

Volume 2 – Board Counsel's Book of Documents

NFAT Review

Subject: Load Forecast & DSM

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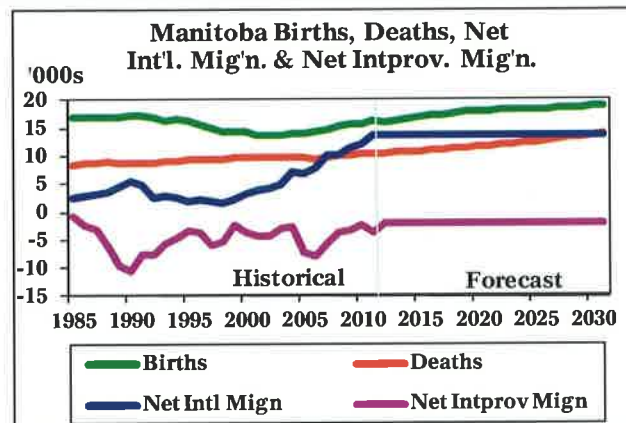
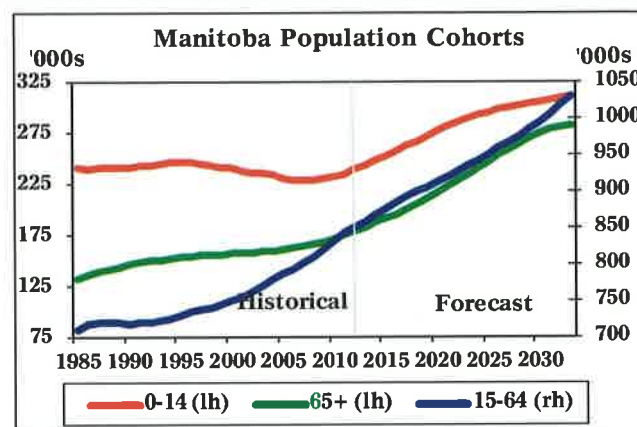
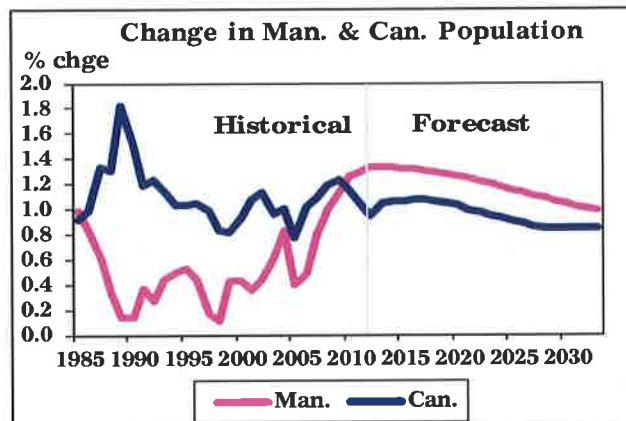
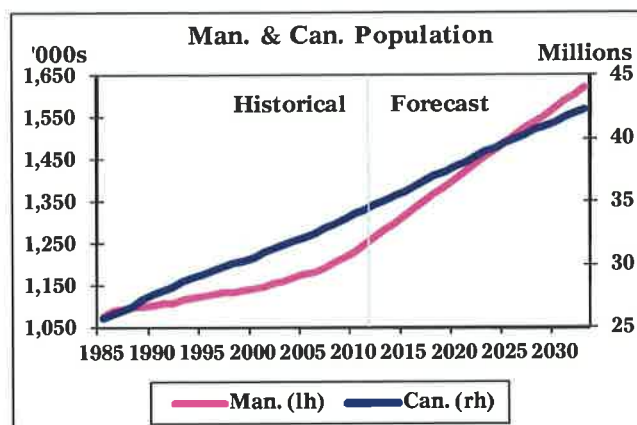
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Manitoba/Canada Economic Statistics
Fiscal Year Basis

Year	Man. Real GDP % chge	Man. CPI % chge	Man. Popu- lation '000s	Man. Residential Customers '000s	Cdn. Real GDP % chge	Cdn. CPI % chge	90 Day T-Bill Rate %	Cdn Long Bond Rate %	C\$/ US\$
1986/87	0.5	4.3	1,093	371	2.3	4.1	8.06	8.86	1.37
1987/88	1.0	4.1	1,099	378	5.0	4.4	8.47	9.90	1.31
1988/89	0.3	4.4	1,103	383	4.4	4.1	10.29	10.11	1.21
1989/90	2.6	4.7	1,104	386	2.2	5.2	12.37	9.77	1.18
1990/91	1.0	5.0	1,106	389	-1.0	5.0	12.07	10.59	1.16
1991/92	-2.3	3.8	1,110	391	-1.0	4.4	8.03	9.29	1.15
1992/93	0.9	1.9	1,114	393	1.1	1.6	6.25	8.18	1.23
1993/94	1.3	2.4	1,119	396	2.8	1.5	4.46	7.39	1.31
1994/95	3.0	1.6	1,125	398	5.1	0.4	6.46	8.95	1.38
1995/96	1.0	2.5	1,130	400	1.8	2.1	6.17	7.93	1.36
1996/97	3.2	2.5	1,135	402	2.4	1.7	3.67	7.28	1.36
1997/98	3.9	1.5	1,136	405	4.5	1.4	3.63	6.06	1.40
1998/99	3.6	1.5	1,139	406	4.1	0.9	4.81	5.35	1.50
1999/00	2.1	2.2	1,144	408	5.8	2.2	4.82	5.69	1.47
2000/01	3.3	2.5	1,148	410	4.6	2.7	5.42	5.66	1.50
2001/02	1.0	2.1	1,153	413	1.5	2.2	3.09	5.91	1.57
2002/03	1.4	2.3	1,158	415	3.1	3.0	2.79	5.41	1.55
2003/04	1.1	0.9	1,166	419	1.7	1.9	2.67	4.97	1.35
2004/05	2.3	2.7	1,175	422	3.5	2.2	2.31	4.81	1.28
2005/06	3.0	2.4	1,180	426	3.2	2.3	3.02	4.17	1.19
2006/07	3.5	2.0	1,186	430	2.2	1.9	4.16	4.23	1.14
2007/08	2.5	1.9	1,197	434	2.3	2.1	3.83	4.24	1.03
2008/09	1.5	2.2	1,209	440	-0.5	2.2	1.84	3.66	1.13
2009/10	0.6	0.6	1,224	444	-1.1	0.4	0.22	3.89	1.09
2010/11	2.5	1.0	1,239	448	3.0	2.0	0.78	3.48	1.02
Forecast									
2011/12	2.7	2.0	1,254	453	2.9	2.3	1.60	3.80	0.98
2012/13	2.8	2.0	1,269	458	2.8	2.1	2.80	4.25	0.99
2013/14	2.9	2.0	1,283	464	2.6	2.0	3.45	4.45	1.03
2014/15	2.6	2.0	1,298	470	2.4	2.0	3.80	4.80	1.05
2015/16	2.5	2.0	1,314	476	2.4	2.0	4.05	5.30	1.06
2016/17	2.3	2.0	1,329	482	2.3	2.0	4.25	5.60	1.06
2017/18	1.9	2.1	1,344	488	2.0	2.1	4.30	5.80	1.06
2018/19	1.9	2.1	1,359	494	2.0	2.1	4.30	5.80	1.06
2019/20	1.9	2.1	1,373	500	2.0	2.1	4.30	5.80	1.06
2020/21	1.9	2.1	1,388	505	2.0	2.1	4.30	5.80	1.06
2021/22	1.9	2.1	1,402	511	2.0	2.1	4.30	5.80	1.06
2022/23	1.9	2.1	1,416	517	2.0	2.1	4.30	5.80	1.06
2023/24	1.9	2.1	1,429	522	2.0	2.1	4.30	5.80	1.06
2024/25	1.9	2.1	1,442	528	2.0	2.1	4.30	5.80	1.06
2025/26	1.9	2.1	1,455	533	2.0	2.1	4.30	5.80	1.06
2026/27	1.9	2.1	1,467	538	2.0	2.1	4.30	5.80	1.06
2027/28	1.9	2.1	1,479	543	2.0	2.1	4.30	5.80	1.06
2028/29	1.9	2.1	1,490	548	2.0	2.1	4.30	5.80	1.06
2029/30	1.9	2.1	1,501	553	2.0	2.1	4.30	5.80	1.06
2030/31	1.9	2.1	1,512	557	2.0	2.1	4.30	5.80	1.06
2031/32	1.9	2.1	1,522	562	2.0	2.1	4.30	5.80	1.06

Population



Manitoba's total population increased by 16,039 persons in 2011 or 1.3% relative to 2010. Total net migration to Manitoba was 10,338 people and the total natural increase was 5,701 in 2011.

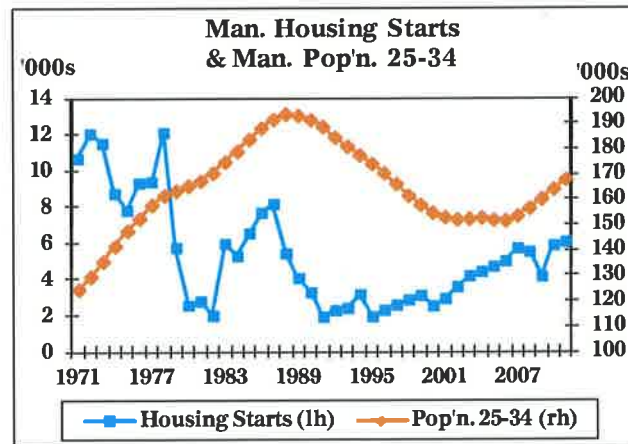
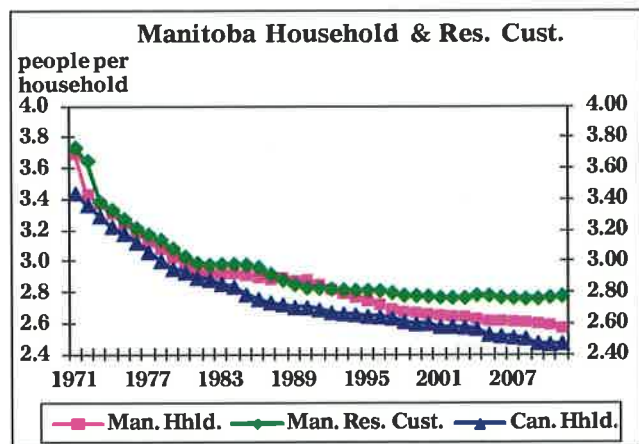
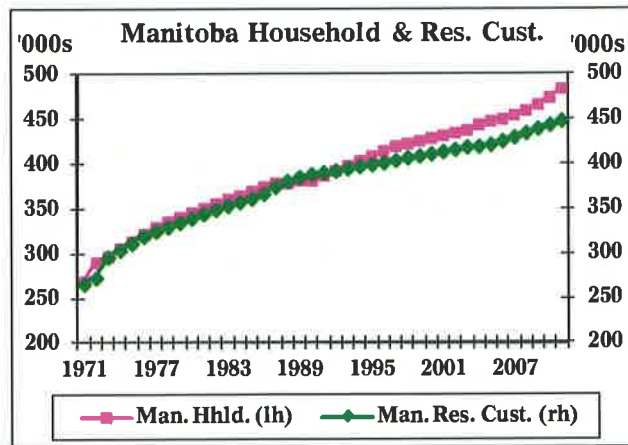
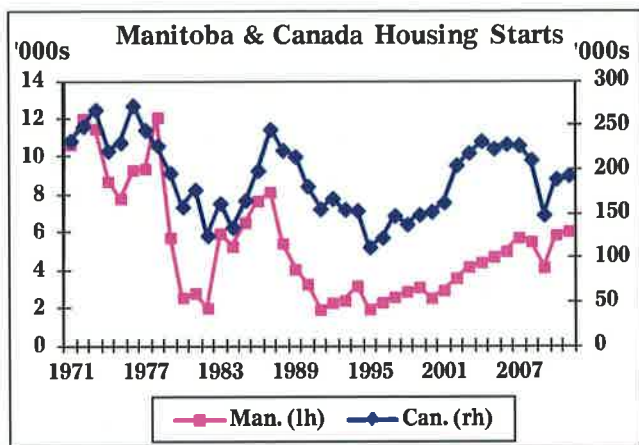
Manitoba's population is expected to grow on average at 1.2% or 17,000 people annually over the forecast period, 3,700 people higher than the growth rate forecast in EO2011. This year's forecast assumes that the Provincial Nominee Program will continue to sustain high annual growth in immigrants. As a result, international migration is forecast to grow by 16,000 immigrants annually. Manitoba's population forecast is based on a 1.9 total fertility rate and 13,700 net international migration offset by -2,000 net interprovincial migration. This translates to population growth resulting from a natural increase of 5,300 per annum and 11,700 from net migration. Refer to Appendices A and B for the forecasts of Manitoba population expressed in calendar and fiscal years.

Year	Mb Pop'n. 5 Yr Avg (% chge)
1960-1965	1.2
1965-1970	0.4
1970-1975	0.8
1975-1980	0.2
1980-1985	0.9
1985-1990	0.4
1990-1995	0.4
1995-2000	0.3
2000-2011	0.8
2012-2033	1.2

Year	Mb Pop'n. Changes
1995	5,921
1996	5,046
1997	1,929
1998	1,360
1999	4,962
2000	4,864
2001	4,126
2002	5,174
2003	7,206
2004	9,747
2005	4,736
2006	5,730
2007	9,528
2008	11,918
2009	13,706
2010	15,352
2011	16,039

Canada's population is expected to grow on average at 0.9% or 361,000 people annually over the forecast period. The United States' population is expected to grow on average at 0.9% or 3,230,000 people annually.

Housing



	Man. Housing Starts	Man. Res. Cust. '000s	Can. Housing Starts '000s
1994	3,197	398	154
1995	1,963	401	113
1996	2,318	403	123
1997	2,612	405	148
1998	2,895	408	138
1999	3,133	410	149
2000	2,560	413	153
2001	2,963	415	163
2002	3,617	417	205
2003	4,206	420	219
2004	4,440	421	233
2005	4,731	423	224
2006	5,028	427	229
2007	5,738	431	228
2008	5,537	436	211
2009	4,174	441	149
2010	5,888	445	190
2011	6,083	449	194

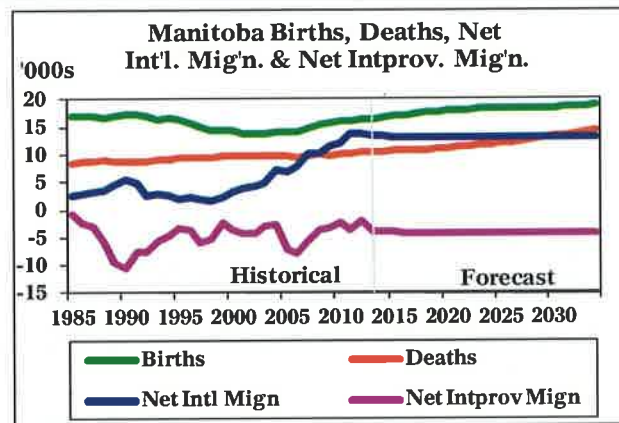
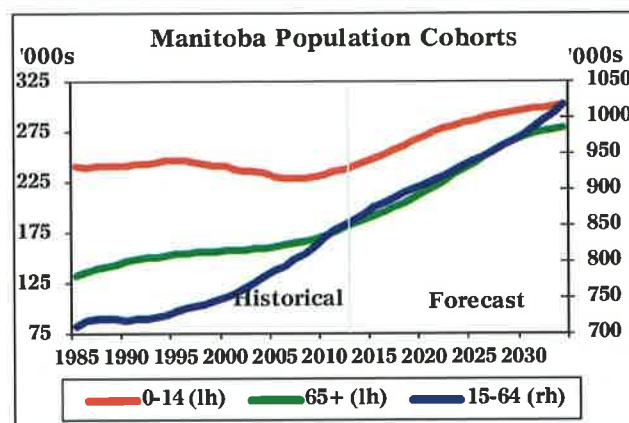
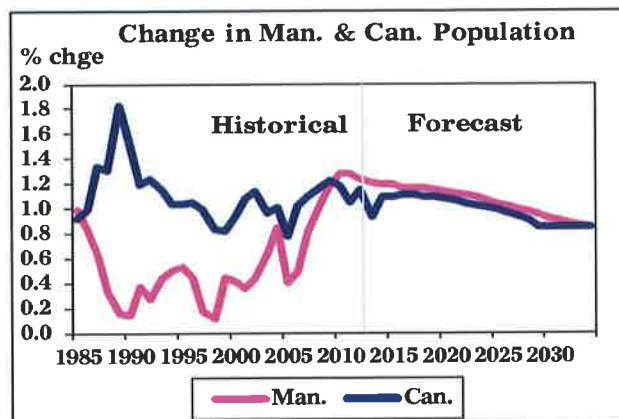
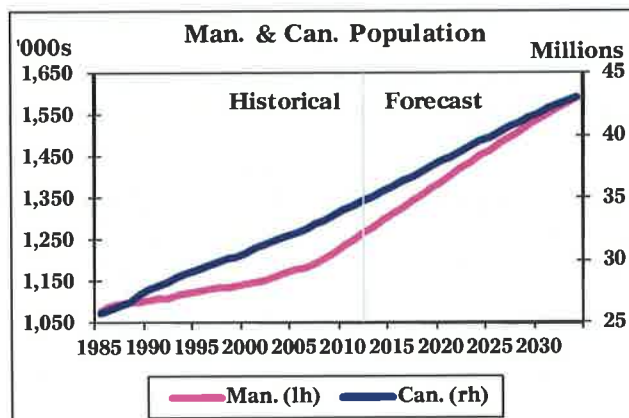
Total Manitoba housing starts were 6,083 in 2011, up from 5,888 units in 2010. Strong population and employment growth, rising wages, and low mortgage rates were the driving force behind the demand for housing in 2011, which was the highest level in 24 years. EO2012 forecasts that Manitoba housing starts will increase at approximately 8,300 units annually in the longer term. The forecasted annual population growth rate in Manitoba of 17,000 people in EO2012 is 3,700 people higher than the growth rate forecast in EO2011 and is the main driver in the increased housing starts.

The number of Manitoba Hydro metered residential customers increased by 4,654 units in 2011 relative to 2010. EO2012 forecasts that Manitoba residential customers will increase by 6,300 units or 1.2% annually over the 2012-2033 period, up 900 units annually from EO2011. Refer to Appendices A and B for the forecasts of Manitoba residential customers expressed in calendar and fiscal years.

Manitoba/Canada Economic Statistics
Fiscal Year Basis

Year	Man. Real GDP % chge	Man. CPI % chge	Man. Popu- lation '000s	Man. Residential Customers '000s	Cdn. Real GDP % chge	Cdn. CPI % chge	90 Day T-Bill Rate %	Cdn LT Bond Rate 10 Yr+ %	C\$/ US\$
1987/88	1.0	4.1	1,099	378	5.0	4.4	8.47	9.90	1.31
1988/89	0.3	4.4	1,103	383	4.4	4.1	10.29	10.11	1.21
1989/90	2.6	4.7	1,104	386	2.2	5.2	12.37	9.77	1.18
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2002/03	1.5	2.3	1,158	415	3.1	3.0	2.79	5.41	1.55
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2004/05	2.3	2.7	1,175	422	3.5	2.2	2.31	4.81	1.28
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2007/08	2.7	1.9	1,197	434	2.3	2.1	3.83	4.24	1.03
2008/09	2.8	2.2	1,209	440	-0.5	2.2	1.84	3.66	1.13
2009/10	0.2	0.6	1,223	444	-1.3	0.4	0.22	3.89	1.09
2010/11	2.3	1.0	1,239	448	3.0	2.0	0.78	3.48	1.02
2011/12	2.2	2.8	1,255	453	2.4	2.8	0.91	2.79	0.99
Forecast									
2012/13	2.3	1.7	1,272	459	2.1	1.9	1.00	2.65	1.00
2013/14	2.4	1.8	1,289	465	2.3	1.9	1.45	3.00	0.99
2014/15	2.4	1.8	1,306	472	2.3	1.9	2.95	3.95	1.02
2015/16	2.5	1.8	1,323	478	2.4	1.9	3.60	4.45	1.03
2016/17	2.4	1.8	1,340	484	2.3	1.9	4.05	5.00	1.04
2017/18	2.1	1.9	1,358	491	2.3	1.9	4.30	5.30	1.04
2018/19	1.8	1.9	1,375	497	2.1	1.9	4.30	5.40	1.04
2019/20	1.7	1.9	1,393	504	1.9	1.9	4.30	5.40	1.04
2020/21	1.7	1.9	1,411	510	1.9	1.9	4.30	5.40	1.04
2021/22	1.7	1.9	1,428	517	1.9	1.9	4.30	5.40	1.04
2022/23	1.7	1.9	1,446	523	1.9	1.9	4.30	5.40	1.04
2023/24	1.7	1.9	1,463	530	1.9	1.9	4.30	5.40	1.04
2024/25	1.7	1.9	1,480	536	1.9	1.9	4.30	5.40	1.04
2025/26	1.7	1.9	1,497	542	1.9	1.9	4.30	5.40	1.04
2026/27	1.7	1.9	1,514	549	1.9	1.9	4.30	5.40	1.04
2027/28	1.7	1.9	1,531	555	1.9	1.9	4.30	5.40	1.04
2028/29	1.7	1.9	1,547	561	1.9	1.9	4.30	5.40	1.04
2029/30	1.7	1.9	1,564	567	1.9	1.9	4.30	5.40	1.04
2030/31	1.7	1.9	1,580	573	1.9	1.9	4.30	5.40	1.04
2031/32	1.7	1.9	1,596	579	1.9	1.9	4.30	5.40	1.04
2032/33	1.7	1.9	1,612	585	1.9	1.9	4.30	5.40	1.04

Population



Manitoba's total population increased by 15,313 persons in 2012 or 1.2% relative to 2011. Total net migration to Manitoba was 9,522 people and the total natural increase was 5,791 in 2012.

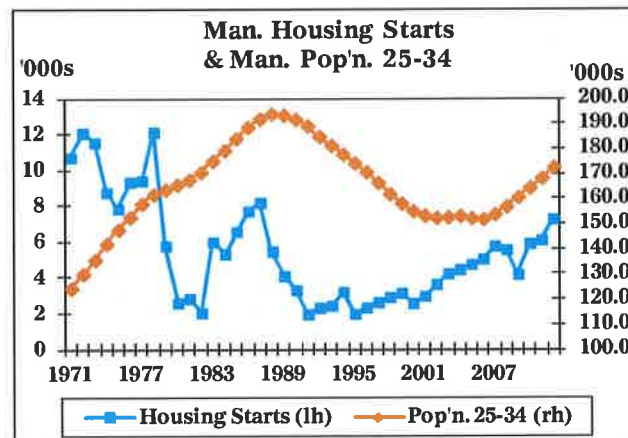
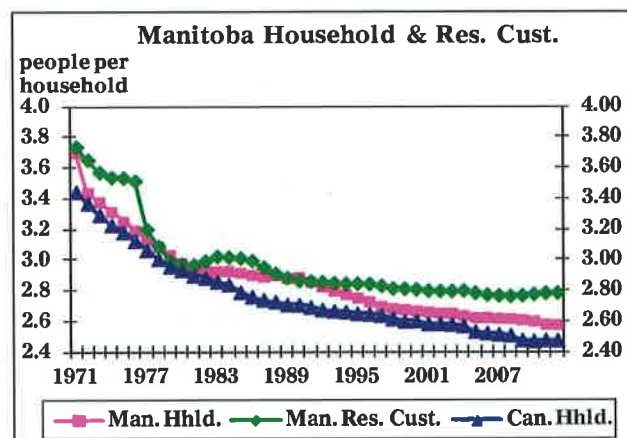
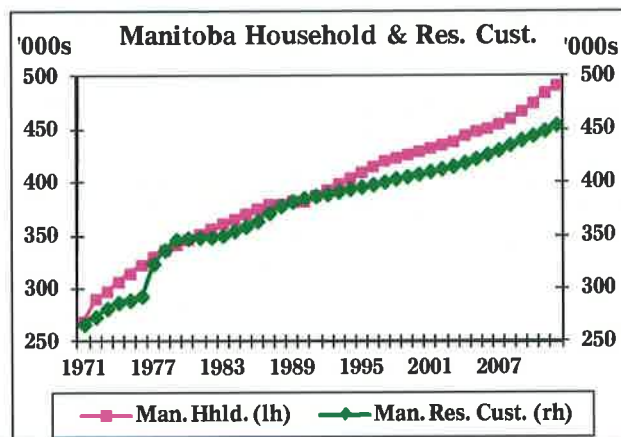
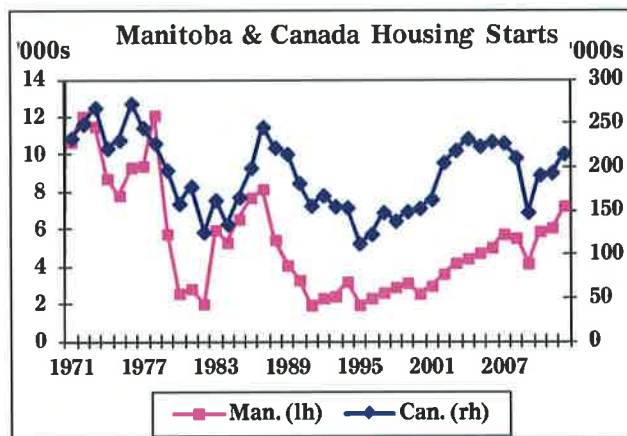
Manitoba's population is expected to grow on average at 1.0% or 14,900 people annually over the forecast period, 2,100 people lower than the growth rate forecast in EO2012. This year's forecast assumes that the Provincial Nominee Program will continue to sustain high annual growth in immigrants. As a result, international migration is forecast to grow by 15,100 immigrants annually. Manitoba's population forecast is based on a 1.9 total fertility rate and 13,100 net international migration offset by -4,100 net interprovincial migration. This translates to population growth resulting from a natural increase of 6,000 per annum and 8,900 from net migration. Refer to Appendices A and B for the forecasts of Manitoba population expressed in calendar and fiscal years.

Canada's population is expected to grow on average at 1.0% or 383,000 people annually over the forecast period. The United States' population is expected to grow on average at 0.9% or 3,100,000 people annually.

Year	Mb Pop'n. 5 Yr Avg (% chge)
1960-1965	1.2
1965-1970	0.4
1970-1975	0.8
1975-1980	0.2
1980-1985	0.9
1985-1990	0.4
1990-1995	0.4
1995-2000	0.3
2000-2012	0.8
2013-2034	1.0

Year	Mb Pop'n. Changes
1995	5,921
1996	5,046
1997	1,929
1998	1,360
1999	4,962
2000	4,864
2001	4,126
2002	5,174
2003	7,206
2004	9,747
2005	4,736
2006	5,730
2007	9,571
2008	12,088
2009	14,213
2010	15,819
2011	15,967
2012	15,313

Housing



	Man. Housing Starts	Man. Res. Cust. '000s	Can. Housing Starts '000s
1994	3,197	395	154
1995	1,963	397	113
1996	2,318	399	123
1997	2,612	401	148
1998	2,895	404	138
1999	3,133	406	149
2000	2,560	409	153
2001	2,963	411	163
2002	3,617	413	205
2003	4,206	416	219
2004	4,440	419	233
2005	4,731	423	224
2006	5,028	427	229
2007	5,738	431	228
2008	5,537	436	211
2009	4,174	441	148
2010	5,888	445	191
2011	6,083	449	194
2012	7,242	455	215

Total Manitoba housing starts were 7,242 in 2012, up from 6,088 units in 2011. Strong population growth, increase in employment force, rising wages, and low mortgage rates were the driving forces behind the demand for housing in 2012, which was the highest level since 1987. EO2013 forecasts that Manitoba housing starts will increase at approximately 7,000 units annually in the longer term. The forecasted annual population growth rate in Manitoba of 14,900 people in EO2013 is 2,100 people lower than the growth rate forecast in EO2012 and is the main driver in the increased housing starts.

The number of Manitoba Hydro metered residential customers increased by 5,309 units in 2012 relative to 2011. EO2013 forecasts that Manitoba residential customers will increase by 5,350 units or 1.0% annually over the 2013-2034 period, down about 1,000 units annually from EO2012. Refer to Appendices A and B for the forecasts of Manitoba residential customers expressed in calendar and fiscal years.

Manitoba/Canada Economic Statistics

Fiscal Year Basis

Year	Man. Real GDP % chge	Man. CPI % chge	Man. Popu- lation '000s	Man. Residential Customers '000s	Cdn. Real GDP % chge	Cdn. CPI % chge	90 Day T-Bill Rate %	Cdn LT Bond Rate 10 Yr+ %	C\$/ US\$
1988/89	0.3	4.4	1,103	381	4.0	4.1	10.29	10.11	1.21
1989/90	2.6	4.7	1,104	385	2.1	5.2	12.37	9.77	1.18
1990/91	1.0	5.0	1,106	387	-1.1	5.0	12.07	10.59	1.16
1991/92	-2.3	3.8	1,110	389	-1.1	4.4	8.03	9.29	1.15
1992/93	0.9	1.9	1,114	391	1.1	1.6	6.25	8.18	1.23
1993/94	1.3	2.4	1,119	394	3.1	1.5	4.46	7.39	1.31
1994/95	3.0	1.6	1,125	396	4.8	0.4	6.46	8.95	1.38
1995/96	1.0	2.5	1,130	398	1.7	2.1	6.17	7.93	1.36
1996/97	3.2	2.5	1,135	400	2.5	1.7	3.67	7.28	1.36
1997/98	3.9	1.5	1,136	404	4.6	1.4	3.63	6.06	1.40
1998/99	3.6	1.5	1,139	405	4.0	0.9	4.81	5.35	1.50
1999/00	2.3	2.2	1,144	408	5.5	2.2	4.82	5.69	1.47
2000/01	3.4	2.5	1,148	411	4.5	2.7	5.42	5.66	1.50
2001/02	1.0	2.1	1,153	413	1.5	2.2	3.09	5.91	1.57
2002/03	1.5	2.3	1,158	415	3.0	3.0	2.79	5.41	1.55
2003/04	1.6	0.9	1,166	419	1.8	1.9	2.67	4.97	1.35
2004/05	2.3	2.7	1,175	422	3.3	2.2	2.31	4.81	1.28
2005/06	2.8	2.4	1,180	426	3.5	2.3	3.02	4.17	1.19
2006/07	3.1	2.0	1,186	430	1.5	1.9	4.16	4.23	1.14
2007/08	2.7	1.9	1,197	434	2.7	2.1	3.83	4.24	1.03
2008/09	2.9	2.2	1,209	440	0.1	2.2	1.84	3.66	1.13
2009/10	0.2	0.6	1,224	444	-1.3	0.4	0.22	3.89	1.09
2010/11	2.3	1.0	1,240	448	3.0	2.0	0.78	3.48	1.02
2011/12	2.2	2.8	1,256	453	2.4	2.8	0.91	2.83	0.99
2012/13	2.1	1.6	1,271	459	1.8	1.2	0.97	2.18	1.00
Forecast									
2013/14	2.1	1.8	1,286	464	1.9	1.5	1.05	2.50	1.02
2014/15	2.4	2.0	1,302	470	2.4	2.0	1.45	3.05	1.01
2015/16	2.6	2.0	1,317	476	2.4	2.0	2.35	3.50	1.01
2016/17	2.3	2.0	1,332	481	2.3	2.0	3.25	4.25	1.03
2017/18	2.1	2.0	1,348	487	2.3	2.0	3.70	4.70	1.03
2018/19	2.0	2.0	1,363	492	2.1	2.0	3.90	5.05	1.03
2019/20	2.0	2.0	1,379	498	2.0	2.0	3.90	5.05	1.03
2020/21	2.0	2.0	1,395	503	2.0	2.0	3.90	5.05	1.03
2021/22	2.0	2.0	1,410	509	2.0	2.0	3.90	5.05	1.03
2022/23	2.0	2.0	1,426	515	2.0	2.0	3.90	5.05	1.03
2023/24	2.0	2.0	1,441	520	2.0	2.0	3.90	5.05	1.03
2024/25	2.0	2.0	1,457	526	2.0	2.0	3.90	5.05	1.03
2025/26	2.0	2.0	1,472	531	2.0	2.0	3.90	5.05	1.03
2026/27	2.0	2.0	1,487	536	2.0	2.0	3.90	5.05	1.03
2027/28	2.0	2.0	1,502	542	2.0	2.0	3.90	5.05	1.03
2028/29	2.0	2.0	1,516	547	2.0	2.0	3.90	5.05	1.03
2029/30	2.0	2.0	1,530	552	2.0	2.0	3.90	5.05	1.03
2030/31	2.0	2.0	1,544	557	2.0	2.0	3.90	5.05	1.03
2031/32	2.0	2.0	1,558	562	2.0	2.0	3.90	5.05	1.03
2032/33	2.0	2.0	1,572	567	2.0	2.0	3.90	5.05	1.03
2033/34	2.0	2.0	1,585	572	2.0	2.0	3.90	5.05	1.03

Change between the 2012 and 2013 Forecasts

Change Between the 2012 and 2013 Residential Basic Forecast

The Residential Basic Forecast is down from the 2012 forecast. By 2031/32 the difference is 423 GW.h or 4.3%. This is equivalent to about 1 year of Manitoba system load growth (1 year = approximately 420 GW.h).

Changes made (and the 2031/32 effect):

1. The customer forecast was reduced by 16,901 customers (-282 GW.h).
2. The appliance unit energy consumptions (UECs) or average use per appliance per year were updated in the Residential End Use model. The update was done using a preliminary Conditional Demand Analysis of the 2009 Residential Energy Use Survey data with customer billing data (+212 GW.h).
3. An adjustment to reflect initiatives being undertaken by Manitoba Hydro was included to reduce the number of customers choosing electric space and water heat (-366 GW.h).

