

**RCM/TREE/MH II-1**

**Subject: Marginal Cost**

**Reference: *MH's Draft of Application for Approval of Energy Intensive Industrial Rate, Tab 1***

- a) Please provide the derivation of the \$57.5 per MW.h average price for energy sold under “dependable contracts” in fiscal 2008/09 and 2009/10, including all sources, assumptions, calculations, workpapers and spreadsheets (with formulas intact) relied upon.

**ANSWER:**

The data below represents actual Dependable sales data for each fiscal year

	<b>MWh</b>	<b>Revenue (CAD \$)</b>	<b>Average Price</b>
<b>2008/09</b>	4,087,091	233,468,426	57.12
<b>2009/10</b>	3,262,977	185,966,514	56.99

**RCM/TREE/MH II-1**

**Subject: Marginal Cost**

**Reference: MH's Draft of Application for Approval of Energy Intensive Industrial Rate, Tab 1**

**b) Please provide the price data used in the derivation of the \$57.5 per MW.h average price.**

**ANSWER:**

The volumes and revenues used for 2009/10 are forecast amounts since Dec 1, 2009, actual realized sales data was used prior to that.

	<b>MWh</b>	<b>Revenue (CAD \$)</b>	<b>Average Price</b>
<b>2008/09</b>	4,087,091	233,468,426	
<b>2009/10</b>			
<b>Actual up to</b>			
<b>Nov 2009</b>	2,386,963	134,116,126	
<b>2009/10</b>			
<b>Forecast Data</b>			
<b>for Dec/09 to</b>			
<b>Mar/10</b>	875,000	55,254,000	
<b>TOTAL</b>	7,349,054	422,838,552	57.50

**RCM/TREE/MH II-1**

**Subject: Marginal Cost**

**Reference: *MH's Draft of Application for Approval of Energy Intensive Industrial Rate, Tab 1***

- c) **Please indicate whether the average price for “dependable contracts” includes**
- i. all sales or only firm sales;**
  - ii. short-term firm sales as well as long-term firm sales;**
  - iii. sales in all hours or sales only during the on-peak period.**

**ANSWER:**

Dependable Contracts include only the Long Term Firm sales including energy sold in both on peak and off peak hours. However, given the terms of the long term contracts, the vast majority of energy sold was in the on peak hours.

**RCM/TREE/MH II-2**

**Subject: Marginal Cost**

- a) **Please provide a current estimate of the cost per MW.h (in 2010 dollars) for power supply from**
- i. the Wuskwatim project,**
  - ii. Keeyask, and**
  - iii. Conawapa**
  - iv. Please provide the derivation of these costs (capital costs, carrying charges, O&M, capacity factor, etc.), including spreadsheets (with formulas intact), and specify whether these costs are in nominal or real dollars (and if in real terms, the year used).**

**ANSWER:**

Manitoba Hydro's estimate of the unit costs of energy from individual plants is commercially sensitive information.

Please see the responses to CAC/MSOS/MH I-40(b) and CAC/MSOS/MH I-41(c). Manitoba Hydro has not made a commitment at this time to develop Keeyask or Conawapa. These projects will be subject to a full examination when the "need for and alternatives to" process is initiated.

**RCM/TREE/MH II-2**

**Subject: Marginal Cost**

- b) **Please indicate whether MH believes that Bipole III is required to meet load growth.**
- i. **If so, please provide MH's estimate of the MW by which forecast annual load for each year exceeds the load that can be served without Bipole III.**

**ANSWER:**

Bipole III is required for system reliability purposes as soon as possible as stated in the response to PUB/MH II 63(a).

In the absence of new export sales, new generation is estimated to be required by 2022 under the assumptions of the 2009/10 power resource plan. Bipole III is expected to reduce system transmission losses by 89 MW and 243 GW.h (under dependable generation levels) but this is expected to have minimal effect on being able to meet forecast loads. Without this reduction in losses, new resources would be required by 2021.

**RCM/TREE/MH II-2**

**Subject: Marginal Cost**

- c) **Please indicate whether MH believes that the Pointe du Bois G.S. replacement is required to meet load growth.**
- i. **If not, provide the rationale for the Pointe du Bois G.S. replacement.**
  - ii. **If so, provide the cost of the plant per MW.h (in 2010 dollars) and the derivation of that estimate.**

**ANSWER:**

Please see Manitoba Hydro's response to CAC/MSOS/MH I-42(a) for information on Manitoba Hydro's plan for Pointe du Bois. The primary driver for modernization of Pointe du Bois is to meet Canadian Dam Association guidelines related to spillway capacity. The existing powerhouse can continue to operate, and the decision to rebuild, renew or decommission it is being deferred to a later period.

