Keeyask. However, Elenchus has reviewed the Keeyask
29 Impact Statement and notes that there is no consideration of the life-cycle environmental impacts of
30 MH's Power Smart plan. If the CEC's Terms of Reference for Conawapa were to include an assessment of
31 the life-cycle environmental impacts of MH's Power Smart plan as well as of the Conawapa project, then
32 this would be consistent with Elenchus' suggestion.

33

34 **c) QUESTION:**

35

36 Does Elenchus accept that a decision to proceed with both Keeyask and Conawapa, as per the preferred
37 development plan, would likely be made prior to the above footprint analysis?

38

39 **RESPONSE:**

40 Elenchus does not recommend an EF analysis of Keeyask. With regard to Conawapa, Elenchus'
41 suggestion stands.

1 **REFERENCE: Elenchus report, page 2.**

2

3 **PREAMBLE:**

4 Footnote 4 states that "While this report does not purport to be a thoroughgoing analysis and critique of
5 DSM EM &V reference is made to this literature. However, no protocols or methodological guidelines
6 can change the central theoretical issue, which is that DSM savings estimates are in principle not
7 falsifiable. It is important to understand the logical consequences of this shortcoming and we also
8 provide some empirical heuristics for dealing with the irreducible uncertainties of DSM in the context of
9 system requirements for very high reliability of supply down to a few seconds (i.e. Automated
10 Generation Control (AGC))."

11

12 **QUESTION:**

13 Please elaborate on the conclusions in Footnote 4 for greater clarity.

14

15 **RESPONSE:**

16 The central flaw of DSM is that savings are unobservable **in principle**. We cannot observe the load that
17 would have happened, only the load that did occur. Instead, EM&V protocols have been established to
18 estimate savings against an assumed "baseline". I.e., what is unobservable is converted into a pseudo-
19 observable by assumption. There are two elements to the baseline: the tertiary energy consumption of
20 the electrical device or process, or devices or processes; and, behavioural assumptions about the use of
21 the device, devices, process or processes, including consumer reactions to market prices and competing
22 technologies. Without independent estimates of tertiary usage and of the relationship of behaviour and
23 the use of devices and processes (i.e. independent of the estimates used by MH) it is not possible to test
24 the assumption that the baseline is a reasonable proxy for the unobserved consumption that did not
25 occur. Given this uncertainty and the need of electricity systems for the exact balance of load and
26 generation at all times, Elenchus suggests a heuristic of assigning probabilities to different levels of
27 actual realisable DSM at future time in a manner equivalent to the way system operators have learned
28 in recent years to treat intermittent generation.

1 **REFERENCE: Elenchus report, page 4.**

2

3 **PREAMBLE:**

4 Some of the difficulties of integrating DSM in IRP are pointed out and the opinion given that, based only
5 on early work on dependability of renewables integration, it may be possible to adequately incorporate
6 DSM in IRP.

7

8 **QUESTION:**

9 What is the rationale for recommending the adoption of IRP with DSM dependability with respect to
10 Conawapa, as opposed to the generic adoption as of right now?

11

12 **RESPONSE:**

13 Elenchus is of the view that MH should move to IRP “right now” and understands from MH staff that it is
14 the intention to move back to IRP. The suggestion to institute IRP in advance of a commitment to an ISD
15 for Conawapa is based on an understanding that the determination of the ISD for Conawapa is not
16 imminent and still a matter for discussion.

1 **REFERENCE: Elenchus report, page 10.**

2

3 **PREAMBLE:**

4 Elenchus states that "The decisive consideration in this regard is the question as to whether or not
5 Keeyask or Conawapa should be deferred on the basis of assumed capacity reductions from this
6 program. Elenchus' understanding is that such a deferral would run counter to the intent of the program
7 which is to obtain greater value from the additional capacity represented by Keeyask and Conawapa by
8 making energy available for export during times of low water levels. This value presumes the existence
9 of generating capacity. True DSM presumes the opposite; that deferred capacity adds value to MH (since
10 the resulting total resource cost to MH's consumers is less)."