Figure 1 - Change of Res Basic Forecast

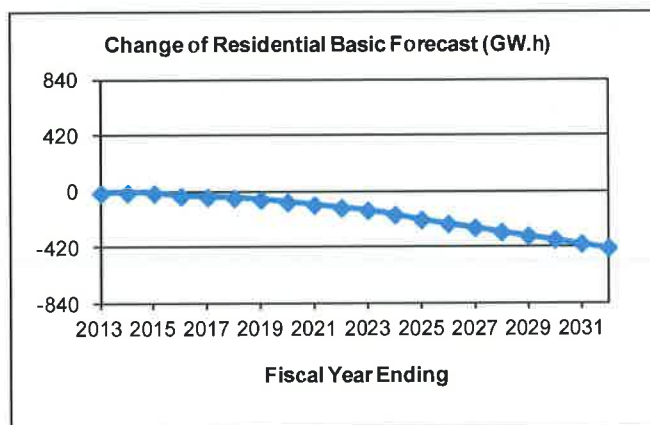


Table 8 - Change of Res Basic Forecast

CHANGE OF RESIDENTIAL BASIC FORECAST (GW.h)									
Comparison of 2012 to 2013 forecast									
Fiscal Year	2012 Fcst	2013 Fcst	Change	%	Fiscal Year	2012 Fcst	2013 Fcst	Change	%
2012/13	7227	7219	(8)	-0.1%	2022/23	8429	8290	(139)	-1.6%
2013/14	7344	7339	(5)	-0.1%	2023/24	8577	8405	(172)	-2.0%
2014/15	7467	7458	(9)	-0.1%	2024/25	8730	8520	(210)	-2.4%
2015/16	7569	7538	(31)	-0.4%	2025/26	8877	8635	(241)	-2.7%
2016/17	7662	7624	(38)	-0.5%	2026/27	9021	8750	(271)	-3.0%
2017/18	7774	7730	(45)	-0.6%	2027/28	9167	8864	(303)	-3.3%
2018/19	7900	7842	(58)	-0.7%	2028/29	9315	8983	(332)	-3.6%
2019/20	8030	7953	(77)	-1.0%	2029/30	9463	9102	(361)	-3.8%
2020/21	8161	8063	(97)	-1.2%	2030/31	9611	9219	(392)	-4.1%
2021/22	8292	8173	(119)	-1.4%	2031/32	9760	9337	(423)	-4.3%

Population Growth to Residential Customer Growth

Source: 2013 Economic Outlook - Appendix A

(000s)	Population	Increase in Population	Residential Customers	Increase in Customers	PUB Calc: New Pop/ New Cust 5=2/4
Column:	1	2	3	4	
2006/07	1186		430		
2007/08	1197	11	434	4	2.75
2008/09	1209	12	440	6	2.00
2009/10	1224	15	444	4	3.75
2010/11	1240	16	448	4	4.00
2011/12	1256	16	453	5	3.20
2012/13	1271	15	459	6	2.50
Total Growth		85		29	2.93 Average

(000s)	Population	Increase in Population	Residential Customers	Increase in Customers	PUB Calc: Additional Residential Customers assuming 2.93 population per customer = 2 / (2.93)	PUB Calc: Revised Residential Customers =previous row6 +5	2012 Load Forecast Residential Customers
Column:	1	2	3	4	5	6	
2013/14	1286	15	464	5	5.1	464.1	465
2014/15	1302	16	470	6	5.5	469.6	472
2015/16	1317	15	476	6	5.1	474.7	478
2016/17	1332	15	481	5	5.1	479.8	484
2017/18	1348	16	487	6	5.5	485.3	491
2018/19	1363	15	492	5	5.1	490.4	497
2019/20	1379	16	498	6	5.5	495.8	504
2020/21	1395	16	503	5	5.5	501.3	510
2021/22	1410	15	509	6	5.1	506.4	517
2022/23	1426	16	515	6	5.5	511.9	523
2023/24	1441	15	520	5	5.1	517.0	530
2024/25	1457	16	526	6	5.5	522.5	536
2025/26	1472	15	531	5	5.1	527.6	542
2026/27	1487	15	536	5	5.1	532.7	549
2027/28	1502	15	542	6	5.1	537.8	555
2028/29	1516	14	547	5	4.8	542.6	561
2029/30	1530	14	552	5	4.8	547.4	567
2030/31	1544	14	557	5	4.8	552.1	573
2031/32	1558	14	562	5	4.8	556.9	579
2032/33	1572	14	567	5	4.8	561.7	585
Total Growth		301		108	102.7		126
PUB Calc Fewer Customers:					5.3		

Using most recent 6 years of data, new population per new Residential customer is 2.93.

There would only be 102,700 new customers by 2032/33 instead of 108,000.

This would reduce the load forecast by $5,300 \times 16,746 \text{ kWh} = 89 \text{ GWh}$.

Note: 16,746 kWh/customer is 2032/33 average use for all Residential - Basic customers

2012 Load Forecast = 126,000 new residential customers; 2013 Load Forecast = 108,000

Winnipeg Free Press

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Newcomers needed to fill jobs

Tide of immigrants slows to trickle after rule changes Manitoba and its provincial nominee program used to have the edge in recruiting new workers for the province's smaller centres. Starting today, rural reporter Bill Redekop takes a close-up look at the state of the program almost 17 years after its inception.

By: Bill Redekop

Posted: 02/18/2014 1:00 AM | Comments: 0g | Last Modified: 10:33 AM | Updates



KEN GIGLIOTTI / WINNIPEG FREE PRESS FILES

Winkler's Meridian Manufacturing develops grain bins, among other products. It has had trouble attracting more workers. Photo Store

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WINKLER -- The first immigrants started to arrive here in 1997 under a pilot project that would eventually be called the Provincial Nominee Program.

Manitoba's population was stagnant at the time and on the verge of slipping back. A defeatist attitude was setting in. Some people said Manitoba would never grow because no one wanted to live in this climate.



Winkler Mayor Martin Harder said the major companies in the area all have English-training courses for immigrants. (RUTH BONNEVILLE / WINNIPEG FREE PRESS) Photo Store

The pilot project that started in Winkler, and suddenly landed scores of immigrants to fill jobs that couldn't be filled locally, shook the province from its doldrums. The population started to grow again and Manitoba's Provincial Nominee Program (PNP) became the most successful immigration venture in the country.

But today, almost 17 years later, the program is tanking in the very place it began. Companies in Winkler and Morden, eight kilometres apart, are begging for workers again. Major local employers like Meridian Manufacturing and Triple E Recreational Vehicles have Help Wanted signs posted on highways leading into their communities.

"We need all kinds of different workers and we are trying all kinds of different ways to find those workers," said Bernie Thiessen, vice-president of Meridian Manufacturing. "The problem is governments keep changing the program (PNP) to

the point it's almost useless to us."

The figures back him up. As late as 2009, this area was still getting about 1,000 immigrants per year. But just 400 arrived last year, and about 225 for the first three quarters of 2013.

Five years ago, 27 per cent of immigrants to Manitoba were settling outside Winnipeg. The rate is now 15 per cent in the latest figures for 2013.

The PNP selects skilled foreign workers with the potential to contribute to Manitoba's labour market. Close to 80 per cent of immigrants arrive in Manitoba through the PNP.

"We need all kinds of different workers and we are trying all kinds of

The problem, say business people such as Thiessen and local mayors, is politicians keep fiddling with the program.

In 2010, the NDP government passed Bill 22, its Worker Recruitment and Protection Act. While the bill has provided immigrants more protection from shady immigration brokers, it also stops licensed immigration brokers from acting as job recruiters. They can't even mention jobs without losing their licence. But the first question any immigrant asks is, "Where will I work?" So immigrant workers began bypassing Manitoba for Saskatchewan and Alberta.

Next it was the Harper government's turn. First, it capped the number of PNP immigrants a province could obtain. In Manitoba's case, the cap is at about 5,000 approvals, plus their families. The cap meant Manitoba lost its head start and other provinces have caught up.

Then in 2011, the Harper government raised English-language standards on newcomers to a Level 4 in the International English Language Testing System. The problem is that excludes many welders and mechanics, the type of employee needed in the booming manufacturing sector in the Pembina Valley.

The immigrants being approved are those with better English skills and they tend to be professionals such as engineers, Internet techies, economists and lawyers. They have been arriving in the Pembina Valley but the retention rate is low.

In an email, the province blamed Ottawa's cap on PNP approvals for reduced immigration, plus smaller family sizes among immigrants and longer processing times by Citizenship and Immigration Canada. The provincial spokeswoman said the province's Bill 22 has ensured the PNP process is transparent and fair and supports employers in international recruitment.

On the federal side, an email from Citizenship and Immigration Canada defended its new language requirement, saying language "is a key factor in the success of new citizens to establish themselves both economically and socially in Canada." It added that minimum language skills are necessary for health and safety reasons, "especially in the low-skilled occupations."

However, the Harper government is also drafting an approach used in New Zealand it hopes to implement in 2015 that would pool and filter those immigrants who meet Canada's labour needs more quickly.

*different ways
to find those
workers,"
said. "The
problem is
governments
keep changing
the program
(PNP) to the
point it's
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to us'*

*-- Bernie
Thiessen, vice-
president of
Meridian
Manufacturing*

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2

Figure 4.5 SECTORS OF DOMESTIC LOAD FOR 2011/12

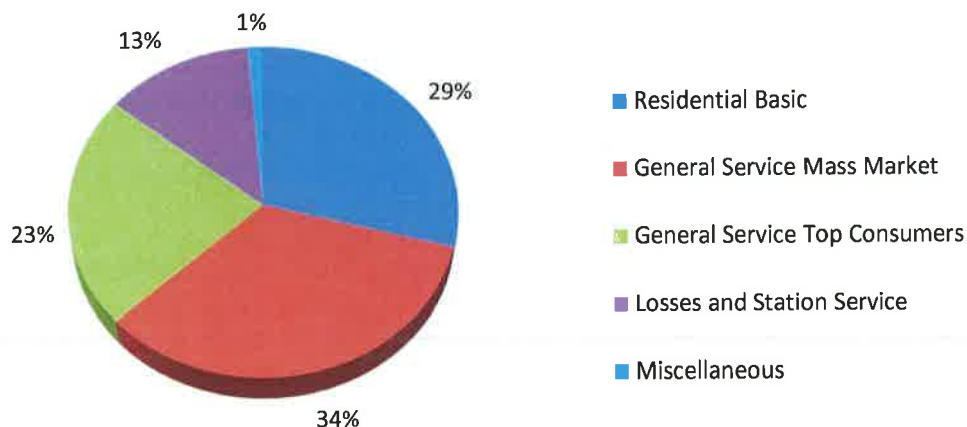
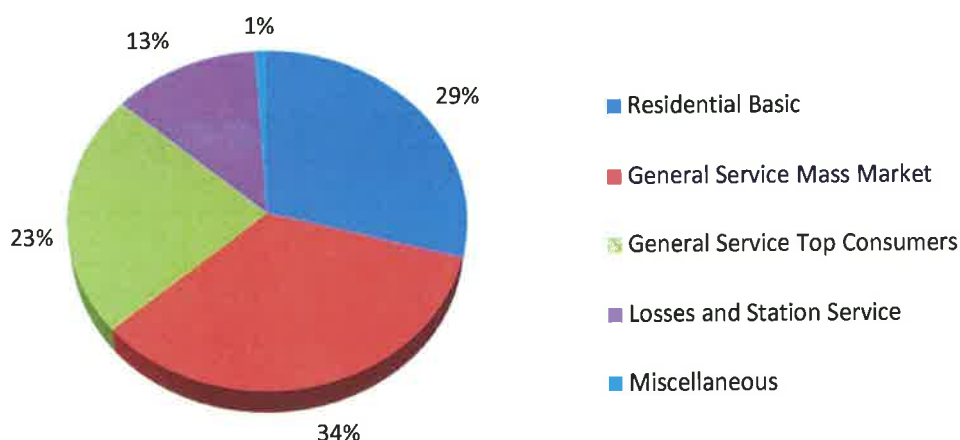


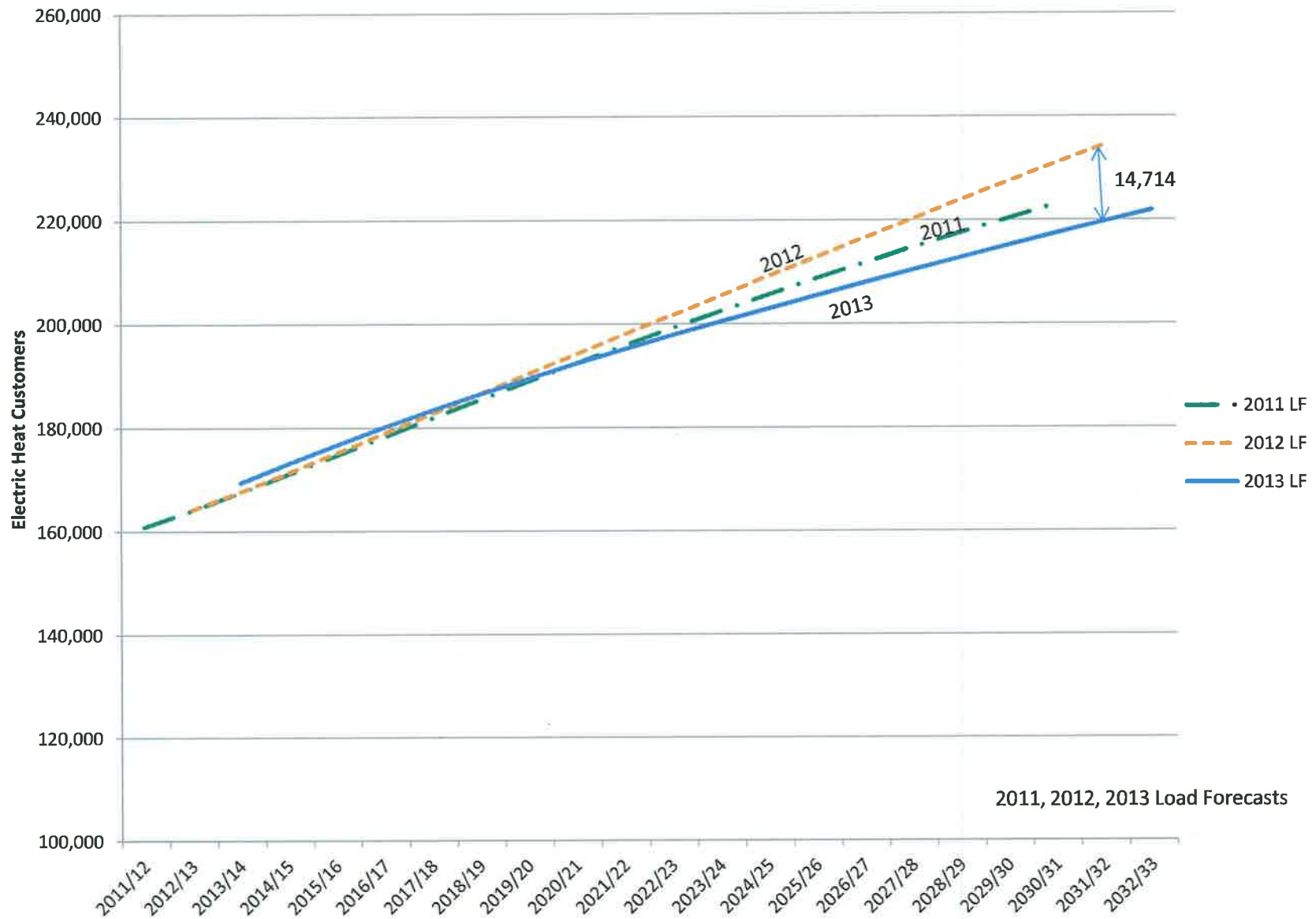
Figure 4.6 SECTORS OF DOMESTIC LOAD FOR 2031/32



Residential Basic

The residential sector—excluding seasonal, diesel and flat-rate customers—is known as Residential Basic. Residential Basic had 450,748 customers in 2011/12, whose weather-adjusted energy consumption was 29% of the total energy consumed in Manitoba or 7,114 GWh. The major driver of Residential Basic load in the 2012 Load Forecast is the Manitoba population. Manitoba's population in 2011/12 was 1,255,000. Manitoba Hydro has one residential basic customer for every 2.8 people in Manitoba, and this ratio is expected to remain at about this level.

2011 - 2013 Residential Load Forecast - Electric Heat Customers



2011 - 2013 Residential Load Forecast - Standard Customers

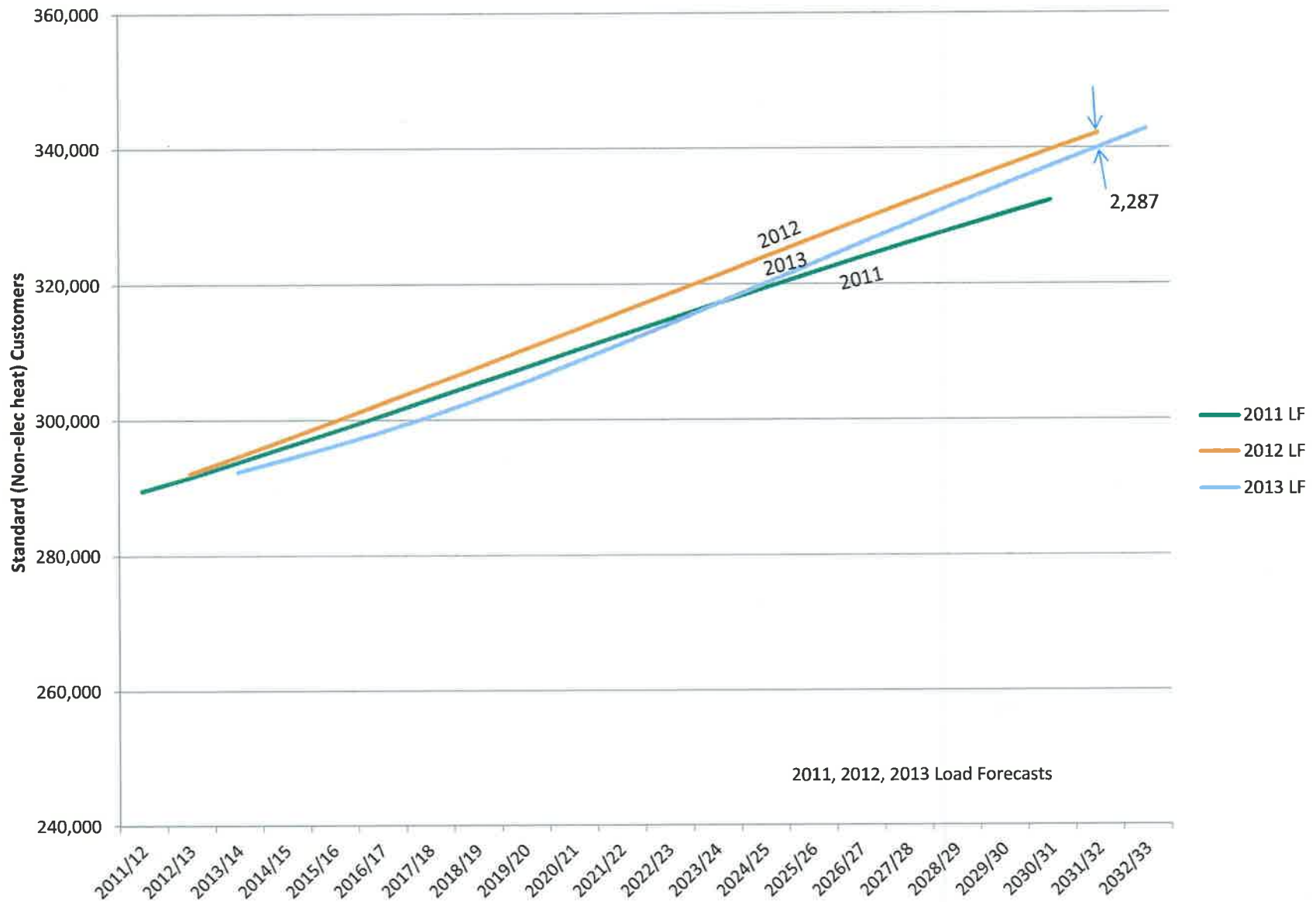


Table 6 - Residential Basic Sales

RESIDENTIAL BASIC SALES History and Forecast 2010/11 - 2030/31											
Fiscal Year	Electric Heat Billed			Other			Total Basic			% Elec Space Heat	% Elec Water Tanks
	(Custs.)	(GW.h)	(Avg.)	(Custs.)	(GW.h)	(Avg.)	(Custs.)	(GW.h)	(Avg.)		
2010/11	158012	4036	25545	287870	2916	10129	445882	6952	15592	35.4%	47.8%
2011/12	160849	4157	25847	289549	2961	10226	450399	7118	15805	35.7%	49.3%
2012/13	164043	4232	25800	291571	2983	10232	455614	7216	15837	36.0%	51.0%
2013/14	167547	4316	25758	293806	3010	10244	461353	7326	15878	36.3%	52.5%
2014/15	171056	4400	25723	296032	3037	10261	467089	7438	15923	36.6%	54.0%
2015/16	174627	4487	25693	298314	3067	10280	472941	7554	15971	36.9%	55.5%
2016/17	178242	4575	25668	300648	3098	10304	478890	7673	16022	37.2%	56.8%
2017/18	181856	4664	25648	303011	3130	10330	484867	7794	16075	37.5%	58.1%
2018/19	185430	4753	25632	305381	3163	10358	490811	7916	16129	37.8%	59.3%
2019/20	188955	4841	25622	307753	3197	10390	496708	8039	16184	38.0%	60.4%
2020/21	192427	4929	25616	310120	3233	10424	502547	8162	16241	38.3%	61.5%
2021/22	195838	5016	25615	312475	3269	10460	508313	8285	16299	38.5%	62.5%
2022/23	199181	5103	25619	314813	3305	10500	513995	8408	16359	38.8%	64.0%
2023/24	202451	5188	25627	317125	3343	10542	519576	8531	16420	39.0%	65.5%
2024/25	205640	5273	25641	319406	3382	10587	525046	8654	16483	39.2%	66.6%
2025/26	208745	5356	25660	321650	3421	10635	530395	8777	16548	39.4%	67.6%
2026/27	211763	5439	25683	323853	3461	10687	535617	8900	16616	39.5%	68.5%
2027/28	214693	5520	25712	326013	3502	10742	540705	9022	16686	39.7%	69.3%
2028/29	217532	5601	25747	328126	3544	10801	545658	9145	16759	39.9%	70.1%
2029/30	220281	5680	25785	330190	3586	10862	550471	9266	16834	40.0%	70.9%
2030/31	222939	5759	25830	332203	3630	10928	555142	9389	16913	40.2%	71.7%

Table 14 - Residential Basic Sales

RESIDENTIAL BASIC SALES History and Forecast 2011/12 - 2031/32											
Fiscal Year	Electric Heat Billed			Other			Total Basic			% Elec Space Heat	% Elec Water Tanks
	Custs	GW.h	kW.h/cust	Custs	GW.h	kW.h/cust	Custs	GW.h	kW.h/cust		
2011/12	161078	3910	24273	289670	2908	10038	450748	6818	15125	35.7%	47.3%
2012/13	164166	4156	25316	292114	3071	10512	456280	7227	15839	36.0%	48.6%
2013/14	167665	4228	25215	294552	3117	10581	462217	7344	15890	36.3%	50.2%
2014/15	171358	4304	25117	297157	3163	10644	468515	7467	15938	36.6%	51.7%
2015/16	175111	4371	24960	299766	3198	10667	474877	7569	15938	36.9%	53.1%
2016/17	178901	4434	24784	302391	3228	10675	481292	7662	15920	37.2%	54.5%
2017/18	182714	4511	24691	305037	3263	10696	487751	7774	15939	37.5%	55.8%
2018/19	186536	4598	24648	307703	3302	10732	494239	7900	15984	37.7%	57.0%
2019/20	190355	4686	24616	310390	3344	10775	500745	8030	16036	38.0%	58.1%
2020/21	194165	4774	24587	313092	3387	10818	507257	8161	16088	38.3%	59.1%
2021/22	197955	4862	24560	315805	3430	10863	513760	8292	16140	38.5%	60.1%
2022/23	201721	4952	24547	318521	3477	10917	520242	8429	16202	38.8%	61.1%
2023/24	205458	5043	24544	321234	3535	11003	526692	8577	16285	39.0%	62.4%
2024/25	209162	5134	24545	323939	3596	11100	533101	8730	16375	39.2%	63.8%
2025/26	212837	5225	24548	326626	3652	11181	539463	8877	16455	39.5%	64.9%
2026/27	216488	5315	24551	329286	3706	11254	545774	9021	16528	39.7%	65.7%
2027/28	220113	5406	24562	331920	3761	11331	552033	9167	16607	39.9%	66.4%
2028/29	223712	5498	24576	334526	3817	11410	558238	9315	16686	40.1%	67.1%
2029/30	227286	5589	24588	337105	3874	11492	564391	9463	16766	40.3%	67.8%
2030/31	230835	5679	24601	339656	3932	11577	570491	9611	16847	40.5%	68.4%
2031/32	234363	5768	24612	342182	3992	11666	576545	9760	16929	40.6%	69.1%

Electric Heat Billed: Customers who have electric space heating included with their electric bill.

Other: Customers who do not have electric space heating included with their electric bill.

% Elec Space Heat: The proportion of Total Basic customers who are Electric Heat Billed.

% Elec Water Tanks: The proportion of Total Basic customers who have Electric Water Heaters.

Note: Average use (kW.h/cust) for Electric Heat Billed and Other homes is a blended average of single detached dwellings, multi-family dwellings, and apartments.

Table 14 - Residential Basic Sales

RESIDENTIAL BASIC SALES												
History and Forecast												
2011/12 - 2031/32												
Fiscal Year	Electric Heat Billed			Other			Total Basic			% Elec Spacc Heat	% Elec Water Heat	
	Custs	GW.h	kW.h/cust	Custs	GW.h	kW.h/cust	Custs	GW.h	kW.h/cust			
2012/13	165576	4255	25701	290554	2964	10201	456130	7219	15827	36.3%	49.0%	
2013/14	169399	4342	25635	292364	2997	10250	461763	7339	15894	36.7%	50.1%	
2014/15	173080	4425	25568	294212	3033	10309	467292	7458	15961	37.0%	51.2%	
2015/16	176666	4492	25428	296150	3046	10284	472816	7538	15943	37.4%	52.2%	
2016/17	180099	4559	25313	298234	3065	10277	478333	7624	15938	37.7%	53.2%	
2017/18	183380	4629	25244	300492	3100	10318	483872	7730	15975	37.9%	54.1%	
2018/19	186502	4698	25191	302950	3144	10378	489452	7842	16023	38.1%	54.8%	
2019/20	189479	4763	25140	305582	3190	10439	495061	7953	16065	38.3%	55.6%	
2020/21	192355	4826	25089	308326	3237	10500	500681	8063	16105	38.4%	56.2%	
2021/22	195141	4886	25041	311159	3286	10562	506300	8173	16142	38.5%	56.9%	
2022/23	197812	4947	25010	314088	3343	10643	511900	8290	16194	38.6%	57.5%	
2023/24	200399	5006	24978	317064	3399	10721	517463	8405	16242	38.7%	58.0%	
2024/25	202950	5064	24950	320026	3456	10800	522976	8520	16292	38.8%	58.6%	
2025/26	205463	5121	24925	322968	3514	10880	528431	8635	16341	38.9%	59.1%	
2026/27	207935	5178	24903	325887	3572	10960	533822	8750	16391	39.0%	59.6%	
2027/28	210365	5235	24884	328778	3630	11040	539143	8864	16442	39.0%	60.1%	
2028/29	212752	5292	24876	331635	3691	11130	544387	8983	16502	39.1%	60.6%	
2029/30	215094	5349	24870	334457	3752	11219	549551	9102	16562	39.1%	61.1%	
2030/31	217392	5406	24866	337243	3814	11308	554635	9219	16622	39.2%	61.6%	
2031/32	219649	5462	24866	339995	3875	11397	559644	9337	16684	39.2%	62.0%	
2032/33	221868	5518	24869	342718	3937	11487	564586	9454	16746	39.3%	62.5%	

Electric Heat Billed: Customers who have electric space heating included with their electric bill.

Other: Customers who do not have electric space heating included with their electric bill.

% Elec Space Heat: The proportion of Total Basic customers who are Electric Heat Billed.

% Elec Water Heat: The proportion of Total Basic customers who have Electric Water Heaters.

The average use (kW.h/customer) for Electric Heat Billed customers is decreasing as apartments are making up a higher proportion of the growth and as existing homes become better insulated. The average use for Other customers is increasing primarily due to the increase in electric water heaters.



**Needs For and Alternatives To
GAC/MH I-034**

- 1 This Information was assembled to forecast each of the five areas and dwelling types for both
- 2 electric heat billed and other heat. The following two tables provide the detailed number of
- 3 customers that formed the basis of the electric space heat saturation rate.

Electric Space Heat Billed (average annual customers)						
	5D Winnipeg	5D Gas Avail	5D No Gas Avail	Multi-Attached	Apartments	Total
2011/12	6,625	53,138	71,075	9,046	21,195	161,078
2012/13	6,875	54,062	71,908	9,361	21,960	164,166
2013/14	7,119	55,120	72,938	9,677	22,811	167,665
2014/15	7,367	56,248	74,024	10,006	23,713	171,358
2015/16	7,618	57,413	75,121	10,336	24,624	175,111
2016/17	7,869	58,599	76,225	10,665	25,544	178,901
2017/18	8,117	59,798	77,335	10,994	26,469	182,714
2018/19	8,362	61,001	78,450	11,322	27,400	186,536
2019/20	8,602	62,204	79,567	11,650	28,334	190,355
2020/21	8,836	63,402	80,684	11,975	29,268	194,165
2021/22	9,064	64,591	81,799	12,299	30,202	197,955
2022/23	9,286	65,772	82,910	12,620	31,134	201,721
2023/24	9,502	66,942	84,015	12,938	32,061	205,458
2024/25	9,711	68,101	85,113	13,254	32,983	209,162
2025/26	9,916	69,254	86,203	13,566	33,898	212,837
2026/27	10,117	70,405	87,284	13,874	34,807	216,488
2027/28	10,313	71,554	88,356	14,180	35,709	220,113
2028/29	10,506	72,701	89,419	14,482	36,603	223,712
2029/30	10,696	73,845	90,473	14,780	37,491	227,286
2030/31	10,882	74,988	91,518	15,076	38,372	230,835
2031/32	11,065	76,129	92,555	15,369	39,246	234,364

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	Other Heat (average annual customers)						Total
	SD Winnipeg	SD Gas Avail	SD No Gas Avail	Multi- Attached	Apartments	2nd meter	
2011/12	159,327	59,913	7,090	24,992	36,120	2,227	289,670
2012/13	161,014	60,442	7,013	25,120	36,215	2,310	292,114
2013/14	162,620	61,111	6,937	25,254	36,321	2,310	294,552
2014/15	164,335	61,814	6,862	25,402	36,433	2,310	297,157
2015/16	166,067	62,500	6,787	25,555	36,547	2,310	299,766
2016/17	167,816	63,180	6,713	25,712	36,661	2,310	302,391
2017/18	169,580	63,859	6,640	25,872	36,776	2,310	305,037
2018/19	171,357	64,543	6,567	26,036	36,891	2,310	307,703
2019/20	173,145	65,233	6,495	26,202	37,005	2,310	310,390
2020/21	174,940	65,929	6,424	26,369	37,120	2,310	313,092
2021/22	176,739	66,631	6,353	26,539	37,234	2,310	315,805
2022/23	178,537	67,336	6,283	26,709	37,347	2,310	318,521
2023/24	180,332	68,041	6,213	26,879	37,459	2,310	321,234
2024/25	182,120	68,746	6,144	27,050	37,570	2,310	323,939
2025/26	183,898	69,443	6,076	27,220	37,679	2,310	326,626
2026/27	185,664	70,128	6,008	27,389	37,787	2,310	329,286
2027/28	187,418	70,799	5,941	27,558	37,894	2,310	331,920
2028/29	189,159	71,458	5,875	27,727	37,999	2,310	334,526
2029/30	190,886	72,103	5,809	27,894	38,102	2,310	337,105
2030/31	192,602	72,735	5,744	28,061	38,205	2,310	339,656
2031/32	194,306	73,355	5,679	28,227	38,306	2,310	342,181

1.0% 1.0% -1.1% 0.6% 0.3% 0.2% 0.8%

2

3 The "2nd meter" are dwellings that have more than one Residential Basic meter.

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5 The following table shows the breakdown of electric heat percentage by area and dwelling type
 6 by dividing the Electric Space Heat customers for each customers category by all customers
 7 within each customer category (the sum of the Electric Space Heat customers and the Other
 8 Heat customers). The final column labeled "Total" was used as the "% Elec Space Heat" column
 9 in Table 14 on page 18 of the 2012 Electric Load Forecast included as Appendix C of this
 10 submission.



**Needs For and Alternatives To
GAC/MH I-034**

	% Electric Space Heat Billed						
	SD Winnipeg	SD Gas Avail	SD No Gas Avail	Multi- Attached	Apartments	2nd meter	Total
2011/12	4.0%	47.0%	90.9%	26.6%	37.0%	0.0%	35.7%
2012/13	4.1%	47.2%	91.1%	27.1%	37.7%	0.0%	36.0%
2013/14	4.2%	47.4%	91.3%	27.7%	38.6%	0.0%	36.3%
2014/15	4.3%	47.6%	91.5%	28.3%	39.4%	0.0%	36.6%
2015/16	4.4%	47.9%	91.7%	28.8%	40.3%	0.0%	36.9%
2016/17	4.5%	48.1%	91.9%	29.3%	41.1%	0.0%	37.2%
2017/18	4.6%	48.4%	92.1%	29.8%	41.9%	0.0%	37.5%
2018/19	4.7%	48.6%	92.3%	30.3%	42.6%	0.0%	37.7%
2019/20	4.7%	48.8%	92.5%	30.8%	43.4%	0.0%	38.0%
2020/21	4.8%	49.0%	92.6%	31.2%	44.1%	0.0%	38.3%
2021/22	4.9%	49.2%	92.8%	31.7%	44.8%	0.0%	38.5%
2022/23	4.9%	49.4%	93.0%	32.1%	45.5%	0.0%	38.8%
2023/24	5.0%	49.6%	93.1%	32.5%	46.1%	0.0%	39.0%
2024/25	5.1%	49.8%	93.3%	32.9%	46.7%	0.0%	39.2%
2025/26	5.1%	49.9%	93.4%	33.3%	47.4%	0.0%	39.5%
2026/27	5.2%	50.1%	93.6%	33.6%	47.9%	0.0%	39.7%
2027/28	5.2%	50.3%	93.7%	34.0%	48.5%	0.0%	39.9%
2028/29	5.3%	50.4%	93.8%	34.3%	49.1%	0.0%	40.1%
2029/30	5.3%	50.6%	94.0%	34.6%	49.6%	0.0%	40.3%
2030/31	5.3%	50.8%	94.1%	34.9%	50.1%	0.0%	40.5%
2031/32	5.4%	50.9%	94.2%	35.3%	50.6%	0.0%	40.6%

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Year	Cumulative # of Fuel Switched Customers				Total # of Customers (Meters)			
	Space Heating		Water Heating		Electric		Natural Gas	
	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial
2020/21	23,511	440	72,868	440	502,547	71,267	261,356	25,405
2030/31	47,592	920	146,316	920	555,142	76,298	282,131	26,206

4.2.1. Energy Load Impact

The following table provides the impact on Manitoba Hydro's electric load relative to the 2011 Electric Load Forecast.