**RCM/TREE/MH II-2**

**Subject: Marginal Cost**

- d) **Please indicate whether MH still believes that “it may be required to build a combined cycle natural gas fired plant...to meet projected energy deficits that could arise as early as 2017, ahead of Keeyask and Conawapa coming on stream.” (Order No. 116/08, p. 145).**
- i. **If so, provide MH’s estimate of the cost of such a plant, in 2010\$/kW and in 2010\$/MW.h generated.**

**ANSWER:**

A combined cycle natural gas fired plant remains as a contingency option to provide energy should load grow faster than forecast or if other resources cannot be put in-service as soon as required.

The capital cost of a combined cycle plant used for study purposes is \$1,340/kW (2010 dollars), including generating station and transmission station costs.

Combined cycle plants are usually operated at capacity factors between 48% and 65%. The levelized costs, including generating station and transmission station capital costs, capital taxes, operating and maintenance, and fuel costs for this range of capacity factors are from \$69 to \$78/MW.h corresponding to a natural gas price of \$7/MMbtu in Canadian dollars.

Other options that would be considered as contingency resources would include increased wind power purchases, increased imports, and deferral of Brandon Unit 5 retirement.

**RCM/TREE/MH II-2**

**Subject: Marginal Cost**

- e) **Please provide MH's estimates of marginal line losses on the transmission system, from generation to 30 kV, by load level or time of day.**

**ANSWER:**

Line losses are included as part of the Manitoba Load Forecast. Estimates of line losses are based on the difference in energy generated and the metered energy at various distribution points. Manitoba Hydro does not estimate real-time line losses as a function of line loading or time of day.



**RCM/TREE/MH II-2**

**Subject: Marginal Cost**

- f) **Please provide MH's estimates of marginal line losses on the primary and secondary distribution system, by load level or time of day.**

**ANSWER:**

As stated in the response to RCM/TREE/MH II-2(e), line losses are included as part of the Manitoba Load Forecast. Estimates of line losses are based on the difference in energy generated and the metered energy at various distribution points. Manitoba Hydro does not estimate line losses in real-time as a function of line loading or time of day.

**RCM/TREE/MH II-2**

**Subject: Marginal Cost**

- g) Please provide, under appropriate confidentiality agreement, the prices for on-peak and off-peak firm export sales under each existing MH contract.**

**ANSWER:**

Pricing information is trade secret and confidential.

**RCM/TREE/MH II-2**

**Subject: Marginal Cost**

- h) Please provide, under appropriate confidentiality agreement, the on-peak and off-peak prices under the negotiated contracts with Wisconsin Public Service, Minnesota Power, and Northern States Power (referred to in IFF 09-1, p. 3).**

**ANSWER:**

Pricing information is trade secret and confidential.

Manitoba Hydro notes that the reference in IFF09-1, p. 3 relates to term sheets and that to date contracts have not been entered with Wisconsin Public Service or Minnesota Power.

**RCM/TREE/MH II-2**

**Subject: Marginal Cost**

- i) **Please provide, under appropriate confidentiality agreement, the on-peak and off-peak prices under negotiation with any other extra-provincial counterparties with whom MH is in negotiation for power sales.**

**ANSWER:**

Pricing information is trade secret and confidential.

**RCM/TREE/MH II-3**

**Subject: Marginal Cost**

**Reference: Integrated Financial Forecast (IFF 09-1), Appendix 5.2**

- a) **Please provide in tabular format the export prices and export volumes (separately by type of sale, e.g., opportunity, short-term firm, long-term firm) assumed in the IFF09-1 Baseline, Low Export and High Export Case financial forecasts for each year of the period 2011/12 through 2019/20.**

**ANSWER:**

Please refer to the response PUB/MH I-209 which provides the overall average export prices and export volumes associated with IFF09-1 for Baseline, Low Export and High Export Case financial forecasts. The specific details of Manitoba Hydro's potential export transactions, including details on contract type and specific pricing and volume information, are commercially sensitive information, and therefore are confidential since public release could harm the Corporation in negotiation of contracts for export sales.

