

2014 ELECTRIC LOAD FORECAST

MARKET FORECAST
AUGUST 2014



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EXECUTIVE SUMMARY

Overview

The Gross Firm Energy in Manitoba is forecast to grow from a weather adjusted value of 24,677 GW.h in 2013/14 to 29,626 GW.h in 2023/24. This average growth is 495 GW.h or 1.8% per year for 10 years. By 2033/34, Gross Firm Energy is forecast to be 33,177 GW.h, a twenty-year growth rate of 425 GW.h or 1.5% per year.

Gross Total Peak is forecast to grow at about the same pace, growing 81 MW or 1.6% a year for the next 10 years, and 70 MW or 1.3% a year for the next 20 years. In 20 years, the peak will grow 1,408 MW to 5,995 MW.

Growth is expected in all sectors. The 20 year growth rates in the Residential Basic, General Service Mass Market and General Service Top Consumers sectors are forecast to be 1.2%, 1.4% and 2.0% respectively.

During the last 10 years, Gross Firm Energy has grown 269 GW.h or 1.2% per year. This ten year period includes the 2009 economic downturn that slowed growth.

The primary driver of growth in Manitoba is the population, with the secondary driver being the economy. Manitoba Hydro's 2014 Economic Outlook provides both the forecast of the population and the resulting forecast of Residential Basic customers that is used in this document. The population of Manitoba has grown from 1,166,000 people in 2003/04 to 1,269,000 people in 2013/14, averaging 0.9% growth per year. The forecast is that Manitoba's population will grow to 1,542,000 by 2033/34, averaging 1.0% per year. The primary reason for the expected increase of population growth in Manitoba is due to the Provincial Nominee Program which will continue to sustain moderate annual growth in immigrants.

Residential Basic customer growth is expected to mimic population growth, growing 1.0% per year over the next 20 years. An increase in average use per customer adds 0.2% to the growth and is primarily due to increased use of electric space and electric water heating in dwellings.

General Service Mass Market is forecast to grow at an average 1.4% per year, comparable to its historic growth of 1.4% per year over the past ten years.

General Service Top Consumers is forecast to grow at 2.0% per year. This is higher than its 0.1% growth per year during the past ten years which included the loss of a customer and an economic downturn. But it is less than the 3.5% growth per year during the prior ten years. Combined, the 20 year historical growth of the Top Consumers has been 1.9% per year. Short term committed loads include 1,194 GW.h of growth in the Pipeline sector, an expected top consumer load decrease of 494 GW.h, and other top consumer increases totaling 401 GW.h.

Change Between the 2013 and 2014 Forecast

The Gross Firm Energy in 2013/14 was 562 GW.h less than forecast in 2013 due to a temporary load loss of two Top Consumers. By 2019/20, the 2014 forecast is 850 GW.h higher due to increases to Top Consumers in the Pipeline sector and a higher Residential customer forecast in the earlier years. By 2032/33 the increase in the 2014 forecast is reduced to 129 GW.h due to an reduction in the Residential customer forecast and increases to the projected impacts of Codes and Standards. This equates to a 0.4% increase in the forecast of 2032/33, which represents a gain of less than half a year of load growth (1 year = approximately 425 GW.h).

The Gross Total Peak forecast in 2032/33 is down 28 MW compared to the 2013 Load Forecast, less than a half a year of load growth (1 year = approximately 70 MW).

Load Sensitivities and Extreme Events

The effect of alternate assumptions has been quantified for sensitivity or scenario analysis:

	Annual Energy Effect (GW.h)	Peak Effect (MW)
1% Increase/Decrease in Population	± 130	± 24
1% Increase/Decrease in Income and GDP	± 125	± 23
1% Increase/Decrease in Electricity Price	∓ 62	∓ 11
1% Increase/Decrease in Gas to Electricity Price Ratio	± 0.5	± 0.1
Climate Change per Degree Celsius Warmer	+ 23	- 47
If 0% or 100% of Residential had Electric Space Heat	-2,733, +4,796	-891, +1,564
If 0% or 100% Residential had Electric Water Heat	-892, +928	-102, +106
Increase/Decrease of One Very Large Industrial Customer	± 1,500	± 180
Maximum Potential Effect of Increased Online Shopping	- 846	- 156
Additional Load if 100% Electric Vehicle Saturation Rate	+ 4,172	+ 289
Illustrated Effect of Grid Parity (e.g. Solar Panels)	- 1,824	-104

(For comparison, 1 year of load growth is approximately 425 GW.h or 70 MW)

Table 1 - Gross Energy and Peak

GROSS FIRM ENERGY AND GROSS TOTAL PEAK					
History and Forecast					
2003/04 - 2033/34					
Fiscal Year	Gross Firm Energy		Gross Total Peak		Load Factor
	(GW.h)	Growth (%)	(MW)	Growth (%)	
2003/04	22,069		3,994		63.1%
2004/05	22,589	2.4%	4,201	5.2%	61.4%
2005/06	22,757	0.7%	4,085	-2.8%	63.6%
2006/07	23,464	3.1%	4,208	3.0%	63.7%
2007/08	24,122	2.8%	4,304	2.3%	64.0%
2008/09	24,417	1.2%	4,509	4.8%	61.8%
2009/10	23,412	-4.1%	4,393	-2.6%	60.8%
2010/11	23,892	2.1%	4,286	-2.4%	63.6%
2011/12	23,605	-1.2%	4,367	1.9%	61.7%
2012/13	24,750	4.9%	4,559	4.4%	62.0%
2013/14	25,625	3.5%	4,743	4.0%	61.7%
2013/14 Wadj	24,677	-3.7%	4,587	-3.3%	61.4%
10 Year Avg Gr.	269	1.2%	55	1.3%	
2014/15	25,639	3.9%	4,716	2.8%	62.1%
2015/16	26,130	1.9%	4,803	1.8%	62.1%
2016/17	26,436	1.2%	4,861	1.2%	62.1%
2017/18	27,174	2.8%	4,985	2.6%	62.2%
2018/19	27,662	1.8%	5,068	1.7%	62.3%
2019/20	28,247	2.1%	5,166	1.9%	62.4%
2020/21	28,583	1.2%	5,223	1.1%	62.5%
2021/22	28,937	1.2%	5,284	1.2%	62.5%
2022/23	29,284	1.2%	5,342	1.1%	62.6%
2023/24	29,626	1.2%	5,400	1.1%	62.6%
10 Year Avg Gr.	495	1.8%	81	1.6%	
2024/25	29,970	1.2%	5,458	1.1%	62.7%
2025/26	30,316	1.2%	5,516	1.1%	62.7%
2026/27	30,659	1.1%	5,574	1.0%	62.8%
2027/28	31,006	1.1%	5,632	1.0%	62.8%
2028/29	31,352	1.1%	5,690	1.0%	62.9%
2029/30	31,703	1.1%	5,748	1.0%	63.0%
2030/31	32,061	1.1%	5,808	1.0%	63.0%
2031/32	32,424	1.1%	5,869	1.0%	63.1%
2032/33	32,796	1.1%	5,931	1.1%	63.1%
2033/34	33,177	1.2%	5,995	1.1%	63.2%
20 Year Avg Gr.	425	1.5%	70	1.3%	

*Note: History and historic growth rates include DSM. Forecast and forecasted growth rates exclude DSM.

Table 2 - Change in Energy and Peak

GROSS FIRM ENERGY AND GROSS TOTAL PEAK						
Change from Previous Forecast						
2014/15 - 2033/34						
Fiscal Year	Gross Firm Energy			Gross Total Peak		
	2014 Forecast (GW.h)	2013 Forecast (GW.h)	Change (GW.h)	2014 Forecast (MW)	2013 Forecast (MW)	Change (MW)
2013/14 Act	25,625			4,743		
Weather Adj.	-948			-155		
2013/14 Wadj	24,677	25,239	(562)	4,587	4,601	(14)
2014/15	25,639	25,676	(37)	4,716	4,680	36
2015/16	26,130	26,013	117	4,803	4,742	61
2016/17	26,436	26,322	114	4,861	4,801	60
2017/18	27,174	26,606	568	4,985	4,857	128
2018/19	27,662	27,003	660	5,068	4,930	138
2019/20	28,247	27,398	850	5,166	5,002	164
2020/21	28,583	27,789	794	5,223	5,074	149
2021/22	28,937	28,197	740	5,284	5,147	137
2022/23	29,284	28,605	679	5,342	5,222	120
2023/24	29,626	29,013	614	5,400	5,296	104
10 Year Avg Gr.	495 1.8%	377 1.4%		81 1.6%	70 1.4%	
2024/25	29,970	29,418	552	5,458	5,369	89
2025/26	30,316	29,822	493	5,516	5,443	73
2026/27	30,659	30,225	433	5,574	5,516	58
2027/28	31,006	30,625	380	5,632	5,588	44
2028/29	31,352	31,041	312	5,690	5,664	26
2029/30	31,703	31,453	251	5,748	5,739	9
2030/31	32,061	31,863	198	5,808	5,813	(5)
2031/32	32,424	32,265	159	5,869	5,886	(17)
2032/33	32,796	32,667	129	5,931	5,959	(28)
19 Year Avg Gr.	427 1.5%	391 1.4%	36 0.1%	71 1.4%	71 1.4%	-1 0.0%

*Note: History includes DSM. Forecast and forecasted growth rates exclude DSM.

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INTRODUCTION

This document is prepared annually as Manitoba Hydro's forecast of its future load requirements for its service area. The service area consists of all of Manitoba (99.85% of sales), as well as two resale customers that supply energy to Creighton, Sask. (0.12% of sales) and the Northwest Angle, Minn. (0.03% of sales). Exports of power to other utilities are not included.

This information is provided for several purposes. Short term forecasts of sales by billing month within rate groups are needed to forecast revenue for rate making, accounting and system operations. Long term forecasts of energy and peak is required by power planning to determine long term supply requirements.

A "customer" in this document refers to a metered electrical service. Unmetered services, such as flat rate water heating and sentinel rentals do not count as customers, and street lights group a number of services as one customer. A customer is not the same as a building. One building can have multiple electric services and may count as more than one customer, or multiple buildings may have only one service and may count as only one customer. A customer in this document is also not the same as a customer on the billing system. The latter is a person or organization that Manitoba Hydro serves. One billing customer may pay the bill for multiple services and thus count as multiple customers in this document.

Electric consumption is read from a customer's meter in units of kilowatt-hours (kW.h). A typical dwelling not using electricity for heating uses approximately 10,000 kW.h per year. This document reports electric use in terms of gigawatt-hours (GW.h). One GW.h equals one million kW.h, which is approximately the energy of 100 typical dwellings not using electricity for heating.

The highest load requirement for a time period is known as the peak load. It is given in terms of megawatts (MW). One MW equals one thousand kilowatts (kW). A typical dwelling not using electricity for heating would use a maximum of about 2.5 kW sometime during the year. However, dwellings will not all be at their maximum use at the same hour. The use of all dwellings at any specific hour is known as the coincident load. The coincident peak is the load at the hour of Manitoba's system peak. A typical dwelling not using electricity for heating would use about 1.6 kW at the coincident peak. Therefore 1 MW is approximately the coincident peak requirement of 600 typical dwellings not using electricity for heating.

Components of Manitoba's Electricity Use – 2013/14

General Consumers Sales (also referred to as Total Sales) includes the energy supplied to all of Manitoba Hydro's individually billed customers. Over the 2013/14 fiscal year, Manitoba Hydro averaged 552,660 General Consumers Sales customers who consumed 22,338 GW.h.

The major groups include

- (1) Residential Basic, with 462,274 customers who used 7,767 GW.h or 34.8% of Sales. These are mostly residences that include single-family dwellings, multi-family dwellings and individual apartment suites.
- (2) General Service Mass Market, with 66,569 customers who used 8,839 GW.h or 39.6% of Sales. These are small to large Commercial and Industrial customers.
- (3) General Service Top Consumers, with 31 customers who used 5,461 GW.h or 24.4% of sales. These are 17 high-usage companies (some count as multiple customers) that are forecast individually.

The remaining customers include Seasonal customers (billed twice a year rather than monthly), Diesel customers (four remote towns not connected to the integrated grid system), Flat Rate Water Heating and Area and Roadway Lighting. Their electricity use totals only 271 GW.h or 1.2% of Total Sales. Over 50,000 of these services do not count as customers.

Manitoba Load at Common Bus is the total load metered at all the substations in the province that supplies Manitoba Hydro's non-Diesel customers and includes Distribution Losses and Construction Power. In 2013/14, Common Bus was 23,541 GW.h or about 5.4% more than Total Sales.

Gross Firm Energy is the total load needed to be generated for domestic firm load requirements on the Integrated System (excludes diesel). It includes Transmission Losses and Station Service. Some customers are on non-firm contracts (Surplus Energy Program), and their load is not included as part of Manitoba Hydro's generation requirement. In 2013/14, Gross Firm Energy was 25,625 GW.h or about 14.7% more than Total Sales.

Table 3 - Components of Manitoba Electricity Use

COMPONENTS OF MANITOBA ELECTRICITY USE 2013/14 (Customers, Actual Consumption and Average Use)				
Forecast Group	Cust/Serv	GW.h	% of Sales	kW.h/cust
Residential Basic	462,274	7,767	34.8%	16,802
Residential Diesel	583	9	0.0%	14,791
Residential Seasonal	20,757	92	0.4%	4,455
Residential Flat Rate Water Heating	3,858	20	0.1%	5,080
Total Residential	483,613	7,888	35.3%	
GS Mass Market	66,569	8,839	39.6%	132,777
GS Top Consumers	31	5,461	24.4%	179,045,566
GS Diesel	179	5	0.0%	29,141
GS Seasonal	861	5	0.0%	6,112
GS Flat Rate Water Heat	392	7	0.0%	18,165
GS Surplus Energy Program	28	29	0.1%	1,044,126
Total General Service	67,668	14,347	64.2%	
Sentinal Flat Rate	20,399	12	0.1%	568
Sentinal Rental	25,764	-	0.0%	-
Street Lighting	1,157	92	0.4%	79,571
Total Lighting	1,157	104	0.5%	
Total General Consumer Sales	552,438	22,338	100.0%	
Less Diesel Sales		(14)	-0.1%	
Distribution Losses		1,205	5.4%	
Construction Power		12	0.1%	
Manitoba Load at Common Bus		23,541	105.4%	
Transmission Losses		1,969	8.8%	
Less Non-Firm Energy		(29)	-0.1%	
Station Service		144	0.6%	
Gross Firm Energy		25,625	114.7%	
* flat rate and rental services are shown in yellow, which do not count as customers				

FORECAST OVERVIEW

General Consumers Customer Forecast

In 2013/14, Manitoba Hydro had an average of 552,438 General Consumer Sales customers. These were made up of 462,274 Residential Basic customers, 66,569 General Service Mass Market customers, 31 General Service Top Consumers customers and 28 SEP (Surplus Energy Program, i.e. non-firm) customers, with the rest being Diesel, Seasonal and Area and Roadway Lighting.

During the last 10 years, Residential Basic customers have grown at an average of 4,558 (1.0%) per year. Manitoba Hydro's 2014 Economic Outlook provides the forecast of Residential Basic customers, and this document uses that forecast. It calls for a growth of 5,906 (1.2%) per year over the next ten years and 5,069 (1.0%) per year over the next 20 years. The primary reason for the increase is an expectation of increased population growth in Manitoba due to government immigration initiatives which will impact both the Residential and Commercial Sectors.

General Service Mass Market customers have grown 590 (0.9%) per year over the last 10 years. They are forecast to grow 546 (0.8%) over the next ten years and 446 (0.6%) over the next 20 years.

Residential Seasonal customers, who are mainly cottages with lower usage, are growing at a slower rate than Residential Basic, averaging 70 (0.3%) customers per year over the last 10 years. They are forecast to grow at 96 (0.5%) over the next 10 years and 98 (0.5%) over the next 20 years.

Area and Roadway Lighting customers were re-grouped in 2006 when Manitoba Hydro changed its billing system, and the lighting customer counts changed at that time. Area and Roadway Lighting is expected to grow at 5 (0.4%) customers annually over the next 10 years and 5 (0.4%) over the next 20 years.

Table 4 - General Consumers Sales Customers

GENERAL CONSUMERS SALES (Average Customers)										
History and Forecast										
2003/04 - 2033/34										
Fiscal Year	Residential			General Service					Lighting	Total Custs
	Basic	Diesel	Seas	Mass Mkt	Top Cons	Diesel	Seas	SEP		
2003/04	416,690	500	20,056	60,672	27	151	788	33	757	499,674
2004/05	420,135	508	20,075	60,924	26	160	793	31	759	503,409
2005/06	423,742	519	20,145	61,491	26	168	814	29	793	507,727
2006/07	427,886	525	20,312	63,596	26	169	783	28	1129	514,455
2007/08	432,144	531	20,437	63,855	26	175	798	27	1142	519,135
2008/09	437,263	540	20,648	64,140	26	178	818	24	1175	524,811
2009/10	441,710	539	20,839	64,758	26	177	830	24	1191	530,095
2010/11	445,882	550	20,950	65,193	26	176	842	24	1184	534,828
2011/12	450,748	568	20,844	65,546	32	174	847	26	1155	539,939
2012/13	456,130	577	20,731	65,974	31	175	850	28	1164	545,660
2013/14	462,274	583	20,757	66,569	31	179	861	28	1157	552,438
10 Year Avg Gr.	4,558	8	70	590	0	3	7	-1	40	5,276
	1.0%	1.5%	0.3%	0.9%	1.3%	1.7%	0.9%	-1.6%	4.3%	1.0%
2014/15	468,076	587	20,814	67,125	31	180	871	28	1,160	558,871
2015/16	473,761	595	20,914	67,670	31	182	876	28	1,165	565,222
2016/17	479,963	603	21,014	68,267	31	184	881	32	1,170	572,144
2017/18	486,387	611	21,114	68,902	32	185	886	32	1,175	579,324
2018/19	492,700	619	21,214	69,530	32	187	891	32	1,180	586,385
2019/20	498,887	627	21,314	70,119	32	189	896	32	1,185	593,280
2020/21	504,914	635	21,414	70,655	32	191	901	32	1,190	599,963
2021/22	510,687	643	21,514	71,144	32	192	906	32	1,195	606,345
2022/23	516,160	652	21,614	71,599	32	194	911	32	1,200	612,393
2023/24	521,337	660	21,714	72,029	32	196	916	32	1,205	618,119
10 Year Avg Gr.	5,906	8	96	546	0	2	5	0	5	6,568
	1.2%	1.3%	0.5%	0.8%	0.5%	0.9%	0.6%	1.3%	0.4%	1.1%
2024/25	526,282	668	21,814	72,438	32	197	921	32	1,210	623,594
2025/26	531,016	676	21,914	72,828	32	199	926	32	1,215	628,837
2026/27	535,517	684	22,014	73,197	32	201	931	32	1,220	633,827
2027/28	539,802	692	22,114	73,547	32	202	936	32	1,225	638,582
2028/29	543,914	700	22,214	73,884	32	204	941	32	1,230	643,150
2029/30	547,924	708	22,314	74,210	32	206	946	32	1,235	647,607
2030/31	551,878	716	22,414	74,532	32	208	951	32	1,240	652,001
2031/32	555,807	724	22,514	74,850	32	209	956	32	1,245	656,370
2032/33	559,731	732	22,614	75,168	32	211	961	32	1,250	660,731
2033/34	563,659	740	22,714	75,485	32	213	966	32	1,255	665,095
20 Year Avg Gr.	5,069	8	98	446	0	2	5	0	5	5,633
	1.0%	1.2%	0.5%	0.6%	0.2%	0.9%	0.6%	0.7%	0.4%	0.9%

General Consumers Sales Forecast

During 2013/14, Total General Consumer Sales was 22,338 GW.h. The fiscal billing year (using weather from March 16, 2013 to March 15, 2014) was much colder than normal giving a weather adjustment for the year of -772 GW.h, resulting in a weather adjusted Total Sales value of 21,566 GW.h.

Over the last 10 years, Total Sales have grown at 228 GW.h (1.1%) per year. The growth was 1.6% per year in Residential Basic, 1.4% per year in General Service Mass Market, but only 0.1% in General Service Top Consumers due to the economic downturn in 2009 that included the loss of one Top Consumer customer. This historical growth includes the effect of past Demand Side Management (DSM) initiatives.

Sales are forecast to grow at 444 GW.h (1.9%) per year over the next 10 years and 378 GW.h (1.5%) per year over the next 20 years before accounting for future market-based DSM programs.

Most of the growth is forecast to occur in General Service Mass Market, growing 142 GW.h (1.4%) per year over the next twenty years, followed by Top Consumers at 132 GW.h (2.0%) per year and Residential Basic at 102 GW.h (1.2%) per year.