2011 Load Forecast (Net Firm Energy) 2030/31 (GW.h)	Portion of 2011 Forecast Attributed to Fuel Switching 2030/31		
		GW.h	% of Load
32,465	Space Heating:	605	2%
	Water Heating:	269	1%

From an incremental perspective, the 2011 forecast includes increased domestic electric load due to fuel switching of 874 GW.h by 2030/31, which represents 3% of the expected 2030/31 domestic electrical load.

The table below provides the impact of fuel switching on Manitoba Hydro's domestic natural gas load in 2030/31 (Total Gas Volume Forecast) which is included in the 2011 Natural Gas Volume Forecast.

2011 Load Forecast (Total Natural Gas Sales) 2030/31 (10 ⁶ m ³)	Portion of 2011 Forecast Attributed to Fuel Switching 2030/31		
		(10 ⁶ m ³)	% of Load
1,924	Space Heating:	(65)	-3%
	Water Heating:	(38)	-2%

The 2011 forecast includes a reduction in provincial natural gas sales of 5% in 2030/31. From an incremental perspective, the 2011 forecast includes decreased domestic sales of 103 million cubic metres by 2030/31.

4.2.2 Economic Impact

The net present value economic impact under the 2011 load forecasts over the next 30 years for space and water heating applications is outlined in the following table.



REFERENCE: September 5, 2013 Technical Conference, PowerPoint

QUESTION:

Please provide Manitoba Hydro's calculations as to the effects of Manitoba Hydro's gas initiative on Manitoba Hydro's residential load forecast.

RESPONSE:

To determine the effects of Manitoba Hydro's heating fuel choice initiative as outlined in Manitoba Hydro's response to PUB/MH I-253b, the 2013 residential load forecast was modeled without and with the effects of Manitoba Hydro's initiative. The four market sectors in the residential forecast that are targeted by the initiative are: new home space heating, replacement space heating, new home water heating and replacement water heating.

The effects of Manitoba Hydro's gas initiative equates to a cumulative reduction of 366 GWh by 2032/33 which is comprised of the following sectors:

Residential Sector	Reduction in Consumption (GWh)
New Home Space Heating	194
New Home Water Heating	12
Replacement Space Heating	96
Replacement Water Heating	64

Tables 1 to 4 outline the changes in market penetration for electric space and water heating in natural gas available areas used in modeling the 2013 residential load forecast without the heating fuel choice initiative and with the heating fuel choice initiative.

- 1 **Table 1 – New Homes – Market Saturation of Electric Space Heating in Natural Gas Available**
- 2 **Areas Without and With Heating Fuel Choice Initiative**

Fiscal Year	Total New Single Detached Built in Winnipeg	% New Single Detached in Winnipeg Installing Electric Heat		Total New Single Detached Built in South Gas Area	% New Single Detached in South Gas Installing Electric Heat		Total New Single Detached Built in Gas AVAILABLE	% of Total New Single Detached Installing Electric Heat in GAS AVAILABLE	
		Without Initiative	With Initiative		Without Initiative	With Initiative		Without Initiative	With Initiative
2013/14	1,594	3.3%	3.2%	1,799	63.4%	61.8%	3,393	35%	34%
2014/15	1,645	3.3%	3.0%	1,772	63.4%	59.4%	3,418	34%	32%
2015/16	1,646	3.3%	3.0%	1,773	63.4%	57.8%	3,418	34%	31%
2016/17	1,644	3.3%	2.9%	1,771	63.4%	55.4%	3,416	34%	30%
2017/18	1,652	3.3%	2.5%	1,779	63.4%	50.6%	3,431	34%	27%
2018/19	1,665	3.3%	2.1%	1,794	63.4%	43.4%	3,458	34%	24%
2019/20	1,673	3.3%	1.7%	1,803	63.4%	37.2%	3,476	34%	20%
2020/21	1,678	3.3%	1.5%	1,808	63.4%	33.2%	3,486	34%	18%
2021/22	1,678	3.3%	1.2%	1,809	63.4%	30.0%	3,487	34%	16%
2022/23	1,674	3.3%	0.9%	1,804	63.4%	26.1%	3,478	34%	14%
2023/24	1,665	3.3%	0.7%	1,794	63.4%	23.8%	3,460	34%	13%
2024/25	1,653	3.3%	0.5%	1,780	63.4%	23.8%	3,433	34%	13%
2025/26	1,638	3.3%	0.4%	1,764	63.4%	23.8%	3,401	34%	13%
2026/27	1,621	3.3%	0.3%	1,745	63.4%	23.6%	3,367	34%	12%
2027/28	1,603	3.3%	0.3%	1,725	63.4%	23.8%	3,329	34%	12%
2028/29	1,583	3.3%	0.2%	1,703	63.4%	23.8%	3,286	34%	12%
2029/30	1,562	3.3%	0.2%	1,680	63.4%	23.8%	3,241	34%	12%
2030/31	1,541	3.3%	0.1%	1,657	63.4%	23.8%	3,198	34%	12%
2031/32	1,522	3.3%	0.1%	1,635	63.4%	23.8%	3,157	34%	12%
2032/33	1,504	3.3%	0.1%	1,615	63.4%	23.8%	3,120	34%	12%

3

- 1 **Table 2 – Existing Homes – Market Saturation of Electric Space Heating in Natural Gas**
 2 **Available Areas Without and With Heating Fuel Choice Initiative**

Fiscal Year	Total Existing Gas Dwellings Replacing a Heating System	Without Initiative		With Initiative	
		Total Existing Gas Dwellings Switching to Electric Heat	% of Total Existing Gas Dwellings Switching to Electric Heat	Total Existing Gas Dwellings Switching to Electric Heat	% of Total Existing Gas Dwellings Switching to Electric Heat
2013/14	12,101	300	2.5%	222	1.8%
2014/15	12,327	300	2.4%	153	1.2%
2015/16	12,559	300	2.4%	114	0.9%
2016/17	12,797	300	2.3%	37	0.3%
2017/18	13,039	300	2.3%	0	0.0%
2018/19	13,284	300	2.3%	0	0.0%
2019/20	13,530	300	2.2%	0	0.0%
2020/21	13,772	300	2.2%	0	0.0%
2021/22	14,010	300	2.1%	0	0.0%
2022/23	14,239	300	2.1%	0	0.0%
2023/24	14,457	300	2.1%	0	0.0%
2024/25	14,662	300	2.1%	0	0.0%
2025/26	14,850	300	2.0%	0	0.0%
2026/27	15,020	300	2.0%	0	0.0%
2027/28	15,171	300	2.0%	0	0.0%
2028/29	15,302	300	2.0%	0	0.0%
2029/30	15,411	300	2.0%	0	0.0%
2030/31	15,501	300	1.9%	0	0.0%
2031/32	15,571	300	1.9%	0	0.0%
2032/33	15,623	300	1.9%	0	0.0%

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- 1 Table 3 – New Homes – Market Saturation of Electric Water Heating in Natural Gas Available
- 2 Areas Without and With Heating Fuel Choice Initiative

Fiscal Year	Total New Single Detached Built in Gas Available Areas	Without Initiative	With Initiative
		% of Total New Single Detached Installing Electric Water Heat in Gas Available	% of Total New Single Detached Installing Electric Water Heat in Gas Available
2013/14	3,393	100.00%	99.3%
2014/15	3,418	100.00%	98.7%
2015/16	3,418	100.00%	98.7%
2016/17	3,416	100.00%	97.7%
2017/18	3,431	100.00%	96.7%
2018/19	3,458	100.00%	94.7%
2019/20	3,476	100.00%	93.4%
2020/21	3,486	100.00%	93.4%
2021/22	3,487	100.00%	93.4%
2022/23	3,478	100.00%	93.4%
2023/24	3,460	100.00%	93.4%
2024/25	3,433	100.00%	93.4%
2025/26	3,401	100.00%	93.4%
2026/27	3,367	100.00%	93.4%
2027/28	3,329	100.00%	93.4%
2028/29	3,286	100.00%	93.4%
2029/30	3,241	100.00%	93.4%
2030/31	3,198	100.00%	93.4%
2031/32	3,157	100.00%	93.4%
2032/33	3,120	100.00%	93.4%

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- 1 Table 4 – Existing Homes – Market Saturation of Electric Water Heating in Natural Gas
- 2 Available Areas Without and With Heating Fuel Choice Initiative

Fiscal Year	Without Initiative				With Initiative			
	Total Gas Water Heaters Replaced by all Water Heat Types	Gas Water Heaters in Single Detached Dwellings Switching to Electric	Existing Gas Water Heaters in Apartments & Multi-Attached Dwellings Switching to Electric	% of Total Gas Water Heaters Replaced Switching to Electric	Total Gas Water Heaters Replaced by all Water Heat Types	Gas Water Heaters in Single Detached Dwellings Switching to Electric	Existing Gas Water Heaters in Apartments & Multi-Attached Dwellings Switching to Electric	% of Total Gas Water Heaters Replaced Switching to Electric
2013/14	16,577	2,833	302	18.9%	16,577	2,833	302	18.9%
2014/15	16,332	2,792	297	18.9%	16,333	2,695	287	18.3%
2015/16	16,071	2,748	292	18.9%	16,078	2,471	264	17.0%
2016/17	15,799	2,703	287	18.9%	15,820	2,252	241	15.8%
2017/18	15,519	2,658	282	18.9%	15,564	2,038	219	14.5%
2018/19	15,235	2,608	277	18.9%	15,313	1,831	197	13.3%
2019/20	14,949	2,560	272	18.9%	15,070	1,631	176	12.0%
2020/21	14,663	2,512	266	19.0%	14,836	1,481	161	11.1%
2021/22	14,378	2,464	261	19.0%	14,608	1,375	149	10.4%
2022/23	14,095	2,416	256	19.0%	14,384	1,272	139	9.8%
2023/24	13,816	2,369	251	19.0%	14,163	1,214	132	9.5%
2024/25	13,540	2,322	246	19.0%	13,944	1,196	130	9.5%
2025/26	13,268	2,276	240	19.0%	13,727	1,177	128	9.5%
2026/27	13,001	2,231	236	19.0%	13,510	1,159	126	9.5%
2027/28	12,739	2,187	231	19.0%	13,295	1,141	124	9.5%
2028/29	12,482	2,143	226	19.0%	13,080	1,123	122	9.5%
2029/30	12,241	2,102	222	19.0%	12,878	1,105	120	9.5%
2030/31	12,017	2,063	218	19.0%	12,688	1,089	119	9.5%
2031/32	11,796	2,026	214	19.0%	12,499	1,073	117	9.5%
2032/33	11,579	1,989	210	19.0%	12,310	1,057	115	9.5%

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Impact of MH's Heating Fuel Choice Initiatives

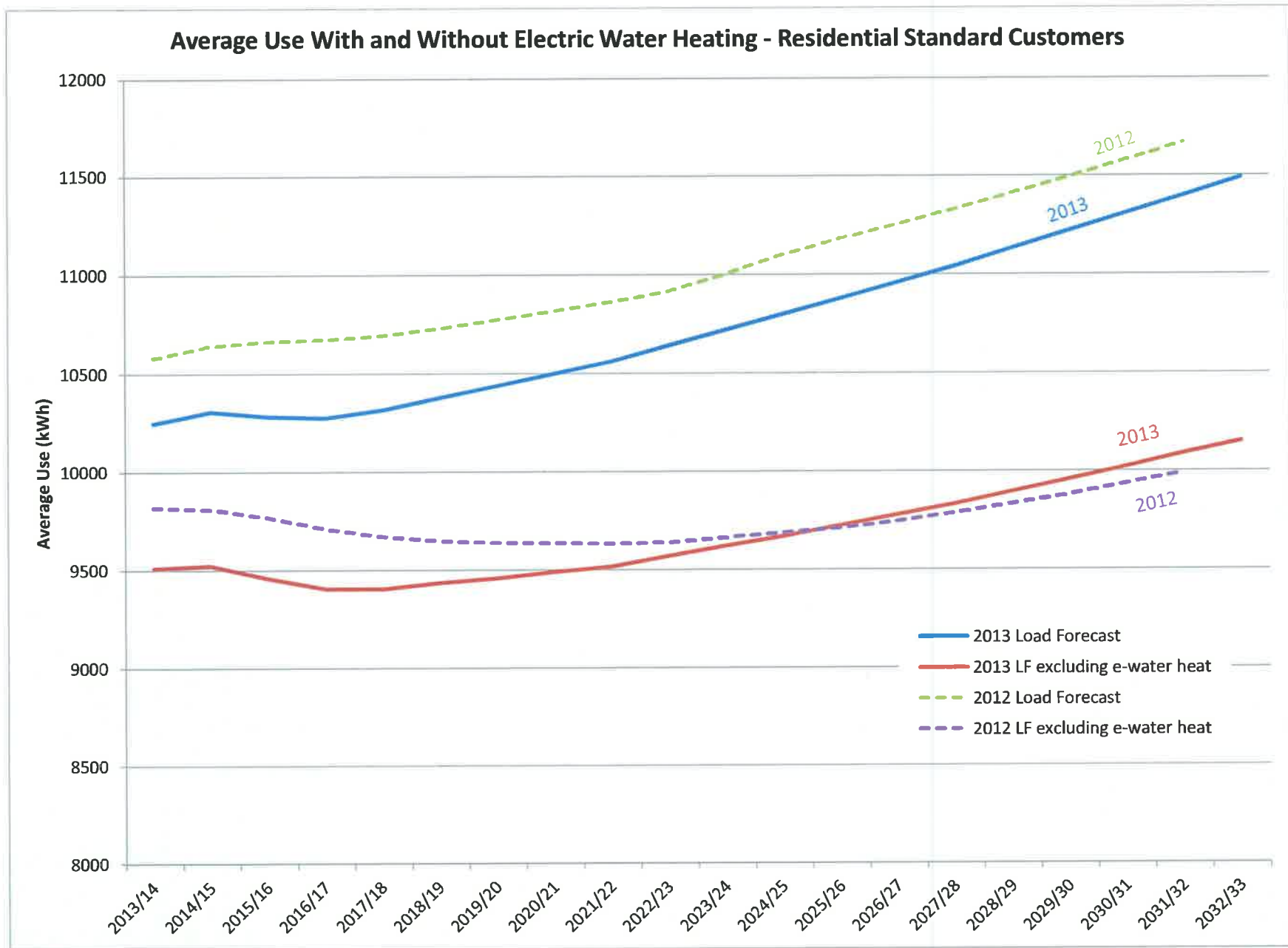
MH predicts its Initiatives will:

- reduce the number of new homes in Winnipeg with electric heat from 3.3% down to 0.1% by 2032/33
- reduce the number of new homes in South Gas Area with electric heat from 63.4% down to 23.8% by 2032/33
- reduce the number of new homes in all gas areas with electric heat from 35% down to 12% by 2032/33
- reduce the number of retrofits to electric heat from 2.5% of existing dwellings to 1.8% in first year and to 0% by 2032/33
- reduce the saturation of electric water heaters in new homes from 100% to 93.4% by 2032/33
- reduce the number of retrofits from gas to electric water heaters in existing single detached homes, apartments, and multi-attached from 18.9% down to 9.5% by 2032/33

(Source: PUB/MH I-253a)

If the Initiative was 100% effective and residential customers in gas available areas did not 1) build new homes with electric space or water heating and 2) retrofit gas space or water heating with electric, the load impacts would be:

Residential Sector	MH Forecast Consumption Reduction Dues to Initiatives (GWh)	100% Effective Fuel Choice Initiative Consumption Reduction (GWh)
New Home Space Heating	194	425
New Home Water Heating	12	229
Replacement Space Heating	96	105
Replacement Water Heating	64	183
Total	366 GWh	942 GWh



Residential - Standard increase in average use excluding the impact of increasing electric water heating saturation - 2013 Load Forecast Table 14											PUB Calculations:				
Column:	Electric Heat			Standard			Total			%e-space heat	%e-water heat	Total # e-water heaters	Standard customers w/ e- water heat	%Standard customers w/ e-water heat	Standard Avg Use exclud. e-water heat kWh
	Consumpt	Avg Use		Consumpt	Avg Use		Consumpt	Avg Use							
	Customers	GWh	kWh	Customers	GWh	kWh	Customers	GWh	kWh						
	1	2	3	4	5	6	7	8	9	10	11	12 =7 x 11	13 =12-1	14 =13/4	15 =(5-13*0.0035)/4
2013/14	169399	4342	25635	292364	2997	10250	461763	7339	15894	36.70%	50.10%	231,343	61,944	21%	9,509
2014/15	173080	4425	25568	294212	3033	10309	467292	7458	15961	37.00%	51.20%	239,254	66,174	22%	9,522
2015/16	176666	4492	25428	296150	3046	10284	472816	7538	15943	37.40%	52.20%	246,810	70,144	24%	9,456
2016/17	180099	4559	25313	298234	3065	10277	478333	7624	15938	37.70%	53.20%	254,473	74,374	25%	9,404
2017/18	183380	4629	25244	300492	3100	10318	483872	7730	15975	37.90%	54.10%	261,775	78,395	26%	9,403
2018/19	186502	4698	25191	302950	3144	10378	489452	7842	16023	38.10%	54.80%	268,220	81,718	27%	9,434
2019/20	189479	4763	25140	305582	3190	10439	495061	7953	16065	38.30%	55.60%	275,254	85,775	28%	9,457
2020/21	192355	4826	25089	308326	3237	10500	500681	8063	16105	38.40%	56.20%	281,383	89,028	29%	9,488
2021/22	195141	4886	25041	311159	3286	10562	506300	8173	16142	38.50%	56.90%	288,085	92,944	30%	9,515
2022/23	197812	4947	25010	314088	3343	10643	511900	8290	16194	38.60%	57.50%	294,343	96,531	31%	9,568
2023/24	200399	5006	24978	317064	3399	10721	517463	8405	16242	38.70%	58.00%	300,129	99,730	31%	9,619
2024/25	202950	5064	24950	320026	3456	10800	522976	8520	16292	38.80%	58.60%	306,464	103,514	32%	9,667
2025/26	205463	5121	24925	322968	3514	10880	528431	8635	16341	38.90%	59.10%	312,303	106,840	33%	9,723
2026/27	207935	5178	24903	325887	3572	10960	533822	8750	16391	39.00%	59.60%	318,158	110,223	34%	9,777
2027/28	210365	5235	24884	328778	3630	11040	539143	8864	16442	39.00%	60.10%	324,025	113,660	35%	9,831
2028/29	212752	5292	24876	331635	3691	11130	544387	8983	16502	39.10%	60.60%	329,899	117,147	35%	9,893
2029/30	215094	5349	24870	334457	3752	11219	549551	9102	16562	39.10%	61.10%	335,776	120,682	36%	9,955
2030/31	217392	5406	24866	337243	3814	11308	554635	9219	16622	39.20%	61.60%	341,655	124,263	37%	10,020
2031/32	219649	5462	24866	339995	3875	11397	559644	9337	16684	39.20%	62.00%	346,979	127,330	37%	10,086
2032/33	221868	5518	24869	342718	3937	11487	564586	9454	16746	39.30%	62.50%	352,866	130,998	38%	10,150

Residential - Standard increase in average use excluding the impact of increasing electric water heating saturation - 2012 Load Forecast Table 14											PUB Calculations:				
Column:	Electric Heat			Standard			Total			%e-space heat	%e-water heat	Total # e-water heaters	Standard customers w/ e- water heat	%Standard customers w/ e-water heat	Standard Avg Use exclud. e-water heat kWh
	Customers	Consumpt GWh	Avg Use kWh	Customers	Consumpt GWh	Avg Use kWh	Customers	Consumpt GWh	Avg Use kWh			12 =7 x 11	13 =12-1	14 =13/4	15 =(5-13*0.0035)/4
	1	2	3	4	5	6	7	8	9	10	11				
2012/13	164166	4156	25316	292114	3071	10512	456280	7227	15839	36.00%	48.60%	221,752	57,586	20%	9,823
2013/14	167665	4228	25215	294552	3117	10581	462217	7344	15890	36.30%	50.20%	232,033	64,368	22%	9,817
2014/15	171358	4304	25117	297157	3163	10644	468515	7467	15938	36.60%	51.70%	242,222	70,864	24%	9,810
2015/16	175111	4371	24960	299766	3198	10667	474877	7569	15938	36.90%	53.10%	252,160	77,049	26%	9,769
2016/17	178901	4434	24784	302391	3228	10675	481292	7662	15920	37.20%	54.50%	262,304	83,403	28%	9,710
2017/18	182714	4511	24691	305037	3263	10696	487751	7774	15939	37.50%	55.80%	272,165	89,451	29%	9,671
2018/19	186536	4598	24648	307703	3302	10732	494239	7900	15984	37.70%	57.00%	281,716	95,180	31%	9,648
2019/20	190355	4686	24616	310390	3344	10775	500745	8030	16036	38.00%	58.10%	290,933	100,578	32%	9,639
2020/21	194165	4774	24587	313092	3387	10818	507257	8161	16088	38.30%	59.10%	299,789	105,624	34%	9,637
2021/22	197955	4862	24560	315805	3430	10863	513760	8292	16140	38.50%	60.10%	308,770	110,815	35%	9,633
2022/23	201721	4952	24547	318521	3477	10917	520242	8429	16202	38.80%	61.10%	317,868	116,147	36%	9,640
2023/24	205458	5043	24544	321234	3535	11003	526692	8577	16285	39.00%	62.40%	328,656	123,198	38%	9,662
2024/25	209162	5134	24545	323939	3596	11100	533101	8730	16375	39.20%	63.80%	340,118	130,956	40%	9,686
2025/26	212837	5225	24548	326626	3652	11181	539463	8877	16455	39.50%	64.90%	350,111	137,274	42%	9,710
2026/27	216488	5315	24551	329286	3706	11254	545774	9021	16528	39.70%	65.70%	358,574	142,086	43%	9,744
2027/28	220113	5406	24562	331920	3761	11331	552033	9167	16607	39.90%	66.40%	366,550	146,437	44%	9,787
2028/29	223712	5498	24576	334526	3817	11410	558238	9315	16686	40.10%	67.10%	374,578	150,866	45%	9,832
2029/30	227286	5589	24588	337105	3874	11492	564391	9463	16766	40.30%	67.80%	382,657	155,371	46%	9,879
2030/31	230835	5679	24601	339656	3932	11577	570491	9611	16847	40.50%	68.40%	390,216	159,381	47%	9,934
2031/32	234363	5768	24612	342182	3992	11666	576545	9760	16929	40.60%	69.10%	398,393	164,030	48%	9,989

PUB Calculations assume 100% of electric heat customers have electric water heaters

Electric water heater average use = 0.0035 GWh from 2012 Fuel Switching Report

4

based on 2-years, or 24-months, of monthly (or mid-monthly) energy and DDH/DDC observations. It is unclear why Manitoba Hydro has restricted the regression analysis to such a short time series.¹⁹ However, in doing so, the approach appears to imply significantly different weather sensitivity by customers in the same sales sector for different years. Manitoba Hydro has provided to Elenchus the annual weather sensitivity coefficients used to calculate the weather adjustment for 1992/93 through 2012/13. The coefficients for Residential Basic, GS Mass Market and Gross Firm Energy are displayed in the table below. The table displays the coefficients on the basis of kWh per degree-day.²⁰

Year	Degree-Day Sensitivity Coefficients					
	Residential Basic		GS Mass Market		Gross Firm Energy	
	kWh per DDH	kWh per DDC	kWh per DDH	kWh per DDC	kWh per DDH	kWh per DDC
2012/13	562,885	1,083,071	266,467	915,584	1,076,708	2,348,435
2011/12	578,833	1,442,491	274,852	1,224,633	1,047,163	2,529,636
2010/11	574,547	1,314,169	298,088	2,310,063	1,028,744	2,818,276
2009/10	534,488	840,833	259,666	1,167,411	1,004,304	2,544,819
2008/09	491,467	592,810	241,829	829,953	950,709	2,155,998
2007/08	469,982	579,696	231,155	779,694	904,513	2,046,997
2006/07	483,984	797,990	233,063	811,418	885,553	2,269,015
2005/06	482,666	745,408	232,878	755,772	850,653	1,610,544
2004/05	466,644	759,917	214,910	670,921	842,968	1,848,738
2003/04	460,717	782,521	208,755	661,104	877,179	2,404,829
2002/03	442,158	718,714	213,639	699,602	829,847	2,255,925
2001/02	444,829	737,560	220,798	832,224	833,864	2,369,997
2000/01	456,853	789,621	232,865	947,148	861,551	2,179,088
1999/00	458,239	823,336	246,215	876,738	871,335	2,073,027
1998/99	423,281	525,250	227,486	646,509	814,669	1,715,525
1997/98	418,032	360,599	213,535	680,674	805,210	1,505,541
1996/97	419,796	328,941	206,034	594,879	797,736	1,347,915
1995/96	419,973	178,537	241,177	1,126,509	812,974	1,795,456
1994/95	417,009	25,288	241,027	818,992	821,041	1,959,666
1993/94	419,373	312,842	236,840	432,117	813,538	1,386,636
1992/93	444,300	549,800	249,410	639,711	862,923	1,635,019

The table shows significant variation in weather sensitivity from year-to-year, particularly in the Residential sector, and especially for cooling degree-day sensitivity. Cooling sensitivity in the

¹⁹ Manitoba Hydro Staff has indicated to Elenchus that one reason may have been to reduce the variability of the coefficients year-to-year, especially for cooling.

²⁰ These can be converted to GWh per degree-day by dividing by 1,000,000. In Manitoba Hydro's Electric Load Forecast documents, the coefficients are expressed in GWh per degree-day.

REFERENCE: Appendix D 2013 Electric Load Forecast; Page No.: 42

PREAMBLE: To determine low income rate impact CAC MB requires the following information.

QUESTION:

Please provide a schedule that sets out the Heating and Cooling Degree Days for Winnipeg, by month for Jan. 2000 to Dec. 2012. Please provide in both hard copy and accessible Excel spreadsheet formats.

RESPONSE:

Monthly Degree Days Heating History in Winnipeg (base 14°C)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2012	767.6	698.9	371.3	244.3	62.7	9.9	.0	.0	89.1	310.9	601.1	889.8	4,066
2011	1,031.2	788.9	698.8	286.8	110.3	12.9	.0	.0	60.8	204.0	481.2	683.6	4,359
2010	860.1	793.6	451.1	173.5	108.8	10.3	.0	9.0	79.9	188.7	520.6	878.1	4,074
2009	1,052.3	800.9	676.4	321.4	177.1	47.4	3.8	2.4	19.8	330.1	396.9	895.9	4,724
2008	962.2	933.1	696.6	319.8	180.9	21.3	.0	3.0	56.3	227.9	546.4	1,033.0	4,981
2007	931.0	919.6	592.5	296.6	62.7	16.5	.0	4.0	66.8	231.8	540.3	903.2	4,584
2006	662.6	841.1	624.1	150.3	105.2	3.5	.5	.0	70.3	330.7	556.9	734.3	4,080
2005	1,042.3	775.2	684.8	204.3	145.1	7.6	.0	.7	48.3	222.0	506.9	717.2	4,354
2004	1,106.8	745.3	616.8	311.8	207.9	36.7	5.4	32.0	36.6	253.0	446.3	882.9	4,681
2003	916.6	934.0	688.7	260.2	67.8	10.8	1.3	4.9	98.8	241.0	634.6	733.8	4,593
2002	886.5	671.1	795.2	362.9	210.4	11.5	.0	2.8	75.9	449.7	585.8	698.0	4,750
2001	825.0	905.0	625.0	278.5	74.9	19.5	2.9	5.4	52.9	300.9	392.7	758.8	4,242
2000	969.3	864.1	435.7	300.5	102.1	32.6	3.6	4.4	90.0	234.3	579.8	1,117.2	4,534

1

Monthly Degree Days Cooling History in Winnipeg (base 18°C)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2012	.0	.0	.5	.0	5.0	39.9	137.0	59.9	12.9	.0	.0	.0	255
2011	.0	.0	.0	.0	.5	32.0	109.0	76.5	19.0	10.6	.0	.0	250
2010	.0	.0	.0	.0	7.8	17.5	75.5	72.7	.0	.0	.0	.0	173
2009	.0	.0	.0	.0	.0	41.4	13.0	23.3	40.8	.0	.0	.0	119
2008	.0	.0	.0	.0	.0	15.8	36.7	68.2	2.7	.0	.0	.0	123
2007	.0	.0	.0	.0	6.2	32.2	110.8	37.3	12.4	.0	.0	.0	199
2006	.0	.0	.0	.8	10.5	40.8	120.0	65.1	18.6	.0	.0	.0	253
2005	.0	.0	.0	.0	3.6	40.8	92.1	39.6	21.7	.0	.0	.0	198
2004	.0	.0	.0	.0	.0	7.9	48.1	1.0	14.8	.0	.0	.0	72
2003	.0	.0	.0	.0	2.4	23.2	60.7	130.7	17.9	.0	.0	.0	235
2002	.0	.0	.0	.0	4.8	50.2	95.9	43.3	12.9	.0	.0	.0	207
2001	.0	.0	.0	1.7	2.8	29.7	92.6	72.2	12.1	.0	.0	.0	211
2000	.0	.0	.0	.0	.0	7.5	69.9	57.8	2.1	.0	.0	.0	137

2

3 The spreadsheet is provided as an attachment.

1 **REFERENCE: Chapter 4: The Need for New Resources; 2012 GRA PUB Exhibit 30**
 2 **(undertaking #10)**

3

4 **QUESTION:**

5 Please re-file the Residential Basic Customers Sales (GWh) Table separately defining actual and
 6 weather adjusted sales for basic standard and basic all-electric sub-groups.

7

8 **RESPONSE:**

RESIDENTIAL BASIC STANDARD CUSTOMER SALES (GW.h)									
Fiscal Year	Actual GW.h Sales				Weather Adjusted GW.h Sales				
	Actual Sales	Annual Growth	Annual % Growth	Average Annual Growth	Weather Adjustment	Weather Adjusted Sales	Annual Growth	Annual % Growth	Average Annual Growth
1998/99	2609				57	2666			
1999/00	2607	-2	-0.1%		117	2725	59	2.2%	
2000/01	2736	129	4.7%		20	2756	32	1.1%	
2001/02	2771	35	1.3%		22	2793	37	1.3%	
2002/03	2977	205	6.9%	3.4%	-81	2895	102	3.5%	2.1%
2003/04	3019	43	1.4%		-26	2994	99	3.3%	
2004/05	2991	-28	-0.9%		72	3063	70	2.3%	
2005/06	3045	53	1.8%		65	3110	47	1.5%	
2006/07	3167	123	3.9%		-43	3124	14	0.5%	
2007/08	3237	70	2.1%	1.5%	-28	3209	85	2.6%	1.8%
2008/09	3243	6	0.2%		-7	3236	27	0.8%	
2009/10	3243	0	0.0%		83	3325	89	2.7%	
2010/11	3331	89	2.7%		37	3368	43	1.3%	
2011/12	3323	-9	-0.3%	0.3%	31	3354	-14	-0.4%	1.1%

1

RESIDENTIAL BASIC ALL ELECTRIC CUSTOMER SALES (GW.h)									
Fiscal Year	Actual GW.h Sales				Weather Adjusted GW.h Sales				
	Actual Sales	Annual Growth	Annual % Growth	Average Annual Growth	Weather Adjustment	Weather Adjusted Sales	Annual Growth	Annual % Growth	Average Annual Growth
1998/99	2774				146	2920			
1999/00	2757	-18	-0.6%		189	2946	25	0.9%	
2000/01	3001	245	8.1%		-59	2943	-3	-0.1%	
2001/02	2902	-99	-3.4%		107	3009	66	2.2%	
2002/03	3289	387	11.8%	4.3%	-185	3105	96	3.1%	1.5%
2003/04	3151	-138	-4.4%		24	3175	70	2.2%	
2004/05	3283	132	4.0%		-62	3221	46	1.4%	
2005/06	3126	-158	-5.0%		185	3311	90	2.7%	
2006/07	3275	149	4.6%		22	3297	-14	-0.4%	
2007/08	3499	224	6.4%	2.7%	-56	3443	146	4.2%	2.0%
2008/09	3604	106	2.9%		-152	3452	9	0.3%	
2009/10	3544	-61	-1.7%		48	3591	139	3.9%	
2010/11	3621	77	2.1%		41	3662	70	1.9%	
2011/12	3495	-126	-3.6%	0.0%	265	3760	99	2.6%	2.2%



**Needs For and Alternatives To
PUB/MH I-001b**

1 **REFERENCE: Chapter 4: The Need for New Resources; Page No.: 2012 GRA PUB Exhibit**
2 **30 (undertaking #10)**

3

4 **QUESTION:**

5 Please define the specific components of basic standard and basic all-electric that are weather-
6 sensitive (and adjusted) at a total sub-group sales level (GWh) and at an average unit
7 consumption level (kWh)/customer) as reflected in the 2012 GRA MH Exhibit #66.

8

9 **RESPONSE:**

10 The following tables break out the weather adjustments shown in the response to PUB/MH I-
11 0001(a) into the heating adjustment and cooling adjustment. These adjustments are also shown
12 on a kW.h/customer basis.