**RCM/TREE/MH II-3**

**Subject: Marginal Cost**

**Reference: Integrated Financial Forecast (IFF 09-1), Appendix 5.2**

**b) Please provide the basis of the export price forecasts for the Expected, High and Low export price cases for each year of the period 2011/12 through 2019/20. Include:**

- i. data, assumptions, workpapers and spreadsheets (with formulas intact), and**
- ii. all explanatory analyses and reports.**

**ANSWER:**

The specific details of Manitoba Hydro's electricity export price forecast, including details on specific pricing factors, are commercially sensitive information, and therefore are confidential since public release could harm the Corporation in negotiation of contracts for export sales.

**RCM/TREE/MH II-3**

**Subject: Marginal Cost**

**Reference: Integrated Financial Forecast (IFF 09-1), Appendix 5.2**

- c) **Please provide the “industry research” on which the Low and High export-price forecasts were based. (p. 21).**

**ANSWER:**

The specific details of Manitoba Hydro’s electricity export price forecast, including details on specific pricing factors, are commercially sensitive information, and therefore are confidential since public release could harm the Corporation in negotiation of contracts for export sales.

The industry research is obtained from the five external price forecast consultants used to prepare the Manitoba Hydro electricity export price forecast. For more information on the export price forecast process, please see the response to PUB/MH I-156(a).

**RCM/TREE/MH II-3**

**Subject: Marginal Cost**

**Reference: Integrated Financial Forecast (IFF 09-1), Appendix 5.2**

- d) **Please provide in tabular format the export prices and export volumes assumed in each of the following forecast cases included in the IFF09-1 risk analysis:**
- i. The plus or minus 1% Interest Rate;**
  - ii. Cdn \$ down or up \$0.10 US;**
  - iii. 5 Year Drought (starting in 2011/12)**
  - iv. Medium High Electric Load Forecast**

**ANSWER:**

- i. Export volumes and prices are unchanged from IFF09 under the plus or minus 1% interest scenario. Please see PUB/MH-I 45(b).



ii.

IFF09 CDN\$ Up \$0.10 Export Revenue Assumptions

<b>(in GWh)</b>	<b>2009/10</b>	<b>2010/11</b>	<b>2011/12</b>	<b>2012/13</b>	<b>2013/14</b>	<b>2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>
MH Hydraulic Generation	33,124	30,525	30,067	30,789	30,989	30,913	30,929	31,078	30,812	30,755	33,518
MH Thermal Generation	152	159	432	437	441	444	497	531	580	591	521
Import Energy (including Wind)	733	1,508	2,616	2,576	2,569	2,608	2,663	2,717	2,794	3,789	3,459
Manitoba Domestic Energy Sales	23,968	24,346	24,728	25,075	25,413	26,030	26,439	26,790	26,743	26,929	27,229
Total Export Sales	9,149	7,122	7,841	8,150	8,020	7,430	7,181	7,082	7,006	7,746	9,598

  

<b>(in Millions of Dollars)</b>	<b>2009/10</b>	<b>2010/11</b>	<b>2011/12</b>	<b>2012/13</b>	<b>2013/14</b>	<b>2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>
MH Hydraulic Generation	\$ 111	\$ 102	\$ 100	\$ 103	\$ 104	\$ 103	\$ 103	\$ 104	\$ 103	\$ 103	\$ 112
MH Thermal Generation	8	8	41	41	43	45	54	60	69	74	77
Import Energy (including Wind)	36	53	165	166	171	177	187	197	207	272	249
Total Manitoba Domestic Energy Sales	1,160	1,193	1,246	1,305	1,365	1,441	1,510	1,582	1,653	1,725	1,805
Total Export Sales	332	266	471	498	523	500	592	593	603	737	913

  

<b>Average Price (\$/MWh)</b>	<b>2009/10</b>	<b>2010/11</b>	<b>2011/12</b>	<b>2012/13</b>	<b>2013/14</b>	<b>2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>
MH Hydraulic Generation	\$ 3.36	\$ 3.35	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34
MH Thermal Generation	52.79	49.67	94.22	93.02	97.87	100.59	108.08	113.61	119.05	125.64	147.20
Import Energy (including Wind)	49.69	34.91	63.02	64.51	66.58	67.88	70.41	72.53	74.22	71.82	72.07
Total Manitoba Domestic Energy Sales	48.40	48.99	50.39	52.03	53.69	55.36	57.13	59.05	61.80	64.07	66.30
Total Export Sales	36.24	37.31	60.07	61.08	65.26	67.27	82.42	83.69	86.08	95.09	95.16