Table 5 - General Consumers Sales Energy

GENERAL CONSUMERS SALES (GW.h)												
History and Forecast												
2003/04 - 2033/34												
Fiscal Year	Residential				General Service						Lighting	Total Sales
	Basic	Diesel	Seas	FRWH	Mass Mkt	Top Cons	Diesel	Seas	FRWH	SEP		
2003/04	6,170	6	56	34	7,460	5,423	5	5	13	17	91	19,280
2004/05	6,275	7	58	31	7,516	5,714	5	5	10	25	91	19,735
2005/06	6,171	7	59	30	7,587	5,948	5	5	9	23	91	19,935
2006/07	6,443	7	60	29	7,839	5,989	5	4	9	23	101	20,510
2007/08	6,736	7	68	27	8,006	6,075	5	4	9	24	101	21,061
2008/09	6,847	7	74	25	8,049	6,065	5	5	8	22	102	21,210
2009/10	6,786	7	81	24	7,985	5,461	6	5	8	20	102	20,486
2010/11	6,952	8	77	23	8,258	5,324	5	5	8	24	103	20,786
2011/12	6,818	8	83	22	8,162	5,531	5	5	8	25	103	20,771
2012/13	7,223	8	81	21	8,434	5,560	5	5	7	28	103	21,477
2013/14	7,767	9	92	20	8,839	5,461	5	5	7	29	104	22,338
Weather Adj.	-518	0	0	0	-252	0	0	0	0	-3	0	-772
2013/14 Wadj	7,249	9	92	20	8,587	5,461	5	5	7	26	104	21,566
10 Year Wadj	106	0	4	-1	114	4	0	0	-1	1	1	228
Avg Gr.	1.6%	3.4%	5.1%	-5.2%	1.4%	0.1%	1.4%	1.2%	-6.1%	4.0%	1.3%	1.1%
2014/15	7,380	9	91	19	8,814	6,003	6	5	7	29	104	22,467
2015/16	7,481	9	93	18	8,993	6,147	6	5	6	29	105	22,891
2016/17	7,606	9	95	17	9,190	6,082	6	5	6	32	105	23,153
2017/18	7,726	9	96	16	9,388	6,430	6	5	6	33	106	23,822
2018/19	7,836	10	98	15	9,560	6,590	6	5	6	33	106	24,264
2019/20	7,946	10	100	14	9,705	6,859	6	5	5	33	107	24,791
2020/21	8,049	10	102	14	9,833	6,922	6	5	5	33	107	25,087
2021/22	8,151	10	104	13	9,958	7,006	6	6	5	33	108	25,399
2022/23	8,248	10	106	12	10,079	7,091	6	6	5	33	108	25,704
2023/24	8,342	11	108	12	10,199	7,177	6	6	4	33	109	26,006
10 Year	109	0	2	-1	161	172	0	0	0	1	1	444
Avg Gr.	1.4%	2.1%	1.5%	-5.0%	1.7%	2.8%	1.5%	0.6%	-5.0%	2.2%	0.5%	1.9%
2024/25	8,435	11	110	11	10,320	7,264	6	6	4	33	109	26,309
2025/26	8,527	11	111	11	10,442	7,353	6	6	4	33	110	26,613
2026/27	8,619	11	113	10	10,560	7,443	6	6	4	33	110	26,916
2027/28	8,711	11	115	10	10,681	7,534	6	6	3	33	111	27,221
2028/29	8,802	12	117	9	10,801	7,626	6	6	3	33	111	27,527
2029/30	8,895	12	119	9	10,922	7,719	6	6	3	33	112	27,836
2030/31	8,990	12	121	8	11,046	7,813	6	6	3	33	112	28,151
2031/32	9,087	12	123	8	11,172	7,908	7	6	3	33	113	28,471
2032/33	9,186	13	125	7	11,301	8,005	7	6	3	33	113	28,799
2033/34	9,289	13	127	7	11,433	8,103	7	6	3	33	114	29,134
20 Year	102	0	2	-1	142	132	0	0	0	0	1	378
Avg Gr.	1.2%	2.0%	1.6%	-5.0%	1.4%	2.0%	1.2%	0.5%	-5.0%	1.1%	0.5%	1.5%

Manitoba Energy Forecast

The actual Gross Firm Energy was 25,625 GW.h in 2013/14. Gross Firm Energy has grown 269 GW.h (1.2%) per year for the past 10 years. This historical growth reflects the effect of past Demand Side Management (DSM) initiatives. Gross Firm energy is forecast to grow to 33,177 GW.h by 2033/34 at an average growth of 425 GW.h or 1.5% per year. This is before accounting for future market-based DSM programs.

Distribution losses, which is the difference between Manitoba Hydro's substations and the customers' meters, has a wide variance from year to year and has ranged between 3.5% and 5.5% of Total Sales. It is forecast to be 4.4% of Sales for the entire forecast.

Transmission Losses which is the difference between the generators and the substations is forecast to be 9.2% of Total Sales for the entire forecast.

Distribution Losses and Transmission Losses total almost 14% which needs to be added to Total Sales to estimate Gross Firm Energy. This 14% value should generally be used to estimate load at generation when only load at the customer's meter is known, for example to convert Power Smart program savings from the customer meter to generation. The exception is for large General Service customers who own their own transformation and incur minimal Distribution Losses. For these customers, a 10% value should be used.

Table 6 - Components of Manitoba Energy

MANITOBA FIRM ENERGY (GW.h)										
History and Forecast										
2003/04 - 2033/34										
Fiscal Year	General Consumer Sales less Diesel	Dist. Losses	Dist. Loss %	Const. Power	Manitoba Load at Common Bus	Trans. Losses	Trans. Loss %	Less Non Firm Energy	Station Service	Gross Firm Energy
2003/04	19,269	804	4.2%	43	20,116	1,792	9.3%	17	179	22,069
2004/05	19,724	830	4.2%	46	20,600	1,852	9.4%	26	163	22,589
2005/06	19,923	797	4.0%	42	20,761	1,860	9.3%	23	158	22,757
2006/07	20,497	900	4.4%	45	21,442	1,885	9.2%	22	159	23,464
2007/08	21,049	940	4.5%	47	22,036	1,949	9.3%	24	161	24,122
2008/09	21,198	1,052	5.0%	56	22,305	1,979	9.3%	22	154	24,417
2009/10	20,473	813	4.0%	75	21,361	1,934	9.4%	20	137	23,412
2010/11	20,773	947	4.6%	85	21,806	1,977	9.5%	25	134	23,892
2011/12	20,757	736	3.5%	67	21,560	1,939	9.3%	25	131	23,605
2012/13	21,463	1,184	5.5%	59	22,706	1,936	9.0%	28	136	24,750
2013/14	22,324	1,205	5.4%	12	23,541	1,969	8.8%	29	144	25,625
Weather Adj.	-772	-109		0	-881	-70		-3	0	-948
2013/14 Wadj	21,552	1,096	5.1%	12	22,660	1,899	8.8%	26	144	24,677
10 Year Wadj Avg Gr.	227	24		-3	262	14		1	-4	269
	1.1%	2.5%		-11.7%	1.2%	0.8%		4.3%	-2.2%	1.2%
2014/15	22,452	988	4.4%	24	23,464	2,067	9.2%	29	137	25,639
2015/16	22,876	1,007	4.4%	33	23,915	2,106	9.2%	29	137	26,130
2016/17	23,138	1,018	4.4%	43	24,200	2,131	9.2%	32	137	26,436
2017/18	23,807	1,047	4.4%	25	24,879	2,191	9.2%	33	137	27,174
2018/19	24,249	1,067	4.4%	12	25,328	2,231	9.2%	33	137	27,662
2019/20	24,775	1,090	4.4%	0	25,865	2,278	9.2%	33	137	28,247
2020/21	25,071	1,103	4.4%	0	26,174	2,305	9.2%	33	137	28,583
2021/22	25,383	1,117	4.4%	0	26,499	2,334	9.2%	33	137	28,937
2022/23	25,688	1,130	4.4%	0	26,818	2,362	9.2%	33	137	29,284
2023/24	25,989	1,144	4.4%	0	27,133	2,390	9.2%	33	137	29,626
10 Year Avg Gr.	444	5		-1	447	49		1	-1	495
	1.9%	0.4%		-100.0%	1.8%	2.3%		2.3%	-0.5%	1.8%
2024/25	26,292	1,157	4.4%	0	27,449	2,418	9.2%	33	137	29,970
2025/26	26,596	1,170	4.4%	0	27,766	2,446	9.2%	33	137	30,316
2026/27	26,898	1,184	4.4%	0	28,082	2,473	9.2%	33	137	30,659
2027/28	27,204	1,197	4.4%	0	28,401	2,501	9.2%	33	137	31,006
2028/29	27,509	1,210	4.4%	0	28,719	2,529	9.2%	33	137	31,352
2029/30	27,818	1,224	4.4%	0	29,042	2,558	9.2%	33	137	31,703
2030/31	28,133	1,238	4.4%	0	29,370	2,587	9.2%	33	137	32,061
2031/32	28,452	1,252	4.4%	0	29,704	2,616	9.2%	33	137	32,424
2032/33	28,780	1,266	4.4%	0	30,046	2,646	9.2%	33	137	32,796
2033/34	29,115	1,281	4.4%	0	30,396	2,677	9.2%	33	137	33,177
20 Year Avg Gr.	378	9		-1	387	39		0	0	425
	1.5%	0.8%		-100.0%	1.5%	1.7%		1.1%	-0.2%	1.5%

Comparison of the 2013 Forecast to Actuals

Comparison of the 2013 Forecast to the 2013/14 Weather Adjusted Actuals

The weather adjusted General Consumer Sales for 2013/14 was 21,566 GW.h which was 510 GW.h lower than the 2013 forecast of 22,076 GW.h.

The weather adjusted Residential Basic sector was 90 GW.h lower than the forecast and the weather adjusted General Service Mass Market sector for was 37 GW.h higher than forecast. These differences do not take into account Demand Side Management (DSM) programs that were forecast to be 25 GW.h for Residential Basic and 56 GW.h for General Service Mass Market. With DSM incorporated, Residential Basic was 65 GW.h lower than forecast and General Service Mass Market was 93 GW.h higher than forecast.

The majority of the difference was in the Top Consumers sector for 2013/14 using 5,461 GW.h that was 464 GW.h lower than the 2013 forecast of 5,925 GW.h. Three Top Consumers contributed to the majority of this difference. Two had unexpected reductions of load in 2013/14 that are expected to be mostly restored in 2014/15. The third had a delay to a current expansion project but the forecast load is still expected and is included in the 2014 Forecast.

Distribution losses were 125 GW.h higher than forecast and Transmission losses were 159 GW.h lower than forecast.

Overall, the weather adjusted Gross Firm Energy for 2013/14 was 24,677 GW.h which was 562 GW.h lower than the 2013 forecast of 25,239 GW.h.

The normalized Gross Total Peak for 2013/14 was 4,587 MW, 28 MW higher than forecast.

Table 7 - 2013/14 Forecast to Actual

2013 FORECAST COMPARED TO WEATHER ADJUSTED ACTUALS					
2013/14 Energy (GW.h) and Peak (MW)					
Forecast Group	Weather		Wthr Adj	2013	WA Actuals
	Actuals	Adjustment	Actuals	Forecast	less Forecast
Residential Basic	7,767	(518)	7,249	7,339	(90)
Residential Diesel	9	-	9	8	0
Residential Seasonal	92	-	92	83	10
Residential Flat Rate Water Heating	20	-	20	20	(0)
Total Residential	7,888	(518)	7,370	7,450	(80)
GS Mass Market	8,839	(252)	8,587	8,550	37
GS Top Consumers	5,461	-	5,461	5,925	(464)
GS Diesel	5	-	5	5	(0)
GS Seasonal	5	-	5	5	0
GS Flat Rate Water Heat	7	-	7	7	0
GS Surplus Energy Program	29	(3)	26	30	(3)
Total General Service	14,347	(255)	14,092	14,522	(430)
Sentinal Flat Rate	12	-	12	12	(0)
Sentinal Rental	-	-	-	-	-
Street Lighting	92	-	92	92	(0)
Total Lighting	104	-	104	104	(0)
Total General Consumer Sales	22,338	(772)	21,566	22,076	(510)
Less Diesel Sales	(14)	-	(14)	(14)	0
Distribution Losses	1,205	(109)	1,096	971	125
Construction Power	12	-	12	43	(30)
Manitoba Load at Common Bus	23,541	(881)	22,660	23,076	(415)
Transmission Losses	1,969	(70)	1,899	2,058	(159)
Less Non-Firm Energy	(29)	3	(26)	(30)	3
Station Service	144	-	144	134	9
Gross Firm Energy (GW.h)	25,625	(948)	24,677	25,239	(562)
Gross Total Peak (MW)	4,743	(155)	4,587	4,559	28

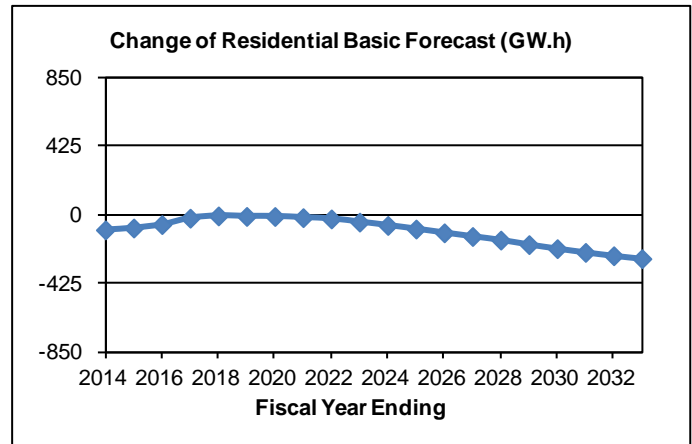
*Note: Actuals include DSM. Forecast excludes program-based DSM initiatives.

Change between the 2013 and 2014 Forecasts

Change Between the 2013 and 2014 Residential Basic Forecast

The 2014 Residential Basic Forecast starts down 78 GW.h from the 2013 forecast. By 2017/18, it is only down 3 GW.h due to a higher customer forecast in the earlier years. The difference then grows to be 268 GW.h down due to a lower customer forecast for the later years. 268 GW.h represents less than 1 year of Manitoba system load growth (1 year = approximately 425 GW.h).

Figure 1 - Change of Res Basic Forecast



Major changes and their 2032/33 effect:

1. The customer forecast was lowered by 4,854 (-80 GW.h).
2. Estimates of the reduction due to future Codes & Standards was increased (-384 GW.h).
3. Change to average use due to implementation of econometric model (+200 GW.h), from:
 - a. Historical growth excluding evaluated DSM and Codes & Standards: +447 GW.h
 - b. Increase due to the modeling of real Income: +628 GW.h
 - c. Decrease due to the modeling of real electricity price: -875 GW.h
4. Modeling of ratio of gas to electric price on new home saturations (-33 GW.h)

Table 8 - Change of Res Basic Forecast

CHANGE OF RESIDENTIAL BASIC FORECAST (GW.h)										
Comparison of 2013 to 2014 forecast										
Fiscal Year	2013 Fcst	2014 Fcst	Change	%		Fiscal Year	2013 Fcst	2014 Fcst	Change	%
2013/14	7,339	7,249	(90)	-1.2%		2023/24	8,405	8,342	(62)	-0.7%
2014/15	7,458	7,380	(78)	-1.0%		2024/25	8,520	8,435	(85)	-1.0%
2015/16	7,538	7,481	(57)	-0.8%		2025/26	8,635	8,527	(108)	-1.3%
2016/17	7,624	7,606	(17)	-0.2%		2026/27	8,750	8,619	(131)	-1.5%
2017/18	7,730	7,726	(3)	0.0%		2027/28	8,864	8,711	(153)	-1.7%
2018/19	7,842	7,836	(7)	-0.1%		2028/29	8,983	8,802	(181)	-2.0%
2019/20	7,953	7,946	(7)	-0.1%		2029/30	9,102	8,895	(206)	-2.3%
2020/21	8,063	8,049	(14)	-0.2%		2030/31	9,219	8,990	(229)	-2.5%
2021/22	8,173	8,151	(22)	-0.3%		2031/32	9,337	9,087	(250)	-2.7%
2022/23	8,290	8,248	(42)	-0.5%		2032/33	9,454	9,186	(268)	-2.8%

Change Between the 2013 and 2014 GS Mass Market Forecast

The 2014 General Service Mass Market Forecast is up 235 GW.h in 2018/19 from the 2013 forecast primarily due to the increase in the short term Residential customer forecast. By 2032/33, the Mass Market forecast is only up 13 GW.h by 2032/33.

Major changes and their 2032/33 effect:

1. The forecast of GS Mass Market customers was lowered by 1,046 due to a lower GDP forecast and a lower Residential Customer forecast (-138 GW.h).
2. Estimates of the reduction due to future Codes and Standards was increased (-517 GW.h)
3. Change to average use due to implementation of econometric model (+637 GW.h), from:
 - a. Growth of historical average use due to adding DSM and Codes & Standards: +423 GW.h
 - b. Increase due to the modeling of real GDP: +997 GW.h
 - c. Decrease due to the modeling of real electricity price: -783 GW.h

Figure 2 - Change of GS Mass Market Forecast

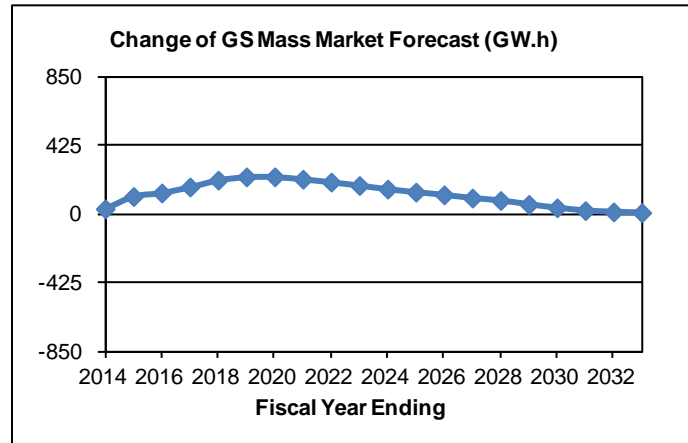


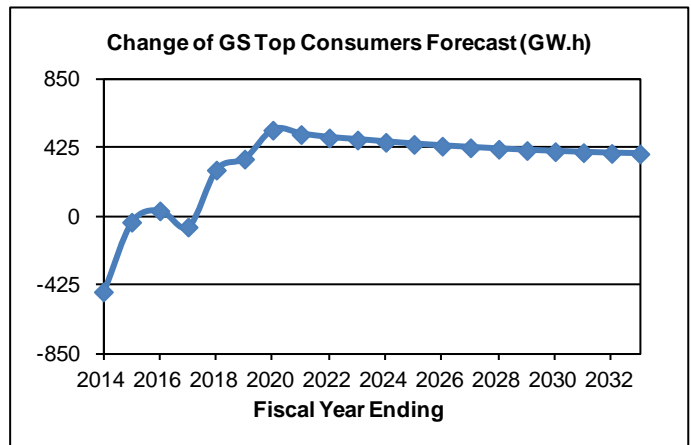
Table 9 - Change of GS Mass Market Forecast

CHANGE OF GS MASS MARKET FORECAST (GW.h)									
Comparison of 2013 to 2014 forecast									
Fiscal Year	2013 Fcst	2014 Fcst	Change	%	Fiscal Year	2013 Fcst	2014 Fcst	Change	%
2013/14	8,550	8,587	37	0.4%	2023/24	10,040	10,199	159	1.6%
2014/15	8,701	8,814	113	1.3%	2024/25	10,179	10,320	141	1.4%
2015/16	8,858	8,993	135	1.5%	2025/26	10,318	10,442	123	1.2%
2016/17	9,018	9,190	172	1.9%	2026/27	10,456	10,560	104	1.0%
2017/18	9,174	9,388	215	2.3%	2027/28	10,592	10,681	89	0.8%
2018/19	9,325	9,560	235	2.5%	2028/29	10,736	10,801	64	0.6%
2019/20	9,470	9,705	235	2.5%	2029/30	10,878	10,922	43	0.4%
2020/21	9,613	9,833	220	2.3%	2030/31	11,020	11,046	26	0.2%
2021/22	9,756	9,958	202	2.1%	2031/32	11,154	11,172	18	0.2%
2022/23	9,898	10,079	181	1.8%	2032/33	11,288	11,301	13	0.1%

Change Between the 2013 and 2014 GS Top Consumers Forecast

Figure 3 - Change of GS Top Consumer Forecast

The General Service Top Consumers is similar to the 2013 forecast for the first three years, and then rises to be 537 GW.h higher in 2019/20 primarily due to pipeline projects. From 2020/21, the change slowly decreases due to a reduction to the annual amount allocated to the Potential Large Industrial Loads. By 2032/33, the increase is 390 GW.h. This is less than a year of Manitoba system load growth (1 year = approximately 425 GW.h).



Changes made (and the 2032/33 effect):

1. Load was down 464 GW.h in 2013/14 due to a temporary equipment problem with one top consumer and an unexpected reduction of a second top consumer. (-50 GW.h)
2. Two major expansion projects are expected in the Pipeline sector. (+655 GW.h)
3. The Potential Large Industrial Loads forecast was reduced from an average 100 GW.h per year to 91 GW.h per year. (-159 GW.h)
4. Potential Large Industrial Loads begins in the 4th year of the forecast, which in the 2014 forecast is one year later giving one less year of PLIL growth by 2032/33. (-98 GW.h)

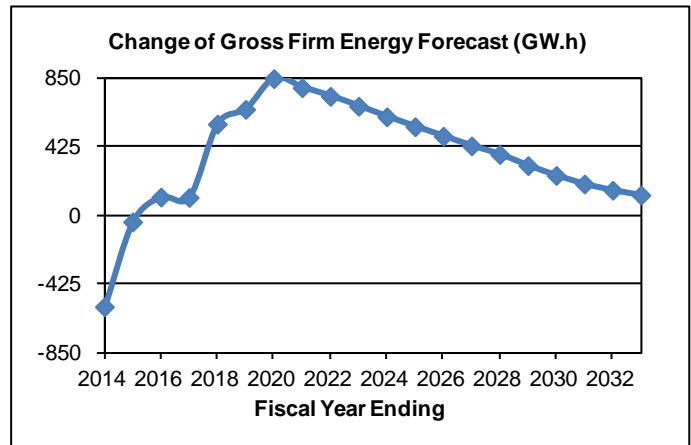
Table 10 - Change of GS Top Consumer Forecast

CHANGE OF GS TOP CONSUMERS FORECAST (GW.h)									
Comparison of 2013 to 2014 forecast									
Fiscal Year	2013 Fcst	2014 Fcst	Change	%	Fiscal Year	2013 Fcst	2014 Fcst	Change	%
2013/14	5,925	5,461	(464)	-7.8%	2023/24	6,715	7,177	462	6.9%
2014/15	6,036	6,003	(33)	-0.5%	2024/25	6,815	7,264	449	6.6%
2015/16	6,110	6,147	37	0.6%	2025/26	6,915	7,353	438	6.3%
2016/17	6,145	6,082	(63)	-1.0%	2026/27	7,015	7,443	428	6.1%
2017/18	6,140	6,430	290	4.7%	2027/28	7,115	7,534	419	5.9%
2018/19	6,232	6,590	358	5.7%	2028/29	7,215	7,626	411	5.7%
2019/20	6,322	6,859	537	8.5%	2029/30	7,315	7,719	404	5.5%
2020/21	6,412	6,922	510	8.0%	2030/31	7,415	7,813	398	5.4%
2021/22	6,517	7,006	489	7.5%	2031/32	7,515	7,908	393	5.2%
2022/23	6,615	7,091	476	7.2%	2032/33	7,615	8,005	390	5.1%

Change Between the 2013 and 2014 Gross Firm Energy Forecast

Figure 4 - Change of Energy Forecast

The Gross Firm Energy forecast was down 562 GW.h in 2013/14 due to a temporary load loss of two Top Consumers. By 2019/20, the 2014 forecast is 850 GW.h higher due to increases to Top Consumers in the Pipeline sector and a higher Residential customer forecast in the earlier years. By 2032/33 the increase in the 2014 forecast is reduced to 129 GW.h due to a reduction in the Residential customer forecast and increases to the projected impacts of Codes and Standards. This equates to a 0.4% increase in the forecast of 2032/33, which is a gain of less than half a year of load growth (1 year = approximately 425 GW.h).