RESIDENTIAL STANDARD WEATHER ADJUSTMENT						
Fiscal Year	Customers	Weather Adjustment	Total Group (GWh)		kW.h / Customer	
			Heating Adjustment	Cooling Adjustment	Heating Adjustment	Cooling Adjustment
1998/99	287368	57	56	1	194	3
1999/00	289419	117	72	45	249	156
2000/01	290679	20	-22	43	-77	146
2001/02	291371	22	41	-19	140	-66
2002/03	292032	-81	-68	-14	-232	-47
2003/04	293020	-26	9	-35	32	-119
2004/05	294108	72	-22	94	-74	319
2005/06	295733	65	73	-8	247	-26
2006/07	297137	-43	8	-51	28	-173
2007/08	298287	-28	-20	-7	-68	-25
2008/09	299852	-7	-54	48	-182	159
2009/10	301147	83	20	62	68	207
2010/11	301495	37	17	20	57	66
2011/12	303089	31	110	-78	362	-258

RESIDENTIAL ALL-ELECTRIC WEATHER ADJUSTMENT						
Fiscal Year	Weather		Total Group (GW.h)		kW.h / Customer	
	Customers	Adjustment	Heating Adjustment	Cooling Adjustment	Heating Adjustment	Cooling Adjustment
1998/99	117110	146	146	0	1247	-2
1999/00	117506	189	187	1	1595	13
2000/01	118412	-59	-56	-2	-476	-19
2001/02	120285	107	105	2	869	19
2002/03	121780	-185	-185	0	-1517	1
2003/04	123671	24	26	-2	206	-15
2004/05	126027	-62	-57	-6	-449	-44
2005/06	128009	185	185	1	1444	5
2006/07	130749	22	23	-1	173	-6
2007/08	133858	-56	-57	1	-425	9
2008/09	137410	-152	-143	-9	-1039	-68
2009/10	140563	48	52	-4	367	-27
2010/11	144387	41	41	0	285	-3
2011/12	147658	265	276	-10	1868	-71

- 1
- 2 The weather adjustments shown here are for the Standard and All-Electric Residential rate
- 3 groups. These differ slightly from the values provided in the reference 2012 GRA PUB Exhibit 30
- 4 (undertaking #10) which was based on Electric Heat and Non-Electric Heat survey categories.

1 **REFERENCE: Chapter 4: The Need for New Resources; 2012 GRA CAC/MSOS/Centra**
 2 **16(a)**

3

4 **QUESTION:**

5 Please re-file the chart on Winnipeg average degree day heating (DDH) updated to include
 6 2011/12 and 2012/13 and explain the downward trend for 10/25 year averages.

7

8 **RESPONSE:**

9 The chart as filed in 2012 GRA CAC/MSOS/Centra 16(a) is provided below and is updated with
 10 recent data including revisions to some historical values provided by Environment Canada:

Fiscal Year Ending	Actual DDH	Normal DDH			DDH Difference: Actual - Normal			DDH % Difference: Actual - Normal		
		10 Yr Avg	25 Yr Avg	Olympic	10 Yr Avg	25 Yr Avg	Olympic	10 Yr Avg	25 Yr Avg	Olympic
1874	4,399									
1875	5,694									
1876	5,769									
1877	5,445									
1878	3,768									
1879	4,880									
1880	5,421									
1881	5,497									
1882	5,261									
1883	5,642									
1884	5,985									
1885	5,760									
1886	5,242									
1887	5,583									
1888	5,746									
1889	4,737									
1890	5,364									
1891	4,939									
1892	5,006									
1893	5,634									
1894	5,474									
1895	4,895									
1896	4,892									
1897	5,229									
1898	4,777									
1899	5,383									
1900	4,664	5,159	5,281	5,159	-495	-617	-495	-10.6%	-13.2%	-10.6%

1901	4,693	5,089	5,240	5,070	-396	-547	-377	-8.4%	-11.6%	-8.0%
1902	4,208	5,065	5,197	5,065	-857	-989	-857	-20.4%	-23.5%	-20.4%
1903	4,693	4,985	5,147	4,995	-292	-454	-302	-6.2%	-9.7%	-6.4%
1904	5,176	4,891	5,184	4,971	286	-8	205	5.5%	-0.1%	4.0%
1905	4,653	4,861	5,196	4,988	-208	-543	-335	-4.5%	-11.7%	-7.2%
1906	4,569	4,837	5,165	4,906	-268	-597	-337	-5.9%	-13.1%	-7.4%
1907	4,802	4,805	5,128	4,824	-2	-326	-22	0.0%	-6.8%	-0.5%
1908	4,931	4,762	5,110	4,815	169	-179	116	3.4%	-3.6%	2.4%
1909	4,631	4,777	5,081	4,819	-147	-451	-188	-3.2%	-9.7%	-4.1%
1910	4,576	4,702	5,027	4,759	-126	-451	-183	-2.8%	-9.9%	-4.0%
1911	4,724	4,693	4,980	4,739	31	-256	-15	0.7%	-5.4%	-0.3%
1912	4,870	4,696	4,959	4,694	174	-89	176	3.6%	-1.8%	3.6%
1913	4,794	4,763	4,931	4,714	31	-137	80	0.7%	-2.9%	1.7%
1914	4,398	4,773	4,893	4,724	-374	-494	-326	-8.5%	-11.2%	-7.4%
1915	4,344	4,695	4,879	4,724	-351	-535	-380	-8.1%	-12.3%	-8.7%
1916	4,699	4,664	4,838	4,695	35	-139	4	0.7%	-3.0%	0.1%
1917	5,151	4,677	4,829	4,672	474	322	479	9.2%	6.3%	9.3%
1918	4,891	4,712	4,834	4,699	179	57	192	3.7%	1.2%	3.9%
1919	4,348	4,708	4,805	4,732	-360	-457	-384	-8.3%	-10.5%	-8.8%
1920	5,064	4,680	4,760	4,686	384	304	378	7.6%	6.0%	7.5%
1921	4,333	4,728	4,766	4,700	-396	-434	-368	-9.1%	-10.0%	-8.5%
1922	4,483	4,689	4,744	4,671	-206	-261	-188	-4.6%	-5.8%	-4.2%
1923	4,645	4,650	4,714	4,662	-5	-69	-17	-0.1%	-1.5%	-0.4%
1924	4,198	4,636	4,709	4,654	-438	-511	-456	-10.4%	-12.2%	-10.9%
1925	4,903	4,616	4,662	4,600	287	241	303	5.9%	4.9%	6.2%
1926	4,483	4,671	4,671	4,611	-189	-188	-128	-4.2%	-4.2%	-2.9%
1927	4,679	4,650	4,663	4,619	29	16	60	0.6%	0.3%	1.3%
1928	4,635	4,603	4,682	4,653	33	-46	-18	0.7%	-1.0%	-0.4%
1929	4,613	4,577	4,679	4,646	36	-67	-34	0.8%	-1.4%	-0.7%
1930	4,835	4,603	4,657	4,601	232	179	234	4.8%	3.7%	4.8%
1931	4,124	4,581	4,664	4,596	-457	-540	-472	-11.1%	-13.1%	-11.4%
1932	4,297	4,560	4,646	4,581	-263	-350	-284	-6.1%	-8.1%	-6.6%
1933	4,980	4,541	4,626	4,520	439	354	460	8.8%	7.1%	9.2%
1934	4,995	4,575	4,628	4,577	421	367	418	8.4%	7.4%	8.4%
1935	4,617	4,654	4,642	4,627	-38	-26	-11	-0.8%	-0.6%	-0.2%
1936	5,562	4,626	4,644	4,624	936	918	938	16.8%	16.5%	16.9%
1937	5,175	4,734	4,678	4,704	441	497	471	8.5%	9.6%	9.1%
1938	3,734	4,783	4,690	4,731	-1050	-956	-998	-28.1%	-25.6%	-26.7%
1939	4,780	4,693	4,647	4,695	87	133	85	1.8%	2.8%	1.8%
1940	4,357	4,710	4,663	4,705	-353	-305	-348	-8.1%	-7.0%	-8.0%
1941	4,491	4,662	4,663	4,677	-171	-172	-186	-3.8%	-3.8%	-4.1%
1942	4,143	4,699	4,655	4,665	-555	-512	-522	-13.4%	-12.3%	-12.6%
1943	5,126	4,683	4,615	4,596	442	511	530	8.6%	10.0%	10.3%
1944	4,481	4,698	4,624	4,696	-217	-142	-215	-4.8%	-3.2%	-4.8%
1945	4,148	4,647	4,629	4,715	-498	-481	-567	-12.0%	-11.6%	-13.7%
1946	4,962	4,600	4,593	4,631	362	369	331	7.3%	7.4%	6.7%
1947	4,810	4,540	4,618	4,628	270	192	182	5.6%	4.0%	3.8%
1948	5,056	4,503	4,631	4,647	553	425	409	10.9%	8.4%	8.1%
1949	4,798	4,635	4,647	4,635	162	150	163	3.4%	3.1%	3.4%
1950	5,031	4,637	4,671	4,603	394	360	428	7.8%	7.2%	8.5%

1951	5,165	4,705	4,676	4,691	461	489	474	8.9%	9.5%	9.2%
1952	4,802	4,772	4,704	4,726	30	98	76	0.6%	2.0%	1.6%
1953	4,193	4,838	4,709	4,770	-645	-515	-577	-15.4%	-12.3%	-13.8%
1954	4,367	4,745	4,691	4,741	-378	-324	-375	-8.7%	-7.4%	-8.6%
1955	4,805	4,733	4,681	4,762	72	124	43	1.5%	2.6%	0.9%
1956	4,868	4,799	4,680	4,730	69	188	138	1.4%	3.9%	2.8%
1957	4,794	4,789	4,710	4,769	4	84	25	0.1%	1.8%	0.5%
1958	4,120	4,788	4,730	4,829	-668	-610	-709	-16.2%	-14.8%	-17.2%
1959	4,789	4,694	4,695	4,752	95	94	37	2.0%	2.0%	0.8%
1960	4,788	4,693	4,687	4,750	94	101	38	2.0%	2.1%	0.8%
1961	4,410	4,669	4,694	4,723	-259	-284	-313	-5.9%	-6.4%	-7.1%
1962	5,005	4,594	4,648	4,685	411	357	320	8.2%	7.1%	6.4%
1963	4,597	4,614	4,641	4,682	-17	-44	-85	-0.4%	-1.0%	-1.8%
1964	4,422	4,654	4,675	4,641	-232	-253	-219	-5.3%	-5.7%	-5.0%
1965	5,206	4,660	4,661	4,603	546	545	603	10.5%	10.5%	11.6%
1966	5,049	4,700	4,695	4,684	349	353	365	6.9%	7.0%	7.2%
1967	5,227	4,718	4,717	4,753	509	509	474	9.7%	9.7%	9.1%
1968	4,785	4,761	4,761	4,793	24	24	-8	0.5%	0.5%	-0.2%
1969	4,878	4,828	4,747	4,784	50	131	94	1.0%	2.7%	1.9%
1970	4,915	4,836	4,763	4,793	78	152	122	1.6%	3.1%	2.5%
1971	4,968	4,849	4,794	4,843	118	174	125	2.4%	3.5%	2.5%
1972	5,041	4,905	4,794	4,861	136	247	180	2.7%	4.9%	3.6%
1973	4,646	4,909	4,803	4,886	-262	-157	-240	-5.6%	-3.4%	-5.2%
1974	5,145	4,914	4,787	4,909	231	358	236	4.5%	7.0%	4.6%
1975	4,741	4,986	4,801	4,923	-245	-60	-182	-5.2%	-1.3%	-3.8%
1976	4,631	4,939	4,789	4,937	-309	-158	-306	-6.7%	-3.4%	-6.6%
1977	4,710	4,897	4,768	4,937	-188	-58	-227	-4.0%	-1.2%	-4.8%
1978	4,737	4,846	4,764	4,888	-109	-27	-151	-2.3%	-0.6%	-3.2%
1979	5,248	4,841	4,786	4,856	407	462	392	7.8%	8.8%	7.5%
1980	4,978	4,878	4,821	4,856	100	157	122	2.0%	3.2%	2.5%
1981	4,143	4,884	4,828	4,876	-741	-684	-733	-17.9%	-16.5%	-17.7%
1982	4,657	4,802	4,799	4,851	-145	-142	-194	-3.1%	-3.0%	-4.2%
1983	4,238	4,764	4,793	4,825	-525	-555	-587	-12.4%	-13.1%	-13.8%
1984	4,625	4,723	4,798	4,752	-98	-173	-127	-2.1%	-3.7%	-2.8%
1985	4,661	4,671	4,791	4,711	-10	-131	-51	-0.2%	-2.8%	-1.1%
1986	4,748	4,663	4,786	4,712	86	-38	36	1.8%	-0.8%	0.8%
1987	4,134	4,675	4,800	4,673	-540	-666	-539	-13.1%	-16.1%	-13.0%
1988	4,160	4,617	4,765	4,613	-457	-605	-453	-11.0%	-14.5%	-10.9%
1989	4,706	4,559	4,748	4,566	147	-42	140	3.1%	-0.9%	3.0%
1990	4,619	4,505	4,759	4,565	114	-140	54	2.5%	-3.0%	1.2%
1991	4,630	4,469	4,736	4,554	160	-106	76	3.5%	-2.3%	1.6%
1992	4,274	4,518	4,719	4,519	-244	-445	-245	-5.7%	-10.4%	-5.7%
1993	4,787	4,480	4,681	4,471	308	106	316	6.4%	2.2%	6.6%
1994	4,867	4,534	4,681	4,470	332	186	397	6.8%	3.8%	8.1%
1995	4,255	4,559	4,680	4,455	-304	-425	-200	-7.1%	-10.0%	-4.7%
1996	5,439	4,518	4,654	4,457	921	785	982	16.9%	14.4%	18.1%
1997	5,350	4,587	4,673	4,469	763	678	881	14.3%	12.7%	16.5%
1998	4,193	4,709	4,685	4,538	-516	-493	-345	-12.3%	-11.7%	-8.2%
1999	4,035	4,712	4,667	4,482	-677	-632	-447	-16.8%	-15.7%	-11.1%
2000	3,924	4,645	4,623	4,473	-721	-699	-550	-18.4%	-17.8%	-14.0%

2001	4,820	4,575	4,590	4,449	244	230	371	5.1%	4.8%	7.7%
2002	4,239	4,594	4,597	4,460	-355	-358	-221	-8.4%	-8.4%	-5.2%
2003	4,936	4,591	4,579	4,422	346	358	514	7.0%	7.2%	10.4%
2004	4,522	4,606	4,587	4,453	-84	-65	69	-1.8%	-1.4%	1.5%
2005	4,715	4,571	4,558	4,478	144	157	237	3.0%	3.3%	5.0%
2006	3,980	4,617	4,547	4,557	-637	-567	-577	-16.0%	-14.3%	-14.5%
2007	4,395	4,471	4,541	4,504	-77	-146	-109	-1.7%	-3.3%	-2.5%
2008	4,733	4,376	4,530	4,518	357	203	215	7.5%	4.3%	4.5%
2009	4,918	4,430	4,550	4,430	488	368	488	9.9%	7.5%	9.9%
2010	4,300	4,518	4,562	4,540	-219	-262	-241	-5.1%	-6.1%	-5.6%
2011	4,488	4,556	4,547	4,580	-68	-59	-92	-1.5%	-1.3%	-2.1%
2012	3,678	4,523	4,537	4,576	-845	-859	-899	-23.0%	-23.4%	-24.4%
2013	4,731	4,466	4,518	4,509	265	213	223	5.6%	4.5%	4.7%

1

2 This table shows lagged averages because its original intended use was to show how well the
3 average values predict the actual value. Adding one more line to the above table would show
4 the 25 year average for 2014 to be 4,541 DDH, which is the 25-year average from 1989 to 2013
5 used as normal weather in the 2013 Electric Load Forecast.

6

7 As expected, the 25 year average for DDH varies with natural climate variability. It was 4,593
8 DDH in 1946, rose to 4,828 DDH in 1981 and was 4,541 DDH in 2013. The overall downward
9 trend in DDH is consistent with the rising trend in annual average temperature, which is
10 presented in Figure 5 of the Corporate Climate Change Report (Appendix K).

11

12 Manitoba Hydro's Load Forecast is produced using 25-year normal weather based upon the
13 most recent 25 years. The forecast does not assume a weather trend, but forecasts using this
14 25-year normal as a basis. Page 51 of the 2013 Electric Load Forecast, included as Appendix D of
15 the submission, quantifies the effect that climate change would have on the forecast.

Calculation of Weather Effects for Residential Standard and All-Electric Customers

PUB calculates Weather Effects by dividing Weather Adjustment by delta DDH or DDC, which is the difference between actual and normal degree days

Heating			Residential - Standard				Residential - All Electric				Residential Total		
	Normal		Customers	PUB/MH 001 Heating Adj per Customer		PUB Calculated Weather Effect GWh/DDH	Customers	PUB/MH 001 Heating Adj per Customer		PUB Calculated Weather Effect GWh/DDH	Total Heating Weather Effect GWh/DDH	MH Weather Effects from Elenchus Load Forecast p.28	All-Electric/ Standard Heating Adj Per Customer Ratio
	Actual DDH	Delta DDH											
1998/99	4,035	4,667	287368	194	56	0.09	117110	1247	146	0.23	0.32	0.42	6.4
1999/00	3,924	4,623	289419	249	72	0.10	117506	1595	187	0.27	0.37	0.46	6.4
2000/01	4,820	4,590	290679	-77	-22	0.10	118412	-476	-56	0.24	0.34	0.46	6.2
2001/02	4,239	4,597	291371	140	41	0.11	120285	869	105	0.29	0.41	0.44	6.2
2002/03	4,937	4,579	292032	-232	-68	0.19	121780	-1517	-185	0.52	0.71	0.44	6.5
2003/04	4,522	4,587	293020	32	9	0.14	123671	206	26	0.40	0.54	0.46	6.4
2004/05	4,712	4,558	294108	-74	-22	0.14	126027	-449	-57	0.37	0.51	0.47	6.1
2005/06	3,980	4,547	295733	247	73	0.13	128009	1444	185	0.33	0.46	0.48	5.8
2006/07	4,390	4,541	297137	28	8	0.05	130749	173	23	0.15	0.21	0.48	6.2
2007/08	4,733	4,530	298287	-68	-20	0.10	133858	-425	-57	0.28	0.38	0.47	6.3
2008/09	4,918	4,550	299852	-182	-54	0.15	137410	-1039	-143	0.39	0.54	0.49	5.7
2009/10	4,300	4,561	301147	68	20	0.08	140563	367	52	0.20	0.28	0.53	5.4
2010/11	4,488	4,547	301495	57	17	0.29	144387	285	41	0.69	0.98	0.57	5.0
2011/12	3,678	4,536	303089	362	110	0.13	147658	1868	276	0.32	0.45	0.58	5.2

Cooling			Residential - Standard				Residential - All Electric				Residential Total		
	Normal		Customers	PUB/MH 001 Cooling Adj per Customer		PUB Calculated Weather Effect GWh/DDC	Customers	PUB/MH 001 Cooling Adj per Customer		PUB Calculated Weather Effect GWh/DDC	Total Cooling Weather Effect GWh	MH Weather Effects from Elenchus Load Forecast p.28	Standard/ All-Electric Cooling Adj Per Customer Ratio
	Actual DDC	Delta DDC (PUB estimate)											
1998/99	unavailable		287368	3	1	-	117110	-2	0	-	-	0.53	-1.5
1999/00	unavailable		289419	156	45	-	117506	13	1	-	-	0.82	12.0
2000/01	137	177	290679	146	43	1.08	118412	-19	-2	-0.05	1.03	0.79	-7.7
2001/02	211	177	291371	-66	-19	0.56	120285	19	2	-0.06	0.50	0.74	-3.5
2002/03	207	177	292032	-47	-14	0.47	121780	1	0	0.00	0.47	0.72	-47.0
2003/04	235	177	293020	-119	-35	0.60	123671	-15	-2	0.03	0.64	0.78	7.9
2004/05	72	177	294108	319	94	0.89	126027	-44	-6	-0.06	0.84	0.76	-7.3
2005/06	198	177	295733	-26	-8	0.39	128009	5	1	-0.05	0.34	0.75	-5.2
2006/07	253	177	297137	-173	-51	0.67	130749	-6	-1	0.01	0.68	0.80	28.8
2007/08	199	177	298287	-25	-7	0.32	133858	9	1	-0.05	0.27	0.58	-2.8
2008/09	123	177	299852	159	48	0.90	137410	-68	-9	-0.17	0.73	0.59	-2.3
2009/10	119	177	301147	207	62	1.06	140563	-27	-4	-0.07	0.99	0.84	-7.7
2010/11	173	180	301495	66	20	2.99	144387	-3	0	0.00	2.99	1.31	-22.0
2011/12	250	184	303089	-258	-78	1.18	147658	-71	-10	0.15	1.33	1.44	3.6

Sources: PUB/MH I-001; Actual DDH and DDC from CAC/MH I-185 (corrected to fiscal years), normal DDC from 2011, 2012, 2013 Load Forecasts; normal DDH from PUB/MH I-004a ; Weather Effects are MH's numbers found in Elenchus Load Forecast Report p.28

5

Table 5 - General Consumers Sales Energy

GENERAL CONSUMERS SALES (GW.h)												
History and Forecast												
2001/02 - 2031/32												
Fiscal Year	Residential				General Service						Lighting	Total Sales
	Basic	Diesel	Seas	FRWH	Mass Mkt	Top Cons	Diesel	Seas	FRWH	SEP		
2001/02	5674	6	49	37	7084	4818	5	4	14	24	89	17805
2002/03	6266	6	54	35	7467	5282	4	4	14	25	90	19246
2003/04	6170	6	56	34	7460	5423	5	5	13	17	91	19280
2004/05	6275	7	58	31	7516	5714	5	5	10	25	91	19735
2005/06	6171	7	59	30	7587	5948	5	5	9	23	91	19935
2006/07	6443	7	60	29	7839	5989	5	4	9	23	101	20510
2007/08	6736	7	68	27	8006	6075	5	4	9	24	101	21061
2008/09	6847	7	74	25	8049	6065	5	5	8	22	102	21210
2009/10	6786	7	81	24	7985	5461	6	5	8	20	102	20486
2010/11	6952	8	77	23	8258	5324	5	5	8	24	103	20786
2011/12	6818	8	83	22	8162	5531	5	5	8	25	103	20771
Weather Adj.	297	0	0	0	108	0	0	0	0	2	0	407
2011/12 Wadj	7114	8	83	22	8270	5531	5	5	8	28	103	21177
10 Year	144	0	3	-1	119	71	0	0	-1	0	1	337
Avg Gr.	2.3%	3.3%	5.4%	-5.0%	1.6%	1.4%	0.2%	1.2%	-6.2%	1.5%	1.5%	1.7%
2012/13	7227	8	85	21	8488	5821	6	5	7	27	104	21797
2013/14	7344	8	87	20	8643	6214	6	5	7	27	105	22465
2014/15	7467	8	90	19	8814	6208	6	5	6	27	106	22755
2015/16	7569	8	92	18	8986	6228	6	5	6	27	107	23050
2016/17	7662	9	94	17	9161	6223	6	5	6	27	108	23316
2017/18	7774	9	96	16	9336	6338	6	5	6	27	108	23721
2018/19	7900	9	98	15	9506	6478	6	5	5	27	109	24159
2019/20	8030	9	101	15	9670	6448	6	5	5	27	110	24425
2020/21	8161	9	103	14	9830	6578	6	5	5	27	111	24848
2021/22	8292	9	105	13	9989	6688	6	5	4	27	112	25251
10 Year	118	0	2	-1	172	116	0	0	0	0	1	407
Avg Gr.	1.5%	1.6%	2.4%	-5.0%	1.9%	1.9%	0.9%	0.6%	-5.1%	-0.5%	0.9%	1.8%
2022/23	8429	9	108	12	10147	6798	6	5	4	27	113	25659
2023/24	8577	10	110	12	10298	6898	6	5	4	27	114	26060
2024/25	8730	10	112	11	10447	6998	6	5	4	27	115	26465
2025/26	8877	10	115	11	10595	7098	6	5	4	27	116	26862
2026/27	9021	10	117	10	10741	7198	6	5	3	27	117	27256
2027/28	9167	10	119	10	10892	7298	6	5	3	27	118	27656
2028/29	9315	10	122	9	11045	7398	6	5	3	27	119	28059
2029/30	9463	10	124	9	11197	7498	6	5	3	27	120	28462
2030/31	9611	11	127	8	11347	7598	7	5	3	27	121	28863
2031/32	9760	11	129	8	11497	7698	7	5	3	27	122	29266
20 Year	132	0	2	-1	161	108	0	0	0	0	1	404
Avg Gr.	1.6%	1.6%	2.2%	-5.0%	1.7%	1.7%	0.9%	0.6%	-5.0%	-0.2%	0.8%	1.6%

Table 5 - General Consumers Sales Energy

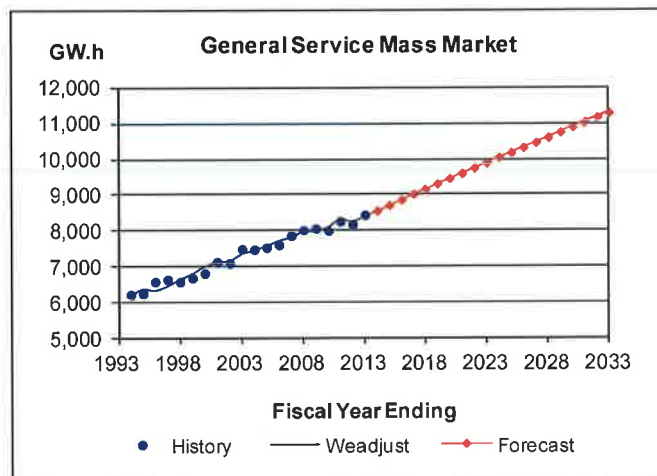
GENERAL CONSUMERS SALES (GW.h)												
History and Forecast												
2002/03 - 2032/33												
Fiscal Year	Residential				General Service						Lighting	Total Sales
	Basic	Diesel	Seas	FRWH	Mass Mkt	Top Cons	Diesel	Seas	FRWH	SEP		
2002/03	6266	6	54	35	7467	5282	4	4	14	25	90	19246
2003/04	6170	6	56	34	7460	5423	5	5	13	17	91	19280
2004/05	6275	7	58	31	7516	5714	5	5	10	25	91	19735
2005/06	6171	7	59	30	7587	5948	5	5	9	23	91	19935
2006/07	6443	7	60	29	7839	5989	5	4	9	23	101	20510
2007/08	6736	7	68	27	8006	6075	5	4	9	24	101	21061
2008/09	6847	7	74	25	8049	6065	5	5	8	22	102	21210
2009/10	6786	7	81	24	7985	5461	6	5	8	20	102	20486
2010/11	6952	8	77	23	8258	5324	5	5	8	24	103	20786
2011/12	6818	8	83	22	8162	5531	5	5	8	25	103	20771
2012/13	7223	8	81	21	8434	5560	5	5	7	28	103	21477
Weather Adj.	-4	0	0	0	-28	0	0	0	0	1	0	-32
2012/13 Wadj	7219	8	81	21	8406	5560	5	5	7	29	103	21445
10 Year Wadj	121	0	3	-1	107	28	0	0	-1	0	1	258
Avg Gr.	1.8%	3.6%	4.2%	-5.1%	1.4%	0.5%	2.1%	1.7%	-6.0%	1.7%	1.4%	1.3%
2013/14	7339	8	83	20	8550	5925	5	5	7	30	104	22076
2014/15	7458	9	85	19	8701	6036	5	5	7	32	104	22460
2015/16	7538	9	86	18	8858	6110	6	5	6	34	105	22774
2016/17	7624	9	88	17	9018	6145	6	5	6	36	106	23059
2017/18	7730	9	90	16	9174	6140	6	5	6	38	106	23319
2018/19	7842	9	92	15	9325	6232	6	5	5	38	107	23677
2019/20	7953	10	93	15	9470	6322	6	5	5	38	107	24024
2020/21	8063	10	95	14	9613	6412	6	5	5	38	108	24369
2021/22	8173	10	97	13	9756	6517	6	5	5	38	108	24728
2022/23	8290	10	99	12	9898	6615	6	5	4	38	109	25087
10 Year	107	0	2	-1	149	106	0	0	0	1	1	364
Avg Gr.	1.4%	2.0%	2.0%	-5.0%	1.6%	1.8%	0.7%	0.6%	-5.0%	2.8%	0.5%	1.6%
2023/24	8405	11	101	12	10040	6715	6	5	4	38	109	25446
2024/25	8520	11	103	11	10179	6815	6	6	4	38	110	25802
2025/26	8635	11	105	11	10318	6915	6	6	4	38	110	26158
2026/27	8750	11	106	10	10456	7015	6	6	4	38	111	26513
2027/28	8864	11	108	10	10592	7115	6	6	3	38	111	26865
2028/29	8983	12	110	9	10736	7215	6	6	3	38	112	27230
2029/30	9102	12	112	9	10878	7315	6	6	3	38	112	27593
2030/31	9219	12	114	8	11020	7415	6	6	3	38	113	27954
2031/32	9337	12	116	8	11154	7515	6	6	3	38	113	28308
2032/33	9454	13	118	7	11288	7615	6	6	3	38	114	28662
20 Year	112	0	2	-1	144	103	0	0	0	0	1	361
Avg Gr.	1.4%	2.0%	1.9%	-5.0%	1.5%	1.6%	0.8%	0.6%	-5.0%	1.4%	0.5%	1.5%

General Service Mass Market

General Service Mass Market includes all Commercial and Industrial customers, excluding the General Service Top Consumers. There were 65,974 General Service Mass Market customers in 2012/13. Approximately 85% are Commercial and the others are Industrial.

Figure 7 - General Service Mass Market

GS Mass Market has grown 118 GW.h (1.7%) per year for the past 20 years and 107 GW.h per year (1.4%) for the past 10 years. This historical growth includes the effect of past Demand Side Management (DSM) initiatives. It is forecast to grow 149 GW.h (1.6%) per year for the next 10 years and 144 GW.h (1.5%) per year for the next 20 years.

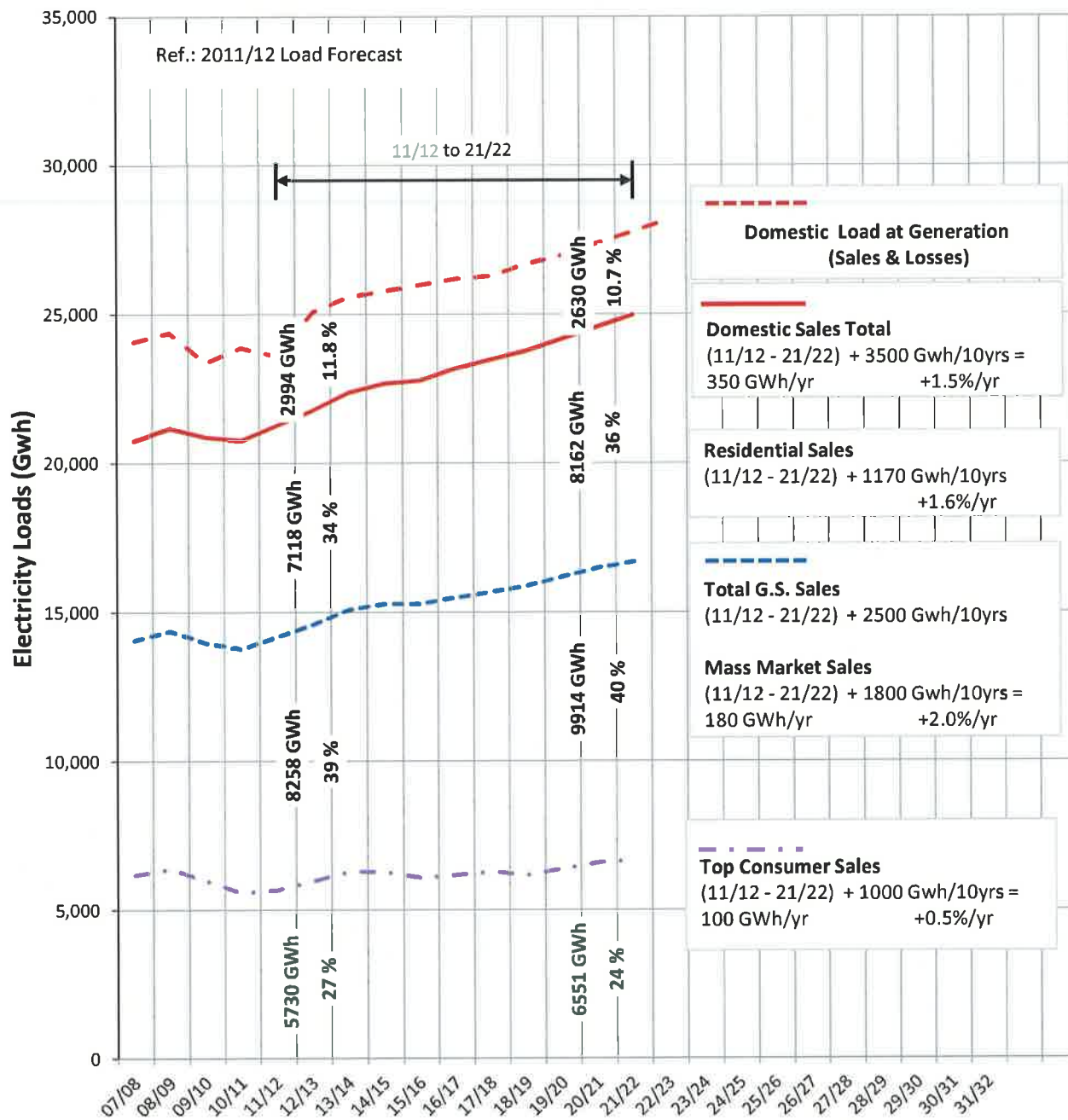


The primary driver for growth in the GS Mass Market is the number of Residential Basic customers. As population grows, commercial and industrial services grow to service the population. The secondary driver is the economy. Changes in the Manitoba Gross Domestic Product (GDP) are reflected in the GS Mass Market's electricity use.