**IFF09 CDN\$ Down \$0.10 Export Revenue Assumptions**

<b>(in GWh)</b>	<b>2009/10</b>	<b>2010/11</b>	<b>2011/12</b>	<b>2012/13</b>	<b>2013/14</b>	<b>2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>
MH Hydraulic Generation	33,124	30,525	30,067	30,789	30,989	30,913	30,929	31,078	30,812	30,755	33,518
MH Thermal Generation	152	159	432	437	441	444	497	531	580	591	521
Import Energy (including Wind)	733	1,508	2,616	2,576	2,569	2,608	2,663	2,717	2,794	3,789	3,459
Manitoba Domestic Energy Sales	23,968	24,346	24,728	25,075	25,413	26,030	26,439	26,790	26,743	26,929	27,229
Total Export Sales	9,149	7,122	7,841	8,150	8,020	7,430	7,181	7,082	7,006	7,746	9,598

  

<b>(in Millions of Dollars)</b>	<b>2009/10</b>	<b>2010/11</b>	<b>2011/12</b>	<b>2012/13</b>	<b>2013/14</b>	<b>2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>
MH Hydraulic Generation	\$ 111	\$ 102	\$ 100	\$ 103	\$ 104	\$ 103	\$ 103	\$ 104	\$ 103	\$ 103	\$ 112
MH Thermal Generation	8	9	42	42	45	47	56	62	71	76	77
Import Energy (including Wind)	36	60	178	179	186	193	205	217	229	310	282
Total Manitoba Domestic Energy Sales	1,160	1,193	1,246	1,305	1,365	1,441	1,510	1,582	1,653	1,725	1,805
Total Export Sales	332	325	574	604	640	611	729	731	744	915	1,139

  

<b>Average Price (\$/MWh)</b>	<b>2009/10</b>	<b>2010/11</b>	<b>2011/12</b>	<b>2012/13</b>	<b>2013/14</b>	<b>2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>
MH Hydraulic Generation	\$ 3.36	\$ 3.35	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34
MH Thermal Generation	52.79	55.11	98.12	96.83	102.06	104.94	112.09	117.59	122.85	129.24	147.20
Import Energy (including Wind)	49.69	39.86	68.12	69.62	72.22	73.88	77.06	79.79	81.97	81.71	81.40
Total Manitoba Domestic Energy Sales	48.40	48.99	50.39	52.03	53.69	55.36	57.13	59.05	61.80	64.07	66.30
Total Export Sales	36.24	45.63	73.19	74.14	79.84	82.30	101.47	103.19	106.13	118.19	118.68

iii.

IFF09 Five Year Drought Export Revenue Assumptions

<b>(in GWh)</b>	<b>2009/10</b>	<b>2010/11</b>	<b>2011/12</b>	<b>2012/13</b>	<b>2013/14</b>	<b>2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>
MH Hydraulic Generation	33,124	30,525	22,950	20,083	25,929	25,329	26,150	31,078	30,812	30,755	33,518
MH Thermal Generation	152	159	1,403	3,567	256	447	426	531	580	591	521
Import Energy (including Wind)	733	1,508	4,665	5,104	4,268	4,352	4,130	2,717	2,794	3,789	3,459
Manitoba Domestic Energy Sales	23,968	24,346	24,728	25,075	25,413	26,030	26,439	26,790	26,743	26,929	27,229
Total Export Sales	9,149	7,122	4,302	3,962	4,860	4,024	4,166	7,082	7,006	7,746	9,598

  

<b>(in Millions of Dollars)</b>	<b>2009/10</b>	<b>2010/11</b>	<b>2011/12</b>	<b>2012/13</b>	<b>2013/14</b>	<b>2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>
MH Hydraulic Generation	\$ 111	\$ 102	\$ 77	\$ 67	\$ 87	\$ 85	\$ 87	\$ 104	\$ 103	\$ 103	\$ 112
MH Thermal Generation	8	8	145	358	24	46	49	61	70	75	77
Import Energy (including Wind)	36	56	291	339	277	297	290	206	217	289	264
Total Manitoba Domestic Energy Sales	1,160	1,193	1,246	1,305	1,365	1,441	1,510	1,582	1,653	1,725	1,805
Total Export Sales	332	292	297	251	389	324	454	654	665	816	1,013

  