Summary of changes made in each sector (and the 2032/33 effect):

1. Residential Basic forecast, primarily due to an overall reduction in the Residential customer forecast and projected energy savings due to Codes and Standards. (-268 GW.h)
2. General Service Mass Market forecast, due to mostly offsetting changes. (+13 GW.h)
3. General Service Top Consumers forecast, mostly in the Pipelines sector. (+390 GW.h)
4. Other Sales and Losses. (-6 GW.h)

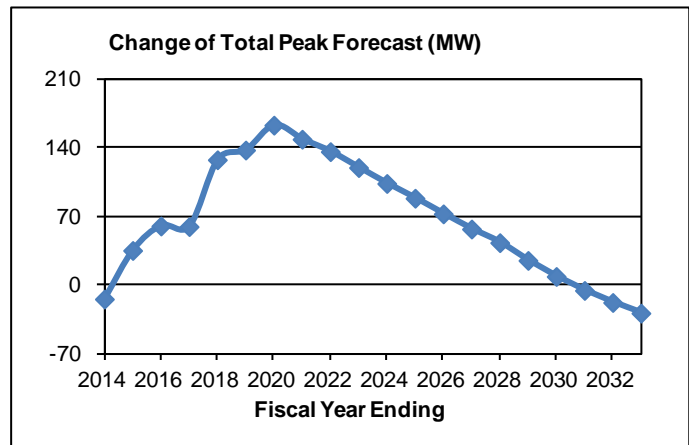
Table 11 - Change of Energy Forecast

GROSS FIRM ENERGY (GW.h)									
Comparison of 2013 to 2014 forecast									
Fiscal Year	2013 Fcst	2014 Fcst	Change	%	Fiscal Year	2013 Fcst	2014 Fcst	Change	%
2013/14	25,239	24,677	(562)	-2.2%	2023/24	29,013	29,626	614	2.1%
2014/15	25,676	25,639	(37)	-0.1%	2024/25	29,418	29,970	552	1.9%
2015/16	26,013	26,130	117	0.4%	2025/26	29,822	30,316	493	1.7%
2016/17	26,322	26,436	114	0.4%	2026/27	30,225	30,659	433	1.4%
2017/18	26,606	27,174	568	2.1%	2027/28	30,625	31,006	380	1.2%
2018/19	27,003	27,662	660	2.4%	2028/29	31,041	31,352	312	1.0%
2019/20	27,398	28,247	850	3.1%	2029/30	31,453	31,703	251	0.8%
2020/21	27,789	28,583	794	2.9%	2030/31	31,863	32,061	198	0.6%
2021/22	28,197	28,937	740	2.6%	2031/32	32,265	32,424	159	0.5%
2022/23	28,605	29,284	679	2.4%	2032/33	32,667	32,796	129	0.4%

Change Between the 2013 and 2014 Gross Total Peak Forecast

Figure 5 - Change of Peak Forecast

The Gross Total Peak forecast is down 28 MW (0.5%) by 2032/33 from the 2013 forecast. The peak forecast very closely follows the energy forecast with the reasons for reduction in peak being similar to those for energy.



In 2032/33 the peak forecast is lower than projected in the 2013 forecast because of a small increase of the expected peak load

factor which is forecast to grow to 63.2% compared to 62.6% in the 2013 forecast. The Load Factor increase is due to the Top Consumers forecast growing at a faster rate than other sectors.

The reduction in peak in 2032/33 amounts to 28 MW, less than a half a year of load growth. (1 year = approximately 70 MW).

Table 12 - Change of Peak Forecast

GROSS TOTAL PEAK (MW)									
Comparison of 2013 to 2014 forecast									
Fiscal Year	2013 Fcst	2014 Fcst	Change	%	Fiscal Year	2013 Fcst	2014 Fcst	Change	%
2013/14	4,601	4,587	(14)	-0.3%	2023/24	5,296	5,400	104	2.0%
2014/15	4,680	4,716	36	0.8%	2024/25	5,369	5,458	89	1.7%
2015/16	4,742	4,803	61	1.3%	2025/26	5,443	5,516	73	1.3%
2016/17	4,801	4,861	60	1.3%	2026/27	5,516	5,574	58	1.0%
2017/18	4,857	4,985	128	2.6%	2027/28	5,588	5,632	44	0.8%
2018/19	4,930	5,068	138	2.8%	2028/29	5,664	5,690	26	0.5%
2019/20	5,002	5,166	164	3.3%	2029/30	5,739	5,748	9	0.2%
2020/21	5,074	5,223	149	2.9%	2030/31	5,813	5,808	(5)	-0.1%
2021/22	5,147	5,284	137	2.7%	2031/32	5,886	5,869	(17)	-0.3%
2022/23	5,222	5,342	120	2.3%	2032/33	5,959	5,931	(28)	-0.5%

FORECAST DETAILS

Residential Basic

In 2013/14, there were 462,274 Residential Basic customers. 79% are single detached, 9% multi attached, and 12% individually metered apartment suites. 54% are in Winnipeg where natural gas is available, 29% in natural gas available areas outside Winnipeg, and 17% do not have natural gas available.

Residential Basic has grown 100 GW.h (1.6%) per year for the past 20 years and 106 GW.h per year (1.6%) for the past 10 years which reflects the effect of past Demand Side

Management (DSM) initiatives. It is forecast to grow 109 GW.h (1.4%) per year for the next 10 years and 102 GW.h (1.2%) per year for the next 20 years.

The primary drivers of Residential Basic growth are population and average use per customer. The population is forecast to grow 1.2% per year over the next 10 years and 1.0% over the next 20 years. The increase in average use per customer is expected to add 0.2% to the growth.

Figure 6- Residential Basic Sales

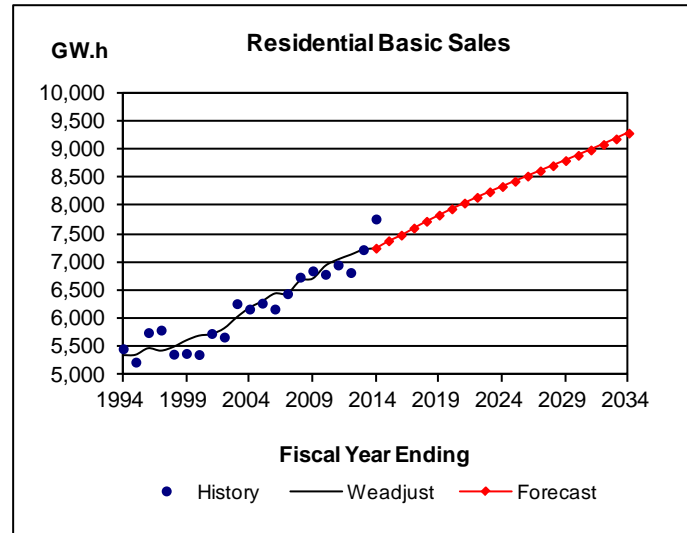


Table 13 - Residential Sales

RESIDENTIAL BASIC (GW.h)					
HISTORICAL/WEATHER ADJUSTMENT/FORECAST					
Fiscal Year	Sales	Weather Adjust	Adjusted Sales	Fiscal Year	Forecast Sales
1994/95	5,230	119	5,348	2014/15	7,380
1995/96	5,753	-288	5,465	2015/16	7,481
1996/97	5,797	-375	5,422	2016/17	7,606
1997/98	5,370	120	5,490	2017/18	7,726
1998/99	5,384	221	5,605	2018/19	7,836
1999/00	5,364	325	5,689	2019/20	7,946
2000/01	5,737	-19	5,718	2020/21	8,049
2001/02	5,674	148	5,821	2021/22	8,151
2002/03	6,266	-247	6,019	2022/23	8,248
2003/04	6,170	18	6,188	2023/24	8,342
2004/05	6,275	30	6,305	2024/25	8,435
2005/06	6,171	272	6,442	2025/26	8,527
2006/07	6,443	-1	6,442	2026/27	8,619
2007/08	6,736	-62	6,674	2027/28	8,711
2008/09	6,847	-137	6,710	2028/29	8,802
2009/10	6,786	154	6,940	2029/30	8,895
2010/11	6,952	101	7,053	2030/31	8,990
2011/12	6,818	319	7,137	2031/32	9,087
2012/13	7,223	4	7,228	2032/33	9,186
2013/14	7,767	-518	7,249	2033/34	9,289

Table 14 - Residential Basic Sales

RESIDENTIAL BASIC SALES											
History and Forecast											
2013/14 - 2033/34											
Fiscal Year	Electric Heat Billed			Non Electric Heat Billed			Total Basic			% Elec Space Heat	% Elec Water Heat
	Custs	GW.h	kW.h/cust	Custs	GW.h	kW.h/cust	Custs	GW.h	kW.h/cust		
2013/14	165,576	4,148	25,050	290,554	3,072	10,572	456,130	7,219	15,827	36.3%	49.0%
2014/15	173,561	4,324	24,913	294,514	3,056	10,377	468,075	7,380	15,767	37.1%	49.4%
2015/16	177,387	4,395	24,775	296,375	3,086	10,412	473,762	7,481	15,790	37.4%	50.5%
2016/17	181,184	4,474	24,693	298,780	3,132	10,484	479,964	7,606	15,848	37.7%	51.5%
2017/18	184,929	4,549	24,601	301,458	3,177	10,538	486,387	7,726	15,885	38.0%	52.3%
2018/19	188,478	4,618	24,501	304,222	3,218	10,577	492,700	7,836	15,904	38.3%	53.1%
2019/20	191,795	4,683	24,419	307,092	3,263	10,625	498,887	7,946	15,928	38.4%	53.8%
2020/21	194,868	4,743	24,341	310,046	3,306	10,663	504,914	8,049	15,942	38.6%	54.5%
2021/22	197,696	4,800	24,280	312,991	3,351	10,705	510,687	8,151	15,960	38.7%	55.1%
2022/23	200,277	4,853	24,230	315,883	3,396	10,749	516,160	8,248	15,980	38.8%	55.8%
2023/24	202,640	4,902	24,192	318,697	3,440	10,794	521,337	8,342	16,002	38.9%	56.4%
2024/25	204,859	4,951	24,167	321,424	3,485	10,842	526,283	8,435	16,028	38.9%	57.1%
2025/26	206,970	4,998	24,148	324,046	3,529	10,891	531,016	8,527	16,058	39.0%	57.7%
2026/27	208,970	5,044	24,140	326,547	3,575	10,947	535,517	8,619	16,095	39.0%	58.3%
2027/28	210,869	5,090	24,140	328,932	3,621	11,008	539,801	8,711	16,138	39.1%	59.0%
2028/29	212,686	5,135	24,145	331,228	3,667	11,071	543,914	8,802	16,183	39.1%	59.6%
2029/30	214,445	5,181	24,158	333,479	3,715	11,140	547,924	8,895	16,235	39.1%	60.2%
2030/31	216,165	5,226	24,176	335,713	3,764	11,212	551,878	8,990	16,290	39.2%	60.8%
2031/32	217,856	5,272	24,200	337,951	3,815	11,289	555,807	9,087	16,349	39.2%	61.4%
2032/33	219,528	5,319	24,228	340,203	3,868	11,369	559,731	9,186	16,412	39.2%	62.0%
2033/34	221,184	5,366	24,262	342,474	3,922	11,453	563,658	9,289	16,479	39.2%	62.6%

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

Non Electric Heat Billed: Customers who do not have electric space heating included with their electric bill.

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

% Electric 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 individually metered apartment suites are making up a higher proportion of the growth. The average use for Non Electric Heat Billed customers is increasing mainly due to the increase in the use of electric water heaters, the increase due to ventilation requirements in new dwellings, and miscellaneous end uses.

Residential Diesel, Seasonal, and Flat Rate Water Heating

Residential Diesel

There were 583 Residential Diesel customers that used 9 GW.h in 2013/14 at an average of 14,791 kW.h per customer. They have 60 amp service that does not allow for electric space heating. Space heating in these four communities is mainly provided by fuel oil. The number of customers is expected to grow to 740 and usage is expected to increase 2.0% a year to 13 GW.h by 2033/34 under the assumption that the communities continue to be separate from the Integrated System.

Residential Seasonal

There were 20,757 Residential Seasonal customers that used 92 GW.h in 2013/14 at an average of 4,455 kW.h per customer. The number of customers is expected increase to 22,714 customers by 2033/34. Seasonal customers are billed only twice a year either due to low usage (being a seasonal residence or cottage) or because of a location that makes it difficult to access for more frequent meter readings. The usage of Residential Seasonal customers is expected to increase 1.6% a year to 127 GW.h in 2033/34.

Residential Flat Rate Water Heating

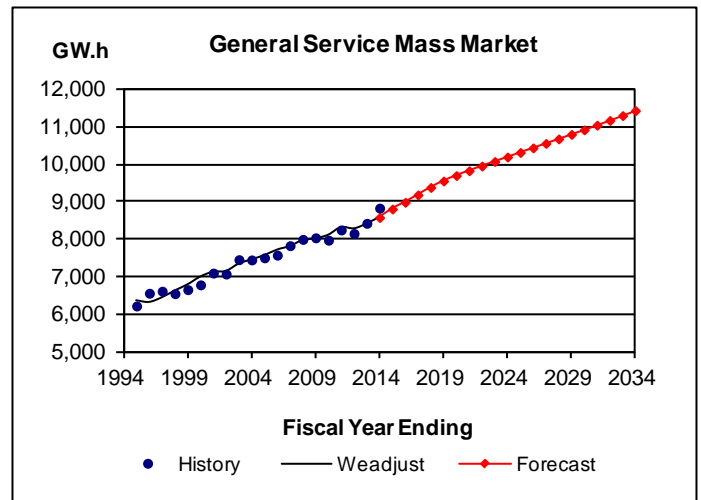
Residential Water Heating is a flat rate unmetered service. This service has not been available to new customers since November 12, 1969. There were 3,858 remaining services in 2013/14. The number of services and usage is expected to decrease 5% per year throughout the forecast period. Usage was 20 GW.h in 2013/14 and that will decrease to 7 GW.h by 2033/34.

General Service Mass Market

General Service Mass Market includes all Commercial and Industrial customers, excluding the General Service Top Consumers. There were 66,569 General Service Mass Market customers in 2013/14. Approximately 85% are Commercial and the others are Industrial.

Figure 7 - General Service Mass Market

GS Mass Market has grown 117 GW.h (1.6%) per year for the past 20 years and 114 GW.h per year (1.4%) for the past 10 years. This historical growth reflects the effect of past Demand Side Management (DSM) initiatives. It is forecast to grow 161 GW.h (1.7%) per year for the next 10 years and 142 GW.h (1.4%) 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

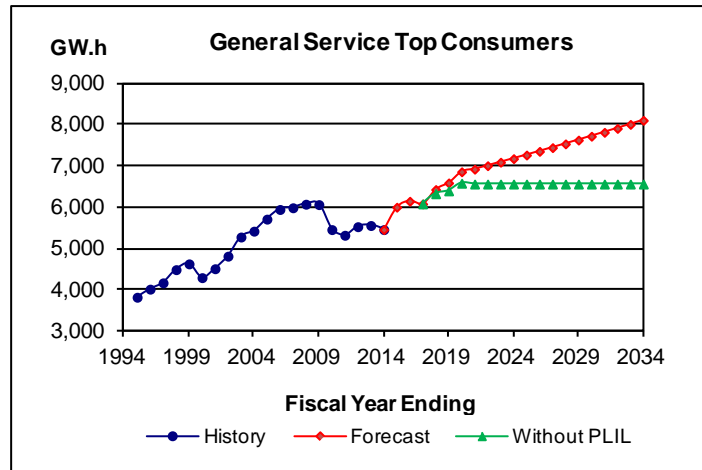
GENERAL SERVICE MASS MARKET (GW.h)					
HISTORICAL/WEATHER ADJUSTMENT/FORECAST					
Fiscal Year	Sales	Weather Adjust	Adjusted Sales	Fiscal Year	Forecast Sales
1994/95	6,233	131	6,364	2014/15	8,814
1995/96	6,573	-252	6,321	2015/16	8,993
1996/97	6,627	-185	6,442	2016/17	9,190
1997/98	6,562	62	6,624	2017/18	9,388
1998/99	6,668	118	6,786	2018/19	9,560
1999/00	6,796	197	6,993	2019/20	9,705
2000/01	7,110	15	7,125	2020/21	9,833
2001/02	7,084	60	7,144	2021/22	9,958
2002/03	7,467	-128	7,339	2022/23	10,079
2003/04	7,460	-8	7,452	2023/24	10,199
2004/05	7,516	49	7,565	2024/25	10,320
2005/06	7,587	125	7,712	2025/26	10,442
2006/07	7,839	-30	7,809	2026/27	10,560
2007/08	8,006	-38	7,968	2027/28	10,681
2008/09	8,049	-35	8,013	2028/29	10,801
2009/10	7,985	123	8,108	2029/30	10,922
2010/11	8,258	55	8,313	2030/31	11,046
2011/12	8,162	116	8,278	2031/32	11,172
2012/13	8,434	-27	8,407	2032/33	11,301
2013/14	8,839	-252	8,587	2033/34	11,433

General Service Top Consumers

General Service Top Consumers includes the top energy consuming businesses in Manitoba and represents 25% 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 86 GW.h (1.9%) per year over the past 20 years and but only 4 GW.h per year (0.1%) 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 2014 forecast is expected to grow 172 GW.h (2.8%) per year for the next 10 years and 132 GW.h (2.0%) per year for the next 20



years. The short term increase is primarily due to planned expansions in the Petrol/Oil/Natural Gas sector. In the long term, GS Top Consumers is expected to grow at a rate dependent on the Canada and U.S. Gross Domestic Product (GDP) projections.

Table 16 - General Service Top Consumers

GENERAL SERVICE TOP CONSUMERS (GW.h) HISTORICAL/FORECAST WITH PLIL					
Fiscal Year	Sales	Fiscal Year	Individual	PLIL	Total
1994/95	3,825	2014/15	6,003	0	6,003
1995/96	4,021	2015/16	6,147	0	6,147
1996/97	4,173	2016/17	6,082	0	6,082
1997/98	4,493	2017/18	6,327	103	6,430
1998/99	4,632	2018/19	6,397	193	6,590
1999/00	4,299	2019/20	6,582	277	6,859
2000/01	4,515	2020/21	6,562	360	6,922
2001/02	4,818	2021/22	6,562	444	7,006
2002/03	5,282	2022/23	6,562	529	7,091
2003/04	5,423	2023/24	6,562	615	7,177
2004/05	5,714	2024/25	6,562	702	7,264
2005/06	5,948	2025/26	6,562	791	7,353
2006/07	5,989	2026/27	6,562	881	7,443
2007/08	6,075	2027/28	6,562	972	7,534
2008/09	6,065	2028/29	6,562	1,064	7,626
2009/10	5,461	2029/30	6,562	1,157	7,719
2010/11	5,324	2030/31	6,562	1,251	7,813
2011/12	5,531	2031/32	6,562	1,346	7,908
2012/13	5,560	2032/33	6,562	1,443	8,005
2013/14	5,461	2033/34	6,562	1,541	8,103

GS Top Consumers are forecast individually as their usage does not grow in a slow, steady, predictable pattern. Their short term outlooks are not conducive to econometric forecasting models and must be examined on an individual basis. The forecast for each company includes their short term committed plans and expectations over the next several years, but excludes longer term plans that are uncommitted and subject to change.

The sum of the individual company forecasts grow from 5,461 GW.h in 2013/14 to 6,582 GW.h by 2019/20. This growth of 1,121 GW.h includes the load changes due to committed plans of companies, and also includes an expected major load decrease of one customer by 2016.

Top Consumers do not add small amounts of load on a regular interval basis. Instead, they make major changes that add or remove a large amount of load at one time. Load changes are related to individual business cycles and it may be years between one of these changes.

For the longer term, an average expected growth is included for all customers together. This added growth is called Potential Large Industrial Loads (PLIL). It includes consideration for company expansions, cutbacks and shutdowns, new startups of 100 GW.h a year or more, and the long term normal incremental growth of all the companies within the Top Consumers sector combined. Since customer intentions are generally known for the first three years, PLIL is not added until 2017/18, the fourth year of the forecast.

GS Top Consumers has grown an average of 86 GW.h (1.9%) per year over the past twenty years. During that time, there were four new customers totaling 1,100 GW.h, nine instances of major customer expansions totaling 1,400 GW.h, and two existing customers who closed operations reducing consumption by 700 GW.h. None of these events could have been predicted five years before they occurred. One new customer and four expansions occurred within the past 10 years despite the economic downturn. These major events amount to a net 1,800 GW.h increase or 90 GW.h annually over the past 20 years. PLIL is estimated econometrically and averages 91 GW.h (1.3%) per year starting in the fourth year of the forecast and will total 1,541 GW.h by 2033/34.

1,541 GW.h is approximately equivalent to the load of Manitoba Hydro's largest consumer. If only one other customer of similar size starts up in Manitoba within the next 20 years, this one new customer alone would consume all of the provision that PLIL has projected.

General Service Diesel, Seasonal, and Flat Rate Water Heat

General Service Diesel

In 2013/14, there were 179 General Service Diesel Full Cost customers. They used 5 GW.h in 2013/14. The group is forecast to use 7 GW.h by 2033/34.