11

12 **QUESTION:**

13 Please explain the fundamental economic difference between load reduction incentives that defer the
14 need for new supply capacity and those that extend the time existing capacity is adequate to meet
15 needs when in both cases the incentive is based on the export price of electric energy as part of the
16 marginal cost.

17

18 **RESPONSE:**

19 The context for this statement is a discussion of the Curtailable Rates (CR) program, not as a general
20 economic proposition, fundamental or otherwise. If solely as a result of the CR program Keeyask were
21 deferred for a year, then for a year MH could not use Keeyask to generate export revenues. Since the CR
22 program is designed to increase export revenues this would run counter to the intent of that program.
23 The "load reduction" incentive in the CR program is a lower cost to the consumer, not the export price.
24 MH has an incentive to offer the CR program because it can reduce overall costs to its domestic
25 consumers by earning more in extra export revenues than it expects to give up in reduced revenues
26 from participating CR customers.

1 **REFERENCE:** Elenchus report, page 15.

2

3 **PREAMBLE:**

4 Elenchus states that "Where the relevant data is kept by a government department or agency (e.g.
5 housing stock characteristics) MH would not likely confront data confidentiality issues that may apply to
6 private companies."

7

8 **QUESTION:**

9 What is the basis for stating that MH would have less difficulty with accessing government data
10 protected by privacy laws than would a private company?

11

12 **RESPONSE:**

13 This is best answered by a specific example. In the 1980s an Elenchus Associate was a principal
14 investigator in an Ontario Ministry of Energy study of natural gas consumption in Toronto homes. In
15 order to carry out the study, street address data on natural gas consumption was obtained from
16 Consumers Gas (now Enbridge) and on housing characteristics from the City of Toronto. While this was
17 prior to the current privacy regime in Ontario, privacy was respected because the identity of the
18 occupants of the street addresses was unknown to the investigators. The City of Toronto provided the
19 necessary data on the direction of the Ministry of Municipal Affairs and Housing. Perhaps the City would
20 have provided the data to a private company; we cannot know. If this scenario is not a likely one for
21 present-day Manitoba then this would not be an advantage of having MH carry out a similar study.
22 Neither would it represent a disadvantage.

1 **REFERENCE: Elenchus report, page 17.**

2

3 **PREAMBLE:**

4 Elenchus states that, "As an illustration of this economic controversy, consider Canada. Between 1999
5 and 2012 the average annual decline in the real electricity intensity (kWh per \$GDP) of the Canadian
6 economy was 1.4%.The average increase in energy efficiency savings, in terms of avoided capacity, for
7 DSM participants for the period 2002 to 2012 estimated by MH is 9.8%. If Manitoba DSM capacity
8 reductions had occurred at the average Canadian rate of decrease in electricity use intensity the
9 contribution of DSM would be about 30MW by 2012 (not including the Curtailable Rates program). If
10 this amount increased at the annual average DSM savings rate of 1.8% projected by MH to 2028 (from
11 2012) there would be a 300MW less DSM capacity reduction (i.e. 300MW would have to be made up by
12 supply) in 2028."

13

14 **QUESTION:**

15 Please clarify whether this discussion is intended to indicate the difference between alternative
16 approaches to estimating DSM potential or that in MH's application over-estimates DSM potential by
17 300 MW in 2028.

18

19 **RESPONSE:**

20 The discussion is intended to indicate the former.

1 **REFERENCE: Elenchus report, pages 20-21.**

2

3 **PREAMBLE:**

4 Elenchus states that "In the forecast period (from 2013) the DSM LF is less than the system LF by an
5 average of 16%. This is an indication that DSM estimates are not fully consistent with projected load.

6 The difference 11 between system and DSM load factors leads to an ambiguity; we may either assume
7 that the capacity reduction is accurate or that the energy reduction is accurate."

8

9 **a) QUESTION:**

10 Could the lower LF for DSM compared to system be due to some DSM programs that time-shift load
11 (and therefore might be more consistent with load forecast and not result from different LF of
12 participating and non-participating customers)?