<b>Average Price (\$/MWh)</b>	<b>2009/10</b>	<b>2010/11</b>	<b>2011/12</b>	<b>2012/13</b>	<b>2013/14</b>	<b>2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>
MH Hydraulic Generation	\$ 3.36	\$ 3.35	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34
MH Thermal Generation	52.79	52.09	103.09	100.36	93.95	103.88	115.94	115.37	120.73	127.24	147.20
Import Energy (including Wind)	49.69	37.12	62.37	66.39	65.01	68.17	70.12	75.75	77.65	76.20	76.21
Total Manitoba Domestic Energy Sales	48.40	48.99	50.39	52.03	53.69	55.36	57.13	59.05	61.80	64.07	66.30
Total Export Sales	36.24	41.02	69.07	63.23	80.08	80.53	109.01	92.33	94.97	105.33	105.58

iv.

**IFF09 Medium High Load Export Revenue Assumptions**

<b>(in GWh)</b>	<b>2009/10</b>	<b>2010/11</b>	<b>2011/12</b>	<b>2012/13</b>	<b>2013/14</b>	<b>2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>
MH Hydraulic Generation	33,124	30,525	30,118	30,744	30,738	30,984	30,951	31,134	30,941	31,110	33,524
MH Thermal Generation	152	159	504	512	516	538	554	592	646	596	481
Import Energy (including Wind)	733	1,508	2,601	2,660	2,741	2,871	2,803	2,859	2,938	3,940	3,743
Manitoba Domestic Energy Sales	23,968	24,346	25,397	25,878	26,340	27,074	27,594	28,051	28,108	28,395	28,792
Total Export Sales	9,149	7,122	7,339	7,536	7,192	6,894	6,343	6,185	6,088	6,887	8,416

  

<b>(in Millions of Dollars)</b>	<b>2009/10</b>	<b>2010/11</b>	<b>2011/12</b>	<b>2012/13</b>	<b>2013/14</b>	<b>2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>
MH Hydraulic Generation	\$ 111	\$ 102	\$ 101	\$ 103	\$ 103	\$ 104	\$ 103	\$ 104	\$ 103	\$ 104	\$ 112
MH Thermal Generation	8	8	43	46	51	57	62	69	79	76	70
Import Energy (including Wind)	36	56	168	175	187	201	205	217	228	301	285
Total Manitoba Domestic Energy Sales	1,160	1,193	1,246	1,305	1,365	1,441	1,510	1,582	1,653	1,725	1,805
Total Export Sales	332	292	484	506	516	510	585	577	586	740	906

  

<b>Average Price (\$/MWh)</b>	<b>2009/10</b>	<b>2010/11</b>	<b>2011/12</b>	<b>2012/13</b>	<b>2013/14</b>	<b>2014/15</b>	<b>2015/16</b>	<b>2016/17</b>	<b>2017/18</b>	<b>2018/19</b>	<b>2019/20</b>
MH Hydraulic Generation	\$ 3.36	\$ 3.35	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34
MH Thermal Generation	52.79	52.09	85.13	89.90	98.91	105.56	111.57	116.97	121.55	126.72	145.36
Import Energy (including Wind)	49.69	37.12	64.68	65.98	68.17	70.08	73.27	75.74	77.54	76.31	76.23
Total Manitoba Domestic Energy Sales	48.40	48.99	49.06	50.42	51.80	53.22	54.74	56.39	58.80	60.76	62.70
Total Export Sales	36.24	41.02	65.88	67.10	71.72	73.93	92.21	93.37	96.19	107.47	107.72

**RCM/TREE/MH II-4**

**Subject: Demand-Side Management**

**Reference: 2007-2008 Power Smart Annual Review, Appendix 9.2**

- a) **Please identify all DSM programs and measures that MH has evaluated and rejected, and for each provide the following information:**
- i. **The results of the MRC, TRC, RIM, LUC, Simple Customer Payback, and PC tests, and**
  - ii. **the reason for rejection of the program and measure.**

**ANSWER:**

- i. Manitoba Hydro conducts analysis on new energy efficient measures on a continuous basis. The table below outlines measures that have recently been screened and rejected as a potential program offering. When a technology is screened using the MRC and the ratio falls below 1.0, generally no program is pursued and thus the TRC, RIM and LUC are not calculated. In some cases, research undertaken indicates that there isn't an energy efficiency opportunity (i.e. large portion of products being purchased are already energy efficient).