General Service Seasonal

There were 861 General Service Seasonal customers in 2013/14. Consumption was 5 GW.h in 2013/14 and is expected to grow to 6 GW.h by 2033/34.

General Service Flat Rate Water Heating

General Service Water Heating is a flat rate unmetered service that has not been available to new customers since November 12, 1969. There were 392 remaining services in 2013/14. The number of services is expected to decrease 5% per year throughout the forecast period. Consumption was 7 GW.h in 2013/14 and that is forecast to decrease to 3 GW.h by 2033/34.

General Service Surplus Energy Program

Participants in the Surplus Energy Program (SEP) used 29 GW.h in 2013/14 and are expected to grow to use 33 GW.h per year by 2017/18 and continue at that rate for the remainder of the forecast. This energy is considered to be “interruptible” and thus “non-firm”. The energy used by these customers is included in Sales. But it is excluded from the Gross Firm Energy forecast.

Plug-In Electric Vehicles

This forecast includes an estimate of the future adoption of Plug-In Electric Vehicles (PEVs) in the Manitoba Hydro service area. 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) run only on electric battery power. Pure electric plug-in vehicles include the Nissan Leaf, the Tesla and Mitsubishi MiEV.

The forecast of PEVs does not include non-plug-in Hybrid Electric Vehicles (HEVs). These vehicles, such as the non-plug-in 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, 2014 and after 13 years in the market, there were only 3,960 HEVs registered in Manitoba, making up about 0.5% of all registered vehicles.

For the most part, the expected success of plug-in electric cars has not materialized worldwide. According to the Plug-In Hybrid & Electric Vehicle Research Center at UC Davis, total cumulative global sales of PHEV's and BEV's worldwide passed the 500,000 mark at the end of June, 2014. Out of the total global vehicle count of just over one billion, electric vehicles represent 0.05% of the total. The US accounts for about 45% of the total electric vehicle sales, while Japan is second, China third and the Netherlands fourth. While President Obama's goal of 1,000,000 electric vehicles on US roads by the end of 2015 seems unrealistic, according to the Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW), there will be over a million such vehicles on the road worldwide by the end of 2016. Range anxiety and price are cited as the main reasons for limited sales.

The Electric Vehicle Forecast

As of March 1st, 2014, there were 67 plug-in electric passenger vehicles, plus the Manitoba Hydro Electric Bus, registered in Manitoba according to the Manitoba Public Insurance Corporation. The passenger electric vehicle registrations comprised of 27 pure electric plug-in vehicles and 40 plug-in hybrid electric vehicles. The 2013 Load Forecast had predicted a total of 103 plug-in vehicles to be registered in Manitoba at fiscal year ending 2014. The

latest electric vehicle forecast is adjusted to incorporate the lower actual registrations recorded in fiscal year ending 2014. The number of new PEVs is expected to slowly increase until it reaches about 0.7% of new vehicle sales (415 per year) in 2023/24 and 4.1% of new vehicle sales (2,837 per year) in 2033/34. The total number of electric vehicles on the road is expected to be 2,057 (0.2% of total vehicle registrations) in 2023/24 and 15,910 (1.3% of total vehicle registrations) in 2033/34.

The following table provides the forecast of the number of new vehicles and total number of vehicles each year in Manitoba, as well as the corresponding numbers for Plug-In Electric Vehicles. Trailers, farm equipment and motor cycles are not included in the count. The forecast incorporates passenger as well as commercial category vehicles such as Sport Utility Vehicles (SUVs), trucks and transit buses. A passenger PEV consumes approximately 3,500 kW.h per year, equivalent to one residential electric hot water tank. An electric transit bus consumes 123,500 kW.h per year, equivalent to four electrically heated single detached dwellings.

Forecast energy usage for PEVs in Manitoba is expected to be 14 GW.h in 2023/24 and 91 GW.h in 2033/34. Forecast peak usage coincident to Manitoba Hydro's system peak is expected to be 1.8 MW in 2023/24 and 11.3 MW in 2033/34.

Figure 9 - Plug-In Electric Vehicles

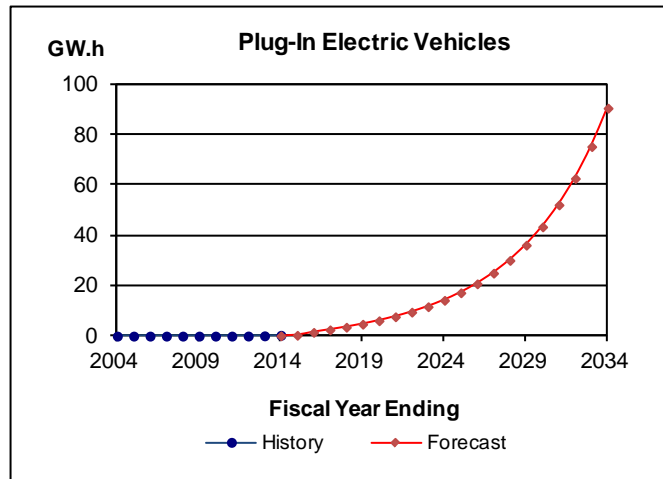


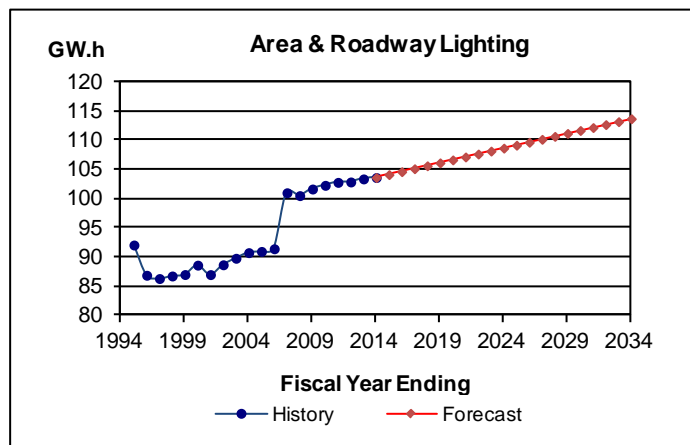
Table 17 - Plug-In Electric Vehicles

PLUG-IN ELECTRIC VEHICLE FORECAST								
History and Forecast								
2003/04 - 2033/34								
Fiscal Year	New Vehicles Purchased	New PEV Purchased	New PEV %	Total Vehicles	Total PEV	Total % PEV	Cumul Total PEV GW.h	Cumul Total PEV MW
2003/04	45,691	0	0.0%	646,925	0	0.0%	0	0
2004/05	45,429	0	0.0%	657,773	0	0.0%	0	0
2005/06	46,127	0	0.0%	665,911	0	0.0%	0	0
2006/07	46,164	0	0.0%	677,922	0	0.0%	0	0
2007/08	47,953	0	0.0%	696,186	0	0.0%	0	0
2008/09	46,710	0	0.0%	711,412	0	0.0%	0	0
2009/10	44,539	0	0.0%	723,823	0	0.0%	0	0
2010/11	45,552	1	0.0%	738,299	1	0.0%	0	0
2011/12	49,177	8	0.0%	762,214	9	0.0%	0	0
2012/13	52,588	28	0.1%	779,935	37	0.0%	0	0
2013/14	56,028	31	0.1%	792,175	68	0.0%	0	0
2014/15	56,720	43	0.1%	810,759	111	0.0%	1	0.1
2015/16	57,412	67	0.1%	829,569	178	0.0%	1	0.2
2016/17	58,103	119	0.2%	848,606	298	0.0%	2	0.3
2017/18	58,795	132	0.2%	867,869	430	0.0%	4	0.4
2018/19	59,487	160	0.3%	887,360	589	0.1%	5	0.6
2019/20	60,179	193	0.3%	907,076	783	0.1%	6	0.8
2020/21	60,871	234	0.4%	927,020	1,016	0.1%	8	1.0
2021/22	61,563	283	0.5%	947,190	1,299	0.1%	10	1.2
2022/23	62,254	343	0.6%	967,587	1,642	0.2%	12	1.5
2023/24	62,946	415	0.7%	988,211	2,057	0.2%	14	1.8
2024/25	63,638	503	0.8%	1,009,061	2,561	0.3%	17	2.2
2025/26	64,330	610	0.9%	1,030,138	3,170	0.3%	21	2.6
2026/27	65,022	739	1.1%	1,051,441	3,909	0.4%	25	3.1
2027/28	65,713	896	1.4%	1,072,972	4,805	0.4%	30	3.8
2028/29	66,405	1,085	1.6%	1,094,728	5,890	0.5%	36	4.5
2029/30	67,097	1,315	2.0%	1,116,712	7,206	0.6%	43	5.4
2030/31	67,789	1,594	2.4%	1,138,922	8,800	0.8%	52	6.5
2031/32	68,481	1,932	2.8%	1,161,359	10,732	0.9%	63	7.8
2032/33	69,173	2,341	3.4%	1,184,023	13,073	1.1%	75	9.4
2033/34	69,864	2,837	4.1%	1,206,913	15,910	1.3%	91	11.3

Area & Roadway Lighting

Figure 10 - Area & Roadway Lighting

The Area and Roadway Lighting sector represents 0.5% of all sales within Manitoba. This sector includes electricity sales for the Sentinel Lighting and Street Lighting rate groups. Sentinel Lighting is an outdoor lighting service where units are available either as rentals to an existing metered service or on an unmetered, flat rate basis. Street Lighting includes all public roadway lighting in Manitoba. Energy-efficient street lighting initiatives caused the significant drop in usage in the mid 1990's. In 2006, a readjustment of the rate classes moved some flat rate General Service meters into the Lighting sector. Only Street Lights count as customers.



The Area and Roadway Lighting sector is forecast to increase from 104 GW.h in 2013/14 to 114 GW.h by 2033/34 at an average growth rate of 1 GW.h or 0.5% per year. This does not include the effect of future Demand Side Management (DSM) initiatives in this sector.

Table 18 - Area & Roadway Lighting

AREA & ROADWAY LIGHTING (GW.h)					
HISTORICAL/WEATHER ADJUSTMENT/FORECAST					
Fiscal Year	Sales	Weather Adjust	Adjusted Sales	Fiscal Year	Forecast Sales
1994/95	92	0	92	2014/15	104
1995/96	87	0	87	2015/16	105
1996/97	86	0	86	2016/17	105
1997/98	87	0	87	2017/18	106
1998/99	87	0	87	2018/19	106
1999/00	89	0	89	2019/20	107
2000/01	87	0	87	2020/21	107
2001/02	89	0	89	2021/22	108
2002/03	90	0	90	2022/23	108
2003/04	91	0	91	2023/24	109
2004/05	91	0	91	2024/25	109
2005/06	91	0	91	2025/26	110
2006/07	101	0	101	2026/27	110
2007/08	101	0	101	2027/28	111
2008/09	102	0	102	2028/29	111
2009/10	102	0	102	2029/30	112
2010/11	103	0	103	2030/31	112
2011/12	103	0	103	2031/32	113
2012/13	103	0	103	2032/33	113
2013/14	104	0	104	2033/34	114

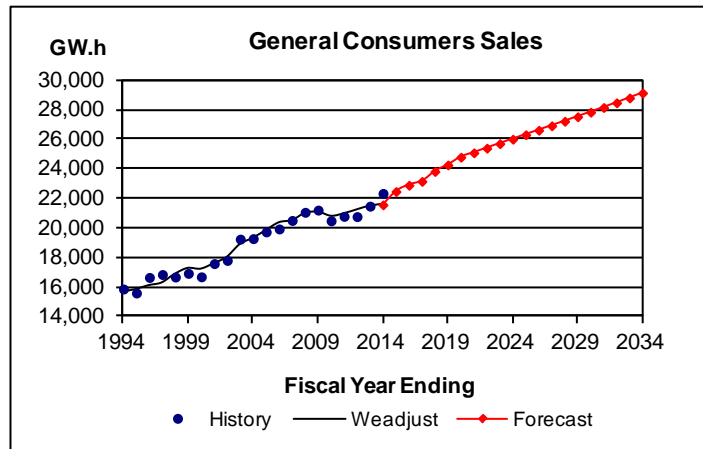
Table 19 - Area & Roadway Lighting

AREA AND ROADWAY LIGHTING								
History and Forecast								
2003/04 - 2033/34								
Fiscal Year	Sentinal Flat Rates		Sentinal Rentals		Street Lighting		Total Lighting	
	(Services)	(GW.h)	(Services)	(GW.h)	(Custs)	(GW.h)	(Custs)	(GW.h)
2003/04	19,527	10	5,505	0	757	81	757	91
2004/05	19,648	10	5,519	0	759	81	759	91
2005/06	19,652	10	7,826	0	793	81	793	91
2006/07	18,669	11	23,994	0	1,129	90	1,129	101
2007/08	18,947	11	24,272	0	1,142	90	1,142	101
2008/09	19,228	11	24,542	0	1,175	91	1,175	102
2009/10	19,539	11	24,886	0	1,191	91	1,191	102
2010/11	19,835	11	25,216	0	1,184	92	1,184	103
2011/12	20,033	11	25,427	0	1,155	91	1,155	103
2012/13	20,238	12	25,613	0	1,164	92	1,164	103
2013/14	20,399	12	25,764	0	1,157	92	1,157	104
2014/15	20,560	12	25,958	0	1,160	92	1,160	104
2015/16	20,748	12	26,202	0	1,165	93	1,165	105
2016/17	20,936	12	26,446	0	1,170	93	1,170	105
2017/18	21,124	12	26,690	0	1,175	94	1,175	106
2018/19	21,312	12	26,934	0	1,180	94	1,180	106
2019/20	21,500	12	27,178	0	1,185	94	1,185	107
2020/21	21,688	12	27,422	0	1,190	95	1,190	107
2021/22	21,876	12	27,666	0	1,195	95	1,195	108
2022/23	22,064	13	27,910	0	1,200	96	1,200	108
2023/24	22,252	13	28,154	0	1,205	96	1,205	109
2024/25	22,440	13	28,398	0	1,210	96	1,210	109
2025/26	22,628	13	28,642	0	1,215	97	1,215	110
2026/27	22,816	13	28,886	0	1,220	97	1,220	110
2027/28	23,004	13	29,130	0	1,225	98	1,225	111
2028/29	23,192	13	29,374	0	1,230	98	1,230	111
2029/30	23,380	13	29,618	0	1,235	98	1,235	112
2030/31	23,568	13	29,862	0	1,240	99	1,240	112
2031/32	23,756	13	30,106	0	1,245	99	1,245	113
2032/33	23,944	14	30,350	0	1,250	100	1,250	113
2033/34	24,132	14	30,594	0	1,255	100	1,255	114

Total General Consumers Sales

General Consumers Sales includes sales to all of Manitoba Hydro’s individually billed customers, but excludes export sales. This includes the total of all sales from the Residential, General Service and Lighting sectors. The General Service sector makes up about two-thirds, the Residential sector makes up about one-third and the Lighting group is only 0.5% of all sales.

Figure 11 - General Consumers Sales



Weather adjusted General Consumers Sales has grown 301 GW.h (1.6%) per year for the past 20 years and 228 GW.h (1.1%) per year over the past 10 years. This historical growth includes the effect of past Demand Side Management (DSM) initiatives. Sales are forecast to grow 444 GW.h (1.9%) per year for the next 10 years and 378 GW.h (1.5%) per year for the next 20 years.

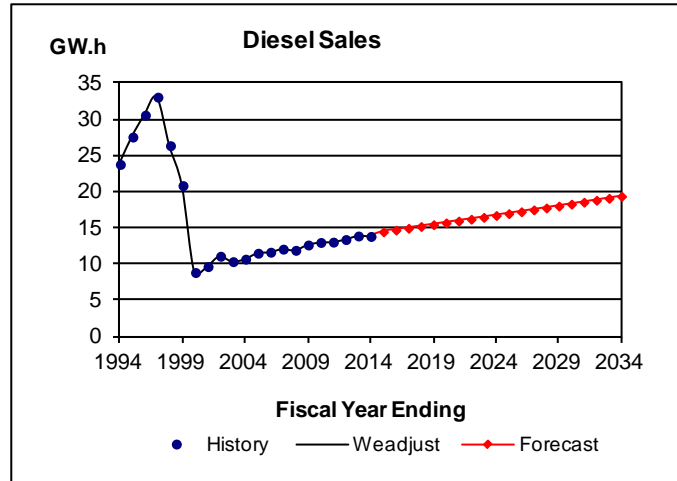
Table 20 - General Consumers Sales

GENERAL CONSUMERS SALES (GW.h) HISTORICAL/WEATHER ADJUSTMENT/FORECAST					
Fiscal Year	Sales	Weather Adjust	Adjusted Sales	Fiscal Year	Forecast Sales
1994/95	15,600	249	15,848	2014/15	22,467
1995/96	16,654	-541	16,113	2015/16	22,891
1996/97	16,851	-561	16,290	2016/17	23,153
1997/98	16,681	182	16,863	2017/18	23,822
1998/99	16,929	340	17,269	2018/19	24,264
1999/00	16,696	525	17,221	2019/20	24,791
2000/01	17,590	-5	17,585	2020/21	25,087
2001/02	17,805	209	18,014	2021/22	25,399
2002/03	19,246	-376	18,871	2022/23	25,704
2003/04	19,280	11	19,291	2023/24	26,006
2004/05	19,735	78	19,813	2024/25	26,309
2005/06	19,935	398	20,333	2025/26	26,613
2006/07	20,510	-30	20,480	2026/27	26,916
2007/08	21,061	-101	20,961	2027/28	27,221
2008/09	21,210	-173	21,037	2028/29	27,527
2009/10	20,486	277	20,763	2029/30	27,836
2010/11	20,786	156	20,942	2030/31	28,151
2011/12	20,771	437	21,208	2031/32	28,471
2012/13	21,477	-22	21,455	2032/33	28,799
2013/14	22,338	-772	21,566	2033/34	29,134

Diesel Sales

Figure 12 - Diesel Sales

There are four communities served by diesel generation in Manitoba: Brochet, Lac Brochet, Tadoule Lake and Shamattawa. Sales within these communities are included in General Consumers Sales, but are not part of the Integrated System, and are thus not part of Common Bus or Gross Firm Load.



Between 1997 and 1999, eleven communities previously served by diesel generation were connected to the Integrated System resulting in the drop in overall diesel sales. The four sites that were to remain diesel were converted from 15 amp service to 60 amp service between 1991 and 2001 causing the increase in those years.

Diesel customers do not have electric heat, which requires a minimum 200 amp service, therefore there is no weather effect.

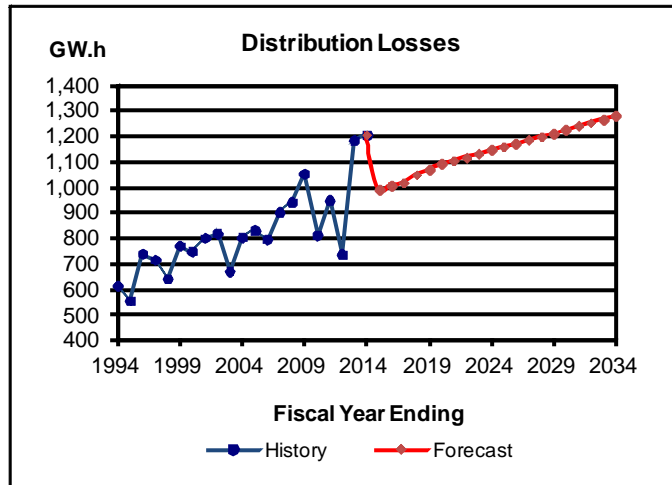
Table 21 - Diesel Sales

DIESEL SALES (GW.h)					
HISTORICAL/WEATHER ADJUSTMENT/FORECAST					
Fiscal Year	Sales	Weather Adjust	Adjusted Sales	Fiscal Year	Forecast Sales
1994/95	28	0	28	2014/15	14
1995/96	31	0	31	2015/16	15
1996/97	33	0	33	2016/17	15
1997/98	26	0	26	2017/18	15
1998/99	21	0	21	2018/19	15
1999/00	9	0	9	2019/20	16
2000/01	10	0	10	2020/21	16
2001/02	11	0	11	2021/22	16
2002/03	10	0	10	2022/23	16
2003/04	11	0	11	2023/24	17
2004/05	12	0	12	2024/25	17
2005/06	12	0	12	2025/26	17
2006/07	12	0	12	2026/27	18
2007/08	12	0	12	2027/28	18
2008/09	13	0	13	2028/29	18
2009/10	13	0	13	2029/30	18
2010/11	13	0	13	2030/31	19
2011/12	13	0	13	2031/32	19
2012/13	14	0	14	2032/33	19
2013/14	14	0	14	2033/34	19

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 2014/15 to be 4.4% of the General Consumers Sales less Diesel and remain at that level throughout the forecast.