13

14 **RESPONSE:**

15 Yes, the lower LF for DSM must, in fact, be due to the aggregate DSM programs time-shifting more load
16 to peak hours. This is somewhat counterintuitive in and of itself. As a general rule, DSM programs in
17 aggregate seek to shift load from peak to off-peak hours, as well as reduce consumption in some cases.

18 Elenchus puts forward the LF comparison as a diagnostic indicator that the bottom-up DSM savings
19 forecasts do not mesh coherently with the top-down stress testing carried out by MH. This does not
20 purport to be a quantitative method but points to the possibility that there are internal inconsistencies
21 in the DSM savings forecasts. This is why Elenchus conducted a different stress test which explores the
22 possibility that all of the error in estimating DSM savings derives from an error in capacity, i.e. that the
23 savings occur more off-peak than on-peak leading to smaller dependable capacity deferrals.

24

25 **b) QUESTION:**

26 Is the effect of the Load Curtailment (*sic*) and Surplus Energy (SE) programs included in the calculation of
27 system LF (to which the DSM LF is being compared)?

28

29 **RESPONSE:**

30 Elenchus' understanding is that MH includes the Curtailable Rates in its projections for DSM savings, but
31 the SE is not. Elenchus' stress-testing includes neither.

1 **REFERENCE: Elenchus report, page 16, page 32.**

2

3 **PREAMBLE:**

4 Elenchus states that "In systems that have significant levels of intermittent generating capacity (which is
5 not the case for MH), operators may make provision for backing up such generation. In Elenchus' view
6 this would be a prudent practice with regard to DSM resources.

7 The overall coherence and robustness of MH's Resource Plan may be improved by a return to IRP.

8 Elenchus further suggests that an IRP approach to which is added an explicit recognition of the statistical
9 nature of expected DSM contributions would be an optimal way of addressing the uncertainties of DSM.

10 The main way in which this recognition may be incorporated into planning is by the treatment of DSM as
11 akin to dispatchable intermittent generation.

12

13 **QUESTION:**

14 Please indicate any known studies or analysis showing that DSM intermittency is similar in character
15 (predictability, correlation to daily load curve, ramping rate etc.) to the intermittency of wind or solar
16 generators.

17

18 **RESPONSE:**

19 The point is not that DSM is intermittent but that its results follow a statistical distribution like
20 intermittent generation. Elenchus is not aware of any studies of DSM intermittency.

1 **REFERENCE: Elenchus report, page 30.**

2

3 **PREAMBLE:**

4 Elenchus states that "Elenchus suggests that PUB consider making it a precondition for the future
5 assessment of the ISD for Conawapa that a comprehensive ecological footprint analysis be carried out
6 for all options."

7

8 **QUESTION:**

9 The recommendation to use a comprehensive analysis of environmental footprint of all alternatives
10 (before approving an ISD for Conawapa) appears not to be supported by the reasoning given, which
11 deals only with the value of including the CO2 impacts of DSM in future plans. Please provide the
12 evidence to support the recommendation.

13

14 **RESPONSE:**

15 Elenchus is suggesting that the ecological footprint concept, advanced in the SOW for CO2 emissions be
16 extended to other environmental issues. This is a logical extension of the SOW issue applied to the
17 existing evidence. Specifically, the inclusion in the SOW of a question on ecological footprint suggests
18 that there is some interest in the EF. Given this interest, Elenchus infers that an extension to
19 environmental impacts (EI) other the CO2 emissions may be of interest. Further, Elenchus points out a
20 gap in the current filed evidence with regard to an equal comparison of DSM options and the supply
21 options. The DSM programs are not evaluated at all for their adverse environmental impacts. If this gap
22 were to be addressed, it may be worthwhile to conduct the analysis in terms of the EF. Relative to other
23 EI methodologies EF has two advantages: it includes lifecycle impacts; and, the use of a common metric
24 for all impacts (area of land) makes the results more comprehensible than methodologies that use
25 different metrics for different impacts (such as the multiple accounts approach used by MH). EF's main
26 drawback is the large number of assumptions that are required. See also MH/Elenchus 6d.