Table 15 - General Service Mass Market

GENERAL SERVICE MASS MARKET (GW.h) HISTORICAL/WEATHER ADJUSTMENT/FORECAST					
Fiscal Year	Sales	Weather Adjust	Adjusted Sales	Fiscal Year	Forecast Sales
1993/94	6210	-53	6158	2013/14	8550
1994/95	6233	130	6363	2014/15	8701
1995/96	6573	-251	6322	2015/16	8858
1996/97	6627	-186	6441	2016/17	9018
1997/98	6562	60	6623	2017/18	9174
1998/99	6668	116	6784	2018/19	9325
1999/00	6796	197	6993	2019/20	9470
2000/01	7110	15	7125	2020/21	9613
2001/02	7084	60	7144	2021/22	9756
2002/03	7467	-129	7338	2022/23	9898
2003/04	7460	-9	7451	2023/24	10040
2004/05	7516	48	7564	2024/25	10179
2005/06	7587	124	7711	2025/26	10318
2006/07	7839	-31	7808	2026/27	10456
2007/08	8006	-39	7967	2027/28	10592
2008/09	8049	-36	8012	2028/29	10736
2009/10	7985	124	8109	2029/30	10878
2010/11	8258	76	8333	2030/31	11020
2011/12	8162	117	8279	2031/32	11154
2012/13	8434	-28	8406	2032/33	11288

MH Domestic Load Growth by Sector Sales



06/07/2013

in real Gross Domestic Product for Manitoba and the annual percentage change in Residential Basic Customers as explanatory variables. The equation is estimated using data over the period of 1984/85 to 2012/13. This is then used to forecast GS Mass Market customers going forward using the forecast of Manitoba GDP and Residential Basic Customers. Therefore, the Residential Basic customer forecast has a significant influence over the GS Mass Market forecast. As can be seen from the estimated formula for the 2013 forecast, the change in the Residential Basic customer forecast has 5 times the influence over the change in GS Mass Market customers than does the change in Manitoba real GDP (coefficient of 0.66 for CRES versus coefficient of 0.132 for CGDP). The model to forecast change in GS Mass Market Customers presented in the 2013 Electric Load Forecast is reproduced below:

Percentage Change in GS Mass Market Customers_t =

$$-0.003 + 0.132*CGDP + 0.660*CRES \quad R^2 = 58.9\%$$

T-statistics: (-1.58) (3.72) (4.05)

CGDP represents the annual percentage change in real Manitoba GDP and CRES represents annual percentage change in residential Basic customers. The R^2 of 58.9% indicates that just under 60% of total variation is explained by the model.

Once GS Mass Market customer growth has been forecast, it is allocated to Medium and Large classes using each of these classes' 10 year average percentage share of Mass Market customer growth; the Small Non-Demand class is allocated 10% of new customers, and the rest of the growth is allocated to the Small Demand class. The customer forecast is then converted to an energy forecast by applying an average use for new customers in each rate class calculated to be the five-year average use of its respective class for the duration of the forecast period. Specifically these are:

i) Small Non-Demand - 31,075 kWh per year

ii) Small Demand - 166,315 kWh per year

iii) Medium - 1,572,917 kWh per year

iv) Large - 5,834,523 kWh per year

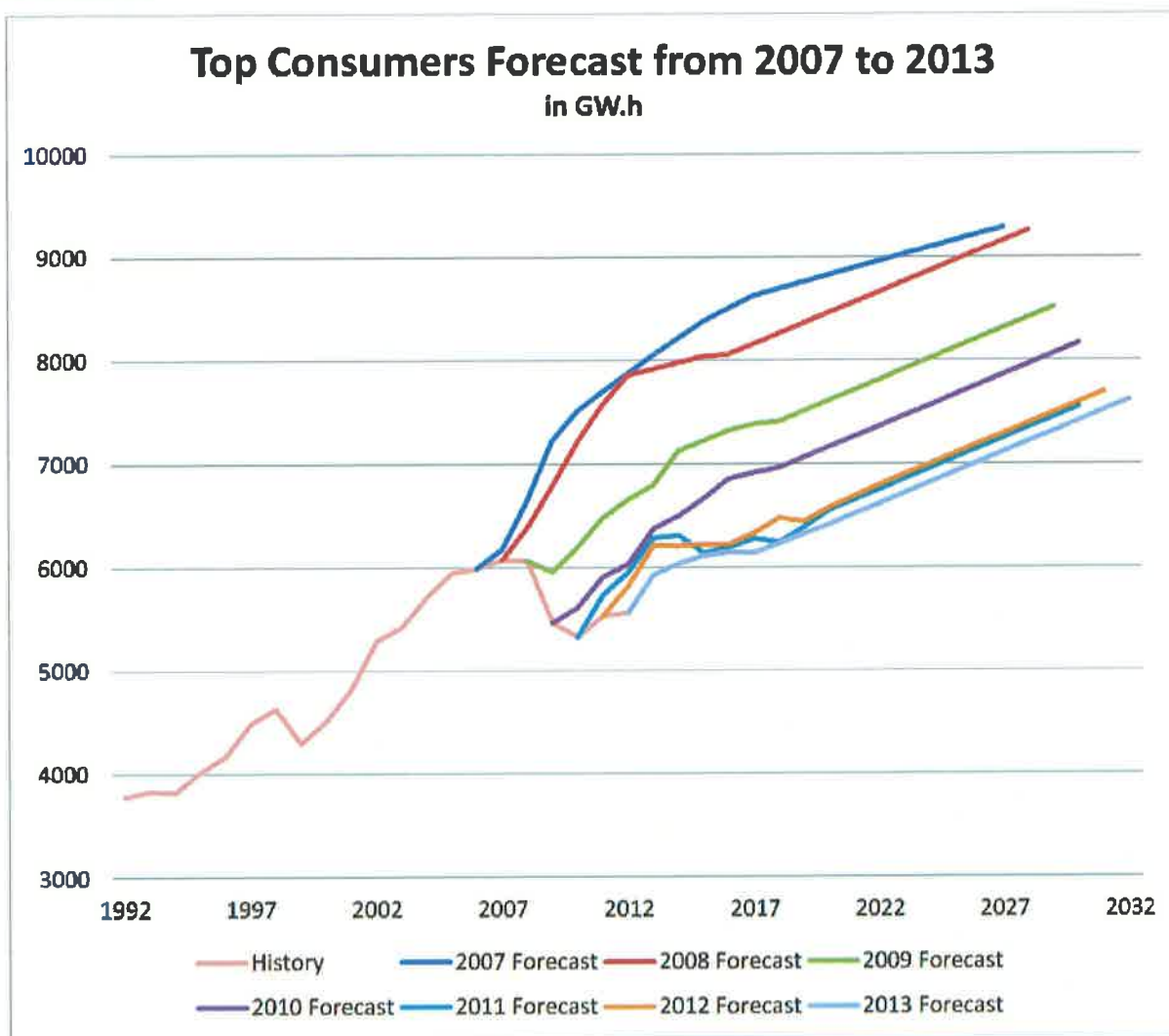
6

REFERENCE: September 5, 2013 Technical Conference; 2012 Forecast GS Top Consumers

QUESTION:

Please provide an enlarged graph adding the Top Consumers forecasts for 2007/2008/2009/2010/2011.

RESPONSE:



General Service Top Consumers

General Service Top Consumers includes the top energy consuming businesses in Manitoba and represents 26% of all General Consumers Sales. GS Top Consumers includes 17 companies that account for 31 customers in the Primary Metals, Chemicals, Petrol/Oil/Natural Gas, Pulp/Paper, Food/Beverage and Colleges/Universities sectors.

Figure 8 - General Service Top Consumers

GS Top Consumers has grown 91 GW.h (2.0%) per year over the past 20 years and but only 28 GW.h per year (0.5%) over the past 10 years. The loss of one Top Consumer and the effect of the economic downturn from 2008 to 2011 lowered the past 10 year growth rate. The 2013 forecast is expected to grow 106 GW.h (1.8%) per year for the next 10 years and 103 GW.h (1.6%) per year for the next 20 years. A loss of a major load is expected by 2016. This loss is more than offset by confirmed plans and expected increases of other Top Consumers. In the long term, GS Top Consumers is expected to grow at a rate reflective of its historic growth.

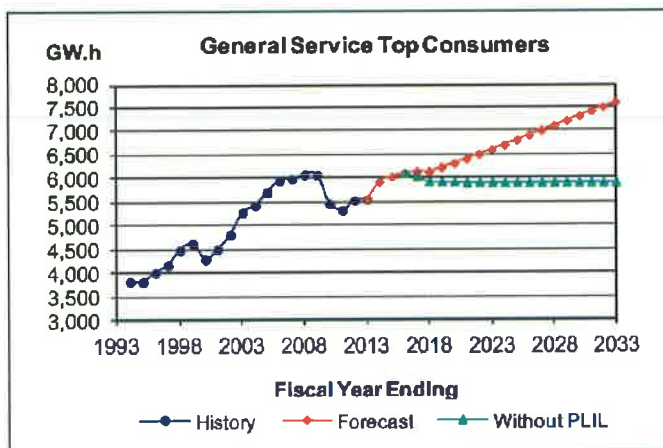


Table 16 - General Service Top Consumers

GENERAL SERVICE TOP CONSUMERS (GW.h) HISTORICAL/FORECAST WITH PLIL					
Fiscal Year	Sales	Fiscal Year	Individual	PLIL	Total
1993/94	3836	2013/14	5925	0	5925
1994/95	3825	2014/15	6036	0	6036
1995/96	4021	2015/16	6110	0	6110
1996/97	4173	2016/17	6045	100	6145
1997/98	4493	2017/18	5940	200	6140
1998/99	4632	2018/19	5932	300	6232
1999/00	4299	2019/20	5922	400	6322
2000/01	4515	2020/21	5912	500	6412
2001/02	4818	2021/22	5917	600	6517
2002/03	5282	2022/23	5915	700	6615
2003/04	5423	2023/24	5915	800	6715
2004/05	5714	2024/25	5915	900	6815
2005/06	5948	2025/26	5915	1000	6915
2006/07	5989	2026/27	5915	1100	7015
2007/08	6075	2027/28	5915	1200	7115
2008/09	6065	2028/29	5915	1300	7215
2009/10	5461	2029/30	5915	1400	7315
2010/11	5324	2030/31	5915	1500	7415
2011/12	5531	2031/32	5915	1600	7515
2012/13	5560	2032/33	5915	1700	7615

**REFERENCE: Chapter 4: The Need for New Resources; 2012 GRA, PUB/MH 1-118 (a)(c)
2012 Load Forecast**

QUESTION:

Please provide an update of the chart defining sector by sector industry growth from 2005/06 to 2011/12 by adding 2012/13 and first two quarters of 2013/14.

RESPONSE:

Following the informal meeting between Manitoba Hydro staff and PUB Advisors contemplated in Order 119/13, the PUB Advisors required this Information Request to be revised and the following information provided:

Please see the table below wherein the sector by sector growth is updated to include 2012/13.

CHEMICAL

kW.h	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Apr	148,601,183	155,892,021	157,927,794	176,891,767	146,405,193	168,686,958	179,219,973	173,942,924
May	146,781,207	152,247,362	146,944,903	168,708,061	134,806,557	169,663,833	177,915,549	168,280,226
Jun	149,290,582	154,831,998	140,606,667	169,713,271	160,468,355	156,771,887	129,556,509	165,080,955
Jul	157,589,204	159,534,571	156,949,601	154,281,069	171,009,832	162,927,407	171,959,769	173,183,304
Aug	154,873,461	160,498,597	159,295,545	172,911,909	174,636,600	171,890,428	174,111,870	154,026,221
Sep	151,860,894	136,798,401	150,627,759	169,165,142	158,381,897	166,860,223	167,352,627	141,419,528
Oct	161,588,348	158,015,891	159,327,729	174,235,816	175,117,431	172,660,610	175,344,159	184,892,427
Nov	155,237,054	156,100,283	151,846,285	171,896,675	163,471,668	177,017,628	174,103,470	183,267,810
Dec	154,159,102	163,256,634	163,808,332	132,627,931	178,355,248	181,196,732	180,121,233	187,810,369
Jan	161,152,004	162,532,896	168,328,709	173,512,201	181,902,400	179,469,032	179,639,750	192,973,619
Feb	147,732,278	144,273,938	160,259,063	145,493,335	170,208,155	163,370,410	164,570,627	153,837,487
Mar	163,694,945	155,015,952	177,169,640	174,554,890	153,366,637	173,689,113	183,318,180	189,040,541
Total	1,852,560,262	1,858,998,544	1,893,092,027	1,983,992,067	1,968,129,973	2,044,204,261	2,057,213,716	2,067,755,411



**Needs For and Alternatives To
PUB/MH I-006a REVISED**

kV.A	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Apr	224,547	227,921	231,027	258,752	222,893	260,387	258,626	264,303
May	225,366	232,489	229,245	253,699	222,726	254,402	249,624	253,576
Jun	225,544	229,860	229,540	254,554	237,036	248,314	249,015	256,852
Jul	225,576	229,772	229,668	254,921	253,939	245,161	250,010	254,640
Aug	221,586	230,693	230,635	254,097	254,680	250,359	250,425	254,912
Sep	224,652	204,407	229,745	254,254	254,116	249,791	249,634	269,735
Oct	180,910	230,022	232,565	253,064	253,581	249,361	252,211	273,047
Nov	228,758	230,009	232,358	253,177	259,069	259,877	258,520	273,965
Dec	221,845	229,993	233,436	210,632	259,610	260,091	254,846	274,237
Jan	229,939	229,469	235,015	258,715	258,942	260,011	258,812	275,392
Feb	228,909	231,120	255,829	252,078	265,755	260,927	259,768	265,496
Mar	229,951	230,309	260,317	258,771	231,428	260,096	259,329	276,205
Total	2,667,584	2,736,065	2,829,378	3,016,714	2,973,774	3,058,776	3,050,820	3,192,360

FOOD AND BEVERAGE

kW.h	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Apr	7,331,721	7,940,843	7,978,390	8,194,913	9,351,095	9,828,558	9,017,071	9,079,862
May	6,804,038	8,074,449	7,745,234	8,628,881	9,806,690	9,946,207	8,367,125	9,245,479
Jun	7,069,018	7,814,565	8,443,883	9,219,983	10,179,624	10,093,965	9,301,871	6,859,386
Jul	6,762,615	7,909,607	8,618,722	8,809,288	8,736,116	9,125,853	7,908,536	7,515,966
Aug	7,097,174	7,508,813	9,225,730	8,357,472	9,597,020	8,328,025	8,615,886	7,694,564
Sep	7,189,369	8,325,854	9,266,409	9,660,346	9,773,546	9,599,494	7,708,840	8,991,173
Oct	6,815,200	8,764,392	9,207,625	10,331,645	9,762,676	8,741,053	9,171,225	10,119,699
Nov	7,646,995	9,122,564	9,458,058	10,166,645	9,000,635	7,896,878	9,297,619	9,856,088
Dec	7,782,850	8,782,313	9,181,531	9,597,913	10,038,982	9,204,737	9,679,053	9,238,267
Jan	7,886,723	8,648,604	9,695,433	9,831,074	9,729,823	9,787,585	9,759,370	10,077,629
Feb	7,956,942	8,753,895	8,815,121	9,478,288	8,920,691	8,739,816	9,226,170	9,554,975
Mar	8,079,588	8,569,844	8,977,461	8,819,300	8,793,745	9,553,683	9,144,926	9,802,105
Total	88,422,233	100,215,743	106,613,597	111,095,748	113,690,643	110,845,854	107,197,692	108,035,193



**Needs For and Alternatives To
PUB/MH I-006a REVISED**

kV.A	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Apr	16,696	16,978	18,500	18,966	19,335	19,950	20,020	19,734
May	16,700	17,509	18,357	18,710	19,907	20,305	20,459	19,765
Jun	17,136	17,791	19,249	18,674	19,958	19,966	20,752	18,829
Jul	17,936	17,935	19,378	18,559	19,628	18,367	19,710	18,455
Aug	16,747	19,071	19,163	19,407	19,952	20,229	18,759	19,109
Sep	16,568	17,622	20,021	19,650	19,960	19,647	18,121	19,774
Oct	16,461	17,974	19,452	19,051	19,881	19,407	19,970	20,096
Nov	16,263	18,216	19,188	19,183	19,090	18,947	19,909	19,548
Dec	17,242	18,112	19,338	19,007	19,124	19,234	19,742	19,579
Jan	17,185	18,288	19,064	18,999	19,376	19,451	19,781	20,032
Feb	17,152	18,301	19,017	19,100	19,172	19,586	19,397	19,997
Mar	17,092	18,475	18,833	19,376	19,141	19,216	19,669	19,913
Total	203,178	216,273	229,561	228,681	234,524	234,305	236,289	234,830

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MINING

kW.h	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Apr	3,327,731	5,025,099	4,891,176	5,401,801	7,159,513	6,533,036	7,481,317	7,378,252
May	2,807,664	2,059,903	4,308,792	4,692,516	6,508,480	6,784,371	7,097,513	9,238,133
Jun	3,065,689	3,437,747	3,793,876	4,609,059	5,240,836	5,941,992	6,155,572	7,851,415
Jul	2,653,635	3,299,686	3,860,997	4,824,177	5,705,635	6,543,732	7,111,386	7,392,243
Aug	2,594,475	3,157,047	3,929,730	4,400,529	4,562,212	6,170,413	6,874,108	8,125,978
Sep	2,570,100	3,475,376	3,824,034	4,302,224	4,243,254	6,427,987	7,976,695	7,493,601
Oct	2,810,304	3,489,820	3,743,476	5,178,034	5,214,065	6,818,045	7,906,458	7,526,176
Nov	3,416,305	3,723,049	5,020,588	5,542,167	5,543,285	6,133,290	8,780,800	8,959,313
Dec	3,427,185	4,280,880	4,846,813	5,785,477	5,427,867	6,594,433	9,503,691	8,518,450
Jan	3,573,438	4,476,594	5,299,429	6,456,118	5,694,618	7,275,482	10,682,180	10,002,823
Feb	3,830,498	4,912,986	5,346,203	6,712,561	5,893,792	7,746,525	9,134,934	9,667,372
Mar	3,727,073	4,658,074	5,073,788	7,253,063	5,626,032	7,077,957	9,832,632	8,299,918
Total	37,804,097	45,996,261	53,938,902	65,157,726	66,819,589	80,047,263	98,537,286	100,453,674

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**Needs For and Alternatives To
PUB/MH I-006a REVISED**

kV.A	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Apr	9,026	8,297	10,034	10,825	13,979	13,898	13,835	14,712
May	8,689	7,857	9,445	10,404	13,378	13,999	14,706	19,216
Jun	8,666	8,374	9,079	9,841	11,665	12,909	13,578	18,793
Jul	8,395	8,162	8,637	10,031	11,609	12,703	14,582	16,629
Aug	8,452	7,672	7,574	9,977	10,800	12,643	14,836	18,391
Sep	8,608	7,858	7,870	9,913	11,483	13,225	15,330	14,904
Oct	8,991	6,963	8,293	10,623	12,258	14,359	16,478	16,943
Nov	6,840	8,745	9,799	10,788	12,653	13,928	17,234	18,468
Dec	6,779	9,116	10,250	11,775	9,971	13,578	18,808	18,672
Jan	7,656	9,951	10,060	13,011	10,498	13,843	19,845	17,800
Feb	7,323	9,824	10,463	13,851	12,137	14,044	19,310	18,448
Mar	7,616	9,756	11,066	14,731	11,843	14,347	19,046	16,390
Total	97,041	102,574	112,570	135,772	142,275	163,476	197,588	209,366



Needs For and Alternatives To
PUB/MH I-006a REVISED

MISC. INDUSTRY

kW.h	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Apr	2,405,700	2,442,552	4,003,706	3,641,075	5,228,683	5,289,854	4,198,702	3,696,041
May	2,296,200	2,235,647	3,822,673	3,319,108	4,542,723	4,205,431	4,574,184	3,586,872
Jun	2,404,500	2,303,544	3,995,373	3,554,598	4,187,744	4,678,700	4,096,759	3,654,396
Jul	2,470,500	2,565,451	4,323,107	3,558,923	3,837,595	4,321,694	4,599,300	4,173,836
Aug	2,520,000	2,574,190	3,884,738	3,461,263	3,925,088	4,294,037	4,622,009	4,220,678
Sep	2,504,700	2,530,603	3,612,707	3,444,621	3,741,488	4,150,956	4,335,208	3,842,661
Oct	2,457,300	3,640,820	3,632,903	3,972,671	3,868,445	4,297,398	3,982,644	4,056,437
Nov	2,777,100	3,410,570	3,644,743	6,817,232	3,819,334	3,712,833	4,047,534	4,402,449
Dec	2,655,000	3,502,950	3,767,931	4,111,100	4,024,852	3,681,746	4,153,843	4,299,032
Jan	2,844,300	3,480,737	3,813,912	4,096,530	4,209,609	3,975,747	4,258,170	4,676,362
Feb	2,810,100	3,787,826	3,721,935	4,143,184	3,911,511	4,281,996	4,082,395	4,463,256
Mar	2,643,977	3,764,979	3,797,911	4,540,236	3,262,965	4,726,440	4,488,193	4,288,889
Total	30,789,377	36,239,869	46,021,639	48,660,541	48,560,037	51,616,832	51,438,941	49,360,909

kV.A	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Apr	5,615	6,759	11,367	10,595	11,431	16,502	13,300	10,658
May	5,578	6,751	10,862	10,503	11,305	12,519	12,913	11,165
Jun	6,537	6,109	10,997	9,762	12,095	12,865	12,631	11,312
Jul	6,726	8,237	12,459	9,913	13,560	13,178	13,659	11,897
Aug	6,582	6,818	11,020	11,031	12,068	12,601	13,879	11,689
Sep	6,189	6,982	10,230	10,513	11,868	10,955	13,242	11,309
Oct	6,174	10,181	10,406	10,762	12,072	11,059	12,569	11,379
Nov	6,333	9,622	9,499	16,152	11,095	11,042	12,160	11,528
Dec	6,453	9,246	9,164	10,289	11,365	10,095	12,649	11,729
Jan	6,383	9,766	9,860	11,107	11,032	11,779	12,786	12,733
Feb	7,178	10,416	10,555	11,708	9,656	13,329	12,981	12,594
Mar	6,655	10,525	11,055	12,431	8,379	13,960	13,807	12,097
Total	76,403	101,414	127,474	134,766	135,925	149,885	156,576	140,089



Needs For and Alternatives To PUB/MH I-006a REVISED

PETROLEUM

kW.h	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Apr	68,684,760	77,252,876	74,915,154	76,770,611	73,269,161	60,303,779	66,034,378	71,803,965
May	64,512,976	68,937,372	64,629,758	70,560,836	70,410,420	67,818,451	64,959,126	77,123,446
Jun	63,243,195	66,828,266	67,429,250	77,140,533	84,788,210	63,889,975	63,074,332	72,430,109
Jul	69,240,765	72,584,134	72,747,357	79,578,937	87,259,561	67,104,793	71,429,490	71,450,235
Aug	69,106,224	77,225,485	83,130,272	80,039,315	73,473,067	57,398,568	70,428,607	74,302,946
Sep	67,357,484	75,516,115	72,646,716	74,894,904	72,036,262	54,100,095	74,880,345	63,941,811
Oct	71,572,688	80,753,890	71,681,068	82,374,133	71,231,601	59,627,334	70,482,931	62,766,523
Nov	71,685,494	78,434,802	78,124,094	86,970,224	73,112,755	52,968,462	67,044,859	69,260,203
Dec	82,569,859	80,759,036	75,234,007	91,095,650	77,112,343	69,492,995	74,608,429	83,589,104
Jan	84,217,077	77,181,923	81,535,327	84,750,806	82,458,671	74,333,710	82,197,737	82,356,735
Feb	75,497,443	75,189,964	69,059,186	74,278,174	70,201,618	74,975,226	73,833,057	79,608,007
Mar	75,555,518	81,827,612	81,792,569	76,293,721	79,996,008	77,916,161	88,011,112	78,177,527
Total	863,243,483	912,491,475	892,924,758	954,747,844	915,349,677	779,929,549	866,984,403	886,810,611

kV.A	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Apr	134,272	161,135	168,636	162,647	163,627	172,856	185,288	181,108
May	141,933	154,803	151,068	147,850	175,099	158,745	168,770	175,115
Jun	146,422	149,325	153,487	164,373	182,462	156,851	169,409	177,032
Jul	143,477	156,362	168,586	161,835	182,801	155,433	169,955	174,034
Aug	135,618	157,984	170,811	160,281	178,588	152,828	179,030	184,746
Sep	138,228	158,361	165,808	160,831	182,796	158,369	177,090	174,338
Oct	143,669	170,922	167,574	167,132	181,289	151,675	177,151	171,953
Nov	155,434	173,154	168,701	173,183	179,450	150,023	178,178	170,658
Dec	153,289	168,973	171,837	185,598	174,098	171,568	185,754	181,149
Jan	164,971	166,609	174,420	169,004	190,160	180,184	185,481	172,398
Feb	164,717	175,755	165,937	169,088	183,593	203,541	184,333	179,589
Mar	155,780	172,466	167,169	163,993	181,044	203,256	209,886	171,328
Total	1,777,810	1,965,849	1,994,036	1,985,815	2,155,006	2,015,330	2,170,326	2,113,449



Needs For and Alternatives To PUB/MH I-006a REVISED

PRIMARY METALS

kW.h	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Apr	188,933,503	182,660,783	192,869,654	188,356,310	165,806,506	170,930,480	183,632,714	180,476,123
May	193,912,944	189,271,715	198,145,512	194,225,067	168,124,697	162,922,639	190,831,891	170,038,603
Jun	186,043,477	180,118,914	183,846,440	176,883,947	161,320,690	168,946,514	174,985,311	178,833,116
Jul	159,245,576	176,349,365	156,810,451	170,763,210	161,332,967	149,259,541	151,169,440	144,423,914
Aug	139,056,043	168,040,469	173,229,085	178,074,758	122,339,720	130,877,418	125,456,109	144,340,045
Sep	156,304,142	170,022,971	186,862,349	183,837,410	162,845,897	173,146,708	165,458,114	172,738,603
Oct	195,536,921	184,824,548	196,429,849	188,825,363	181,313,054	181,308,751	194,151,393	196,819,287
Nov	201,328,038	194,629,494	193,096,365	202,126,743	178,423,574	196,281,835	207,459,235	197,756,723
Dec	204,010,494	200,825,326	202,395,382	189,992,499	184,774,310	198,394,034	216,757,803	205,899,945
Jan	207,060,363	205,807,881	209,213,905	203,256,945	190,035,940	212,314,850	207,574,796	211,646,240
Feb	194,131,728	186,197,229	198,770,197	173,143,331	175,374,034	192,608,108	191,566,837	184,189,569
Mar	211,789,797	209,123,472	207,962,371	187,726,350	181,634,902	216,502,043	191,259,852	192,643,626
Total	2,237,353,026	2,247,872,167	2,299,631,560	2,237,211,933	2,033,326,291	2,153,492,921	2,200,303,495	2,179,805,794

kV.A	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Apr	315,688	325,184	345,058	338,326	314,896	306,163	344,166	337,804
May	313,981	320,316	333,118	329,242	315,863	307,288	336,883	323,959
Jun	305,536	318,425	319,189	311,789	310,782	314,377	319,290	321,164
Jul	301,951	309,100	307,496	307,594	298,947	283,846	308,351	312,928
Aug	285,061	307,638	311,822	309,364	283,131	285,935	282,923	312,753
Sep	313,719	298,888	323,564	316,759	304,226	319,945	305,290	327,972
Oct	319,062	300,404	326,699	328,598	309,465	335,684	339,023	341,843
Nov	334,618	335,072	330,821	336,426	319,170	347,340	365,052	348,826
Dec	341,097	342,169	327,913	345,809	316,701	356,695	365,955	351,709
Jan	343,164	352,539	338,853	345,647	315,712	360,158	355,089	345,399
Feb	344,686	346,504	340,457	328,975	320,229	361,523	334,828	339,380
Mar	333,571	340,696	344,757	327,442	327,983	362,808	324,401	334,884
Total	3,852,134	3,896,935	3,949,748	3,925,971	3,737,106	3,941,761	3,981,252	3,998,620



Needs For and Alternatives To
PUB/MH I-006a REVISED

PULP & PAPER

kW.h	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Apr	65,462,742	62,392,907	63,892,905	56,406,230	66,963,654	15,208,824	15,270,834	22,011,319
May	64,966,706	63,763,003	65,613,499	61,475,290	69,931,644	18,479,659	16,516,480	19,977,633
Jun	63,134,669	64,076,655	63,348,587	61,651,751	41,436,505	18,433,782	17,282,236	20,306,981
Jul	69,639,800	66,763,152	74,068,655	63,595,564	18,784,805	17,119,610	16,956,617	22,137,671
Aug	69,556,426	63,261,771	69,920,817	62,752,543	38,994,446	16,626,426	10,018,069	19,869,960
Sep	68,909,784	63,442,432	59,295,535	58,714,842	15,697,408	16,643,953	14,184,112	14,503,003
Oct	64,115,364	57,087,426	65,021,461	60,512,807	13,591,911	13,169,880	14,439,523	11,271,226
Nov	61,352,244	57,980,835	61,628,186	57,459,095	12,835,293	14,468,904	14,608,567	15,195,040
Dec	62,626,292	62,240,933	59,660,710	42,852,821	14,028,490	12,582,387	13,887,203	21,528,001
Jan	66,102,928	62,617,615	62,508,975	53,310,089	12,902,400	13,991,323	13,969,403	18,945,933
Feb	59,298,869	57,355,092	56,614,098	34,792,372	11,789,316	12,816,607	11,519,528	18,741,571
Mar	64,540,726	62,930,087	64,721,804	62,445,715	16,622,693	16,765,591	13,419,998	19,341,394
Total	779,706,550	743,911,908	766,295,232	675,969,119	333,578,565	186,306,946	172,072,570	223,829,732

kV.A	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Apr	103,871	101,375	98,583	100,093	112,534	32,410	33,870	39,359
May	105,121	103,285	99,913	101,008	113,010	27,937	29,905	38,609
Jun	111,322	106,451	104,703	102,802	100,993	37,093	39,008	39,276
Jul	113,744	103,716	118,396	111,743	96,288	18,748	30,153	39,970
Aug	111,256	103,643	115,567	105,109	99,066	27,929	27,466	39,402
Sep	108,994	101,776	114,412	102,836	89,500	27,540	37,206	28,302
Oct	121,180	99,482	103,593	103,954	78,102	30,335	25,530	26,133
Nov	107,181	103,430	111,176	102,181	80,997	29,607	28,762	33,188
Dec	106,113	98,789	104,984	99,358	45,250	29,680	29,999	39,941
Jan	102,808	102,108	102,334	99,726	46,764	29,452	30,579	39,288
Feb	102,258	100,487	101,955	102,908	44,813	29,076	28,306	37,131
Mar	117,574	99,784	118,259	113,504	55,919	30,449	26,556	34,897
Total	1,311,422	1,224,326	1,293,876	1,245,222	963,236	350,256	367,338	435,495

REFERENCE: Chapter 4: The Need for New Resources; 2012 GRA, PUB/MH 1-118 (a)(c)
2012 Load Forecast

QUESTION:

Please provide an industry sector forecast for 2013/14 to 2020/21 and a similar updated forecast for Top Consumers.

RESPONSE:

Mass Market is not forecast by industry sector. At the most detailed level, the forecast is only available by rate groups.

Top Consumers are forecast by individual customer and have been classified by sector below as forecast in the 2013 Electric Load Forecast:

GWh	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Chemicals	2,151	2,235	2,245	2,245	2,245	2,245	2,245	2,245
Petroleum	995	1,110	1,225	1,325	1,330	1,350	1,360	1,370
Primary Metals	2,250	2,153	2,093	1,928	1,818	1,790	1,770	1,750
Pulp/Paper	225	230	235	235	235	235	235	235
Mining	0	0	0	0	0	0	0	0
Food/Beverage	215	215	215	215	215	215	215	215
College	89	93	97	97	97	97	97	97
Potential Large	0	0	0	100	200	300	400	500
Total GW.h	5,925	6,036	6,110	6,145	6,140	6,232	6,322	6,412

**REFERENCE: Chapter 4: The Need for New Resources; 2012 GRA, PUB/MH 1-118 (a)(c)
2012 Load Forecast**

QUESTION:

Please explain the impact of the northern smelter and refinery closures as well as the pulp and paper decline on Manitoba Hydro's industry or Top Consumer loads; and define the potential new loads that would mitigate those impacts.

RESPONSE:

The smelter that closed in July 2010 was not an electric furnace. The closure of the smelter resulted in the loss of recovery heat used by the customer for process steam and space heating. As a result, this customer was required to install an electric boiler to provide for process steam and space heating requirements. The net result was an increase of approximate 50 GWh in electric consumption per year from the electric boiler's operation.

The smelter planning to close by 2016 is expected to result in a drop of about 550 GWh of electric load per year.

The pulp and paper company that closed in 2009 amounted to a loss of about 550 GWh of electric load per year.

Recent increases included 100 GW.h in the chemical sector in 2010, and 300 GWh in the pipelines sector in 2011.

Forecasts of committed customer plans in the next few years include an additional electric consumption of 100 GWh in the primary metals sector, 250 GWh in the chemicals sector, and 400 GWh in the pipelines sector. The 400 GWh of recent increases plus the 750 GWh of short

- 1 term committed plans more than offset the loss of 1,050 GWh in annual consumption from the
- 2 three closures.

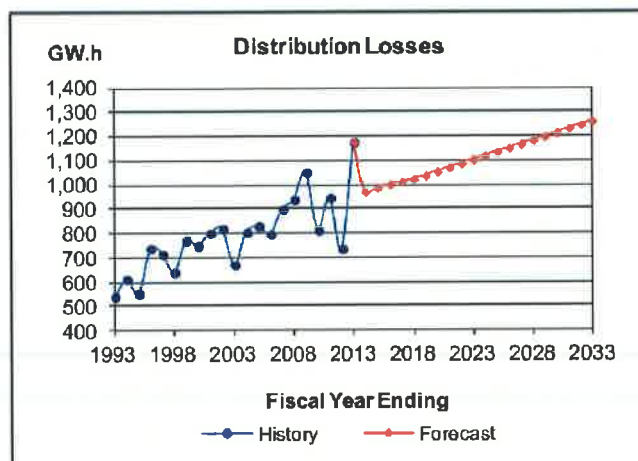
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Distribution Losses

Figure 13 - Distribution Losses

Distribution Losses are made up of the power loss between the distribution substation (Manitoba Load at Common Bus less Construction) and the customer's meter (General Consumers Sales less Diesel), as well as all other differences between what was billed and what was metered. The other differences include:

1. The offset between cycle billing (General Consumers Sales) and actual calendar month usage (Common Bus).
2. Customer Accounting adjustments,
3. Inaccuracies associated with estimated billing (including flat rate estimates),
4. The metered but unbilled consumption of Manitoba Hydro offices, and
5. Energy lost due to theft.



Distribution Losses are forecast in 2013/14 to be 4.4% of the General Consumers Sales less Diesel and remain at about that level throughout the forecast.