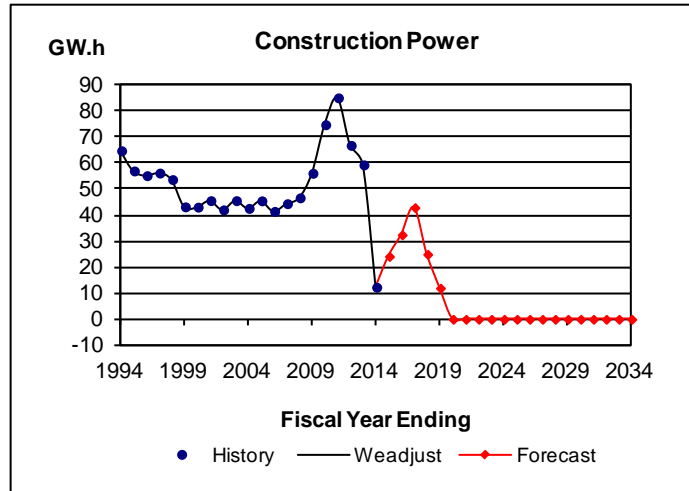
Table 22 - Distribution Losses

DISTRIBUTION LOSSES (GW.h)							
HISTORICAL / PERCENT OF SALES / FORECAST							
Fiscal Year	Losses	Sales less Diesel	% Losses	Fiscal Year	Forecast Losses	Sales less Diesel	% Losses
1994/95	556	15,572	3.6%	2014/15	988	22,452	4.4%
1995/96	740	16,623	4.4%	2015/16	1,007	22,876	4.4%
1996/97	715	16,818	4.3%	2016/17	1,018	23,138	4.4%
1997/98	641	16,655	3.9%	2017/18	1,047	23,807	4.4%
1998/99	771	16,908	4.6%	2018/19	1,067	24,249	4.4%
1999/00	749	16,687	4.5%	2019/20	1,090	24,775	4.4%
2000/01	802	17,580	4.6%	2020/21	1,103	25,071	4.4%
2001/02	819	17,793	4.6%	2021/22	1,117	25,383	4.4%
2002/03	671	19,236	3.5%	2022/23	1,130	25,688	4.4%
2003/04	804	19,269	4.2%	2023/24	1,144	25,989	4.4%
2004/05	830	19,724	4.2%	2024/25	1,157	26,292	4.4%
2005/06	797	19,923	4.0%	2025/26	1,170	26,596	4.4%
2006/07	900	20,497	4.4%	2026/27	1,184	26,898	4.4%
2007/08	940	21,049	4.5%	2027/28	1,197	27,204	4.4%
2008/09	1,052	21,198	5.0%	2028/29	1,210	27,509	4.4%
2009/10	813	20,473	4.0%	2029/30	1,224	27,818	4.4%
2010/11	947	20,773	4.6%	2030/31	1,238	28,133	4.4%
2011/12	736	20,757	3.5%	2031/32	1,252	28,452	4.4%
2012/13	1,184	21,463	5.5%	2032/33	1,266	28,780	4.4%
2013/14	1,205	22,324	5.4%	2033/34	1,281	29,115	4.4%

Construction Power

Figure 14 - Construction Power

Construction Power represents the energy used by Manitoba Hydro and its contractors in the construction of major capital works such as generating stations, converter stations and major transmission lines. Construction Power also includes Station Service until a plant is commissioned. Until 2013, about 48 GW.h of heating load at the Gillam, Limestone and Kettle town sites was included in Construction Power. This energy is now included in Distribution Losses.



The Construction Power forecast includes: (1) the Pointe Du Bois spillway replacement started in April 2013 with expected completion in the Fall of 2015, and (2) the Keewatinow Converter Station, started in January 2012 with expected completion in the Fall of 2017. Construction Power does not include construction power estimates for Keeyask as they were not available at the preparation of this forecast.

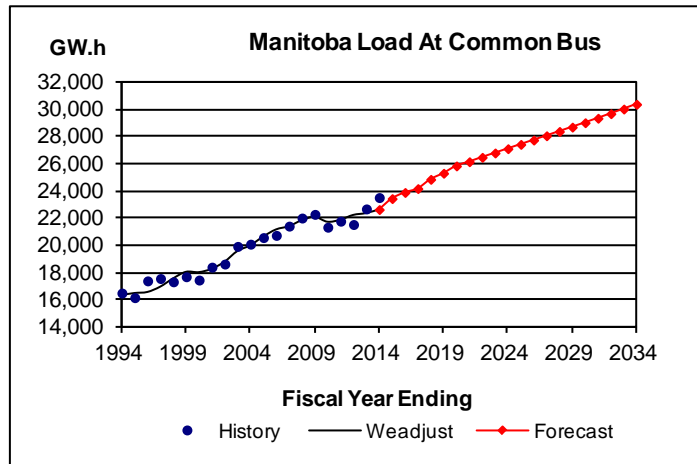
Table 23 - Construction Power

CONSTRUCTION POWER (GW.h)					
HISTORICAL/WEATHER ADJUSTMENT/FORECAST					
Fiscal Year	Usage	Weather Adjust	Adjusted Usage	Fiscal Year	Forecast Usage
1994/95	57	0	57	2014/15	24
1995/96	55	0	55	2015/16	33
1996/97	56	0	56	2016/17	43
1997/98	54	0	54	2017/18	25
1998/99	43	0	43	2018/19	12
1999/00	43	0	43	2019/20	0
2000/01	46	0	46	2020/21	0
2001/02	42	0	42	2021/22	0
2002/03	46	0	46	2022/23	0
2003/04	43	0	43	2023/24	0
2004/05	46	0	46	2024/25	0
2005/06	42	0	42	2025/26	0
2006/07	45	0	45	2026/27	0
2007/08	47	0	47	2027/28	0
2008/09	56	0	56	2028/29	0
2009/10	75	0	75	2029/30	0
2010/11	85	0	85	2030/31	0
2011/12	67	0	67	2031/32	0
2012/13	59	0	59	2032/33	0
2013/14	12	0	12	2033/34	0

Manitoba Load at Common Bus

Manitoba Load at Common Bus is the total load measured from all the distribution points (i.e. substations) within Manitoba. It includes all energy supplied to General Consumers Sales customers, Construction Power plus associated Distribution Losses, but excludes Diesel customers, Transmission Losses and Station Service.

Figure 15 - Manitoba Load at Common Bus



Common Bus is metered and totaled to correspond exactly to each calendar month. Weather adjustment is done on a calendar month basis.

Weather adjusted Common Bus has grown 321 GW.h (1.7%) per year for the past 20 years and 262 GW.h (1.2%) per year during the past 10 years reflecting the recent economic downturn. This historical growth includes the effect of past Demand Side Management (DSM) initiatives. Common Bus is forecast to grow 447 GW.h (1.8%) per year for the next 10 years and 387 GW.h (1.5%) per year for the next 20 years.

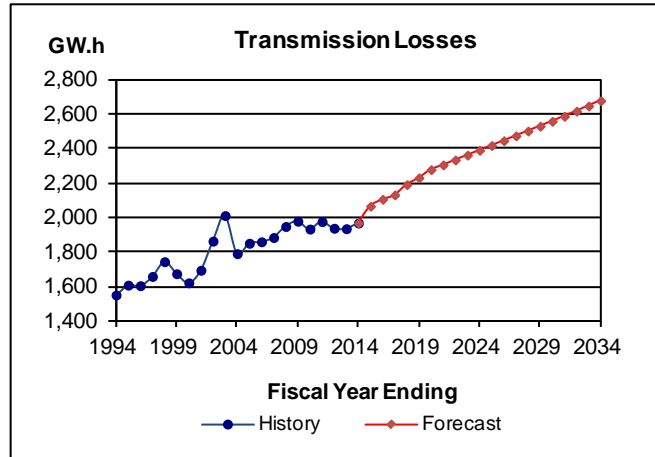
Table 24 - Manitoba Load at Common Bus

MANITOBA LOAD AT COMMON BUS (GW.h)					
HISTORICAL/WEATHER ADJUSTMENT/FORECAST					
Fiscal Year	Energy	Weather Adjust	Adjusted Energy	Fiscal Year	Forecast Energy
1994/95	16,185	374	16,559	2014/15	23,464
1995/96	17,418	-782	16,635	2015/16	23,915
1996/97	17,590	-567	17,023	2016/17	24,200
1997/98	17,350	275	17,625	2017/18	24,879
1998/99	17,722	383	18,105	2018/19	25,328
1999/00	17,479	603	18,082	2019/20	25,865
2000/01	18,428	-103	18,324	2020/21	26,174
2001/02	18,655	190	18,845	2021/22	26,499
2002/03	19,953	-328	19,625	2022/23	26,818
2003/04	20,116	-76	20,040	2023/24	27,133
2004/05	20,600	77	20,677	2024/25	27,449
2005/06	20,761	438	21,199	2025/26	27,766
2006/07	21,442	-5	21,437	2026/27	28,082
2007/08	22,036	-165	21,871	2027/28	28,401
2008/09	22,305	-185	22,120	2028/29	28,719
2009/10	21,361	399	21,760	2029/30	29,042
2010/11	21,806	102	21,908	2030/31	29,370
2011/12	21,560	698	22,258	2031/32	29,704
2012/13	22,706	-314	22,392	2032/33	30,046
2013/14	23,541	-881	22,660	2033/34	30,396

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 mostly losses on the High Voltage



Direct Current (HVDC) lines, and are substantial because of the distance of transmission from northern generation to southern distribution points, but are much less than what AC losses would be over that distance. Transmission Losses vary year to year depending on water conditions, system configuration, outages and the magnitude of the load. Losses were higher in 2002/03 due to two HVDC transformer failures.

Transmission Losses are forecast to be 9.2% of the General Consumers Sales less Diesel Sales.

Table 25 - Transmission Losses

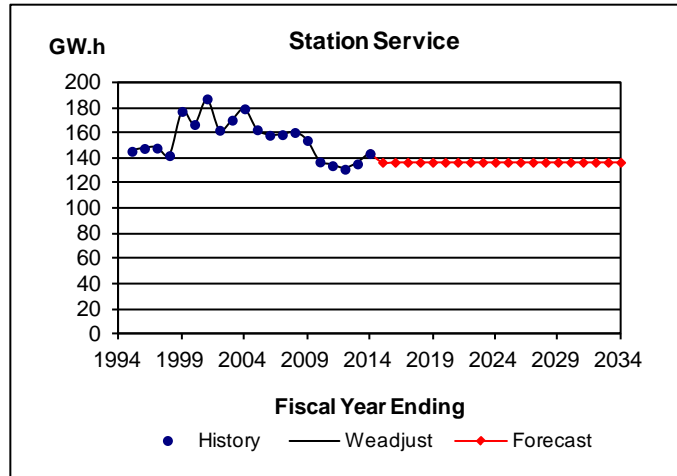
TRANSMISSION LOSSES (GW.h)							
HISTORICAL / PERCENT OF SALES / FORECAST							
Fiscal Year	Losses	Sales less Diesel	% Losses	Fiscal Year	Forecast Losses	Sales less Diesel	% Losses
1994/95	1,609	15,572	10.3%	2014/15	2,067	22,452	9.2%
1995/96	1,606	16,623	9.7%	2015/16	2,106	22,876	9.2%
1996/97	1,660	16,818	9.9%	2016/17	2,131	23,138	9.2%
1997/98	1,745	16,655	10.5%	2017/18	2,191	23,807	9.2%
1998/99	1,675	16,908	9.9%	2018/19	2,231	24,249	9.2%
1999/00	1,623	16,687	9.7%	2019/20	2,278	24,775	9.2%
2000/01	1,696	17,580	9.6%	2020/21	2,305	25,071	9.2%
2001/02	1,864	17,793	10.5%	2021/22	2,334	25,383	9.2%
2002/03	2,012	19,236	10.5%	2022/23	2,362	25,688	9.2%
2003/04	1,792	19,269	9.3%	2023/24	2,390	25,989	9.2%
2004/05	1,852	19,724	9.4%	2024/25	2,418	26,292	9.2%
2005/06	1,860	19,923	9.3%	2025/26	2,446	26,596	9.2%
2006/07	1,885	20,497	9.2%	2026/27	2,473	26,898	9.2%
2007/08	1,949	21,049	9.3%	2027/28	2,501	27,204	9.2%
2008/09	1,979	21,198	9.3%	2028/29	2,529	27,509	9.2%
2009/10	1,934	20,473	9.4%	2029/30	2,558	27,818	9.2%
2010/11	1,977	20,773	9.5%	2030/31	2,587	28,133	9.2%
2011/12	1,939	20,757	9.3%	2031/32	2,616	28,452	9.2%
2012/13	1,936	21,463	9.0%	2032/33	2,646	28,780	9.2%
2013/14	1,969	22,324	8.8%	2033/34	2,677	29,115	9.2%

Station Service

Station Service is the energy used by power plants to generate power and service their own load. Manitoba energy or peak without Station Service is referred to as “Net”, and with Station Service as “Gross”. Station Service has only been reported since 1994.

Station Service energy is forecast to be 137 GW.h and Station Service peak is forecast to be 24 MW from 2014/15 to 2033/34.

Figure 17 - Station Service



Station Service for Keyask and for future non-committed plants is excluded from this forecast.

Table 26 - Station Service

STATION SERVICE (GW.h)					
HISTORICAL/WEATHER ADJUSTMENT/FORECAST					
Fiscal Year	Usage	Weather Adjust	Adjusted Usage	Fiscal Year	Forecast Usage
1994/95	146	0	146	2014/15	137
1995/96	148	0	148	2015/16	137
1996/97	148	0	148	2016/17	137
1997/98	142	0	142	2017/18	137
1998/99	177	0	177	2018/19	137
1999/00	167	0	167	2019/20	137
2000/01	187	0	187	2020/21	137
2001/02	162	0	162	2021/22	137
2002/03	170	0	170	2022/23	137
2003/04	179	0	179	2023/24	137
2004/05	163	0	163	2024/25	137
2005/06	158	0	158	2025/26	137
2006/07	159	0	159	2026/27	137
2007/08	161	0	161	2027/28	137
2008/09	154	0	154	2028/29	137
2009/10	137	0	137	2029/30	137
2010/11	134	0	134	2030/31	137
2011/12	131	0	131	2031/32	137
2012/13	136	0	136	2032/33	137
2013/14	144	0	144	2033/34	137

Table 27 - Monthly Station Service Energy

MONTHLY STATION SERVICE ENERGY (GW.h)													
History and Forecast													
Fiscal Year	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total
2003/04	16.0	11.6	9.7	11.7	12.5	12.7	13.3	17.7	18.6	23.2	16.8	15.6	179.4
2004/05	11.8	10.4	8.1	8.1	8.0	9.6	12.0	15.9	21.2	21.6	17.9	18.0	162.7
2005/06	12.6	11.0	10.0	11.1	10.1	9.6	11.8	15.2	18.4	16.7	17.0	14.9	158.3
2006/07	10.2	8.9	8.4	10.3	9.3	8.6	13.4	16.1	16.7	18.6	19.7	18.7	158.8
2007/08	15.7	12.1	9.1	8.2	8.4	7.3	8.7	14.7	19.2	18.6	19.7	18.8	160.5
2008/09	13.8	9.4	7.5	9.5	10.4	7.1	10.6	15.1	20.1	20.4	14.9	15.5	154.2
2009/10	11.8	10.3	7.9	7.2	7.4	7.2	10.8	14.2	18.8	15.5	13.3	12.7	137.1
2010/11	10.2	9.9	7.3	6.7	7.2	7.4	9.5	12.9	16.4	17.1	14.4	15.0	134.1
2011/12	12.0	9.9	7.5	7.1	7.3	6.7	9.5	13.1	15.1	16.0	13.8	13.1	131.3
2012/13	11.0	9.4	7.7	7.0	6.7	6.4	11.4	14.3	16.2	16.6	13.7	15.2	135.5
2013/14	12.6	11.1	7.0	7.5	7.6	6.9	11.2	13.5	17.8	17.0	15.8	15.8	143.8
2014/15 - 2033/34	11.9	10.1	7.4	7.2	7.2	6.7	10.7	13.7	16.3	16.5	14.4	14.7	136.8

Table 28 - Monthly Station Service Peak

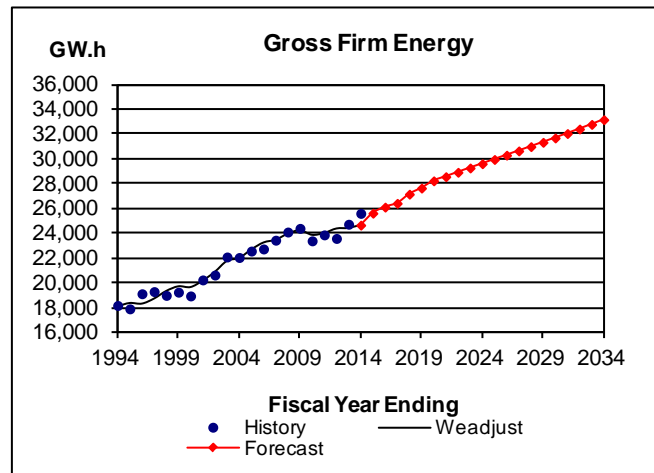
MONTHLY STATION SERVICE PEAK (MW)													
History and Forecast													
Fiscal Year	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Annual
2013/14 Actual	23	17	9	11	14	9	24	24	24	23	24	22	24
2014/15 - 2033/34	20	15	9	11	10	9	20	24	24	24	24	22	24

Gross Firm Energy

Gross Firm Energy is the energy required to serve Manitoba Hydro’s customers on the Integrated System. It excludes exports, interruptible (non-firm) loads, Diesel Sales and Station Service for Keeyask and non-committed plants.

Gross Firm Energy has grown steadily during the past twenty years, except for the economic slowdown in the 1990’s and more recently in 2009.

Figure 18 - Gross Firm Energy



Weather adjusted Gross Firm Energy has grown 333 GW.h (1.6%) per year for the past 20 years and 269 GW.h (1.2%) per year during the past 10 years reflecting the recent economic downturn. This historical growth includes the effect of past Demand Side Management (DSM) initiatives. Energy is forecast to grow 495 GW.h (1.8%) per year for the next 10 years and 425 GW.h (1.5%) per year for the next 20 years.

Table 29 - Gross Firm Energy

GROSS FIRM ENERGY (GW.h) HISTORICAL/WEATHER ADJUSTMENT/FORECAST					
Fiscal Year	Energy	Weather Adjust	Adjusted Energy	Fiscal Year	Forecast Energy
1994/95	17,929	413	18,343	2014/15	25,639
1995/96	19,148	-854	18,294	2015/16	26,130
1996/97	19,321	-618	18,703	2016/17	26,436
1997/98	19,014	302	19,316	2017/18	27,174
1998/99	19,273	418	19,691	2018/19	27,662
1999/00	18,971	660	19,631	2019/20	28,247
2000/01	20,262	-109	20,153	2020/21	28,583
2001/02	20,656	209	20,865	2021/22	28,937
2002/03	22,110	-360	21,750	2022/23	29,284
2003/04	22,069	-86	21,984	2023/24	29,626
2004/05	22,589	85	22,674	2024/25	29,970
2005/06	22,757	475	23,232	2025/26	30,316
2006/07	23,464	-6	23,458	2026/27	30,659
2007/08	24,122	-177	23,945	2027/28	31,006
2008/09	24,417	-199	24,218	2028/29	31,352
2009/10	23,412	436	23,848	2029/30	31,703
2010/11	23,892	114	24,006	2030/31	32,061
2011/12	23,605	758	24,362	2031/32	32,424
2012/13	24,750	-342	24,408	2032/33	32,796
2013/14	25,625	-948	24,677	2033/34	33,177

Table 30 - Monthly Gross Firm Energy

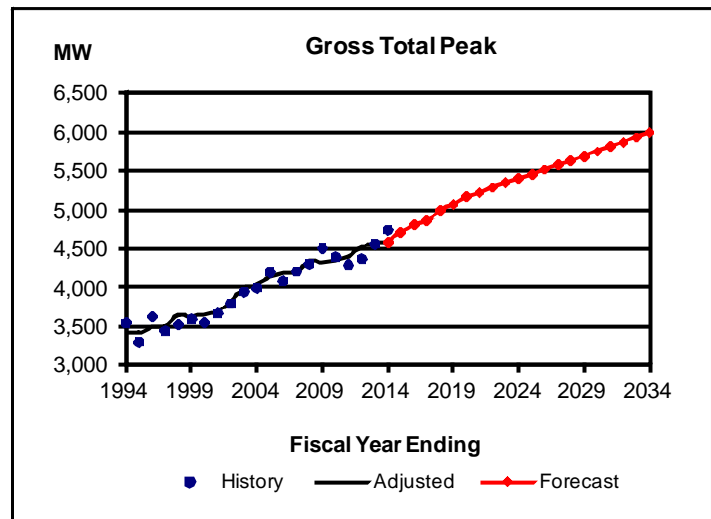
MONTHLY GROSS FIRM ENERGY (GW.h)													
History and Forecast													
2003/04 - 2033/34													
Fiscal Year	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total
2003/04	1,657	1,579	1,520	1,573	1,685	1,548	1,688	2,024	2,198	2,479	2,088	2,029	22,069
2004/05	1,699	1,683	1,545	1,579	1,575	1,574	1,793	1,952	2,411	2,539	2,098	2,140	22,589
2005/06	1,727	1,698	1,660	1,735	1,649	1,610	1,781	2,045	2,301	2,240	2,171	2,139	22,757
2006/07	1,712	1,690	1,681	1,826	1,746	1,622	1,870	2,092	2,303	2,458	2,304	2,159	23,464
2007/08	1,842	1,701	1,663	1,820	1,727	1,650	1,836	2,108	2,490	2,584	2,427	2,273	24,122
2008/09	1,881	1,737	1,662	1,730	1,787	1,681	1,874	2,154	2,652	2,702	2,226	2,331	24,417
2009/10	1,861	1,744	1,671	1,667	1,644	1,672	1,888	1,935	2,560	2,524	2,213	2,032	23,412
2010/11	1,699	1,692	1,611	1,716	1,698	1,638	1,778	2,129	2,563	2,682	2,322	2,364	23,892
2011/12	1,862	1,751	1,603	1,789	1,741	1,643	1,814	2,125	2,435	2,526	2,251	2,064	23,605
2012/13	1,802	1,698	1,688	1,869	1,727	1,606	1,941	2,265	2,665	2,766	2,342	2,383	24,750
2013/14	2,041	1,754	1,650	1,766	1,725	1,657	1,914	2,258	2,884	2,895	2,553	2,527	25,625
13/14 Wadj	1,842	1,778	1,665	1,801	1,678	1,683	1,895	2,218	2,636	2,800	2,371	2,310	24,677
10 Year Hist	15	14	11	21	17	17	18	26	33	46	25	27	269
Avg Growth	0.8%	0.8%	0.7%	1.2%	1.0%	1.1%	1.0%	1.3%	1.4%	1.8%	1.1%	1.2%	1.2%
2014/15	1,959	1,829	1,741	1,865	1,808	1,739	1,975	2,263	2,767	2,828	2,467	2,399	25,639
2015/16	1,996	1,864	1,774	1,900	1,842	1,773	2,012	2,306	2,820	2,882	2,514	2,445	26,130
2016/17	2,020	1,886	1,795	1,922	1,863	1,793	2,036	2,333	2,853	2,916	2,544	2,474	26,436
2017/18	2,076	1,938	1,846	1,977	1,916	1,844	2,093	2,398	2,932	2,997	2,615	2,543	27,174
2018/19	2,113	1,973	1,879	2,013	1,951	1,877	2,131	2,441	2,985	3,050	2,661	2,588	27,662
2019/20	2,157	2,015	1,919	2,056	1,993	1,917	2,176	2,492	3,047	3,115	2,717	2,643	28,247
2020/21	2,183	2,039	1,942	2,081	2,017	1,940	2,201	2,522	3,084	3,152	2,750	2,674	28,583
2021/22	2,210	2,064	1,966	2,106	2,042	1,964	2,229	2,553	3,122	3,191	2,784	2,707	28,937
2022/23	2,236	2,089	1,990	2,132	2,066	1,988	2,255	2,583	3,159	3,229	2,817	2,740	29,284
2023/24	2,263	2,113	2,013	2,157	2,090	2,011	2,282	2,614	3,196	3,267	2,850	2,772	29,626
10 Year Fcst	42	33	35	36	41	33	39	40	56	47	48	46	495
Avg Growth	2.1%	1.7%	1.9%	1.8%	2.2%	1.8%	1.9%	1.7%	1.9%	1.6%	1.9%	1.8%	1.8%
2024/25	2,289	2,138	2,036	2,182	2,114	2,034	2,308	2,644	3,233	3,305	2,883	2,804	29,970
2025/26	2,315	2,162	2,060	2,207	2,139	2,058	2,335	2,674	3,270	3,343	2,916	2,836	30,316
2026/27	2,341	2,187	2,083	2,232	2,163	2,081	2,361	2,705	3,307	3,380	2,949	2,868	30,659
2027/28	2,368	2,212	2,107	2,257	2,188	2,105	2,388	2,735	3,345	3,419	2,983	2,901	31,006
2028/29	2,394	2,236	2,130	2,282	2,212	2,128	2,415	2,766	3,382	3,457	3,016	2,933	31,352
2029/30	2,421	2,261	2,154	2,308	2,237	2,152	2,442	2,797	3,420	3,496	3,050	2,966	31,703
2030/31	2,448	2,287	2,179	2,334	2,262	2,177	2,469	2,828	3,459	3,535	3,084	2,999	32,061
2031/32	2,476	2,313	2,203	2,360	2,288	2,201	2,497	2,860	3,498	3,575	3,119	3,033	32,424
2032/33	2,505	2,339	2,229	2,387	2,314	2,226	2,526	2,893	3,538	3,616	3,155	3,068	32,796
2033/34	2,534	2,366	2,254	2,415	2,341	2,252	2,555	2,927	3,579	3,658	3,192	3,104	33,177
20 Year Fcst	35	29	29	31	33	28	33	35	47	43	41	40	425
Avg Growth	1.6%	1.4%	1.5%	1.5%	1.7%	1.5%	1.5%	1.4%	1.5%	1.3%	1.5%	1.5%	1.5%

Gross Total Peak

Gross Total Peak is the maximum integrated (i.e. average) hourly load required to serve Manitoba Hydro’s customers on the Integrated System. It excludes exports and Diesel Sales. It includes Station Service and Curtailable Loads.