<b>Measure</b>	<b>MRC</b>	<b>TRC</b>	<b>RIM</b>	<b>LUC</b>	<b>Payback</b>	<b>PC</b>
Residential dishwashers	0.7	n/a	n/a	n/a	17 yrs	0.5
Residential window air conditioners	n/a	n/a	n/a	n/a	n/a	n/a
Residential dehumidifiers	n/a	n/a	n/a	n/a	n/a	n/a
Residential Instantaneous Electric Water Heaters	0.5	n/a	n/a	n/a	34 yrs	0.3
Commercial ice machines	n/a	2.41	1.02	2.2¢	1 yr	4.4
Commercial griddles	0.4	n/a	n/a	n/a	86 yrs	0.2
Commercial convection ovens	0.7	n/a	n/a	n/a	47 yrs	0.4
Commercial combi-ovens	0.9	n/a	n/a	n/a	19 yrs	0.5
Commercial food holding cabinets	0.5	n/a	n/a	n/a	75 yrs	0.3
Commercial electric deep fryers	0.2	n/a	n/a	n/a	158 yrs	0.1

- ii. In addition to metrics identified in RCM/TREE/MH II-4(i), there are other considerations that influence the decision on whether to offer a program targeting a

specific energy efficient measure. The following outlines some of these factors for each of the measures listed in the table above.

Residential dishwashers were not included under the Power Smart appliance program as they did not pass the MRC or PC tests and had a long customer payback. Market research revealed that over 50% of dishwashers sold in Manitoba were already Energy Star qualified models.

Residential window air conditioners were researched as a potential program. Market research indicated that the most common size of units purchased (6 000 BTU, 10 000 BTU, 12 000 BTU and 14 000 BTU) are only available in Energy Star qualified models and therefore no energy efficient opportunity was identified.

Residential dehumidifiers were researched as a potential program. Market research indicated that all dehumidifiers sold in Manitoba are Energy Star qualified models and therefore no energy efficient opportunity was identified.

Residential instantaneous electric water heaters were evaluated as part of a domestic water heating conservation strategy. No program was pursued as the opportunity was not economic.

Commercial ice machines passed the various economic tests however, during the design stage of the program, federal regulations were proposed and implemented which increased the minimum performance standard of these ice machines to the level for which the program was intended to be promoted.

Commercial griddles did not pass the MRC test and the customer payback was very long. As such, the technology was not pursued.

Commercial convection ovens did not pass the MRC test and the customer payback was very long. The energy savings were too small for the customer energy bill savings to recoup the incremental cost of the equipment over its useful life and a program was not pursued.

Commercial combi-ovens had a high incremental product cost resulting in a very long customer payback period. A program to pursue this opportunity was not advanced

however the market will be monitored for potential changes in economics due to such factors as reduced product market prices.

Commercial food holding cabinets did not pass the MRC test and the customer payback was very long. As such, no program was designed to pursue this opportunity.

Commercial electric deep fryers did not pass the MRC and TRC and the payback was very long. As such, no program was designed to pursue this opportunity.

**RCM/TREE/MH II-4**

**Subject: Demand-Side Management**

**Reference: 2007-2008 Power Smart Annual Review, Appendix 9.2**

**b) Regarding the marginal cost estimate of 8.26 cents per kW.h (at the meter) used in evaluating DSM, please provide the following information:**

**i. Is it a levelized cost?**

**a) If so,**

**i. is it real-levelized or nominally-levelized?**

**ii. Over how many years, was it levelized?**

**iii. Specify the assumptions and calculations relied upon, including the real or nominally levelized carrying charges and the inflation rate.**

**b) If not, explain.**

**ANSWER:**

The marginal cost estimate of 8.26 cents per kW.h is a levelized value in real terms over a 30 year period beginning in 2009/10. A discount rate of 6% was used to levelize the stream of annual marginal cost values.



**RCM/TREE/MH II-4**

**Subject: Demand-Side Management**

**Reference: 2007-2008 Power Smart Annual Review, Appendix 9.2**

- b) Regarding the marginal cost estimate of 8.26 cents per kW.h (at the meter) used in evaluating DSM, please provide the following information:**
- ii. What load shape is assumed?**

**ANSWER:**

The marginal cost that was utilized for evaluating DSM is derived utilizing the assumption that the load saving is distributed uniformly over all of the months of the year and all of the hours of the month.