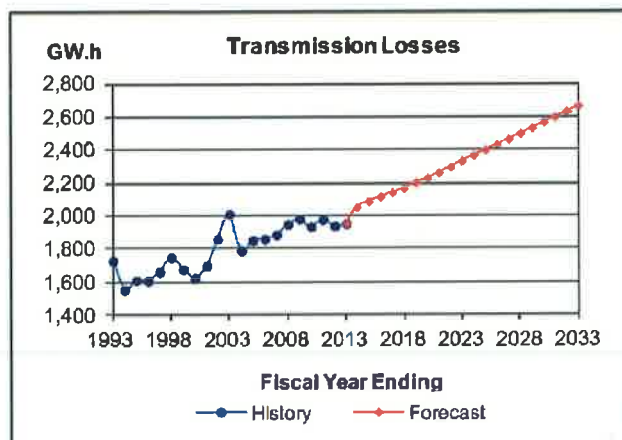
Table 22 - Distribution Losses

DISTRIBUTION LOSSES (GW.h) HISTORICAL / PERCENT OF SALES / FORECAST							
Fiscal Year	Losses	Sales less Diesel	% Losses	Fiscal Year	Forecast Losses	Sales less Diesel	% Losses
1993/94	614	15845	3.9%	2013/14	971	22062	4.4%
1994/95	556	15572	3.6%	2014/15	988	22446	4.4%
1995/96	740	16623	4.4%	2015/16	1001	22759	4.4%
1996/97	715	16818	4.3%	2016/17	1014	23044	4.4%
1997/98	641	16655	3.9%	2017/18	1025	23304	4.4%
1998/99	771	16908	4.6%	2018/19	1041	23661	4.4%
1999/00	749	16687	4.5%	2019/20	1056	24009	4.4%
2000/01	802	17580	4.6%	2020/21	1072	24353	4.4%
2001/02	819	17793	4.6%	2021/22	1087	24712	4.4%
2002/03	671	19236	3.5%	2022/23	1103	25071	4.4%
2003/04	804	19269	4.2%	2023/24	1119	25429	4.4%
2004/05	830	19724	4.2%	2024/25	1135	25786	4.4%
2005/06	797	19923	4.0%	2025/26	1150	26141	4.4%
2006/07	900	20497	4.4%	2026/27	1166	26496	4.4%
2007/08	940	21049	4.5%	2027/28	1181	26847	4.4%
2008/09	1052	21198	5.0%	2028/29	1197	27213	4.4%
2009/10	813	20473	4.0%	2029/30	1213	27575	4.4%
2010/11	947	20773	4.6%	2030/31	1229	27936	4.4%
2011/12	736	20757	3.5%	2031/32	1245	28290	4.4%
2012/13	1176	21463	5.5%	2032/33	1260	28643	4.4%

Transmission Losses

Figure 16 - Transmission Losses

Transmission Losses are the amount of energy lost while delivering power from the generation stations to all of the distribution substations that make up Common Bus. Transmission Losses only contains losses associated with supplying Manitoba customers. Losses attributable to exports and the gains attributable to imports are excluded. Transmission Losses are substantial because most of the northern generation is transmitted to southern distribution points 900 kilometers away. Transmission Losses vary year to year depending on water conditions, system configuration, outages and the magnitude of the load. Losses were up significantly in 2002/03 due to two High Voltage Direct Current (HVDC) transformer failures.



Transmission Losses are forecast to be 9.3% of the General Consumers Sales less Diesel Sales.

Table 25 - Transmission Losses

TRANSMISSION LOSSES (GW.h)							
HISTORICAL / PERCENT OF SALES / FORECAST							
Fiscal Year	Losses	Sales less Diesel	% Losses	Fiscal Year	Forecast Losses	Sales less Diesel	% Losses
1993/94	1552	15845	9.8%	2013/14	2058	22062	9.3%
1994/95	1609	15572	10.3%	2014/15	2094	22446	9.3%
1995/96	1606	16623	9.7%	2015/16	2122	22759	9.3%
1996/97	1660	16818	9.9%	2016/17	2148	23044	9.3%
1997/98	1745	16655	10.5%	2017/18	2171	23304	9.3%
1998/99	1675	16908	9.9%	2018/19	2204	23661	9.3%
1999/00	1623	16687	9.7%	2019/20	2236	24009	9.3%
2000/01	1696	17580	9.6%	2020/21	2268	24353	9.3%
2001/02	1864	17793	10.5%	2021/22	2301	24712	9.3%
2002/03	2012	19236	10.5%	2022/23	2335	25071	9.3%
2003/04	1792	19269	9.3%	2023/24	2368	25429	9.3%
2004/05	1852	19724	9.4%	2024/25	2401	25786	9.3%
2005/06	1860	19923	9.3%	2025/26	2435	26141	9.3%
2006/07	1885	20497	9.2%	2026/27	2468	26496	9.3%
2007/08	1949	21049	9.3%	2027/28	2500	26847	9.3%
2008/09	1979	21198	9.3%	2028/29	2534	27213	9.3%
2009/10	1934	20473	9.4%	2029/30	2568	27575	9.3%
2010/11	1977	20773	9.5%	2030/31	2602	27936	9.3%
2011/12	1939	20757	9.3%	2031/32	2635	28290	9.3%
2012/13	1952	21463	9.1%	2032/33	2667	28643	9.3%

Appendix 11.3 Average Unit Revenue/Cost

[illegible]

2012/13 & 2013/14 Electric General Rate Application

AVERAGE PRICE CALCULATION: IFF11-2

VOLUMES (in GW.h)	ACTUAL 2007/08	ACTUAL 2008/09	ACTUAL 2009/10	ACTUAL 2010/11	ACTUAL 2011/12	FORECAST -> 2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Demand:														
Manitoba Domestic Energy Sales	21061	21210	20486	20786	20770	21147	21749	22261	22488	22523	22796	23173	23351	23728
Domestic energy Losses	3102	3280	3012	3195	2675	3496	3161	3181	3223	3237	3272	3022	3061	3100
Firm & Opportunity Export Sales to Canada	482	417	373	905	886	804	915	589	577	603	595	581	570	537
Firm & Opportunity Export Sales to US	10539	9709	10487	9439	9358	9440	6337	6537	6378	6257	6048	5853	5673	5845
Export Transmission Losses	986	893	528	909	883	876	625	654	632	624	600	575	654	555
Total Demand Volumes:	36170	35509	35286	35234	34872	35763	32787	33222	33299	33244	33311	33204	33209	33767
Supply:														
MH Hydraulic Generation	34897	34193	33818	34036	33158	33158	29268	30744	30712	30693	30699	30461	30375	30813
MH Thermal Generation	457	335	143	86	77	77	111	311	328	314	332	385	430	295
Purchased Energy	816	981	1325	1132	1637	2530	3497	2259	2350	2328	2371	2449	2495	2751
Total Supply Volumes:	36170	35509	35286	35234	34872	35766	32678	33313	33390	33335	33402	33286	33308	33868

REVENUE/COST (in millions of dollars)

Manitoba Domestic Energy Sales @ Approved Rates	1,074,583	1,126,812	1,144,891	1,200,381	1,191,117	1,186,223	1,290,384	1,293,566	1,305,475	1,313,103	1,329,744	1,349,664	1,361,356	1,381,890
Additional Domestic Revenue	0.000	0.000	0.000	0.000	0.000	0.000	45,260	105,523	156,033	208,272	264,834	325,447	387,404	455,377
Total Manitoba Domestic Energy Sales	1074,583	1126,812	1,144,891	1,200,381	1,191,117	1,186,223	1,335,644	1,399,089	1,462,508	1,521,375	1,594,578	1,675,111	1,748,760	1,837,267
Total Export Sales to Canada	38,525	45,389	40,971	35,728	34,416	30,020	33,720	25,704	30,824	37,390	41,398	44,821	47,780	48,654
Total Export Sales to USA	489,137	469,755	341,312	317,638	292,326	270,237	221,081	277,149	320,013	386,869	415,481	438,948	458,828	513,945
Total Export Sales	527,662	515,144	382,283	353,366	326,741	300,257	254,801	302,852	350,838	424,259	456,879	484,769	506,608	562,599
MH Hydraulic Generation	117,006	114,549	114,022	114,122	110,848	110,837	97,834	102,715	102,608	102,546	102,564	101,771	101,482	102,945
MH Thermal Generation	15,358	13,578	8,438	5,403	9,323	9,323	9,386	21,929	25,643	25,530	28,061	34,026	40,391	36,076
Purchased Energy	34,885	58,309	32,074	34,676	78,079	83,914	120,044	108,483	120,490	125,566	133,687	143,093	151,183	167,962

AVERAGE PRICE (\$/MWh)

Manitoba Domestic Energy Sales @ Approved Rates	\$ 51.02	\$ 53.13	\$ 55.89	\$ 57.75	\$ 57.35	\$ 56.10	\$ 59.33	\$ 58.11	\$ 58.10	\$ 58.30	\$ 58.33	\$ 58.24	\$ 58.30	\$ 58.24
Additional Domestic Revenue	-	-	-	-	-	0.00	2.08	4.74	6.94	9.25	11.62	14.04	16.59	19.19
Total Manitoba Domestic Energy Sales @ meter	\$ 51.02	\$ 53.13	\$ 55.89	\$ 57.75	\$ 57.35	\$ 56.10	\$ 61.41	\$ 62.85	\$ 65.04	\$ 67.55	\$ 69.95	\$ 72.29	\$ 74.89	\$ 77.43
Total Export Sales to Canada	48.03	49.46	33.99	27.76	29.65	37.34	36.85	43.86	53.39	62.03	69.62	77.14	83.81	90.54
Total Export Sales to USA	47.33	48.83	32.95	33.71	31.23	28.63	34.89	42.40	50.17	61.63	68.70	75.17	80.88	87.92
Total Export Sales	47.36	48.85	32.99	33.31	31.10	29.31	35.14	42.50	50.44	61.85	66.78	75.34	81.14	88.14
MH Hydraulic Generation	\$ 3.35	\$ 3.35	\$ 3.37	\$ 3.35	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34	\$ 3.34
MH Thermal Generation	33.61	40.53	59.01	81.86	121.08	121.08	84.56	70.61	78.22	81.42	84.54	88.28	93.91	122.44
Purchased Energy	48.85	48.56	31.58	36.71	47.33	33.17	34.33	48.03	51.26	53.93	56.37	68.43	60.69	61.06

1 **REFERENCE: Chapter 11: Financial Evaluation of Development Plans; 2010 GRA**
 2 **PUB/MH II-91(a) (Table and Qualifications)**

3
 4 **QUESTION:**

5 Please refile the tabular summaries of Lower Nelson River Hydraulic Generation and the related
 6 Bipole I, II, and III HVDC transmission system capabilities.

7
 8 **RESPONSE:**

9 The values presented in GRA 2010 PUB/MH II-91a has changed modestly. Updated information
 10 is provided for Keeyask and Conawapa values. HVDC limits represent theoretical limits keeping
 11 the largest valve group spare. Reconfiguration of the HVDC system once Conawapa is fully
 12 operational changes the HVDC spare requirements, and thus the HVDC limits.

13

Bipoles I and II -2013							HVDC Losses (GWh)	
Generating Station	MW	Dependable (GWh)	Median (GWh)	Maximum (GWh)	Maximum HVDC Limit		Dependable	Mean
Kettle	1220	4750	7010	8960	Bipole I	14140 GWh	480	850
Long Spruce	1010	3890	5970	7830				
Limestone	1340	5140	7500	9900	Bipole II	15260 GWh	480	850
Total	3570	13780	20480	26690		29400 GWh	960	1700



**Needs For and Alternatives To
PUB/MH I-042a REVISED**

After Bipole III – 2019 without Keeyask							HVDC Losses (GWh)	
Generating Station	MW	Dependable (GWh)	Median (GWh)	Maximum (GWh)	Maximum HVDC Limit		Dependable	Mean
Kettle	1220	4750	7010	8960	Bipole I	14730 GWh	250	440
Long Spruce	1010	3890	5970	7830	Bipole II	15900 GWh	250	440
Limestone	1340	5140	7500	9900	Bipole III	18270 GWh	250	440
Total	3570	13780	20480	26690		48900 GWh	750	1320

1

After Bipole III- 2022 with Keeyask							HVDC Losses (GWh)	
Generating Station	MW	Dependable (GWh)	Median (GWh)	Maximum (GWh)	Maximum HVDC Limit		Dependable	Mean
Keeyask	630	3000	4400	4740	Bipole I	14730 GWh	310	550
Kettle	1220	4750	7010	8960	Bipole II	15900 GWh	310	550
Long Spruce	1010	3890	5970	7830				
Limestone	1340	5140	7500	9900	Bipole III	18270 GWh	310	550
Total	4200	16780	24880	31430		48900 GWh	930	1650

2



**Needs For and Alternatives To
PUB/MH I-042a REVISED**

After Bipole III -2029 with Keeyask and Conawapa							HVDC Losses (GWh)	
Generating Station	MW	Dependable (GWh)	Median (GWh)	Maximum (GWh)	Maximum HVDC Limit		Dependable	Mean
Keeyask	630	3000	4400	4740	Bipole I	13620 GWh	470	835
Kettle	1220	4750	7010	8960				
Long Spruce	1010	3890	5970	7830	Bipole II	15190 GWh	470	835
Limestone	1340	5140	7500	9900				
Conawapa	1300	4650	7000	9760	Bipole III	17460 GWh	470	835
Total	5270	21260	32010	41190		46270 GWh	1410	2505

1

8

The Keeyask Project will take 11 years to construct. The Keeyask Infrastructure Project began in 2012. The generating station and transmission projects are scheduled to begin in 2014. The construction phase will conclude with decommissioning of infrastructure no longer required for operations and with rehabilitation of the site in 2022. The first of seven generating units will begin producing power in 2019; all seven units will be in production by 2020. The final three years of construction will overlap with the first three years of operation. The budgeted in-service cost for the Keeyask Project, including interest and escalation, is \$6.2 billion.

Manitoba Hydro will purchase all energy produced at the generating station from its owner, the Keeyask Hydropower Limited Partnership ("the Partnership"), and integrate the energy into the Manitoba Hydro system for domestic and export customers. Annual average production of renewable electricity will be approximately 4,400 gigawatt-hours (GWh)—sufficient energy to power approximately 400,000 Manitoba homes.

Table 2.1 summarizes several key project design parameters.

Table 2.1 **KEEYASK GENERATING STATION DESIGN PARAMETERS**

Parameter	Value
Full Supply Level	159 m
Minimum Operating Level	158 m
Initial Reservoir Area	93.1 km ²
Initial Flooded Area	45 km ²
Rated Total Output Power at Stephens Lake at 141.12 m	630 MW
Rated Total Output Power at Stephens Lake at 139.6 m (Low Level)	695 MW
Generator Rated Output	99.3 MW/117 MVA
Net System Capacity Addition	630 MW
Average Annual Energy	4,400 GWh
Annual Dependable Energy	3,003 GWh

Table 2.3 CONAWAPA GENERATING STATION DESIGN PARAMETER

Parameter	Value
Full Supply Level (FSL) Winter/Open Water	57.2 m asl/56.7 m asl
Initial Reservoir Area	37.4 km ²
Initial Flooded Area	5.1 km ²
Rated Total Output Power - open water/end of winter	1,485 / 1,410 MW
Net System Capacity Addition – open water / end of winter	1,395 / 1,300 MW
Generator Rated Output	146 MW / 176 MVA
Average Annual Energy- gross	8,170 GWh
Average Annual Energy – net of losses at Limestone G.S.	7,000 GWh
Annual Dependable Energy	4,650 GWh

2.2.1 Conawapa Ownership Structure

2.2.1.1 Ownership of the Generation Project

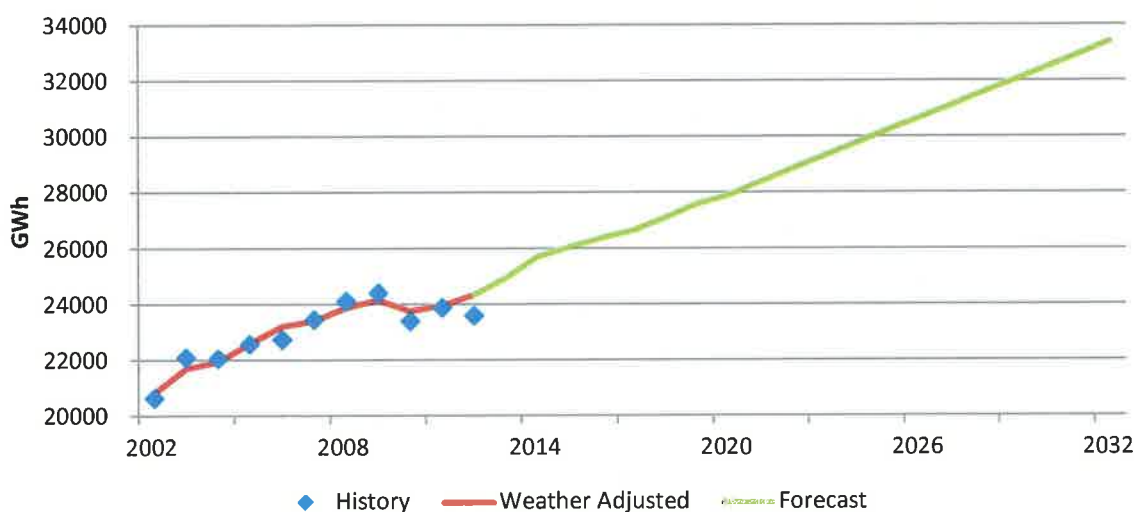
Although the generation ownership structure has not been finalized, Manitoba Hydro is committed to the following:

- providing early involvement and extensive consultations with First Nations in planning the project
- providing a forum for addressing community issues and concerns, incorporating Aboriginal traditional knowledge, and creating understanding of project impacts and benefits
- providing long-term, sustainable benefits for First Nations in the vicinity of the project. As with Wuskwatim and the proposed Keeyask Project, the focus of these benefits will be on income, training, employment and business opportunities
- providing opportunities for First Nations in the vicinity of the project to participate in the environmental assessment, monitoring and governance of the project.

annual growth rates varying by region, reflecting the unique characteristics of their individual markets.

Historical and forecast energy consumption for Manitoba is shown in Figure 4.1. Energy consumption increased from 20,656 GWh in 2001/02 to 24,367 GWh in 2011/12, representing an approximate 18% increase over the past 10 years at a compounded growth rate of 1.7% per year. Energy use is forecast to grow another 18% over the next 10 years to 28,859 GWh in 2021/22, and 37% over the next 20 years to 33,425 GWh in 2031/32 at growth rates of 1.7% and 1.6% respectively. Forecast values assume normal weather (e.g., 25 year average) will occur, and are therefore comparable to historical weather-adjusted values.

Figure 4.1 MANITOBA ENERGY CONSUMPTION (GWH) – HISTORY & FORECAST



Manitoba's domestic energy consumption has grown, on average, at an annual growth rate of 1.7% or 371 GWh over the past 10 years. This growth trend is forecast to continue for the next 20 years at an average annual growth rate of 1.6% or 453 GWh. On an annual-average basis, forecast load growth is consistent with the average annual historical growth trend.

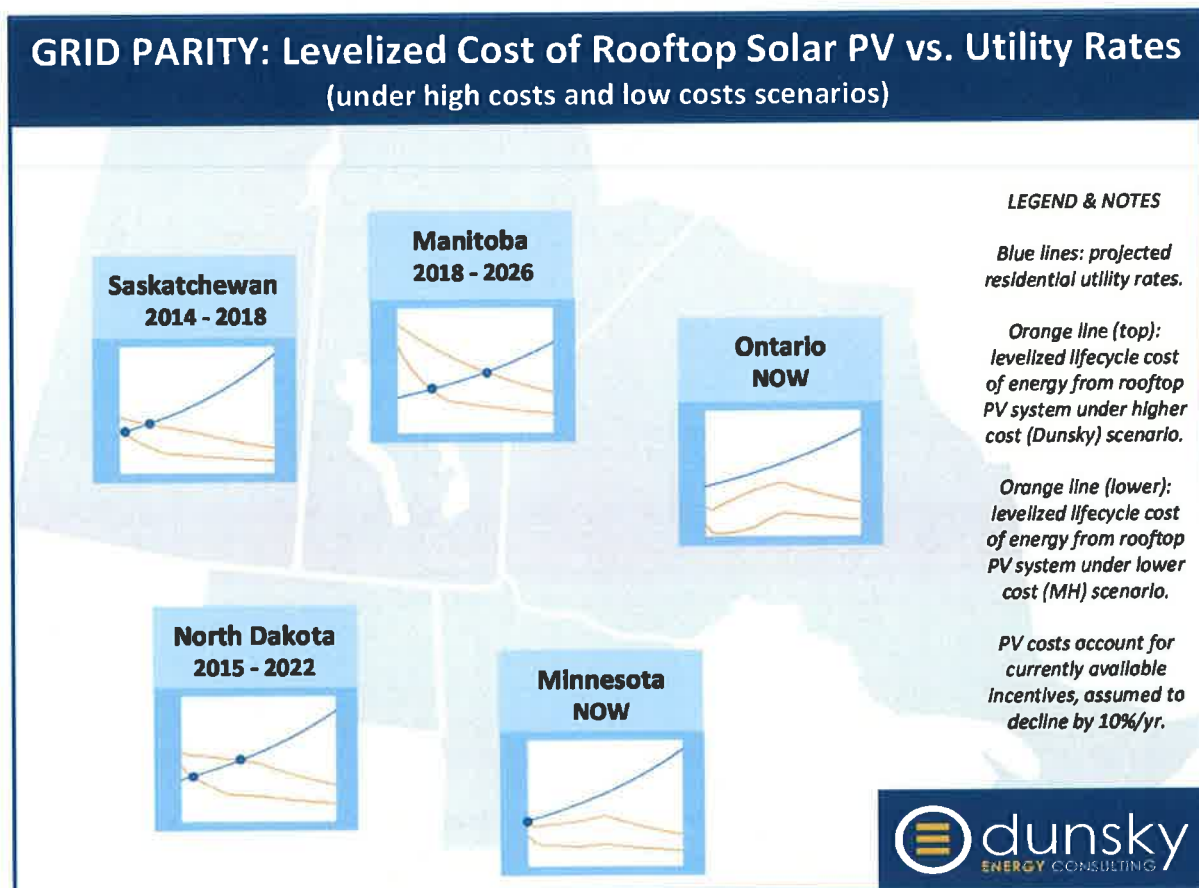
Annual energy growth varies from year to year. The variation is mostly due to increases or decreases in energy consumption by Manitoba's largest electricity customers. The effect of the

9

incentives (rebates, tax credits, feed-in-tariffs, etc.) and faster-than-expected system cost decreases can further speed up the process.³⁶

The chart below illustrates these findings.

FIGURE 15 – Residential Solar PV System Grid Parity



The implications of grid parity are of course significant. I do not anticipate a sudden “solar outbreak” – capital barriers and lack of interest will invariably create an adoption lag. Yet over

³⁶ It is important to note that contrary to common belief, cold climates like Manitoba’s can offer strong solar PV potential. In fact, Manitoba’s potential is amongst the highest in Canada (after Alberta and Saskatchewan). The province’s production suffers in winter months due to the shorter days, but this is offset by higher production during the summer because of longer days; furthermore, PV power conversion efficiencies actually improve in cold weather (or mild summer weather). Another issue – the angle at which the sun hits land in the winter (an acute angle reduces solar radiation per m² of land) – can be corrected by adjusting the tilt of solar panels (there is still a loss of production due to the inclination of the sun but much less severe than what the outside temperature would suggest). Snow accumulation can be addressed in part by appropriate solar PV installation designs; however occasional manual labour to remove snow may be required.

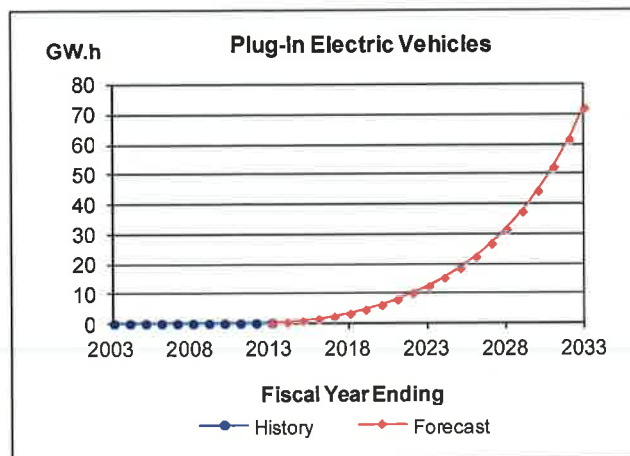
Plug-In Electric Vehicles

This forecast includes an estimate of the future adoption of Plug-In Electric Vehicles (PEVs). This is made up of two types:

(1) Plug-In Hybrid Electric Vehicles (PHEVs) that run on an electric battery but use an internal combustion engine (ICE) when the electricity runs low. An example is the Chevrolet Volt.

(2) Battery Electric Vehicles (BEVs) that run only on electric battery power, such as the Nissan Leaf.

Figure 9 - Plug-In Electric Vehicles



The forecast of PEVs does not include Hybrid Electric Vehicles (HEVs). These vehicles, such as the Toyota Prius, have an internal combustion engine as well as a battery and electric motor to drive the wheels. The HEV battery is charged with power from the ICE and through regenerative braking. It is not charged by plugging in and therefore does not affect electricity consumption in Manitoba. As of March 1, 2013 and after 12 years in the market, there were only 3,581 HEVs registered in Manitoba, making up about 0.46% of all registered vehicles.

For the most part, electric cars have not enjoyed their expected success anywhere. Range anxiety and price are cited as the main reasons for limited sales. In general, electric vehicles are part of a niche market whose demographic is the environmentally aware, very well educated, upper-middle class white male in his late 40s to early 50s with a garage equipped with an electric outlet. General Motors expected to sell 60,000 Chevy Volts globally in 2012, but sold just half that many. Sales of Nissan's all-electric Leaf grew 22% around the world last year to 26,000, short of Nissan's projected 50% growth. One exception has been American high end electric car maker Tesla Motors, which recently posted the first profitable quarter in its 10-year history and whose share price exceeded \$100 US for the first time on May 28, 2013. The price of Tesla shares has almost tripled this year, and its \$90,000 Model S sedan got a near-perfect rating from May 2013 Consumer Reports. On March 1, 2013 there were 4 Tesla vehicles registered in Manitoba with one more on order.

The Electric Vehicle Forecast

As of March 1st, 2013, there were 37 plug-in electric vehicles registered in Manitoba according to the Manitoba Public Insurance Corporation. The 2012 Load Forecast had predicted 34 such vehicles to be registered in Manitoba at fiscal year ending 2013. The number of new PEVs is expected to slowly increase until it reaches about 1.3% of vehicle sales (828 per year) in 2022/23 and 5.4% of sales (4,576 per year) in 2032/33. The total number of electric vehicles on the road is expected to be 4,038 (0.4%) in 2022/23 and 23,879 (2.1%) in 2032/33.

The EPA rating for the pure electric 2012 Nissan Leaf is 3,400 kW.h for 16,000 km. Other electric vehicles, including the plug-in hybrid Chevrolet Volt, have similar EPA ratings. Actual usage depends on the distance driven. For this forecast, the average PEV is assumed to use 3,000 kW.h per year, which is almost equivalent to the annual energy use of an electric hot water tank. There are different opinions on average peak contribution per vehicle, but an acceptable expectation is that peak load use will approximately be equal to non-peak use. A load factor of 91% was chosen to derive the load coincident to Manitoba Hydro's system peak on a cold winter day.

The following table provides the estimate of the number of new vehicles and total vehicles each year in Manitoba, as well as the corresponding numbers for Plug-In Electric Vehicles. The PEV MW is at Hydro's system peak. Forecast energy usage for PEVs in Manitoba is expected to be 12 GW.h in 2022/23 and 72 GW.h in 2032/33. Forecast peak usage at system peak is expected to be 1.5 MW in 2022/23 and 9.0 MW in 2032/33.

10

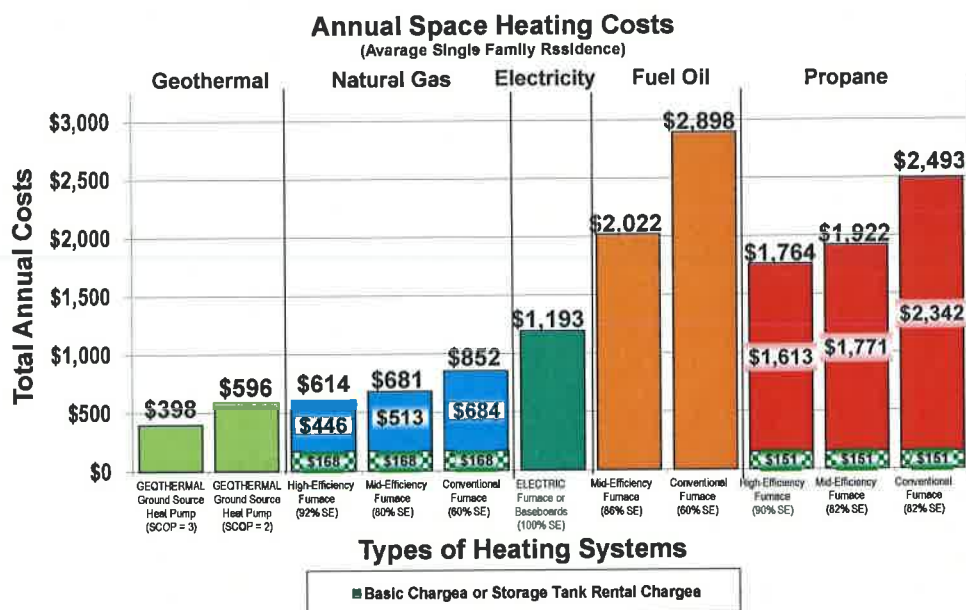
Typical space & water heating costs

1

Average single family residence at rates in effect November 1, 2013

Wondering about your energy options for heating?

1. Consult the charts to identify the costs of your current home heating and water heating systems.
2. Review the costs of other systems to see how your costs compare.
3. Consult the accompanying notes for guidance if you are thinking of switching systems or building a new home.



Energy rates

Natural gas:
\$0.2558/cubic metre

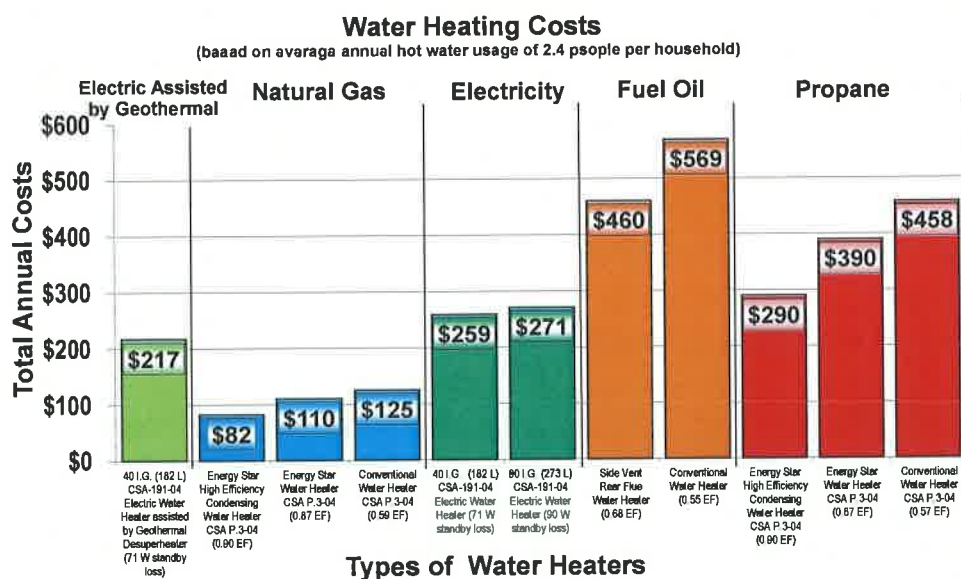
Electricity:
\$0.07183/kilowatt-hour

Fuel oil:
\$1.12/litre

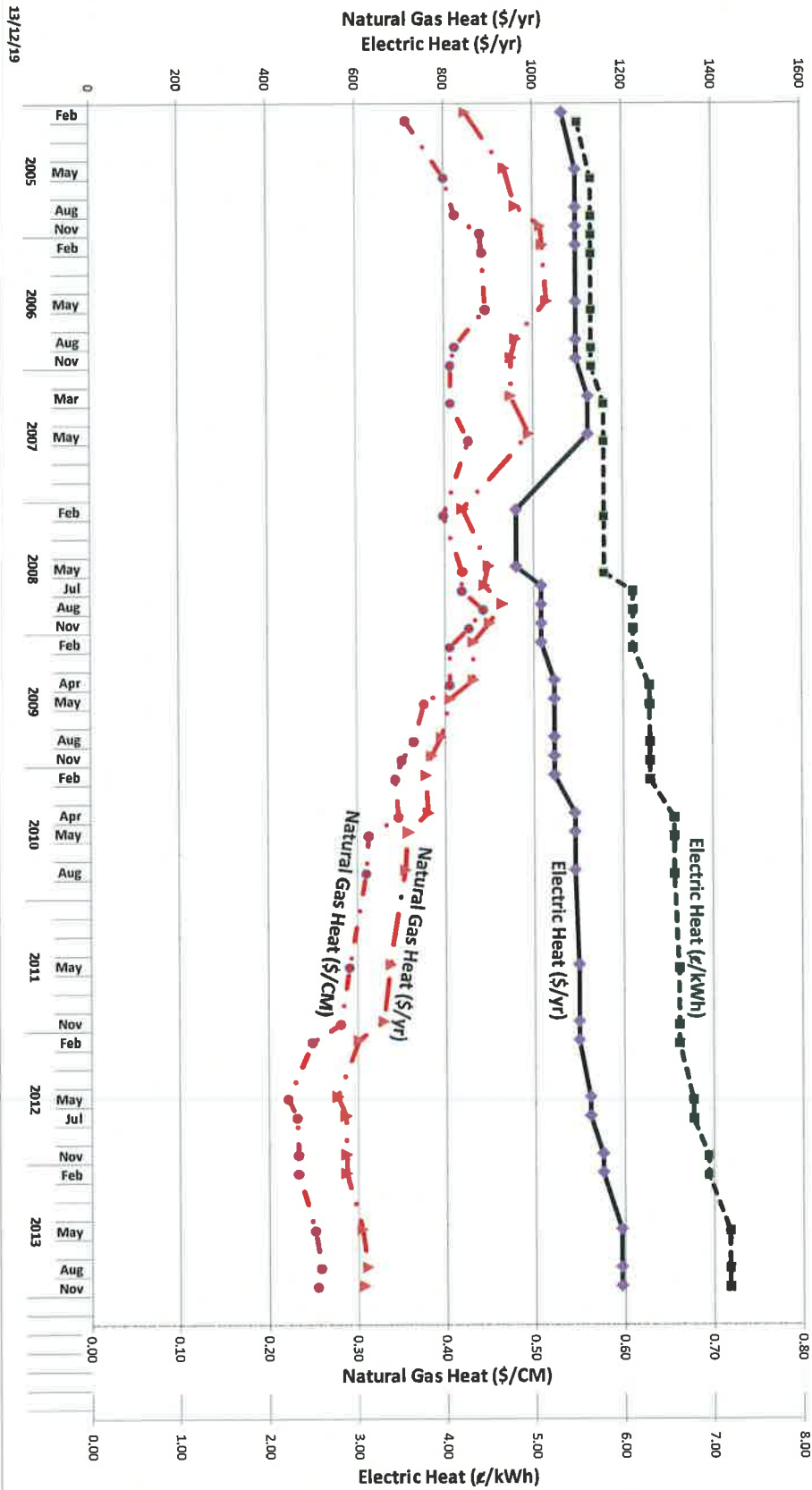
Propane:
\$0.62/litre

Basic monthly charge for natural gas is **\$14**
(**\$168** per year)

Annual propane tank rental: **\$151**



Single Family Home Heating MH Brochures (2005-2013)



NATURAL GAS

Cost to buy & install

\$3,500 NATURAL GAS
TO
\$5,500 FURNACE

ASK YOUR CONTRACTOR:

if you're installing natural gas for the first time, there will be extra charges for running the gas line to your home.