Typically, the peak occurs on a very cold winter weekday either in the morning (often from 8 a.m. to 9 a.m.) or in the afternoon (from 5 p.m. to 6 p.m.) Electric heating contributes by placing the peak on one of the coldest days, whereas the operation or lack thereof of large industrials often makes the difference as to the specific day and peak hour.

Figure 19 - Gross Total Peak



The adjusted Gross Total Peak has grown from 3,403 MW in 1994/95 to 4,587 MW in 2013/14 at an average growth of 62 MW or 1.6% per year. It is forecast to grow to 5,995 MW at 70 MW (1.3%) per year by 2033/34.

Table 31 – Gross Total Peak

GROSS TOTAL PEAK (MW)					
HISTORICAL/ADJUSTED/FORECAST					
Fiscal Year	Peak	Adjustment	Adjusted Peak	Fiscal Year	Forecast Peak
1994/95	3,299	104	3,403	2014/15	4,716
1995/96	3,628	-151	3,477	2015/16	4,803
1996/97	3,444	49	3,493	2016/17	4,861
1997/98	3,525	122	3,647	2017/18	4,985
1998/99	3,596	21	3,617	2018/19	5,068
1999/00	3,555	98	3,653	2019/20	5,166
2000/01	3,672	13	3,684	2020/21	5,223
2001/02	3,797	4	3,800	2021/22	5,284
2002/03	3,948	31	3,979	2022/23	5,342
2003/04	3,994	38	4,033	2023/24	5,400
2004/05	4,201	-65	4,136	2024/25	5,458
2005/06	4,085	91	4,176	2025/26	5,516
2006/07	4,208	-19	4,189	2026/27	5,574
2007/08	4,304	29	4,333	2027/28	5,632
2008/09	4,509	-186	4,322	2028/29	5,690
2009/10	4,393	-48	4,345	2029/30	5,748
2010/11	4,286	115	4,401	2030/31	5,806
2011/12	4,367	155	4,523	2031/32	5,869
2012/13	4,559	-3	4,556	2032/33	5,931
2013/14	4,743	-155	4,587	2033/34	5,995

Table 32 - Monthly Gross Total Peak

MONTHLY GROSS TOTAL PEAK (MW)													
History and Forecast													
2003/04 - 2033/34													
Fiscal Year	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Annual
2003/04	3,242	2,587	2,871	2,877	2,921	2,901	2,988	3,467	3,791	3,994	3,743	3,465	3,994
2004/05	2,868	2,773	2,713	2,893	2,632	2,748	2,980	3,598	4,057	4,201	3,843	3,577	4,201
2005/06	2,959	2,845	3,052	3,116	3,050	2,837	2,948	3,672	3,912	3,630	4,085	3,498	4,085
2006/07	3,092	2,821	3,015	3,141	3,040	2,954	3,220	3,789	4,011	4,208	4,203	3,847	4,208
2007/08	3,494	2,736	3,042	3,294	3,033	2,777	2,979	3,996	4,078	4,304	4,289	4,095	4,304
2008/09	3,221	2,893	2,952	2,920	3,110	2,726	3,159	3,804	4,427	4,509	4,196	4,223	4,509
2009/10	3,196	2,933	3,000	2,758	2,933	2,982	3,054	3,297	4,393	4,256	4,092	4,235	4,393
2010/11	2,905	2,843	2,805	2,991	3,163	2,709	3,056	3,927	4,195	4,286	4,250	4,169	4,286
2011/12	3,183	2,886	3,056	3,278	3,189	3,045	3,129	3,756	4,095	4,367	4,270	3,608	4,367
2012/13	3,328	2,775	3,161	3,260	3,253	2,870	3,312	4,087	4,410	4,559	4,543	4,013	4,559
2013/14	3,622	3,129	3,103	3,179	3,276	3,227	3,448	4,026	4,656	4,743	4,579	4,541	4,743
13/14 Norm	3,351	2,971	3,082	3,194	3,178	2,979	3,252	3,966	4,485	4,554	4,446	4,133	4,587
10 Year Hist	33	26	24	29	53	27	34	48	57	74	55	72	55
Avg Growth	1.0%	0.9%	0.8%	1.0%	1.8%	1.0%	1.1%	1.3%	1.4%	1.8%	1.3%	1.9%	1.3%
2014/15	3,445	3,055	3,168	3,283	3,267	3,063	3,343	4,077	4,611	4,682	4,571	4,249	4,716
2015/16	3,511	3,112	3,227	3,341	3,321	3,120	3,406	4,156	4,696	4,769	4,655	4,330	4,803
2016/17	3,558	3,153	3,271	3,384	3,359	3,161	3,452	4,211	4,753	4,826	4,711	4,388	4,861
2017/18	3,650	3,235	3,356	3,474	3,446	3,244	3,543	4,321	4,875	4,950	4,831	4,502	4,985
2018/19	3,713	3,292	3,416	3,537	3,507	3,301	3,605	4,396	4,956	5,033	4,912	4,580	5,068
2019/20	3,785	3,357	3,484	3,609	3,576	3,367	3,678	4,483	5,052	5,131	5,006	4,669	5,166
2020/21	3,831	3,397	3,526	3,653	3,620	3,408	3,722	4,537	5,109	5,188	5,062	4,726	5,223
2021/22	3,878	3,440	3,570	3,699	3,665	3,450	3,768	4,593	5,168	5,248	5,121	4,785	5,284
2022/23	3,924	3,481	3,613	3,743	3,709	3,491	3,813	4,648	5,225	5,306	5,178	4,842	5,342
2023/24	3,970	3,521	3,655	3,787	3,752	3,532	3,858	4,703	5,282	5,364	5,234	4,898	5,400
10 Year Fcst	62	55	57	59	57	55	61	74	80	81	79	77	81
Avg Growth	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.6%	1.6%	1.6%	1.7%	1.6%
2024/25	4,016	3,562	3,697	3,831	3,796	3,573	3,902	4,757	5,339	5,422	5,290	4,955	5,458
2025/26	4,062	3,603	3,740	3,874	3,840	3,614	3,947	4,812	5,396	5,480	5,347	5,012	5,516
2026/27	4,108	3,644	3,782	3,918	3,883	3,655	3,991	4,866	5,452	5,537	5,403	5,068	5,574
2027/28	4,154	3,685	3,824	3,962	3,927	3,696	4,036	4,921	5,509	5,595	5,459	5,126	5,632
2028/29	4,200	3,725	3,867	4,006	3,971	3,737	4,081	4,975	5,566	5,653	5,515	5,183	5,690
2029/30	4,247	3,767	3,910	4,051	4,016	3,779	4,126	5,031	5,623	5,711	5,572	5,240	5,748
2030/31	4,294	3,809	3,954	4,096	4,061	3,821	4,173	5,087	5,682	5,771	5,631	5,299	5,808
2031/32	4,343	3,852	3,998	4,143	4,107	3,865	4,220	5,145	5,741	5,831	5,690	5,359	5,869
2032/33	4,392	3,896	4,044	4,190	4,154	3,909	4,268	5,203	5,802	5,893	5,750	5,420	5,931
2033/34	4,443	3,941	4,091	4,238	4,202	3,954	4,317	5,263	5,865	5,956	5,812	5,483	5,995
20 Year Fcst	55	48	50	52	51	49	53	65	69	70	68	67	70
Avg Growth	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.3%	1.4%	1.3%

Peak load is measured and recorded differently than energy data. The system load at every hour is calculated by System Operations as:

Hourly Gross Total Peak (t)

$$\begin{aligned}
 &= \text{Hourly Total Generation (t)} \\
 &- \text{Hourly Metered Exports (t)} + \text{Hourly Metered Imports (t)} \\
 &- \text{Losses Associated with Exports (t)} + \text{Gains Associated with Imports (t)} \\
 &+ \text{Curtailments (t)}
 \end{aligned}$$

Losses for exports and gains for imports are only known on a monthly energy basis. The hourly value is obtained by using the ratio of exports/imports for the hour to the total exports/imports for the month and applying that to the total metered loss/gain for the month. The remaining difference between the balance of the load and Common Bus is taken as the Transmission Losses associated with Manitoba load.

Curtailments for individual customers are calculated as the difference between what the customer would have used if not curtailed versus what they did use. This is not the same as the calculation used for billing.

Annual Peak

The forecast annual peak is higher than the maximum of the monthly peaks. This is because the peak can occur in any one of the winter months. The same characteristic is apparent in historical peaks. The average historical annual peak is higher than the maximum of the highest average monthly peaks. For studies requiring yearly data, the annual peak should be used.

16 Hour Peak

The peaks in this document are integrated hourly peaks. For some studies and analysis of avoided cost or DSM savings, an estimate of the average peak during onpeak hours (from 6 a.m. to 10 p.m.) may be desired. To convert hourly peak to 16 hour peak, multiply the hourly peak in the associated month by the following percentages:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
94.4%	94.9%	95.8%	96.0%	96.3%	96.0%	96.6%	95.6%	95.8%	96.6%	95.6%	95.5%	94.8%

VARIABILITY AND ACCURACY

Weather Effect and Weather Adjustment

The weather effect is determined in any sector every year by regressing the previous two years of actual monthly energies against the actual DDH and DDC for the month. This results in a GW.h per DDH effect and a GW.h per DDC effect for that sector for that year.

Only sectors whose major variation is due to weather can have a weather effect estimated. Sectors that vary primarily due to industrial output levels or seasonal but non-weather reasons may yield false weather effects if estimated. Weather effects are not determined for the GS Top Consumers, Seasonal, Diesel, Water Heating and Lighting sectors.

For sectors where a weather effect is calculated, this document will show energy as the reported value and as a weather adjusted value. Forecasts are based on the weather adjusted values. The calculations are:

$$\begin{aligned} \text{Weather Adjustment} &= \text{DDH weather effect} * (\text{DDH actual} - \text{DDH normal}) \\ &+ \text{DDC weather effect} * (\text{DDC actual} - \text{DDC normal}) \end{aligned}$$

$$\text{Weather Adjusted Actual} = \text{Actual} - \text{Weather Adjustment}$$

Following are the DDH and DDC weather effect factors by sector:

Residential Basic: 0.6 GW.h / DDH, 1.0 GW.h / DDC

GS Mass Market: 0.3 GW.h / DDH, 1.0 GW.h / DDC

General Consumers Sales: 0.9 GW.h / DDH, 2.0 GW.h / DDC

Gross Firm Energy: 1.1 GW.h / DDH, 2.5 GW.h / DDC

Gross Total Peak: 47 MW / degree (at -30 degrees Celsius),
103 MW / degree (at +30 degrees Celsius)

Effect of Extreme Weather

A record cold winter will increase load 4% and a record warm winter will decrease it 4%. An additional 2% load increase is possible due to a record hot summer and a 1% decrease due to a record cool summer.

The effect of extreme weather is larger on a monthly basis, and even larger on a daily basis.

Effect of Weather due to Winter Extremes on Gross Firm Energy									
GW.h/DDH 1.1		Normal		Record Warm			Record Cold		
		DDH	GW.h	DDH	GW.h	Effect	DDH	GW.h	Effect
Year:	2014/15	4,570	25,639	3,678	24,633	-4%	5,439	26,619	4%
Month:	Jan 2015	948	2,828	663	2,506	-11%	1,261	3,181	12%
Day:	Jan 2015	31	91	6	64	-30%	56	120	31%

Effect of Weather due to Summer Extremes on Gross Firm Energy									
GW.h/DDC 2.5		Normal		Record Cool Summer			Record Hot Summer		
		DDC	GW.h	DDC	GW.h	Effect	DDC	GW.h	Effect
Year:	2014/15	183	25,639	69	25,355	-1%	364	26,089	2%
Month:	July 2014	69	1,865	6	1,708	-8%	142	2,045	10%
Day:	July 2014	2	60	0	55	-9%	14	89	49%

The effect of a change in temperature on the load at the time of peak due to a 5 degree temperature difference is 16% in the summer and 5% in the winter.

		Effect of Change in Temperature on Gross Total Peak							
Summer	Winter	Normal		Warm Winter, Cool Summer			Cold Winter, Hot Summer		
MW/Deg	MW/Deg	Temp	MW	Temp	MW	Effect	Temp	MW	Effect
103	47								
Summer	2014/15	30	3,283	25	2,766	-16%	35	3,801	16%
Winter:	2014/15	-30	4,716	-25	4,481	-5%	-35	4,951	5%

Load Variability

Uncertainty is an inherent characteristic of forecasting. The load will vary both year to year and long term because of underlying changes in population growth, economic growth, changes in the operations of Top Consumers, and overall use patterns. An economic recession will slow energy growth and an economic boom will increase it. Cycles cannot be predicted in advance so some appropriate midpoint must be chosen as the forecast.

This forecast was created as Manitoba Hydro’s best estimate of Manitoba’s future energy requirement with an expectation of a 50% chance that actual growth will be higher than the forecast, and a 50% chance that actual growth will be lower than the forecast. This can also be called the P50 forecast.

To evaluate the potential for variation, historic load variability has been analyzed using a probabilistic-based approach. Doing this provides an estimate of the magnitude of the potential load variation from the forecast due to population, economy and other effects. 10% and 90% confidence bands (-/+ 1.28 standard deviations), also known as P10 and P90, were selected to be a proxy for the Low and High Load Forecast Scenarios for use in risk analysis studies. They are calculated as follows:

$$\text{Load} = \text{Base Forecast} \pm 1.28 \times \text{Standard Deviation}$$

For other probability points, substitute for the 1.28 the following numbers:

Prob	0.1%	2.5%	10%	20%	50%	80%	90%	97.5%	99.9%
Z(Prob)	-3.09	-1.96	-1.28	-0.84	0.00	0.84	1.28	1.96	3.09

This calculation gives the variability due to long term economic effects. It does not include variability due to weather which was removed through the use of weather adjusted load. The standard deviation of the weather variation has been found to be approximately 2% of both the energy and peak. Annual weather variations tend to be independent of the economy, so the variance due to weather can be added to the variance without weather to derive an overall variance that includes weather.

The following four charts and tables summarize the variability for energy and peak. By 2033/34, the Load Forecast has an 80% probability of being accurate to within $\pm 2,163$ GW.h or $\pm 6.5\%$. Due to the inherent variability of the load, this is the best level of accuracy possible.

The overall economic standard deviation in 2033/34 is 1,688 GW.h or 5.1% of the forecast energy. Analyzed individually, the economic standard deviation of the Top Consumers sector is 1,229 GW.h (15.2%), Residential is 457 GW.h (4.9%) and Mass Market is also 457 GW.h (4.0%), showing that the Top Consumers sector is the majority of the variance.

Figure 20 - Energy Variability

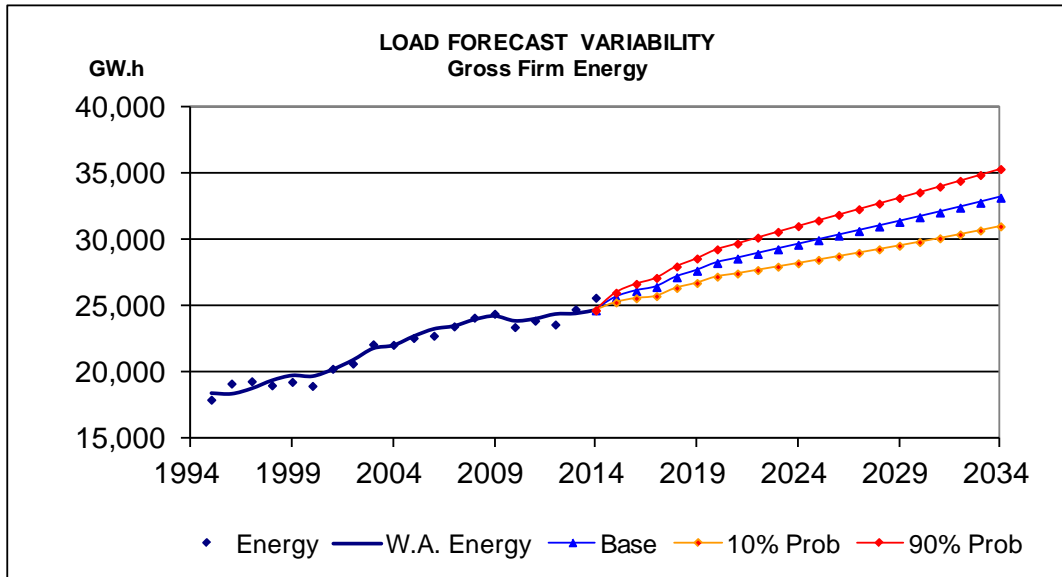


Table 33 – Energy Variability

Fiscal Year	Gross Firm Base Fcst	Long Term Economic Std Dev	10.0% Prob Point	90.0% Prob Point
2014/15	25,639	285	25,274	26,004
2015/16	26,130	424	25,586	26,673
2016/17	26,436	536	25,749	27,122
2017/18	27,174	633	26,363	27,986
2018/19	27,662	722	26,737	28,587
2019/20	28,247	804	27,217	29,277
2020/21	28,583	881	27,454	29,713
2021/22	28,937	955	27,713	30,161
2022/23	29,284	1,026	27,970	30,598
2023/24	29,626	1,093	28,225	31,028
2024/25	29,970	1,159	28,485	31,456
2025/26	30,316	1,223	28,748	31,883
2026/27	30,659	1,285	29,012	32,306
2027/28	31,006	1,346	29,281	32,731
2028/29	31,352	1,406	29,551	33,154
2029/30	31,703	1,464	29,827	33,580
2030/31	32,061	1,521	30,111	34,011
2031/32	32,424	1,578	30,403	34,446
2032/33	32,796	1,633	30,704	34,889
2033/34	33,177	1,688	31,014	35,339

Figure 21 - Peak Variability

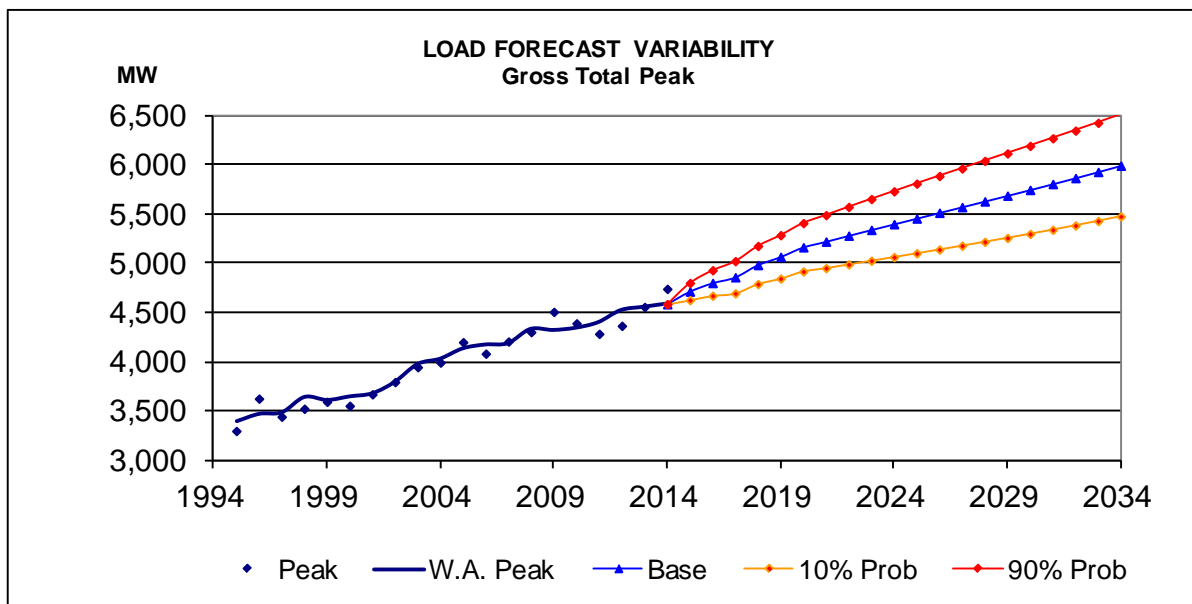


Table 34 – Peak Variability

Fiscal Year	Gross Total Peak Base Fcst	Long Term Economic Std Dev	10.0% Prob Point	90.0% Prob Point
2014/15	4,716	68	4,629	4,803
2015/16	4,803	101	4,673	4,932
2016/17	4,861	128	4,698	5,025
2017/18	4,985	151	4,792	5,179
2018/19	5,068	172	4,848	5,289
2019/20	5,166	192	4,920	5,411
2020/21	5,223	210	4,954	5,492
2021/22	5,284	228	4,992	5,575
2022/23	5,342	244	5,029	5,656
2023/24	5,400	261	5,066	5,734
2024/25	5,458	276	5,104	5,812
2025/26	5,516	292	5,143	5,890
2026/27	5,574	306	5,181	5,966
2027/28	5,632	321	5,221	6,043
2028/29	5,690	335	5,260	6,119
2029/30	5,748	349	5,301	6,196
2030/31	5,808	363	5,343	6,273
2031/32	5,869	376	5,387	6,351
2032/33	5,931	389	5,432	6,430
2033/34	5,995	402	5,479	6,510

5 and 10 Year Forecast Accuracy

Due just to the load variation caused by population growth and economic growth, there is only a certain level of accuracy possible. Using the load variability estimates of the previous section, it can be said that due to economic variability alone, there is less than a 50% chance that a 5 year energy forecast can be within 1.8% of the actual, and less than a 50% chance that a 10 year energy forecast can be within 2.5% of the actual.