**RCM/TREE/MH II-4**

**Subject: Demand-Side Management**

**Reference: 2007-2008 Power Smart Annual Review, Appendix 9.2**

**b) Regarding the marginal cost estimate of 8.26 cents per kW.h (at the meter) used in evaluating DSM, please provide the following information:**

**iii. Does it include a marginal generation cost component?**

**a) If so,**

**i. Provide the cost estimate for this component, in cents per kW.h (at the meter)?**

**ii. Provide the analysis on which this cost estimate is based**

**ANSWER:**

The total marginal cost estimate of 8.26 cents per kW.h is comprised of a generation component, a transmission component and a distribution component. The generation cost component is equal to 6.90 cents per kW.h.

The current methodology that Manitoba Hydro uses to determine the generation component of marginal cost is based solely on the production costing benefits to the Manitoba Hydro system, with export prices being the primary factor in influencing marginal benefit. The marginal cost study is not being provided since it contains information on forecast prices of specific electricity export products. The determination of marginal cost is a complex exercise and a general description of the process is provided below.

The generation-related marginal benefit is derived by an analysis of production costing for a system with or without a small quantity of capacity and energy. A complex computer model (SPLASH) is utilized to simulate operation of the system of reservoir and generating facilities to meet firm load requirements while minimizing operating costs and maximizing export revenues. A range of 94 possible flow conditions is utilized to determine the value of the small increment of energy and capacity. This value is dependent on the mix of thermal and import energy and the quantity of export energy associated with each of the flow conditions. In low flow conditions, the marginal benefit is derived from the displacement of

high-cost thermal and import energy, while in median to high flow conditions the benefit is derived primarily from new export sales. Benefits may be very small or even nonexistent in extremely high flows when tie-lines may be saturated and reservoirs filled to capacity.

**RCM/TREE/MH II-4**

**Subject: Demand-Side Management**

**Reference: 2007-2008 Power Smart Annual Review, Appendix 9.2**

**b) Regarding the marginal cost estimate of 8.26 cents per kW.h (at the meter) used in evaluating DSM, please provide the following information:**

**iv. Does it include a marginal generation capacity cost component?**

**a) If so,**

**i. Provide the cost estimate for this component, in cents per kW.h (at the meter)?**

**ii. Provide the analysis on which this cost estimate is based**

**ANSWER:**

The generation marginal cost component includes a component for capacity as well as energy. The cost estimate for this capacity component is commercially sensitive information and therefore is confidential since public release of this information could harm the Corporation in negotiation of export contracts.

**RCM/TREE/MH II-4**

**Subject: Demand-Side Management**

**Reference: 2007-2008 Power Smart Annual Review, Appendix 9.2**

- b) Regarding the marginal cost estimate of 8.26 cents per kW.h (at the meter) used in evaluating DSM, please provide the following information:**
- ix. If the marginal generation cost estimate for DSM depends on historic and/or forecasted export prices, please provide:**
- a) The forecast of export prices relied upon,**
  - b) The source of the forecast of export prices,**
  - c) The forecast years included in the marginal cost estimate, and**
  - d) The historic prices relied upon.**

**ANSWER:**

The determination of marginal cost utilizes a forecast of export prices over the next 30 years. This forecast is commercially sensitive information that Manitoba Hydro considers to be confidential. Historic export prices are not utilized in the determination of marginal cost.

**RCM/TREE/MH II-4**

**Subject: Demand-Side Management**

**Reference: 2007-2008 Power Smart Annual Review, Appendix 9.2**

**b) Regarding the marginal cost estimate of 8.26 cents per kW.h (at the meter) used in evaluating DSM, please provide the following information:**

**v. Does it include a marginal transmission cost component?**

**a) If so,**

**i. Provide the cost estimate for this component, in cents per kW.h (at the meter)?**

**ii. Provide the analysis on which this cost estimate is based**

**ANSWER:**

The marginal cost associated with the transmission component is 0.85 cents per kW.h. This is based on a marginal value of \$67.53/kW/year that is provided in the report “Marginal Transmission and Distribution Cost Estimates. SPD 04/05” Manitoba Hydro, September 23, 2004. This report is provided in the response to RCM/TREE/MH I-7(f). Please refer to this report for the analysis of the marginal transmission cost component.