25-YEAR
COST TO RUN
\$15,500

Cost to buy & install

\$800 CONVENTIONAL
TO
\$1,200 NATURAL GAS
WATER HEATER

ASK YOUR CONTRACTOR:

natural gas water heaters need to vent the gases through your side wall or roof. Make sure you have the proper venting in place.



10-YEAR
COST TO RUN
\$1,200

TOTAL INVESTMENT:

**\$23,000
OR LESS**

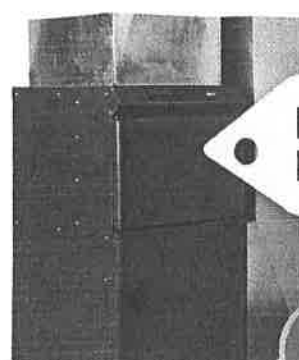
ELECTRICITY

Cost to buy & install

\$2,000 ELECTRIC
TO
\$3,000 FURNACE

ASK YOUR CONTRACTOR:

If you're installing an electric heating system for the first time, you may need to upgrade your electrical service or handle the extra load.



25-YEAR
COST TO RUN
\$29,800

Cost to buy & install

\$800 60 GALLON
TO
\$1,200 ELECTRIC
WATER HEATER

PLAN TODAY AND AVOID UNEXPECTED COSTS:

An emergency furnace or hot water tank replacement may end up costing you hundreds of dollars more than a planned installation. Explore your heating options now so you have time to get quotes and advice from multiple contractors.



10-YEAR
COST TO RUN
\$2,700

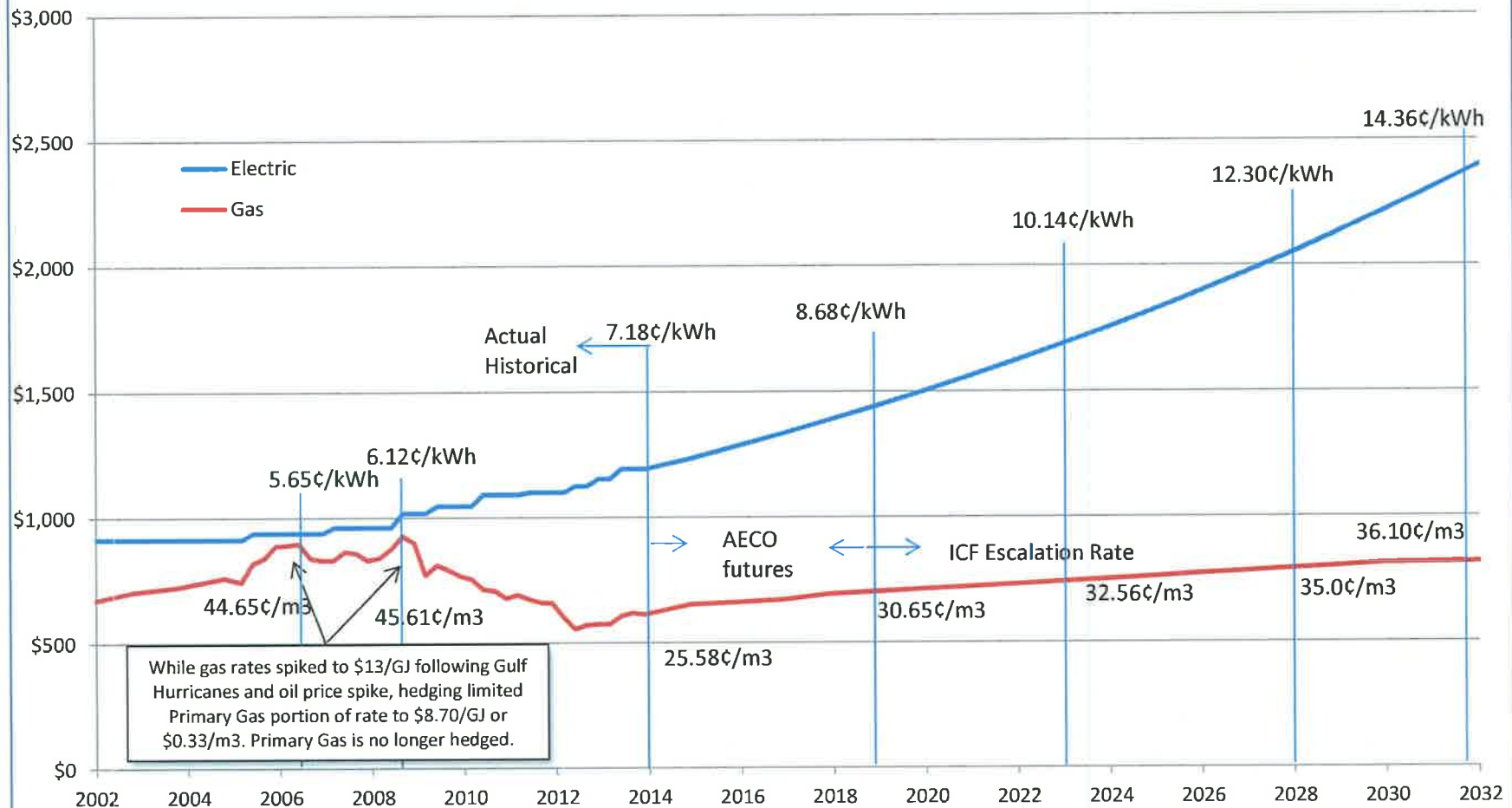
TOTAL INVESTMENT:

**\$36,000
OR MORE**



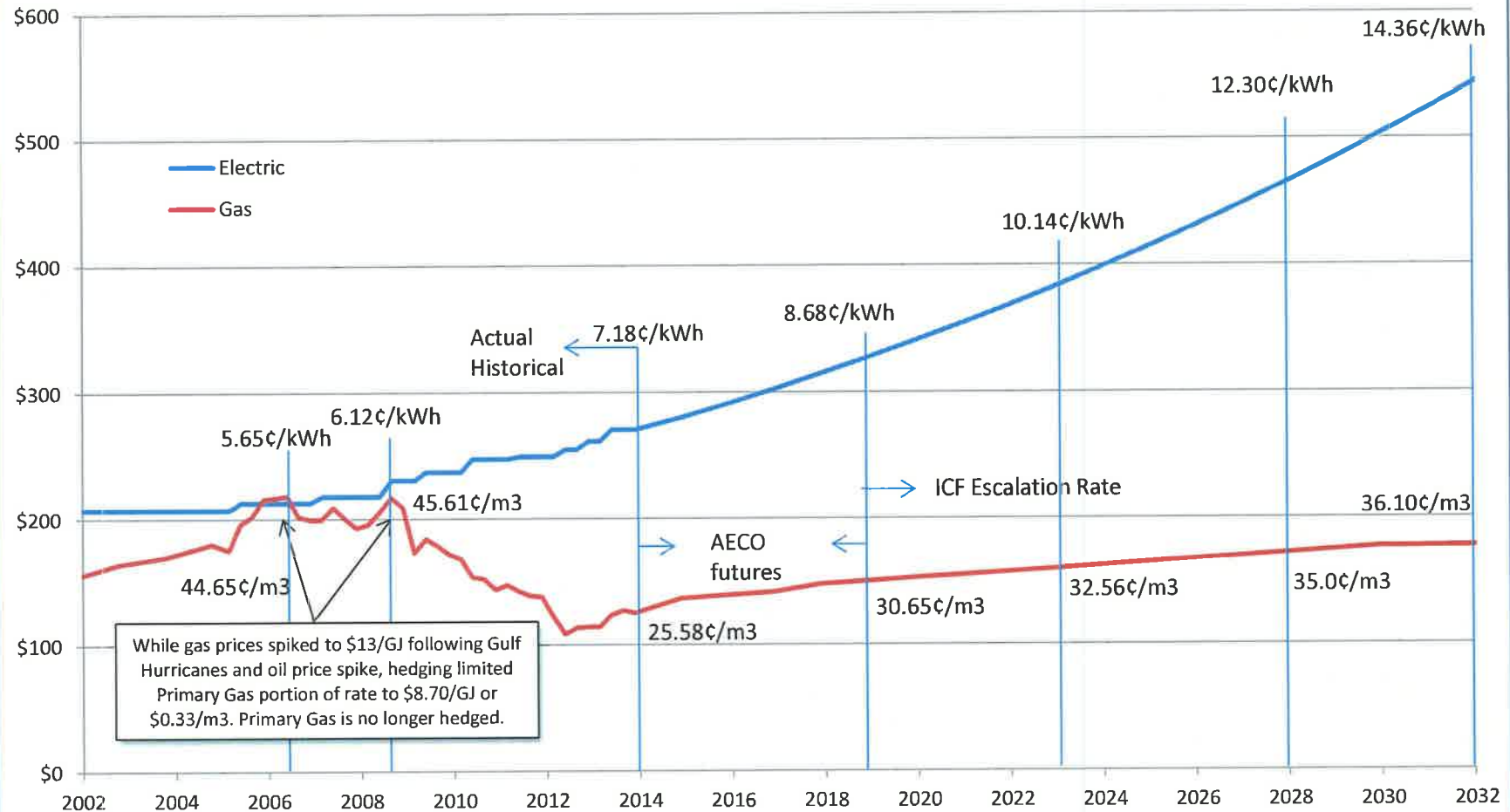
Choose the right system for your home and budget. While an electric heating system is a little cheaper up front, a natural gas system can save you thousands in the long run. Watch a helpful video, and use our online calculator to compare your savings, at hydro.mb.ca/heating

Annual Residential Space Heating Cost Comparison



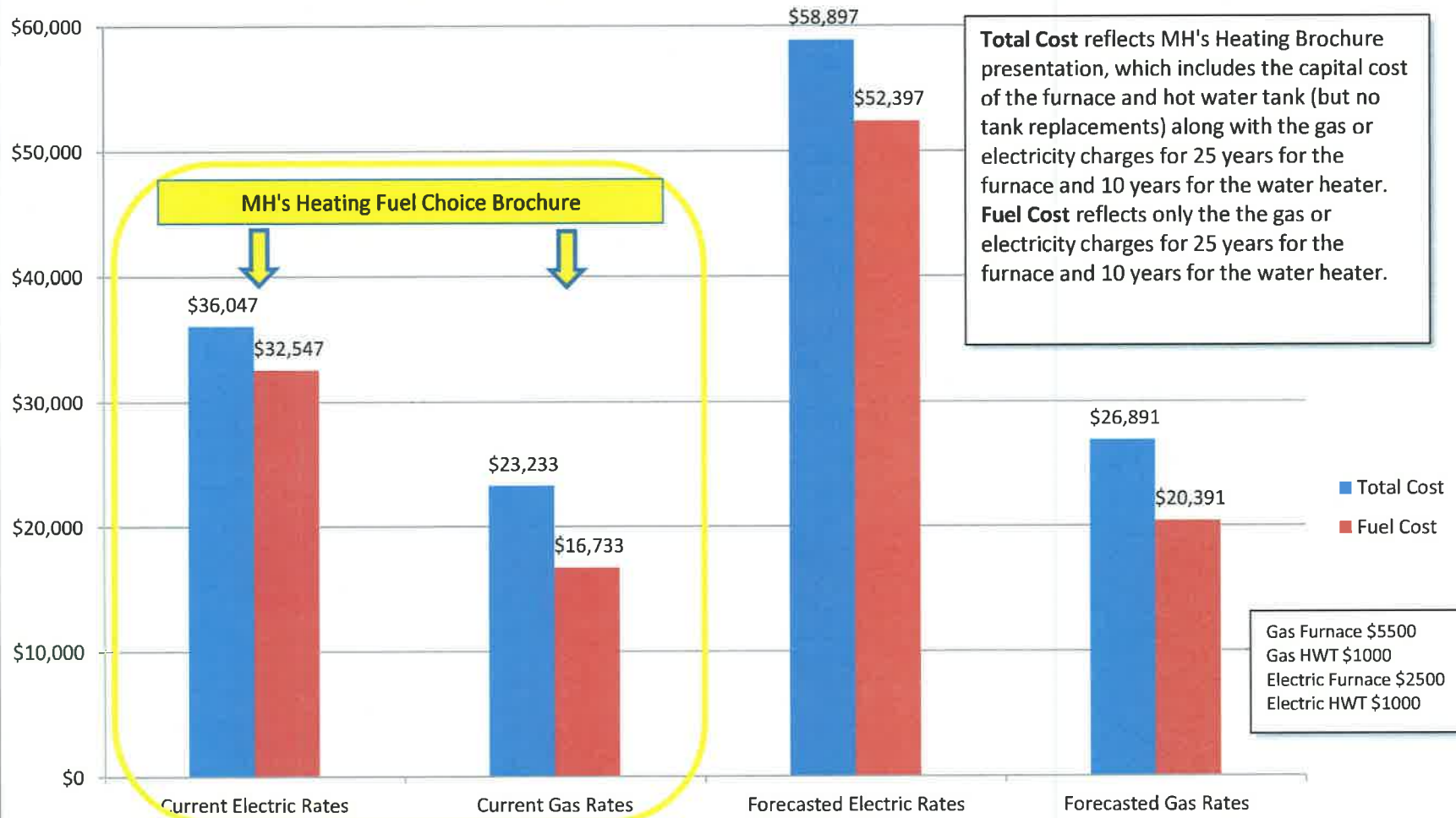
- Historical electric and gas rates are Residential Billed Rates from PUB/MH I-005a Attachments.
- High efficiency (92%) gas furnace assumed.
- Electric Rates assumed to rise at 3.95% annually per IFF12 (3.5% in 2014) . Actual rate increase may be higher if Basic Charge remains constant.
- Commodity portion of forecast gas rates are assumed to rise according to the AECO 5 year futures prices (July 24/13 futures strip) until 2018, then rise at the escalation rate forecasted by ICF as of April 2011 (2011 Storage Portfolio Review PUB/Centra 21), converted to nominal dollars at 1.02% annual CPI increase and Canadian dollars at 1.03 CAN/USD (per Economic Outlook 2013)
- Distribution portion of forecast gas rates are assumed to rise per IFF CGM-12 forecasted non-gas rate increases of 0.5 to 0.75% annually

Annual Residential Water Heating Cost Comparison



- Historical electric and gas rates are Residential Billed Rates from PUB/MH I-005a Attachments.
- Electric Rates assumed to rise at 3.95% annually per IFF 12 (3.5% in 2014). Actual rate increase may be higher if Basic Charge remains constant.
- Commodity portion of forecast gas rates are assumed to rise according to the AECO 5 year futures prices (July 24/13 futures strip) until 2018, then rise at the escalation rate forecasted by ICF as of April 2011 (2011 Storage Portfolio Review PUB/Centra 21), converted to nominal dollars at 1.02% annual CPI increase and Canadian dollars at 1.03 CAN/USD (per Economic Outlook 2013)
- Distribution portion of forecast gas rates are assumed to rise per IFF CGM-12 forecasted non-gas rate increases of 0.5 to 0.75% annually

Total Investment Costs for Space and Water Heating - Gas vs. Electric



- Electric Rates assumed to rise at 3.95% annually per IFF 12 (3.5% in 2014)
- Commodity portion of forecast gas rates are assumed to rise according to the AECO 5 year futures prices (July 24/13 futures strip) until 2018, then rise at the escalation rate forecasted by ICF as of April 2011 (2011 Storage Portfolio Review PUB/Centra 21), converted to nominal dollars at 1.02% annual CPI increase and Canadian dollars at 1.03 CAN/USD (per Economic Outlook 2013)
- Distribution portion of forecast gas rates are assumed to rise per IFF CGM-12 forecasted non-gas rate increases of 0.5 to 0.75% annually
- Space heating consumption: 16616 kWh or 1744 m3 Water heating consumption 3773 kWh or 485 m3

11

REFERENCE: Chapter 12: Economic Evaluations - 2013 Update On Selected Development Plans; Section: 12.4; Page No.: Chapter 12, Section 12.4, DSM

PREAMBLE: At the 2012 GRA Philippe Dunsky presented Benchmarking evidence Comparing Manitoba Hydro's recent reported performance against 52 U.S. states and Canadian provinces. Utilizing the metric of "percentage of sales" meaning incremental annual energy savings divided by total domestic energy sales.

QUESTION:

Please update Tables 12.6 and 12.7 to reflect what the 1.5 times DSM savings and 4 times DSM savings represents in terms of the percentage of savings to sales ratio (GWh Savings/ Domestic GWh sold).

RESPONSE:

The following tables provide the Winter Peak Capacity and Dependable Energy reflecting 1.5 times DSM savings and 4 times DSM savings:

Winter Peak Capacity, MW				
Fiscal Year	2014/15	2022/23	2027/28	2033/34
2013 Base Forecast	4680	5222	5588	6032
2013 Base DSM Forecast	43	144	166	153
% of Savings to Sales	0.9%	2.8%	3.0%	2.5%
1.5x DSM Sensitivity	65	216	249	230
% of Savings to Sales	1.4%	4.1%	4.5%	3.8%
4.0 x DSM Stress Test	174	577	664	612
% of Savings to Sales	3.7%	11.0%	11.9%	10.1%

1

Dependable Energy, GWh				
Fiscal Year	2014/15	2022/23	2027/28	2033/34
2013 Base Forecast	25676	28605	30625	33069
2013 Base DSM Forecast	204	667	773	665
% of Savings to Sales	0.8%	2.3%	2.5%	2.0%
1.5x DSM Sensitivity	306	1000	1159	998
% of Savings to Sales	1.2%	3.5%	3.8%	3.0%
4.0 x DSM Stress Test	815	2667	3090	2661
% of Savings to Sales	3.2%	9.3%	10.1%	8.0%

Table 7.2 Thresholds for Potential Additional DSM with Dunskey DSM Estimates

	Comparison at Forecast Year 2027/28 (at Meter)			
	GWh	% of Power Smart Plan	MW	% of Power Smart Plan
2013-16 Power Smart Plan (2012/13 – 2027/28)	713	100%	154	100%
DSM Potential Study				
Achievable	1135	159%	233	151%
Market	2915	409%	644	418%
Dunskey Estimates				
Scenario 1: ramp up to 1% from programs by 2015; hold	3674	515%	820	532%
Scenario 2: ramp up to 1.5% from programs by 2018; hold	5069	711%	1135	737%
Scenario 3: ramp up to 1.5% all-inclusive by 2017; hold	4493	630%	1005	653%

Table 7.2 from MH Business Case Chapter 7

Dunskey Estimates from MH 2012/13 GRA Undertakings January 17, 2013 submitted January 25, 2013 and reproduced in PUB/MH I-211; 1 and 1.5% refer to percentage of total domestic sales

REFERENCE: Chapter 12: Economic Evaluations - 2013 Update On Selected Development Plans; Section: 12.4; DSM

PREAMBLE: Mr. Dunsky provided estimates of deferral of energy and capacity investments in response to Undertakings at the 2012 GRA.

QUESTION:

Please compare your analysis with the energy and capacity savings estimate provided by Mr. Dunsky in response to undertaking 1 to the 2012 GRA and provide an explanation for any differences in estimated deferral dates for new generation and capacity investments.

RESPONSE:

The following tables compares the NFAT 2013 Update DSM Sensitivity and Stress Test potential efficiency savings with the energy and capacity savings estimates provided by Mr. Dunsky which were based on the 2012 DSM Forecast used in the 2012/13 Power Resource Plan.

As shown in the tables all of the DSM forecasts provided by Mr. Dunsky are significantly higher than Manitoba Hydro's 4x DSM Stress Test by 2027/28.

Mr. Dunsky provided forecasts to 2034/35. Using these forecasts the need for new resources to meet existing obligations would be deferred past the period for which his forecast was prepared.

1

Potential Energy Efficiency Savings (MW)

Winter Peak Capacity, MW				
Fiscal Year	2014/15	2022/23	2027/28	2033/34
Manitoba Hydro Forecasts				
MH 2013 Base DSM Forecast	43	144	166	153
1.5x DSM Sensitivity	65	216	249	230
4.0x DSM Stress Test	174	577	664	612
MH 2012/13 PRP DSM Forecast				
2012 GRA – Mr. Dunskey Forecasts				
Sc1 ramp up to 1% from programs by 2015; hold	93	537	820	1141
Sc 2 ramp up to 1.5% from programs by 2018; hold	93	712	1135	1625
Sc 3 ramp up to 1.5% all-inclusive by 2017; hold	74	608	1005	1494

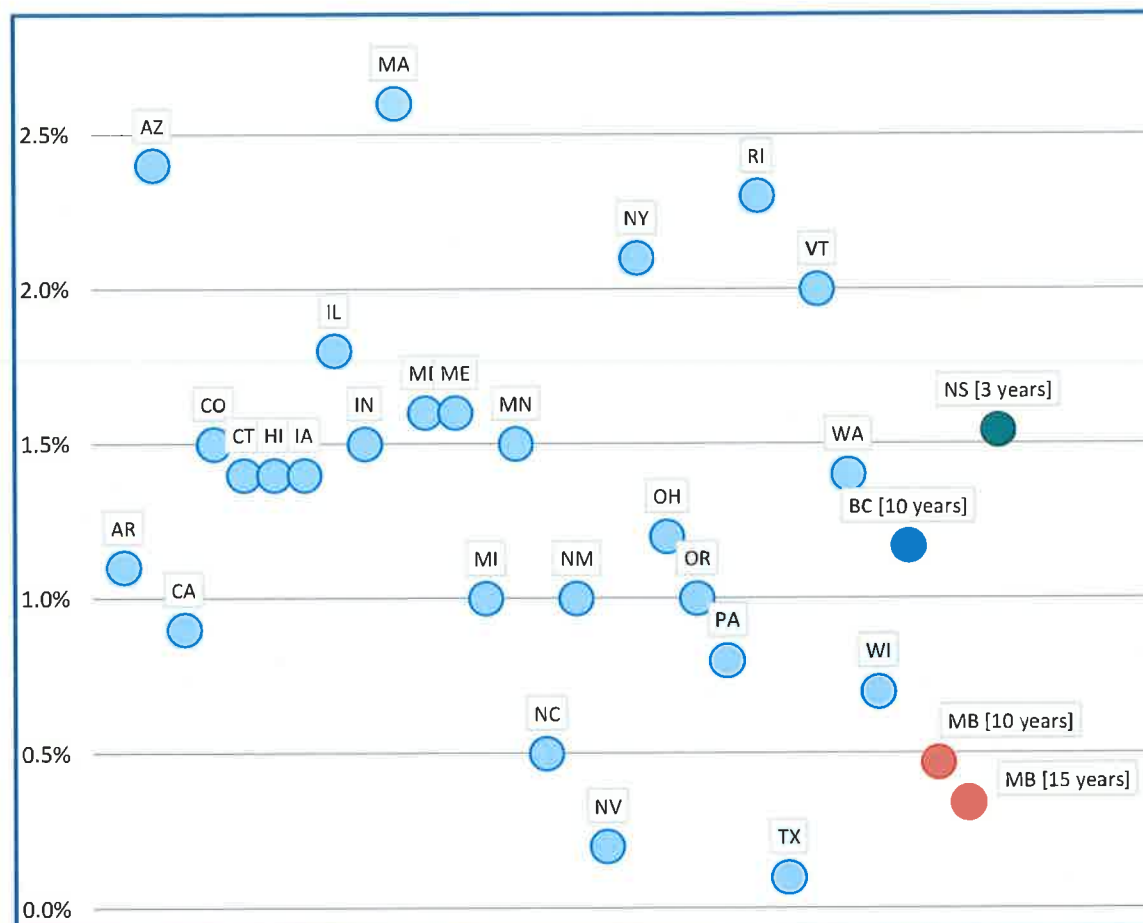
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Potential Energy Efficiency Savings (GWh)

Dependable Energy, MW				
Fiscal Year	2014/15	2022/23	2027/28	2033/34
Manitoba Hydro Forecasts				
MH 2013 Base DSM Forecast	204	667	773	665
1.5x DSM Sensitivity	306	1000	1159	998
4.0x DSM Stress Test	815	2667	3090	2661
MH 2012/13 PRP DSM Forecast	268	738	816	693
2012 GRA – Mr. Dunskey Forecasts				
Sc1 ramp up to 1% from programs by 2015; hold	430	2417	3674	5046
Sc 2 ramp up to 1.5% from programs by 2018; hold	430	3189	5069	7188
Sc 3 ramp up to 1.5% all-inclusive by 2017; hold	350	2728	4493	6612

FIGURE 10 – Electricity Targets (Average Annual Electric Savings as % of Sales)



Not surprisingly, we find that Manitoba Hydro's targets remain far lower than what leaders are aiming at. Even California, with its decades-long commitment to aggressive DSM, continues to target substantially more *additional* savings in coming years, on top of what has been achieved over a strong, three-decade long investment. In fact, California is now joining numerous other regions in relying on DSM to meet *all load growth*, effectively flattening demand despite continued population and economic growth.

Another interesting case is the state of Minnesota, given its proximity to Manitoba (see "Case Study – Minnesota" for details). There, strong state and regulatory support are combining with utility leadership to target and achieve high levels of DSM savings. The Next Generation Act of 2007 sets the minimum annual energy savings at 1.5%, of which 1% must come from utility programs (energy efficiency and self-generation). Xcel Energy Minnesota, the largest electric utility in the State, has achieved an average of 1% savings on energy sales from 2005-2011, and going forward is now relying on 1.4% annually from DSM programs alone. These savings are *in addition* to savings from codes, standards, and other non-program efforts.

FIGURE 11 – Dunsky’s DSM Scenarios (excluding codes and standards)

		2014	2015	2016	2017	2018	2019	2020 ++	10 YEAR AVG 2014-2023 (programs only)	10-yr Avg. 2014-2023 (prog's + C&S)
Scen. A (1.3%)	%/yr:	0.6%	0.8%	1.0%	1.2%	1.4%	1.5%	1.5%	1.3%	1.5%
	GWh/yr:	135	182	231	280	331	360	365	3,013 GWh/yr (cumulative)	3,534 GWh/yr (cumulative)
Scen. B (1.1%)	%/yr:	0.5%	0.7%	0.8%	1.1%	1.3%	1.3%	1.3%	1.1%	1.3%
	GWh/yr:	122	149	181	267	305	312	317+	2,634 GWh/yr (cumulative)	3,220 GWh/yr (cumulative)

The more aggressive scenario (Scenario A) would exceed the “market” potential identified by Manitoba Hydro. This reflects the numerous additional savings opportunities not accounted for by that study, as well as the other limitations I noted previously (see Figure 8). It would require strong commitment and innovative approaches from Manitoba Hydro, but is achievable, and still far lower than what some other leaders are targeting and achieving. I note that this scenario effectively means that Manitoba would achieve neighbouring Minnesota’s current performance in 5 years’ time.²⁴

The less aggressive scenario (Scenario B) would include a somewhat longer ramp-up time and top off at a somewhat lower rate than Scenario A. From a programs perspective, *after the 5-year ramp-up, Manitoba Hydro’s savings would still fall short of Nova Scotia’s latest annual performance results.*²⁵ When accounting for *all* savings opportunities, this scenario is similar to BC Hydro’s latest 10-year target.²⁶

²⁴ Minnesota utilities currently achieve 1.4% from programs alone, and at least 1.5% when including codes and standards.

²⁵ In its most recent, fully-evaluated year (2012), Efficiency Nova Scotia achieved 1.4% savings/load from energy efficiency programs, and 1.5% when including the codes and standards it could have influenced.

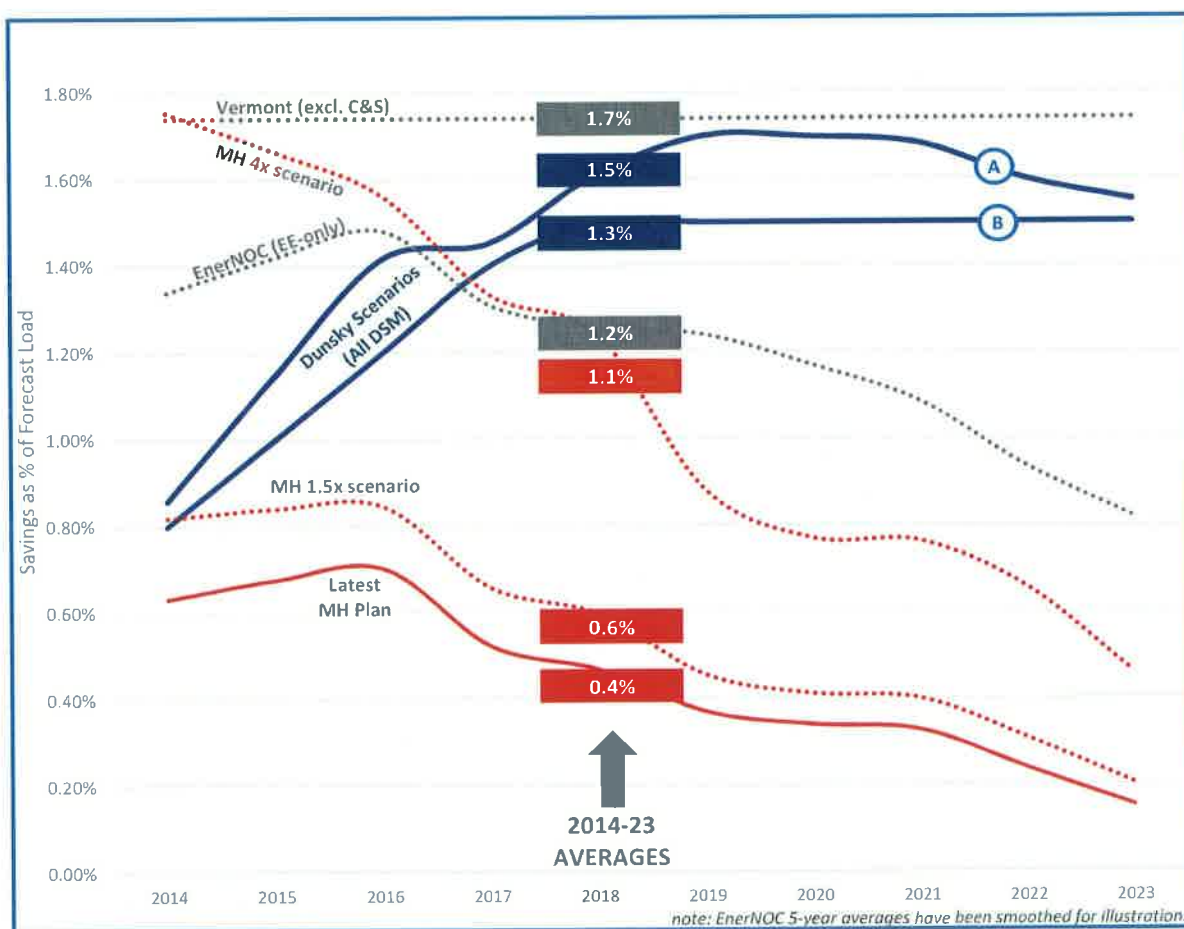
²⁶ BC Hydro’s recently adopted Integrated Resource Plan includes DSM targets of 1.5%/yr, on average, over the 2014-23 timeframe. This includes programs, codes and standards, and customer-sited generation (the latter being 0.2% of the total).

COMPARING SCENARIOS

The following graph illustrates the cumulative savings (as a percentage of load reduction) that would result from a number of options to consider:

- MH's current 2013 Plan
- MH's current "scenarios" that involve 1.5x or 4x savings above its current plan
- Our 2 scenarios, as described above, and
- For illustrative purposes, Vermont's average savings targets for the period

FIGURE 12 – Compared 10-Year Scenarios (incl. anticipated C&S except where otherwise noted)



Note: To ensure an equivalent comparison, each scenario and plan accounts for DSM programs as well as non-program savings, i.e. Manitoba Hydro's currently-anticipated savings from codes and standards. Note that the multiples in MH's "1.5x" and "4x" scenarios apply only to the program portion of the total.

12

Economic Effectiveness Metrics

Manitoba Hydro uses a number of cost effective metrics to assess energy efficient opportunities, including whether to pursue an opportunity, how aggressively an opportunity will be pursued, effectiveness of program design options and the relative investment from ratepayers and participants. In addition to quantitative assessments, Manitoba Hydro also considers various qualitative factors including equity (i.e. reasonable participation by various ratepayer sectors such as lower income) and overall contribution towards having a balanced energy conservation strategy and plan.

Quantitative assessments include using the following cost effective metrics:

Integrated Metrics

- Societal Cost (SC);
- Total Resource Cost (TRC);
- Total Resource Cost NPV (TRC NPV);
- Levelized Resource Cost (LRC)

Utility Metrics

- Rate Impact Measure Cost (RIM);
- Net Utility Benefit (NUB);
- Utility Net Present Value (Utility NPV)
- Levelized Utility Cost (LUC);

Customer Metrics

- Simple Customer Payback calculation;
- Participating Customer Cost (PC); and
- Participating Customer Cost Net Present Value (PC NPV).