Recognizing the inherent uncertainty of the forecast, historic forecast variation has been tracked. The following four figures and tables compare previous load forecasts to actual results 5 and 10 years later.

The energy savings achieved under Manitoba Hydro's market-based DSM programs between the year the forecast was prepared and the year being forecast was subtracted first from the forecast value. The difference is taken as the accuracy of the forecast.

The following figures and tables may seem to give the impression that there may be cycles in the forecast made up of alternating periods of over-forecasting and under-forecasting. But these are not so much due to a bias in the forecast as they are due to unexpected periods of recession or economic growth. Once one of these unexpected periods occur, it will affect the accuracy of the previous five 5-year forecasts for 5 years, and the accuracy of the previous ten 10-year forecasts for ten years.

Compensation for these periods of over and under-forecasting cannot be applied until after the events occur and only then can be identified and quantified. The forecast assumes average expected economic conditions. When that does not occur, the forecast will be high or low.

The weather adjusted Gross Firm Energy is shown in two separate columns in the Energy Accuracy table and they vary in each year due to the difference in weather normals used in each of the respected forecasts. Those weather normals differences are due to the use of a 25 year rolling average which relies on the previous 25 years of weather data at the time the forecast is created.

Figure 22 - Energy Accuracy

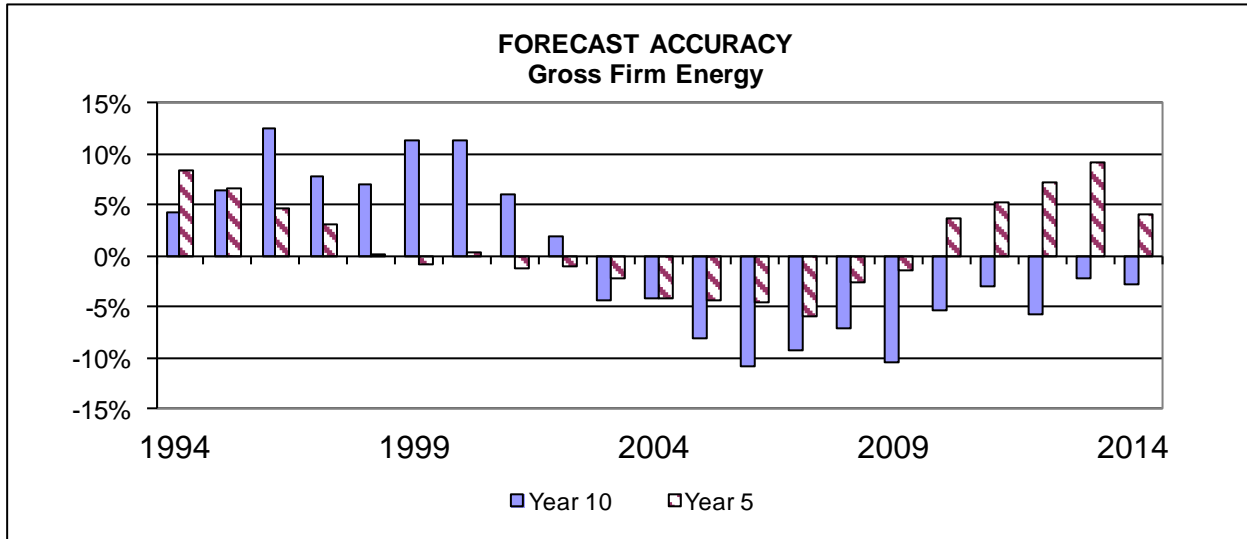


Table 35 - Energy Accuracy

Fiscal Year	Actual Gross Firm Energy	Forecast Prepared 5 Years Previous	W.A. Gross Firm Energy	5 Year Percent Accuracy	Forecast Prepared 10 Years Previous	W.A. Gross Firm Energy	10 Year Percent Accuracy
1993/94	18,201	19,637	18,113	8.4%	18,864	18,101	4.2%
1994/95	17,929	19,597	18,365	6.7%	19,554	18,365	6.5%
1995/96	19,148	19,179	18,318	4.7%	20,659	18,370	12.5%
1996/97	19,321	19,395	18,810	3.1%	20,174	18,716	7.8%
1997/98	19,014	19,455	19,429	0.1%	20,661	19,320	6.9%
1998/99	19,273	19,675	19,818	-0.7%	21,919	19,708	11.2%
1999/00	18,971	19,767	19,703	0.3%	21,833	19,629	11.2%
2000/01	20,262	20,018	20,241	-1.1%	21,300	20,103	6.0%
2001/02	20,656	20,783	20,980	-0.9%	21,364	20,979	1.8%
2002/03	22,110	21,395	21,861	-2.1%	20,916	21,868	-4.4%
2003/04	22,069	21,134	22,062	-4.2%	21,191	22,107	-4.1%
2004/05	22,589	21,693	22,664	-4.3%	20,870	22,714	-8.1%
2005/06	22,757	22,216	23,277	-4.6%	20,812	23,346	-10.9%
2006/07	23,464	22,107	23,489	-5.9%	21,395	23,595	-9.3%
2007/08	24,122	23,353	23,962	-2.5%	22,328	24,034	-7.1%
2008/09	24,417	23,926	24,259	-1.4%	21,756	24,320	-10.5%
2009/10	23,412	24,734	23,850	3.7%	22,611	23,892	-5.4%
2010/11	23,892	25,270	24,020	5.2%	23,330	24,071	-3.1%
2011/12	23,605	25,951	24,202	7.2%	22,966	24,376	-5.8%
2012/13	24,760	26,522	24,280	9.2%	23,902	24,443	-2.2%
2013/14	25,625	25,552	24,538	4.1%	23,978	24,696	-2.9%

Figure 23 - Peak Accuracy

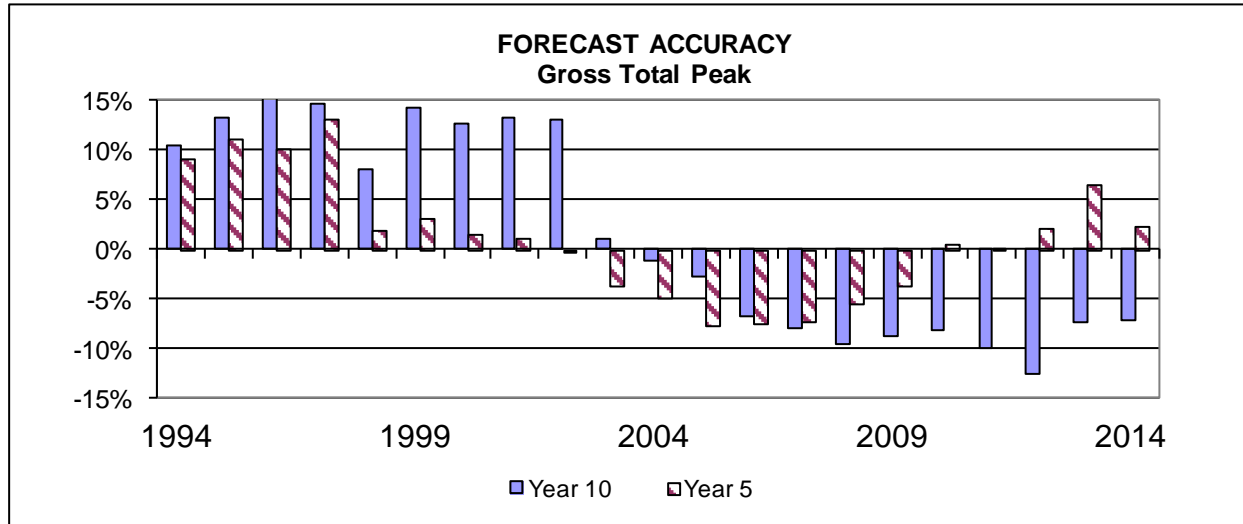


Table 36 - Peak Accuracy

Fiscal Year	Actual Gross Total Peak	Forecast Prepared 5 Years Previous	Normalized Gross Total Peak	5 Year Percent Accuracy	Forecast Prepared 10 Years Previous	Normalized Gross Total Peak	10 Year Percent Accuracy
1993/94	3,547	3,754	3,440	9.1%	3,799	3,440	10.4%
1994/95	3,299	3,829	3,446	11.1%	3,904	3,446	13.3%
1995/96	3,628	3,850	3,498	10.1%	4,081	3,498	16.7%
1996/97	3,444	3,906	3,457	13.0%	3,962	3,457	14.6%
1997/98	3,525	3,768	3,695	2.0%	3,990	3,695	8.0%
1998/99	3,596	3,703	3,593	3.1%	4,108	3,593	14.3%
1999/00	3,555	3,738	3,686	1.4%	4,152	3,686	12.6%
2000/01	3,672	3,758	3,719	1.1%	4,210	3,719	13.2%
2001/02	3,797	3,759	3,763	-0.1%	4,251	3,763	13.0%
2002/03	3,948	3,801	3,946	-3.7%	3,989	3,946	1.1%
2003/04	3,994	3,833	4,032	-4.9%	3,990	4,032	-1.1%
2004/05	4,201	3,817	4,136	-7.7%	4,023	4,136	-2.7%
2005/06	4,085	3,860	4,176	-7.6%	3,899	4,176	-6.6%
2006/07	4,208	3,894	4,202	-7.3%	3,868	4,202	-7.9%
2007/08	4,304	4,097	4,337	-5.5%	3,927	4,337	-9.5%
2008/09	4,509	4,161	4,323	-3.7%	3,948	4,323	-8.7%
2009/10	4,393	4,371	4,345	0.6%	3,993	4,345	-8.1%
2010/11	4,286	4,406	4,401	0.1%	3,967	4,401	-9.9%
2011/12	4,367	4,616	4,522	2.1%	3,952	4,522	-12.6%
2012/13	4,559	4,715	4,431	6.4%	4,108	4,431	-7.3%
2013/14	4,743	4,536	4,433	2.3%	4,119	4,433	-7.1%

LOAD SENSITIVITIES AND EXTREME EVENTS

Manitoba Hydro examines the effect of possible events on the load. The information presented here provides planners with an understanding of what the potential scale of these individual events may have on the system load requirements.

The individual effects of each event can be included in scenario or sensitivity analysis if the need arises. Each change in assumption can be individually applied to the forecast as required to capture the annual energy and peak effect of the desired assumption in any given year. All values are listed at Generation and include transmission and distribution losses.

A change of 1% in annual growth rate over 20 years would be equivalent to a 20% change in any individual event. Effects are summarized below, and the details of each effect follow.

Sensitivity of the Load to a Change In Assumptions	Annual Energy Effect (GW.h)	Peak Effect (MW)
1% Increase/Decrease in Population	± 130	± 24
1% Increase/Decrease in Income and GDP	± 125	± 23
1% Increase/Decrease in Electricity Price	∓ 62	∓ 11
1% Increase/Decrease in Gas to Electricity Price Ratio	± 0.5	± 0.1
Climate Change per Degree Celsius Warmer	+ 23	- 47

Certain events may have a significant effect on the load and are provided for scenario analysis.

Evaluation of Extreme Events	Annual Energy Effect (GW.h)	Peak Effect (MW)
If 0% or 100% of Residential had Electric Space Heat	-2,733, +4,796	-891, +1,564
If 0% or 100% Residential had Electric Water Heat	-892, +928	-102, +106
Increase/Decrease of One Very Large Industrial Customer	± 1,500	± 180
Maximum Potential Effect of Increased Online Shopping	- 846	- 156
Additional Load if 100% Electric Vehicle Saturation Rate	+ 4,172	+ 289
Illustrated Effect of Grid Parity (e.g. Solar Panels)	- 1,824	-104

For context, one year of energy growth is 425 GW.h and one year of peak growth is 70 MW.

Population / Economic / Price Changes

The population, economy and prices are the most significant drivers of the load in Manitoba. These variables are inputs to the econometric models utilized in this forecast. The individual effect of each driver based on the coefficients found in the models is summarized below.

Population: A 1% increase in population (12,686 people) results in a 1% increase in the number of Residential Basic customers (4,653 customers representing 74 GW.h) and a 0.60% change in the number of GS Mass Market Small and Medium customers (397 customers representing 41 GW.h). The total effect on Manitoba Gross Firm Energy would be 130 GW.h (0.53%).

Income / GDP: A 1% increase in real income results in a 0.27% increase in Residential average use (43 kW.h per customer and 20 GW.h overall). A 1% increase in Manitoba GDP results in a 0.55% increase in GS Mass Market Small and Medium average use (563 kW.h per customer totaling 37 GW.h). A 1% increase in Canada/US GDP results in 0.29% increase in GS Large Customer average use (15,934 kW.h per customer totaling 5 GW.h) and a 0.86% change in Top Consumers use (47 GW.h). The total effect of a 1% increase in Income and GDP together on Manitoba Gross Firm Energy is 125 GW.h (0.51%).

Electricity Price: A 1% increase in real electricity price results in a 0.26% decrease in Residential average use (-41 kW.h per customer totaling -19 GW.h). It will also result in a 0.12% decrease in GS Mass Market Small and Medium average use (-120 kW.h per customer totaling -8 GW.h); a 0.26% decrease in GS Mass Market Large average use (-14,213 kW.h per customer totaling -5 GW.h) and a 0.43% decrease in GS Top Consumers use (-23 GW.h). The total effect on Manitoba Gross Firm Energy is -62 GW.h (-0.25%).

Gas to Electricity Price Ratio: The gas to electricity price ratio is only modeled to affect new Residential construction therefore its effect is relatively small. A 1% increase in the ratio will result in 26 new electrically heated dwellings, with a total effect of about 0.5 GW.h.

	Energy (GW.h)	Peak (MW)
1% Increase/Decrease in Population	± 130	± 24
1% Increase/Decrease in Income and GDP	± 125	± 23
1% Increase/Decrease in Electricity Price	∓ 62	∓ 11
1% Increase/Decrease in Gas to Electricity Price Ratio	± 0.5	± 0.1

Climate Change

The Intergovernmental Panel on Climate Change projects an increase in global temperature as a result of rising concentrations of greenhouse gases in the atmosphere. Changes to temperature and extreme events have the potential to influence future energy demands.

In the last 100 years, the city of Winnipeg's 25-year average temperature has resulted in Degree Days Heating (DDH) in the range of 4,500 to 5,000 each year. A 25 year moving average is used for the forecast to help minimize the effects of year to year variability and to represent the long term climatology. This section quantifies the general effect caused by a 1°C increase in average daily temperature throughout the year.

In Manitoba Hydro's case, if Winnipeg experienced a uniform 1°C warming throughout the year, winter months would be subject to less heating while summer months would be subject to more cooling. Over 200 winter days, every degree Celsius of temperature rise above average conditions will result in an approximate decrease of 200 Degree Days Heating (DDH) per year, and a corresponding approximate increase of 100 Degree Days Cooling (DDC) per year over 100 summer days.

Applying the Weather effect for Manitoba Hydro at Generation gives:

Decrease of 200 DDH → -225 GW.h and -47 MW in the winter

Increase of 100 DDC → +248 GW.h and +103 MW in the summer

The resulting total effect of every one degree increase in temperature would be:

An increase of 23 GW.h to annual energy and a decrease of 47 MW to system peak.

	Energy (GW.h)	Peak (MW)
Climate Change per Degree Celsius Warmer	+23	-47

Change in Residential Use of Electricity for Space heat

Currently, 36.3% or 165,576 out of 456,130 Residential Basic customers heat their home with electricity. An increase of 1% in the percentage of customers with electric space heat would result in a change of 4,561 customers with electric space heat at 25,050 kW.h per customer, and a change of -4,561 customers without electric space at 10,572 kW.h per customer. The total Residential Basic increase would be 66 GW.h and 75 GW.h for Manitoba Gross Firm Energy. At a 35% load factor, this would be an increase of 25 MW at Peak.

If all Residential customers had electric space heat, then the additional load would be 4,796 GW.h. If no residential customers had electric space heat, then the reduction in load would be 2,733 GW.h

	Energy (GW.h)	Peak (MW)
If 0% or 100% of Residential had Electric Space Heat	-2,733, +4,796	-891, +1,564

Change in Residential Use of Electricity for Water heat

Currently, 49.0% or 223,500 out of 456,130 Residential Basic customers have electric water heat. An increase of 1% in the percentage of customers with electric water heat would result in a change of 4,561 customers with electric water heat using 3,500 kW.h per customer. The total Residential Basic increase would be 16 GW.h and 18 GW.h for Manitoba Gross Firm Energy. At a 100% load factor, this would be an increase of 2 MW at Peak.

If all Residential customers had electric water heat, then the additional load would be 928 GW.h. If no residential customers had electric space heat, then the reduction in load would be 892 GW.h

	Energy (GW.h)	Peak (MW)
If 0% or 100% Residential had Electric Water Heat	-892, +928	-102, +106

Potential Changes in Load from Very Large Industrial Customers

This forecast includes an expectation that there may be new large industrial users of electricity that may come to Manitoba. GS Top Consumers includes a Potential Large Industrial Loads category that adds 1,541 GW.h to GS Top Consumers by 2033/34. This is expected to be made up of increases and decreases by current top consumers, additions of new top consumers and company closures. However, this forecast does not anticipate the scenario of a single customer using up the entire PLIL projection.

Manitoba Hydro's largest customer currently uses in excess of 1,500 GW.h annually and has a coincident peak load of about 180 MW. It is feasible that one or more customers of this size could decide to start up in Manitoba in the next 20 years. A single large new customer could use the entire amount of energy that has been forecast under the Potential Large Industrial Loads projection.

Similarly, it is possible that one or more very large customers may discontinue operations in Manitoba. This could also be the equivalent of losing Manitoba Hydro's largest customer.

	Energy (GW.h)	Peak (MW)
Increase/Decrease of One Very Large Industrial Customer	± 1,500	± 180

Maximum Potential Load Effect of Increased Online Shopping

Online shopping is a growing service offering by many retailers. It is possible that this trend could lead to fewer retail establishments if online shopping becomes pervasive. The potential load reduction of such a scenario will be the electricity use of about 6,300 General Service customers in the Retail sector who currently use about 742 GW.h. At generation, this represents a potential total of 846 GW.h and 156 MW (using a 62% load factor). This assumes that the structures used for retail are torn down or are refurbished with other businesses that would otherwise have built a new structure.

	Energy (GW.h)	Peak (MW)
Maximum Potential Load Effect of Increased Online Shopping	-846	-156

Potential Load from High Adoption of Electric Vehicle Technology

This forecast includes the expected impact due to adoption of electric vehicles within Manitoba over the next twenty years. The specifics have been detailed in the Electric Vehicle Forecast section of this document.

It is possible that the current technological challenges will be solved, price will match those of internal combustion vehicles, and range anxiety will be alleviated. Should breakthroughs and advances in battery technology, changes in consumer perceptions, and price reductions happen in the next few years, it is possible that electric vehicles may grow to be the dominant vehicle.

The maximum load possible if 100% of all new passenger and commercial vehicles purchased every year are Plug-In Electric Vehicles (PEVs), then these vehicles would require 4,764 GW.h and 592 MW. Currently, the forecast for 2033/34 is 91 GW.h and 11 MW for PEVs, therefore the maximum additional load possible for 100% saturation would be an increase of 4,172 GW.h (10 years of load growth) and 581 MW (about 8 years of peak growth).

	Energy (GW.h)	Peak (MW)
Additional Load if 100% Electric Vehicle Saturation Rate	+4,172	+289

Illustrated Effect of Grid Parity

Grid Parity is when a customer will have an economic option to provide some or all of the electricity needs their home or business requires with an alternative energy source. Grid parity requires the self-generated kW.h cost to be competitive with utility power when considering operating, maintenance costs and a reasonable amortization period for capital costs.