**RCM/TREE/MH II-4**

**Subject: Demand-Side Management**

**Reference: 2007-2008 Power Smart Annual Review, Appendix 9.2**

**b) Regarding the marginal cost estimate of 8.26 cents per kW.h (at the meter) used in evaluating DSM, please provide the following information:**

**vi. Does it include a marginal distribution cost component?**

**a) If so,**

**i. Provide the cost estimate for this component, in cents per kW.h (at the meter)?**

**ii. Provide the analysis on which this cost estimate is based**

**ANSWER:**

The marginal cost associated with the distribution is 0.51 cents per kW.h. This is based on a marginal value of \$40.93/kW/year that is provided in the report "Marginal Transmission and Distribution Cost Estimates. SPD 04/05" Manitoba Hydro, September 23, 2004. This report is referenced in the response to RCM/TREE/MH I-7(f). Please refer to this report for the analysis of the marginal distribution cost component.

**RCM/TREE/MH II-4**

**Subject: Demand-Side Management**

**Reference: 2007-2008 Power Smart Annual Review, Appendix 9.2**

**b) Regarding the marginal cost estimate of 8.26 cents per kW.h (at the meter) used in evaluating DSM, please provide the following information:**

**vii. Does it include an environmental costs component?**

**a) If so,**

**i. Provide the cost estimate for this component, in cents per kW.h (at the meter)?**

**ii. Provide the analysis on which this cost estimate is based,**

**b) If not, please revise the 8.26 cents per kW.h estimate to incorporate environmental costs.**

**ANSWER:**

The marginal cost estimate of 8.26 cents per kW.h does not include an explicit environmental cost component. The avoided GHG and other emissions are implicitly valued in the determination of marginal cost because the forecast of export prices includes consideration of potential environmental costs that may be associated with electricity production in Manitoba Hydro's export markets.

Manitoba Hydro's view of the potential impact of legislation restricting CO2 emissions is commercially sensitive information and is therefore confidential.



**RCM/TREE/MH II-4**

**Subject: Demand-Side Management**

**Reference: 2007-2008 Power Smart Annual Review, Appendix 9.2**

**b) Regarding the marginal cost estimate of 8.26 cents per kW.h (at the meter) used in evaluating DSM, please provide the following information:**

**viii. Identify any other cost components included, and provide the cost estimate for each component and the analysis on which it is based.**

**ANSWER:**

There are no other cost components other than generation, transmission and distribution costs.

**RCM/TREE/MH II-4**

**Subject: Demand-Side Management**

**Reference: 2007-2008 Power Smart Annual Review, Appendix 9.2**

- b) Regarding the marginal cost estimate of 8.26 cents per kW.h (at the meter) used in evaluating DSM, please provide the following information:**
- x. If the marginal generation cost estimate for DSM depends on export prices, please specify whether the estimate includes the following types of sales:**
    - a) Sales under dependable contracts,**
    - b) Short-term firm sales,**
    - c) Opportunity sales,**
    - d) Other kinds of sales (if so, what other types?),**
    - e) Some or all of the above types of sales, or**
    - f) The average price of all exports.**

**ANSWER:**

Please refer to the response to RCM/TREE/MH II-4(b)(iii)(a)(i-ii) which describes the determination of the generation marginal cost component. This response indicates that the generation marginal cost component is derived from the production costs of system operation which is derived from the SPLASH model simulation over 94 different flow conditions. This marginal cost component depends primarily on dependable export sales but short-term firm sales and opportunity sales also are utilized along with costs of import energy and cost of Manitoba Hydro sourced thermal energy. A price structure for each month is utilized for opportunity export energy and import energy to reflect the characteristic that energy has different prices in different months of the year and different hours of a month.

**RCM/TREE/MH II-4**

**Subject: Demand-Side Management**

**Reference: 2007-2008 Power Smart Annual Review, Appendix 9.2**

**b) Regarding the marginal cost estimate of 8.26 cents per kW.h (at the meter) used in evaluating DSM, please provide the following information:**

**xi. Provide the loss factors applied to the 8.26 cents per kW.h that are used for evaluating DSM.**

**ANSWER:**

There are no further loss factors applied to the 8.26 cents per kW.h marginal cost that is used for evaluating DSM at the distribution level. The generation component cost is derived at the generation level and a 14% adjustment has been incorporated into the 8.26 cents per kW.h estimate that is applied to load savings at the distribution level.

**RCM/TREE/MH II-5**

**Subject: Marginal Cost**

**Reference: Tab\_13 PUB Directives, p. 16**

- a) **Please provide the revamped Marginal Cost (MC)-COSS analysis required by the Board in Order 150/08.**

**ANSWER:**

Manitoba Hydro has not prepared the requested analysis. That topic is included in the terms of reference for independent review of Manitoba Hydro's cost of service methodology.