Integrated Metrics

Societal Cost (SC)

The Societal Cost (SC) metric measures the net economic benefit as measured by the TRC, plus additional indirect benefits such the avoided environmental or societal externalities (e.g. reduced health care costs, increase productivity, employment) and “non-priced” benefits enjoyed by participants (improved comfort, improved health).

$$SC = \frac{(PV (\text{Marginal Benefits}) \times 1.10) + PV (\text{Measurable Non-Energy benefits})}{PV (\text{Total Program Admin Costs} + \text{Incremental Product Costs})}$$

Where:

- For electricity, the Marginal Benefits includes the revenue realized by Manitoba Hydro from conserved electricity being sold in the export market, the avoided cost of new infrastructure (e.g. electric transmission facilities)
- Measurable non-energy benefits (e.g. water savings);
- For natural gas, the Marginal Benefits includes Manitoba Hydro's avoided cost of purchasing natural gas, avoided transportation costs, the value of reduced greenhouse gas emissions (GHGs) and measurable non-energy benefits (e.g. water savings);
- Total Program Admin Costs includes the administrative costs involved in program planning, design, marketing, implementation and evaluation. It includes all costs associated with offering the Power Smart program, except for customer incentive costs;
- Incremental Product Costs includes the total incremental cost associated with implementing an energy efficient opportunity. It is the difference in costs between the energy efficient technology and the standard technology that would have been installed in the absence of the program.

Total Resource Cost (TRC)

The Total Resource Cost (TRC) metric assesses whether the benefits that are associated with an energy efficiency program are greater than the costs. This assessment is undertaken irrespective of who realizes the benefits and who pays the costs with any economic transfers between the Corporation and the participating customer being excluded.

In general, if program offers greater benefits relative to costs, then a program for pursuing the opportunity should be considered, however Manitoba Hydro will also consider supporting certain programs where the benefits are less than the costs. In the latter case, the rationale driving the support will be driven by other qualitative factors such as supporting emerging technologies (e.g. solar panels) or targeting low participation market sectors (e.g. lower income). The Total Resource Cost metric is defined as follows:

$$TRC = \frac{PV (\text{Marginal Benefits}) + PV (\text{Measurable Non-Energy Benefits})}{PV (\text{Total Program Admin Costs} + \text{Incremental Product Costs})}$$

Where:

- For electricity, the Marginal Benefits includes the revenue realized by Manitoba Hydro from conserved electricity being sold in the export market, the avoided cost of new infrastructure (e.g. electric transmission facilities);
- Measurable non-energy benefits (e.g. water savings);
- For natural gas, the Marginal Benefits includes Manitoba Hydro's avoided cost of purchasing natural gas, avoided transportation costs, the value of reduced greenhouse gas emissions (GHGs) and measurable non-energy benefits (e.g. water savings);
- Total Program Admin Costs includes the administrative costs involved in program planning, design, marketing, implementation and evaluation. It includes all costs associated with offering the Power Smart program, except for customer incentive costs;
- Incremental Product Costs includes the total incremental cost associated with implementing an energy efficient opportunity. It is the difference in costs between the energy efficient technology and the standard technology that would have been installed in the absence of the program.

Total Resource Cost Net Present Value (TRC NPV)

The Total Resource Cost Net Present Value (TRC NPV) calculation reveals if the economic value of the benefits that are associated with an energy efficiency program are greater than the costs.

$$TRC NPV = PV (\text{Marginal Benefits}) - PV (\text{Total Program Admin Costs} + \text{Incremental Product Costs})$$

Where:

- For electricity, the Marginal Benefits includes the revenue realized by Manitoba Hydro from conserved electricity being sold in the export market, the avoided cost of new infrastructure (e.g. electric transmission facilities) and measurable non-energy benefits (e.g. water savings);
- For natural gas, the Marginal Benefits includes Manitoba Hydro's avoided cost of purchasing natural gas, avoided transportation costs, the value of reduced greenhouse gas emissions (GHGs) and measurable non-energy benefits (e.g. water savings);
- Total Program Admin Costs includes the administrative costs involved in program planning, design, marketing, implementation and evaluation. It includes all costs associated with offering the Power Smart program, except for customer incentive costs;
- Incremental Product Costs includes the total incremental cost associated with implementing an energy efficient opportunity. It is the difference in costs between the energy efficient technology and the standard technology that would have been installed in the absence of the program.

Levelized Resource Cost (LRC)

The Levelized Resource Cost (LRC) is used to determine the overall economic resource cost of energy saved through an energy efficiency program. The LRC provides a levelized cost of energy saved per unit over a fixed time period. The Levelized Resource Cost is defined as follows:

$$\text{LRC} = \frac{\text{PV (Incremental Product Costs + Total Program Admin Costs)}}{\text{PV (Energy)}}$$

Where:

- Incremental Product Costs includes the total incremental cost associated with implementing an energy efficient opportunity. It is the difference in costs between the energy efficient technology and the standard technology that would have been installed in the absence of the program.
- Utility Program Admin Costs includes administrative costs incurred by Manitoba Hydro for staff involved in program planning, design, marketing, implementation and evaluation. It includes all costs associated with offering the Power Smart program, except for customer incentive costs;
- Energy includes the annual energy savings.

Utility Metrics

Rate Impact Measure Cost(RIM)

The Rate Impact Measure (RIM) metric is used to provide an indication of the long term impact of an energy efficient program on energy rates. The metric is a benefit/cost ratio that represents the economic impact of a program from the ratepayer's perspective. All program related savings and costs incurred by the utility, including revenue loss and incentive payments, are taken into account in this assessment. The Rate Impact Measure metric is defined as follows:

$$RIM = \frac{PV \text{ (Utility Marginal Benefits)}}{PV \text{ (Revenue Loss + Utility Program Admin Costs + Incentives)}}$$

Where:

- For electricity, the Utility Marginal Benefits includes the revenue realized by Manitoba Hydro from conserved electricity being sold in the export market and the avoided cost of new infrastructure (e.g. electric transmission facilities);
- For natural gas, the Utility Marginal Benefits includes Manitoba Hydro's avoided cost of purchasing natural gas and avoided transportation costs;
- Revenue Loss includes Manitoba Hydro's lost revenue associated with the participants' reduced energy consumption (i.e. customer energy bill reductions);
- Utility Program Admin Costs includes administrative costs incurred by Manitoba Hydro for staff involved in program planning, design, marketing, implementation and evaluation. It includes all costs associated with offering the Power Smart program, except for customer incentive costs;
- Incentives include the funds transferred from Manitoba Hydro to the participant associated with implementing the Power Smart measure.

Net Utility Benefit (NUB)

The Net Utility Benefit (NUB) metric is used to measure the energy saving benefits to the utility net of any revenue losses. Marginal benefits, after deductions from lost revenue are compare to the cost incurred by the by the utility. The Net Utility Benefit metric is defined as follows:

$$NUB = \frac{PV \text{ (Utility Marginal Benefits)} - PV \text{ (Revenue Loss)}}{PV \text{ (Utility Program Admin Costs + Incentives)}}$$

Where:

- For electricity, the Utility Marginal Benefits includes the revenue realized by Manitoba Hydro from conserved electricity being sold in the export market and the avoided cost of new infrastructure (e.g. electric transmission facilities);
- For natural gas, the Utility Marginal Benefits includes Manitoba Hydro's avoided cost of purchasing natural gas and avoided transportation costs;
- Revenue Loss includes Manitoba Hydro's lost revenue associated with the participants' reduced energy consumption (i.e. customer energy bill reductions);
- Utility Program Admin Costs includes administrative costs incurred by Manitoba Hydro for staff involved in program planning, design, marketing, implementation and evaluation. It includes all costs associated with offering the Power Smart program, except for customer incentive costs;
- Incentives include the funds transferred from Manitoba Hydro to the participant associated with implementing the Power Smart measure.

Utility Net Present Value (Utility NPV)

The Utility Net Present Value (Utility NPV) calculation reveals from the Utility's perspective, if the economic value of the benefits that are associated with an energy efficiency program are greater than the costs.

$$\text{Utility NPV} = \text{PV (Marginal Benefits - Revenue Loss)} - \text{PV (Utility Program Admin Costs + Incentives)}$$

Where:

- For electricity, the Utility Marginal Benefits includes the revenue realized by Manitoba Hydro from conserved electricity being sold in the export market and the avoided cost of new infrastructure (e.g. electric transmission facilities);
- For natural gas, the Utility Marginal Benefits includes Manitoba Hydro's avoided cost of purchasing natural gas and avoided transportation costs;
- Revenue Loss includes Manitoba Hydro's lost revenue associated with the participants' reduced energy consumption (i.e. customer energy bill reductions);
- Utility Program Admin Costs includes administrative costs incurred by Manitoba Hydro for staff involved in program planning, design, marketing, implementation and evaluation. It includes all costs associated with offering the Power Smart program, except for customer incentive costs;
- Incentives include the funds transferred from Manitoba Hydro to the participant associated with implementing the Power Smart measure.

Levelized Utility Cost (LUC)

The Levelized Utility Cost (LUC) is used to provide an economic cost value for the energy saved through an energy efficiency program. The LUC provides the total cost of the conserved energy based upon the utility's investment on behalf of the ratepayer on a per unit basis levelized over a fixed time period. The cost value allows for a comparison to other supply options and other DSM programs occurring over different timeframes. The Levelized Utility Cost is defined as follows:

$$\text{LUC} = \frac{\text{PV (Utility Program Admin Costs + Incentives)}}{\text{PV (Energy)}}$$

Where:

- Utility Program Admin Costs includes administrative costs incurred by Manitoba Hydro for staff involved in program planning, design, marketing, implementation and evaluation. It includes all costs associated with offering the Power Smart program, except for customer incentive costs;
- Incentives includes the funds transferred from Manitoba Hydro to the participant associated with implementing the Power Smart measure;
- Energy includes the annual energy savings.

Customer Metrics

Simple Customer Payback Calculation (Payback)

The Simple Customer Payback calculation provides the simple payback of implementing an energy efficient opportunity for customers. This value outlines the amount of time required before the customer recovers the incremental product cost. The value is useful in projecting customer participation rates for energy efficient opportunities. The Customer Payback is defined as follows:

$$CP = \frac{\text{Participant Costs - Incentives}}{\text{Annual Bill Reductions}}$$

Where:

- Participant Costs includes the participant's total incremental cost associated with implementing the energy efficient opportunity, which is the difference in costs between the energy efficient technology and the standard technology that would have been installed in the absence of the program.
- Incentives includes funds provided by Manitoba Hydro and external parties to the participant associated with implementing the energy efficient opportunity;
- Annual Bill Reductions include the first year dollar reductions in the customer's electricity, natural gas, and water bills.

Participating Customer Cost (PC)

The Participating Customer Cost (PC) metric evaluates from a customer perspective if the benefits that are associated with an energy efficiency program are greater than the costs over the life of the measure. The Participating Customer Cost is defined as follows:

$$PC = \frac{PV (\text{Incentives} + \text{Revenue Loss})}{PV (\text{Incremental Product Costs})}$$

Where:

- Incentives include the funds transferred from Manitoba Hydro to the participant associated with implementing the Power Smart measure.
- Revenue Loss includes Manitoba Hydro's lost revenue associated with the participants' reduced energy consumption (i.e. customer energy and measurable non-energy (i.e. water) bill reductions);
- Incremental Product Costs includes the total incremental cost associated with implementing an energy efficient opportunity. It is the difference in costs between the energy efficient technology and the standard technology that would have been installed in the absence of the program.

Participating Customer Cost Net Present Value (PC NPV)

The Participating Customer Cost Net Present Value (PC NPV) calculation reveals from the customer's perspective, if the economic value of the benefits that are associated with an energy efficiency program are greater than the costs over the life of the measure.

$$\text{PC NPV} = \text{PV (Incentives + Revenue Loss)} - \text{PV (Incremental Product Costs)}$$

Where:

- ☛ Incentives include the funds transferred from Manitoba Hydro to the participant associated with implementing the Power Smart measure.
- ☛ Revenue Loss includes Manitoba Hydro's lost revenue associated with the participants' reduced energy consumption (i.e. customer energy and measurable non-energy (i.e. water) bill reductions);
- ☛ Incremental Product Costs includes the total incremental cost associated with implementing an energy efficient opportunity. It is the difference in costs between the energy efficient technology and the standard technology that would have been installed in the absence of the program.

Other DSM Program Assumptions

Market Transformation

Market transformation is a strategic intervention to achieve a lasting, significant share of energy efficient products and services in targeted markets. Manitoba Hydro's Power Smart strategy focuses on creating a sustainable market change where energy efficient technologies and practices become the market standard.

However, market transformation is difficult to measure. Manitoba Hydro has made significant progress in developing specific methodologies for measuring its impacts. Wherever possible, Manitoba Hydro has attempted to obtain sales/technology specific data to calculate a program's true effect. Difficulties arise in 1) obtaining sales data for areas outside of Manitoba for comparison purposes and in 2) obtaining sales information for Manitoba that fall outside of Power Smart program participation. In some instances, qualitative information is used to determine a program's impact on the market. Manitoba Hydro plans to continue work to further quantify and report on the influence of market transformation within the Manitoba marketplace.

For the 2013-16 Power Smart Plan, the DSM programs that have assumed a future level of market transformation have been noted.

Participant Reinvestment

Participant reinvestment is a marketing assumption which measures the program's influence on a participant's decision to repurchasing the energy efficient technology once the initial product life of the energy efficient technology has ended.

For the 2013-16 Power Smart Plan, the DSM programs that have assumed a future level of participant reinvestment have been noted.

13

PUB/MH I-107**Reference: Tab 7 Section 2.3 Pages 14**

- a) Please indicate the marginal cost and its derivation that MH is currently using to evaluate new and existing DSM initiatives

ANSWER:

The levelized marginal value used for the analysis in the 2011 Power Smart Plan is 8.52 cents per kW.h (at meter). The marginal cost contains the expected value of electricity exports which is commercially sensitive. Therefore, detailed information on the derivation of the marginal cost cannot be provided.

PUB/MH I-107 (Revised)**Reference: Tab 7 Section 2.3 Pages 14**

- b) Please update section 2.3 table on page 14. RIM calculations using current marginal cost (Appendix 10.7 pages 9 & 10) and explain how MH re-evaluates the past DSM initiatives to reflect the post 20098/09 drop in the average price of export prices.

ANSWER:

Manitoba Hydro does not undertake multiple calculations using various marginal costs values either for evaluation or planning purposes. The information requested would require substantive effort to complete for the complete portfolio of programs. However, to demonstrate the impacts of lower marginal values, the RIM calculations have been updated as requested for a program within each of the three market sectors.

		Rate Impact Measure Benefit/Cost Ratio	
		2011 Power Smart Plan	updated marginal values
Residential	Home Insulation	1.5	1.3
Commercial	Commercial Lighting	1.2	1.1
Industrial	Performance Optimization	1.3	1.1

To address changes occurring within the market on a go forward basis, Manitoba Hydro revisits its DSM plan on an annual basis and adjusts its DSM offerings and strategies to respond to these changes. As part of this exercise, revised metrics including RIM's are calculated.

The table in section 2.3 includes the marginal costs that were in place at the time the 2011 Power Smart Plan was developed, which reflected the information available at that time.

PUB/MH I-107**Reference: Tab 7 Section 2.3 Pages 14**

- c) **Please explain the logical basis for future DSM initiatives when export revenue rates fall below:**
- i. **Residential energy rates**
 - ii. **New incremental hydraulic generation costs**
 - iii. **Wind energy purchases.**

ANSWER:

In addition to value derived over the long term from the export market, the marginal values used to assess DSM initiatives also include components reflecting the avoided cost of new transmission and distribution infrastructure. If incremental export revenues were to decline to a level where they no longer offered an offsetting value, then the marginal benefits of DSM would then shift from the value of export market to a valuation of the benefit of deferring new generation facilities recognizing that there is an economic benefit to achieving load savings in the province.

Manitoba Hydro revisits its DSM plan on an annual basis utilizing the latest marginal values and domestic rate forecasts. Each DSM program is assessed using the latest market information and these updated values to determine the appropriate level of investment in the DSM program. This flexibility of DSM allows Manitoba Hydro to increase or decrease its intensity in programs in response to economic conditions and to continue to pursue all cost-effective DSM.

2012/13 & 2013/14 Electric General Rate Application

PUB/MH I-107**Reference: Tab 7 Section 2.3 Pages 14**

- d) Please explain the other benefits of domestic customer energy conservation measures, if future export sales remain at their current low levels.

ANSWER:

Please see Manitoba Hydro's response to PUB/MH I-107(c).

2012/13 & 2013/14 Electric General Rate Application

PUB/MH 1-107**Reference: Tab 7 Section 2.3 Pages 14**

- e) Please update MH's planned DSM savings (2011 GRA- RCM/TREE #6) to reflect the lower MC of energy.

ANSWER:

Please see the following graph which is based on the information provided in Appendix A.3 of the 2011 Power Smart Plan, which was filed as Appendix 7.1 of the Application.



14

- 1 higher levels of DSM. For plans with a new U.S. interconnection, the in-service dates for the
2 Keeyask G.S. and the interconnection were not changed.

3 **Table 12.8 LIST OF 2013 DSM SENSITIVITY DEVELOPMENT PLANS**

Order of Capital Investment in 2012 Analysis	Development Plan Short Name	Description of Development Plan
2	K23/Gas 1x DSM	Keeyask 2023/24, Natural Gas-Fired Generation starting in 2031/32
	K24/Gas 1.5x DSM	Keeyask 2024/25, Natural Gas-Fired Generation starting in 2032/33
	K30/Gas 4x DSM	Keeyask 2030/31, Natural Gas-Fired Generation starting in 2036/37
4	K19/Gas30/250MW 1x DSM	Keeyask 2019/20, Natural Gas-Fired Generation starting in 2030/31, 250 MW Export/50 MW Import Interconnection 2020/21, 250 MW MP Sale
	K19/Gas30/250MW 1.5x DSM	Keeyask 2019/20, Natural Gas-Fired Generation starting in 2030/31, 250 MW Export/50 MW Import Interconnection 2020/21, 250 MW MP Sale
	K19/Gas34/250MW 4x DSM	Keeyask 2019/20, Natural Gas-Fired Generation starting in 2034/35, 250 MW Export/50 MW Import Interconnection 2020/21, 250 MW MP Sale
14	K19/C26/750MW (WPS Sale & Inv) 1x DSM	Keeyask 2019/20, Conawapa 2026/27, Natural Gas-Fired Generation starting in 2045/46, 750 MW Import/Export Interconnection 2020/21, 250 MW MP Sale and proposed 300 MW WPS Sale
	K19/C26/750MW (WPS Sale & Inv) 1.5x DSM	Keeyask 2019/20, Conawapa 2026/27, Natural Gas-Fired Generation starting in 2046/47, 750 MW Import/Export Interconnection 2020/21, 250 MW MP Sale and proposed 300 MW WPS Sale
	K19/C26/750MW (WPS Sale & Inv) 4x DSM	Keeyask 2019/20, Conawapa 2026/27, Natural Gas-Fired Generation starting in 2048/49, 750 MW Import/Export Interconnection 2020/21, 250 MW MP Sale and proposed 300 MW WPS Sale
14a	K19/C30/750MW (WPS Sale & Inv) 4x DSM	Keeyask 2019/20, Conawapa 2030/31, Natural Gas-Fired Generation starting in 2048/49, 750 MW Import/Export Interconnection 2020/21, 250 MW MP Sale and proposed 300 MW WPS Sale

- 4
- 5 **12.4.1 2013 – DSM Sensitivity 1.5 Times and 4 Times – Economic Analysis Results**

- 6 Table 12.9 provides the incremental NPVs for the three plans selected for the 1.5 times DSM
7 sensitivity analysis. There is a one-year change in the in-service date in Keeyask G.S. as a result

1 of increasing the level of DSM by 50% for Plan 2 (K24/Gas 1.5xDSM). Table 12.9 shows the
2 relative economic ranking of the three development plans: when compared to the 2012 and
3 2013 reference scenario economics in Table 12.5, the economic ranking remains the same.

4

5

Table 12.9 2013- 1.5x DSM SENSITIVITY – INCREMENTAL IMPACT ON NPVs

Development Plan	Incremental NPV, millions of 2014 Dollars @ 5.40% Discount Rate	
	2 - K24/Gas 1.5x DSM	4 - K19/Gas30/250MW 1.5x DSM
2 K24/Gas 1.5x DSM	-	
4 K19/Gas30/250MW 1.5x DSM		
MP Sale	\$429	
14 K19/C26/750MW 1.5x DSM	14 -2	14 -4
MP Sale, WPS Sale & Inv Preferred Development Plan	\$771	\$342

6

7 Table 12.10 provides the incremental NPVs for Plan 2 (K30/Gas 4xDSM), Plan 4
8 (K19/Gas34/250MW 4xDSM), and the Preferred Plan (Plan 14 and Plan 14a), which were
9 selected for the 4.0 times DSM stress test. The 4.0 times DSM stress test has the effect of
10 deferring the in-service date for Keeyask G.S. in Plan 2 by six years and defers the in-service
11 date of the first natural gas-fired resource in Plan 4 by four years. Plan 14 in Table 12.10 is the
12 Preferred Development Plan with fixed in-service dates for both Keeyask G.S. and Conawapa
13 G.S. Plan 14a is a variant of the Preferred Development Plan in which the in-service date for
14 Conawapa G.S. is deferred four years with 4.0 times DSM. Table 12.10 demonstrates that the
15 relative economic ranking of the three development plans (Plan 2, Plan 4, and Plan 14) remains
16 the same when compared to Table 12.5. Plan 14a, deferring Conawapa G.S. from 2026/27 to
17 2030/31, shows a net benefit of \$11 million when compared to Plan 14, an amount which is
18 small enough to result in indifference between the plans. This indicates that the benefit from

PHILIPPE DUNSKY: UNDERTAKINGS FOR MANITOBA PUBLIC UTILITIES BOARDJanuary 17th, 2013 – Submitted January 25th, 2013**#1: CONDUCT A REVISED DEFERRAL ANALYSIS USING MANITOBA HYDRO'S MOST RECENT "NO NEW GENERATION" SCENARIO**

Response: We revised the analysis as requested. The table below provides the detailed results, both for energy and capacity needs¹; the subsequent table further provides the inputs (amount of additional DSM) used for each scenario. Note that to ensure comparability with Manitoba Hydro's protocols, all DSM savings are presented below "at generator".

As can be seen, under the revised analysis, our Scenario 1 (ramping-up to 1%/yr savings by 2015 – the lowest of the cohort levels) would defer the need for new energy by 11 years, and for new capacity by 7 years. Our scenarios 2 and 3 (ramping up to roughly the levels of the middle group of cohorts) would defer needs indefinitely (past 2034). Our scenarios did not include savings on the order of magnitude of the most aggressive of the cohorts.

¹ Manitoba Hydro – 2012/2013 Power Resource Plan, Appendix A – Dependable Supply and Demand Tables, pp. 27-30.

Table 1. Surplus (Shortfall) Without New Generation

Notes: Based on most recent MH "No New Generation" scenario. Accounts only for Dunsky DSM savings above and beyond already-planned PowerSmart savings (see separate table). Year indicated is first year in fiscal (eg. "2019" =fiscal 2019/20)

DSM Savings Summary			Deferral (yrs)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
ENERGY (GWh)	MH (no new Gen):	Per MH Plan (2012 update, ind. PowerSmart)	n/a	1,534	1,317	2,667	2,667	2,510	2,079	998	549	120	-330	-756	-1,213	-773	-1,303	-1,758	-2,243	-2,725	-3,142	-3,503	-3,984	-4,488	-4,977
		Sc 1 - ramp-up to 1% from programs by 2015; hold	11 yrs	1,584	1,479	2,995	3,163	3,182	2,928	2,043	1,791	1,582	1,359	1,144	911	1,587	1,306	1,100	864	631	463	351	120	-135	-375
	ind. add'l DSM:	Sc 2 - ramp-up to 1.5% from programs by 2018; hold	Indef.	1,584	1,479	2,995	3,213	3,331	3,202	2,442	2,314	2,230	2,131	2,041	1,933	2,733	2,576	2,495	2,384	2,275	2,232	2,245	2,137	2,007	1,892
		Sc 3 - ramp-up to 1.5% all-inclusive by 2017; hold	Indef.	1,554	1,399	2,856	3,018	3,106	2,926	2,116	1,942	1,812	1,670	1,540	1,391	2,156	2,000	1,919	1,807	1,699	1,656	1,668	1,561	1,431	1,315
CAPACITY (MW)	MH (no new Gen):	Per MH Plan (2012 update, ind. PowerSmart)	n/a	582	566	719	675	694	614	450	364	281	195	105	13	-323	-410	-503	-600	-686	-749	-845	-943	-1,045	-1,146
		Sc 1 - ramp-up to 1% from programs by 2015; hold	7 yrs	593	603	793	787	846	806	686	645	611	574	534	493	210	179	142	102	62	65	25	-16	-62	-107
	ind. add'l DSM:	Sc 2 - ramp-up to 1.5% from programs by 2018; hold	Indef.	593	603	793	799	880	868	776	763	758	749	737	724	469	466	457	445	433	464	453	439	422	406
		Sc 3 - ramp-up to 1.5% all-inclusive by 2017; hold	Indef.	586	584	762	754	829	805	703	679	663	645	624	601	339	336	327	315	303	334	323	309	291	275

Table 2. Additional DSM Savings Scenarios (savings at generator)

			Notes	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
% of Domestic Loads	MH Planned	Per MH Plan (2012 update, ind. PowerSmart)	% = programs	0.40%	0.35%	0.33%	0.33%	0.29%	0.29%	0.21%	0.21%	0.12%	0.13%	0.11%	0.10%	0.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
		Sc 1 - ramp-up to 1% from programs by 2015; hold	% = programs	0.60%	0.80%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
	Dunsky DSM Scenarios	Sc 2 - ramp-up to 1.5% from programs by 2018; hold	% = programs	0.60%	0.80%	1.00%	1.20%	1.40%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
		Sc 3 - ramp-up to 1.5% all-inclusive by 2017; hold	% = all-inclusive	0.80%	1.00%	1.20%	1.40%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
ENERGY (GWh)	MH Planned	Per MH Plan (2012 update, ind. PowerSmart)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Sc 1 - ramp-up to 1% from programs by 2015; hold		50	162	328	496	672	849	1,045	1,242	1,462	1,679	1,900	2,124	2,360	2,609	2,858	3,107	3,356	3,605	3,854	4,104	4,353	4,602
	Dunsky DSM Scenarios	Sc 2 - ramp-up to 1.5% from programs by 2018; hold		50	162	328	546	821	1,123	1,444	1,765	2,110	2,451	2,797	3,146	3,506	3,879	4,253	4,627	5,000	5,374	5,748	6,121	6,495	6,869
		Sc 3 - ramp-up to 1.5% all-inclusive by 2017; hold		20	82	189	351	596	847	1,118	1,393	1,692	1,990	2,296	2,604	2,929	3,303	3,677	4,050	4,424	4,798	5,171	5,545	5,919	6,292
CAPACITY (MW)	MH Planned	Per MH Plan (2012 update, ind. PowerSmart)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Sc 1 - ramp-up to 1% from programs by 2015; hold		11	37	74	112	152	192	236	281	330	379	429	480	533	589	645	702	758	814	870	927	983	1,039
	Dunsky DSM Scenarios	Sc 2 - ramp-up to 1.5% from programs by 2018; hold		11	37	74	124	186	254	326	399	477	554	632	711	792	876	960	1,045	1,129	1,213	1,298	1,382	1,467	1,551
		Sc 3 - ramp-up to 1.5% all-inclusive by 2017; hold		4	18	43	79	135	191	253	315	382	450	519	588	662	746	830	915	999	1,083	1,168	1,252	1,336	1,421

NOTES

Manitoba "No New Gen" scenario from 2022/2013 Power Resource Plan, Appendix A - Dependable Supply and Demand Tables, pp. 27-30

Per Manitoba Hydro's request, all data presented "at generator", using At Generator / At Meter multiplier of 1.13286/133 (ref: 2011 PS Plan, 2011/2012 to 2025/2026 cumulative DSM savings, appendix A.3)

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- b) Please indicate the source of the information that supports the claim that there are 13,750 new electrically heated homes built in Manitoba annually.

The correct value should read "approximately 2,750". This is from Manitoba Hydro's response to CAC-GAC/MH II-4(a), in which 13,750 was provided as the value for new housing starts that use electric heat. I failed to notice that this value was not annual but covered the five-year period from 2005-2009.

PUB/CAC & GAC 18 Reference: Dunskey Report Page 38

Please indicate to what extent increased DSM spending could defer the current need for new Generation in MH's current plans.

To answer this question, we examine two scenarios:

In the first scenario, program-related savings are increased such that, when combined with MH's anticipated *other* savings (codes, standards, self-gen), total savings achieve and maintain a 1% savings/sales ratio. This implies that Manitoba Hydro's programs alone achieve a ratio of approximately 0.6% every year on average.

In the second scenario, program savings are increased such that, combined with other savings sources, the total achieves 1.5%/year on average. For comparison purposes, we note that over the next ten years (2012-2021), B.C.'s *average* equivalent total savings ratio is 1.7%.

Under the 1% scenario (0.6% from programs), additional savings of 637 GWh are generated by the time the Keeyask project is supposed to be commissioned (in-service date 2019/20). This allows Manitoba Hydro to defer this project by three years (assuming that exports do not change). The Conawapa project, scheduled to be commissioned in 2024/25, would be deferred by 7 years (to 2031/32). I note that this analysis is based on energy needs; I have not had the time to conduct the analysis of capacity needs needed to confirm these values.

Under the 1.5% scenario, additional savings of 1,385 GWh/yr by 2019/20 would allow for Keeyask to be deferred by 12 years (to 2031/32). I did not calculate the expected in-service date for the Conawapa project under this scenario as this would be too speculative.

On the cost side, the reader will recall (see Fig. 16 of my testimony) that Manitoba Hydro's current savings cost some 28¢/kWh_{1st-yr} (this is not to be confused with levelized lifetime savings). This is slightly below the costs incurred by BC Hydro, Efficiency Nova Scotia, and Vermont (30¢/kWh). Assuming that Manitoba Hydro's unit costs increase to 30¢/kWh, Manitoba Hydro would have to spend an additional \$191 million (cumulative) by 2019/20 for the 1% scenario, or \$416 million (cumulative) for the 1.5% scenario. Of course, other DSM options like codes & standards, and rate structures, are a lot cheaper from the utility's point of view, and would decrease the amount of additional spending required.

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	Business as usual	1% DSM target*	1.5% DSM target*
Additional savings by 2019/20	---	637 GWh	1,385 GWh
Additional spending by 2019/20	---	\$191 M or less	\$416 M or less
Keeyask in-service date	2019/20	2022/23	2031/32
Conawapa in-service date	2024/25	2031/32	?

* Includes all of Manitoba Hydro's anticipated savings from codes, standards, and self-generation. The implied MH program-related savings ratios are 0.6% and 1.1%/year, the latter being approximately the same as BC Hydro's.

The incremental cost is annotated with "or less" because the cost provided assumes that the full increase in savings is derived from increased program-related activity. For example, under the fully-inclusive 1.5% target, we assume that program savings increase to 1.1%/yr on average (similar to BC Hydro's latest plans), the remainder involving the same level of non-program savings (from codes, standards and self-generation) as currently anticipated by MH. Should the non-program portion of savings increase – e.g. from the introduction of rate structure strategies – then the program-related costs would likely be lower to achieve the same overall savings goal.

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ENERGY EFFICIENCY POTENTIAL FOR ELECTRICITY

Table 6-1 and Figure 6-1 present the total electric energy-efficiency potential across sectors as well as the baseline projections of energy consumption and peak demand, respectively. Key findings related to market, economic and technical potentials are summarized below.

- **Achievable potential** is 542 GWh in 2017/18, which represents 2.6% of the baseline projection. By 2031/32, the cumulative savings are 1,943 GWh, or 7.9%, of the baseline projection. The winter peak demand savings in 2017/18 are 109 MW or 2.7% of the peak. In 2031/32, the peak savings are 421 MW or 8.8% of the peak.
- **Market potential** is 1,292 GWh in 2017/18, which represents 6.2% of the baseline energy projection. By 2031/32, the cumulative savings are 4,014 GWh, or 16.2%, of the baseline energy projection. The winter peak demand savings in 2017/18 are 252 MW or 6.3% of the peak. In 2031/32, the peak savings are 863 MW or 18.0% of the peak.
- **Economic potential**, which reflects the savings when all cost-effective measures are taken, is 2,533 GWh in 2017/18. This represents 12.1% of the baseline energy projection. By 2031/32, economic potential reaches 6,125 GWh, 24.8% of the baseline energy projection. The winter peak demand savings in 2017/18 are 469 MW or 11.7% of the peak. In 2031/32, the peak savings are 1,308 MW or 27.4% of the peak.
- **Technical potential**, which reflects the adoption of all energy efficiency measures regardless of cost-effectiveness, is a theoretical upper bound on savings. In 2017/18, energy savings are 3,180 GWh, or 15.2% of the baseline energy projection. By 2031/32, technical potential reaches 7,474 GWh, 30.2% of the baseline energy projection. The winter peak demand savings in 2017/18 are 653 MW or 16.3% of the peak. In 2031/32, the peak savings are 1,745 MW or 36.5% of the peak.

Table 6-1 Summary of Energy Efficiency Potential for Electricity (GWh)

	2012/13	2017/18	2022/23	2027/28	2031/32
Baseline Projection (GWh)	20,621	20,935	22,007	23,466	24,716
Energy Savings (Cumulative GWh)					
Achievable Potential	48	542	1,038	1,615	1,943
Market Potential	166	1,292	2,513	3,507	4,014
Economic Potential	766	2,533	4,249	5,507	6,125
Technical Potential	895	3,180	5,244	6,740	7,474
Energy Savings (% of Baseline)					
Achievable Potential	0.2%	2.6%	4.7%	6.9%	7.9%
Market Potential	0.8%	6.2%	11.4%	14.9%	16.2%
Economic Potential	3.7%	12.1%	19.3%	23.5%	24.8%
Technical Potential	4.3%	15.2%	23.8%	28.7%	30.2%