Solar photovoltaic installations are frequently referenced in discussions related to grid parity as costs continue to decline. Initial adoption rates may be gradual and may take years to mature. For illustrative purposes, the effect at utility generation if 400,000 customers added solar panels each providing 4,000 kW.h per year with a 200% coincident load factor would be:

	Energy (GW.h)	Peak (MW)
Illustrated Effect of Grid Parity (e.g. Solar Panels)	-1,824	-104

ASSUMPTIONS

Economic Assumptions

Economic forecast assumptions are taken from the 2014 Economic Outlook and the 2014 Energy Price Outlook. These documents contain Manitoba Hydro's forecasts of economic variables including prices of electricity, natural gas and oil, Manitoba disposable income, Gross Domestic Product (GDP), Manitoba population and residential customers.

The following are the economic variables used in the preparation of this Electric Load Forecast:

Residential Customers - The number of Residential Basic customers in Manitoba is forecast to increase by 1.3% (5,802 units) in 2014/15 and averages 1.0% per year over the forecast period. This compares to a historical average increase of 1.0% per year over the last ten years. This is used in the Residential and GS Mass Market customer forecasts.

Electricity Prices - The electricity price forecast is based on CPI and rate increase projections used in the Integrated Financial Forecast. The real electricity price is forecast to increase by 2.2% in 2014/15, increase between 1.9% and 2.1% from 2015/16 to 2018/19 and then increase by 1.9% per year throughout the rest of the forecast period.

Natural Gas Prices – Manitoba Hydro views the natural gas price forecast as commercially sensitive information. Consistent with the Clean Environment Commission and Electric General Rate Application, this information will not be publicly disclosed. This is used in the Residential Basic forecast.

Manitoba Disposable Income - Real Manitoba disposable income annual growth was 1.2% for the past 10 years and 0.8% for the past 20 years. It is forecast to grow at 1.0% annually for the next 10 years and 1.2% annually for the next 20 years. This is used in the Residential forecast.

Gross Domestic Product (GDP) - Real economic growth in Manitoba is forecast to be 2.2% in 2014/15. It is expected to grow to 2.7% by 2016/17 and then drop to 1.6% by 2020/21 and then stay at that level for the remainder of the forecast period. This is used in the GS Mass Market and GS Top Consumer forecasts.

Normal Weather Assumptions

Weather for forecast purposes is measured by degree days. Winnipeg temperatures are used, as Winnipeg is central to most of the weather-dependent load (Residential and General Service Mass Market) in Manitoba.

Cold weather is expressed in Degree Days Heating (DDH), which is the number of average degrees colder than 14 degrees Celsius each day. Hot weather is expressed in Degree Days Cooling (DDC), which is the number of average degrees warmer than 18 degrees Celsius each day. Daily temperature is the average of the high and low temperature for the day. The equations are:

$$\text{DDH} = \text{sum} (\max(0, 14 - (\text{Daily high} + \text{Daily low}) / 2))$$

$$\text{DDC} = \text{sum} (\max(0, (\text{Daily high} + \text{Daily low}) / 2 - 18))$$

The base temperature of 14 degrees for DDH is the temperature below which most buildings have their heating systems (furnaces) running.

The base temperature of 18 degrees for DDC is the temperature above which buildings start to run their space cooling systems (air-conditioning).

The forecast is prepared assuming normal weather. Normal weather is determined from the 25 year average of Degree Days Heating and Degree Days Cooling in Winnipeg over the period April 1989 to March 2014.

The 25 year weather normals used for every year of this forecast are 4,569.8 DDH and 182.9 DDC. This is an increase of 28.5 DDH from last year's normal of 4,541.3 DDH, and a decrease of 7.2 DDC from last year's normal of 190.1 DDC.

The range of DDH from 1989 to 2014 was from a warm winter of 3,677.6 DDH in 2011/12 (892.2 DDH below normal) to a cold winter of 5,439.3 DDH in 1995/96 (869.5 DDH above normal).

The range of DDC from 1989 to 2014 was from a cool summer of 71.8 DDC in 2004/05 (111.1 DDC below normal) to a hot summer of 270.3 DDC in 1989/90 (87.4 DDC above normal).

Demand Side Management (DSM) in the Forecast

This forecast reflects future DSM savings associated with existing Provincial building codes and improved equipment efficiency standards (Codes and Standards). This is the only DSM initiative that is specifically accounted for in the forecast.

Savings due to DSM programs to date are embedded in the historical data that is the basis for this forecast. The current level of past achieved DSM savings is assumed to remain in place throughout the future. Future DSM savings arising from future Power Smart offerings and market engagement above the current level and incremental to the above mentioned Codes and Standards are treated as a supply-side resource and are not reflected in this forecast. They are accounted for separately in Manitoba Hydro's Power Smart.

As a result, historical growth rate in this document are not directly comparable to future growth rates because the history includes the effect of past DSM initiatives, but the forecast does not.

For customers involved in DSM initiatives such as the Load Displacement and Alternative Energy, the forecast excludes the effect of the initiatives, and project the load without the savings due to the initiatives.

Price / Income / GDP Elasticity

The economic effects of price, income and GDP have been incorporated into the 2014 forecast. The elasticity of each has been estimated from econometric modeling. See the Methodology section for more details. A summary of the elasticities found is:

	Price Elasticity	Real Income Elasticity	Real GDP Elasticity
Residential Basic	-0.26	0.27	
GS Mass Mkt Small/Medium	-0.12		0.55
GS Mass Mkt Large	-0.26		0.29
GS Top Consumers	-0.43		0.86
Gross Firm Energy	-0.25	0.51 (Income + GDP combined)	

METHODOLOGY

Residential Basic Methodology

The Residential Basic forecast was derived from population forecasts contained in Manitoba Hydro's 2014 Economic Outlook produced by the Economic Analysis Department, combined with an average use forecast developed from an econometric model. These results were then embedded into a residential end use model. The following components make up the end use model:

1. **Forecast Residential Dwellings** - The forecast of the total number of Residential Basic customers for the 2014/15 to 2033/34 period was taken from the 2014 Economic Outlook. The customer forecast is based on the average of several Manitoba population forecasts from various external agencies multiplied by a forecast of the people per customer ratio. The customer forecast is reduced by about 0.5% to account for customers with multiple services to obtain the forecast of individual dwellings.
2. **Determine Historical and Forecast Dwelling Breakdowns** – Historical data was taken back to 2009, the year of the last Residential Energy Use Survey. Billing data between 2009/10 and 2013/14 was used to update the survey data. The number of historical dwellings each year since 2009/10 was broken down by dwelling type (Single-Family Detached, Multi-Family Attached, and Individually-Metered Apartment suites) within each fuel region (Winnipeg, Gas Available outside Winnipeg and No Gas Available). Demolitions were estimated and the historical percentage of the number of new dwellings out of the total was applied to each regional dwelling forecast.
3. **Historical Space Heating Systems** – The number of historical dwellings by type and region were each divided into nine space heating systems: Electric Forced Air Furnace, Electric Baseboard, Electric Ground Source Heatpump, Electric Boiler, Gas High-Efficiency Furnace, Gas Mid-Efficiency Furnace, Gas Standard-Efficiency Furnace, Gas Boiler, and Other heat that is not billed for gas or electric. Starting percentages for 2009/10 were taken from the 2009 Residential Survey.

4. **Forecast of Space Heating Systems in New Dwellings** – Econometric equations were developed to forecast the number of electric space heating systems in new single detached and multi attached dwellings in Winnipeg and South Gas regions as follows:

Logit (Percentage of New Dwellings (t))

= -7.27 + 5.09 * PGEFF (lag(t))	Single Detached, Winnipeg
= -2.10 + 3.01 * PGEFF (lag(t))	Single Detached, South Gas
= -8.31 + 9.67 * PGEFF (lag(t))	Multi Attached, Winnipeg
= -2.42 + 4.91 * PGEFF (lag(t))	Multi Attached, South Gas

Logit	- A log transformation of percentages used for saturation analysis
PGEFF	- Ratio of the gas to electricity price for high efficiency furnaces
lag(t)	- The weighted average (30%, 40%, 30%) of the 3, 4 and 5 year lags

R-squared: 35.7%, 72.4%, 28.8%, 49.1%

T-stats:

Constant:	-7.06, -7.53, -3.63, -3.22
PGEFF:	3.49, 7.59, 2.98, 4.61

5. **Forecast of Space Heating Systems in Existing Dwellings** – The average age of heating systems in existing dwellings was determined from the 2009 Residential Energy Use Survey. The number of replacements was estimated using a Weibull distribution based on average age of furnaces. Switches of furnace types were estimated using survey respondents in older dwellings with newer heating systems. Their former heating system was determined from billing system notes and inventory.
6. **Forecast of Water Heating Systems in New and Existing Dwellings** – Electric and natural gas water heater saturations and average age were estimated for dwellings with and without natural gas space heat using information from the 2009 Residential Energy Use Survey. The number of replacements was forecast using a Weibull distribution based on the average age of water heaters and switches between fuels were taken into account when forecasting future numbers of water heaters.
7. **Other End Uses** – Other major uses of residential electricity were forecast by dwelling type, including central air conditioning, major appliances, televisions and lighting using the saturation data from the 2009 Residential Energy Use Survey.

8. **Space Heating, Water Heating and Appliance Usage** – Conditional Demand Analysis using the 2009 Residential Survey data combined with 2009/10 customer annual use from billing data was used to derive the average annual energy use for different types of heating systems and appliances for existing and for newer dwellings. These average uses were multiplied by the number of each type of system and appliance to get the forecast of total energy use.
9. **Determine Overall Average Use** – An econometric model was used to forecast the average annual electricity use per customer of the Residential Basic sector. The Average Use per customer without Demand Side Management (DSM) programs and Codes & Standards (C&S) savings was used as the dependant variable in the econometric log model. Historical yearend data from 1989/90 to 2013/14 was modeled. The resulting model and parameters are :

Log ((Total Use + DSM Programs + C&S) / customers)

$$=6.529 + 1.596 \times \text{Ratio} - 0.256 \times \text{Log Elec Price} + 0.270 \times \text{LIncomeE} + 0.005 \times \text{Trend}$$

Ratio - Electric Heat Customer Count / Total Res Basic Customer Count

Log Elec Price - Natural Log of Manitoba Real Residential Electricity Price lagged 2.5 yrs

LIncome - Natural Log of Manitoba Real Income per Residential Basic Customer

R-squared: 99.4%

T-stats:

Constant:	6.89
Ratio:	3.33
Log Elec Price:	-3.45
LIncomeE:	2.99
Trend:	5.26

10. Determine Total GW.h used

The forecast number of dwellings multiplied by the overall average use determined the GW.h forecast. Annual savings estimates from the Heating Fuel Choice Initiative were subtracted, forecast Codes and Standards energy savings as outlined in the 2014-2017 Power Smart Plan 15 year Supplementary Analysis Report were subtracted, and future use of Electric Vehicles in the Residential sector was added. The result was the forecast of Residential Basic customer total energy use. This excludes savings from future Demand Side Management programs.

General Service Mass Market Methodology

A) General Service Mass Market Customer Forecast

Econometric analysis of historical sales data is used to develop models to forecast the number of General Service Mass Market customers. Forecasts of Manitoba GDP and Manitoba Hydro Residential Customers from the 2014 Economic Outlook are then input into the models, which generate forecasts for the number of customers for each year of the forecast period.

The number of customers at fiscal yearend was forecast using the following calculations for each year (t):

Number of Customers (t)

$$\begin{aligned} &= \text{Number of Customers (t-1)} \\ &+ \text{Change in the Number of Customers (t)} \end{aligned}$$

Change in the Number of Customers (t)

$$\begin{aligned} &= \text{Number of Customers (t-1)} \\ &\times \text{Percentage Change in Number of Customers (t)} \end{aligned}$$

The percentage change in number of Small Non-Demand, Small Demand and Medium customers was modeled using yearend historical customer data from 1984/85 to 2013/14. The resulting model and parameters are as follows:

Percentage Change in Number of Customers (t)

$$= -0.002 + 0.129 \times \text{LCGDP} + 0.601 \times \text{CRES}$$

LCGDP - Annual Lagged Percentage Change in Manitoba Gross Domestic Product

CRES - Annual Percentage Change in Residential Basic Customers

R-squared: 60.6%

T-stats:

Constant:	-1.45
CGDP:	4.08
CRES:	4.19

The number of General Service Large customers was modeled using yearend historical customer data from 1989/90 to 2013/14. The resulting model and parameters are as follows:

$$\begin{aligned} \text{Number of GS Large Customers (t)} \\ = 11.694 + 0.005 \times \text{GDP} \end{aligned}$$

R-squared: 97.7%

T-stats:

Constant:	1.53
GDP:	31.56

B) General Service Mass Market Average Use Forecast

Historical Average Use was calculated by removing the effects of DSM and Codes & Standards. Average use for Small Non-Demand, Small Demand and Medium classes are forecast using econometric log model with Electricity Price and Manitoba GDP included in the regression.

Average Use of Small Non-Demand, Small-Demand and Medium classes were modeled using historical data from 1989/90 to 2013/14. The resulting model and parameters are as follows:

Log Average Use

$$= 5.835 - 0.118 \times \text{Log Elec Price} + 0.554 \times \text{LGDP} - 0.033 \times \text{Dummy}$$

Log Elec Price - Natural Log of Manitoba Real GSMM Electricity Price

LGDP - Natural Log of Manitoba Real Gross Domestic Product

Dummy - "1" after year 2006/07, due to a billing system change causing a reclassification of customers in 2006/07.

R-squared: 98.5%

T-stats:

Constant:	10.81
Log Elec Price:	-2.03
LGDP:	13.06
Dummy:	-3.18

The Average Use for Large Mass Market customers was modeled using historical data from 1989/90 to 2013/14. The resulting model and parameters are as follows:

Log Average Use

$$=13.528 - 0.256 \times \text{Log Elec Price} + 0.287 \times \text{LGDP}$$

Log Elec Price - Natural Log of Manitoba Real GSMM Electricity Price

LGDP - Natural Log of Cross Real Gross Domestic Product (equally weighted on Canadian and US GDP)

R-squared: 94.2%

T-stats:

Constant:	23.23
Log Elec Price:	-2.30
LGDP:	6.47

Top Consumer customers are excluded from these classes for forecasting purposes.

Customers are assigned to a rate class depending on their usage. If usage by an individual customer increases (or decreases) sufficiently then they will be re-assigned to the appropriate rate class. These shifts tend to offset each other over time so individual classes have not shown significant upward or downward trends in average use. By definition, the truncation of these classes results in relatively stable average use for each class.

C) General Service Mass Market Total Use Forecast

General Service Mass Market customer growth is assigned to Small Non Demand, Small Demand and Medium classes by using their 5 year average use by class and allocating the customers appropriately.

Total GW.h for the General Service Mass Market sector is forecast by multiplying the forecast number of customers in each rate class by the forecast average use. Codes and Standards energy savings from the 2014-2017 Power Smart Plan 15 Year Supplementary Analysis Report were subtracted, and future use of Electric Vehicles in the Mass Market sector was added.

General Service Top Consumers Methodology

Each company in the Top Consumers group is forecast individually. Information on individual company operating plans is collected from industry news, Manitoba Hydro's economic experts and Manitoba Hydro's Key & Major Account advisors. This information is used to prepare company specific short term forecasts for committed projects that are known for the next 3 to 5 years. The company's individual forecast is then held constant for the years following.

To account for longer term energy requirements in this group of consumers, a special classification called Potential Large Industrial Loads (PLIL) has been created. PLIL is used instead of attempting to forecast each top consumer individually for the long term. It represents the natural growth or contraction of all the top consumers as a group, as well as unexpected major expansions, new customers, or loss of customers.

To forecast PLIL, an econometric model was used. Historical effects of Demand Side Management (DSM) energy savings were removed from the Top Consumer load. An econometric log model was developed by applying Top Consumer Electricity Price and equally weighted Canadian and US Real GDP.

Total Load of Top Consumers was modeled using historical data from 1983/84 to 2013/14. The resulting model and parameters are as follows:

Log Total Load

$$=1.477 - 0.426 \times \text{Log Top Price} + 0.862 \times \text{LGDP}$$

Log Top Price - Natural Log of Manitoba Real Top Consumers Electricity Price

LGDP - Natural Log of Cross Real Gross Domestic Product (equally weighted on Canadian and US GDP)

R-squared: 97.6%

T-stats:

Constant:	2.27
Log Top Price:	-2.95
LGDP:	15.98

Electric Vehicles

The methodology for forecasting Electric Vehicles used historical data on automobile registrations per year in Manitoba to help estimate future trends. Appropriate assumptions from recent relevant literature were applied to Manitoba's situation. The forecast section on Electric Vehicles provides further details.

Other Sectors

Seasonal, Water Heating, Lighting

Most of the smaller sales sectors, including Seasonal, Flat Rate Water Heating and Area and Roadway Lighting were done by analysis of changes in the number of customers or services and in changes in average use per customer or service. Growth rates were applied based on history and a best estimate as to what the future will bring.

Diesel

Each of the diesel generated supplied communities was individually forecast and included in the forecast under the assumption that these communities are not anticipated to be connected to the Integrated System during the forecast period.

Monthly Sales Allocations

Monthly percentages of customer growth through the year and GW.h for the month of the year were averaged for the past five years. These were applied to the forecast annual customers and kW.h to get the monthly forecast.

Monthly and Annual Gross Firm Energy and Gross Total Peak

The 5 year monthly percentage of Common Bus and Station Service are applied to their annual energy to calculate their monthly values. Transmission Losses are calculated using a 5 year average of their ratio to Common Bus. Monthly Common Bus, Transmission Losses and Station Service are added up to give the Monthly System Energy. Monthly Common Bus, Transmission Losses, Station Service and Gross Firm Energy are totaled to give the Annual Gross Firm Energy.

The Gross Total Peak is calculated from Load Factors applied to the forecast monthly Gross Total Energy. Prior to calculating the Load Factors, the Top Consumer energy and peak are subtracted because the Top Consumers have a higher average hourly energy relative to their peak value than the Residential and General Service Mass Market Customers. A 10 year historical average Load Factor is calculated for the remaining energy and is applied to the forecast monthly energy to get the peaks for the remaining energy. The Top Consumer peaks are added using an 95% Load Factor applied to the Top Consumer monthly energy.

The annual Gross Total Peak is calculated using the 3 month winter Load Factor for the winter months of December, January and February applied to the energy for the same three months.

Historical weather adjusted energy is used to calculate the annual Load Factor. The historical trend of the load factor increasing 0.1% per year is applied to the forecast. The number of hours in the month is used to calculate monthly Load Factors and the number of hours in the three winter months is used to calculate annual Load Factors.

Growth Rates

Annual GW.h/year growth rates in this document are linear growth rates, calculated as:
$$\text{GW.h growth} / \text{number of years}.$$

Annual percentage growth rates in this document are compound growth rates calculated as:
$$(\text{final GW.h} / \text{initial GW.h})^{(1 / \text{number of years})} - 1.$$

GLOSSARY OF TERMS

Area and Roadway Lighting sector - includes electricity sales for the Sentinel Lighting and Street Lighting rate groups.

Common Bus - is the total load measured from all the distribution points (i.e. substations) within Manitoba. It includes all energy supplied to General Consumers Sales customers, Construction Power plus associated Distribution Losses, but excludes Diesel customers, Transmission Losses and Station Service.

Customer – Most metered electrical services count as a customer. Unmetered services such as flat rate water heating and sentinel rental services do not count as a customer. Street lighting counts all the services grouped as a premise as one customer.

Codes and Standards – A Demand Side Management (DSM) initiative associated with existing Provincial building codes and improved equipment efficiency standards. This is the only DSM initiative that is specifically accounted for in the forecast.

Curtaillable - is a load that can be curtailed on short notice. A discount is given for subscribing to this program. Curtailable loads can affect peak demand because some periods of curtailment may be at or near the system peak.

Degree Days Cooling (DDC) - DDC is a measurement designed to reflect the demand for energy needed to cool a building. DDC is the number of degrees warmer than 18 degrees Celsius each day is, based on the average of the high and low temperature of the day.

$$\text{DDC} = \text{sum} (\max(0, (\text{Daily high} + \text{Daily low}) / 2) - 18)$$

Degree Days Heating (DDH) – DDH is a measurement designed to reflect the demand for energy needed to heat a building. DDH is the number of degrees colder than 14 degrees Celsius each day is, based on the average of the high and low temperature of the day.

$$\text{DDH} = \text{sum} (\max(0, 14 - (\text{Daily high} + \text{Daily low}) / 2))$$

Gas Available Area – A city or town in Manitoba where customers have natural gas service available and can choose to heat their dwelling with either natural gas or electricity.

Approximately 82% of Residential Basic customers, including the entire city of Winnipeg, have gas available.

General Consumers Sales - includes the energy supplied to all of Manitoba Hydro's individually billed customers. It excludes export sales.

General Service Mass Market - includes all Commercial and Industrial customers, excluding the Top Consumers group.

General Service Sector - made up of sales to Commercial and Industrial businesses served by Manitoba Hydro. This sector consists of five rate groups (Basic, Diesel, Seasonal, Flat Rate Water Heating and Surplus Energy Program).

General Service Top Consumers - is made up of the largest electricity users of Manitoba Hydro.

Gross Firm Energy - is the energy required to serve Manitoba Hydro's customers on the Integrated System. It excludes exports, interruptible (non-firm) loads and diesel customers.

Gross Total Peak - is the maximum integrated (i.e. average) hourly load required to serve Manitoba Hydro's customers on the Integrated System. It excludes exports and diesel customers. It includes curtailable loads.

GW.h (gigawatt-hour): The unit of energy primarily used in this document. One GW.h equals one million kW.h (kilowatt-hours), which is approximately equal to the energy of 100 typical dwellings not using electricity for heating, or 40 dwellings that use electricity for heating.

Integrated System - is the power grid that connects Manitoba Hydro's generation sources to its customers. All Manitoba Hydro's customers except diesel are on the Integrated System.

Interruptible (Non-Firm) Energy - includes all energy sold to Manitoba customers on a non-firm basis. Currently, the only rate group for this is the Surplus Energy Program (SEP).

kW.h/cust (kilowatt-hours per customer): The unit of energy primarily used in this document to represent the average use of one customer. The total usage in GW.h of a group of customers is divided by the number of customers and then multiplied by one million.

Load Factor - is the ratio of the average hourly energy over a period, usually a year, divided by the energy used at a specific hour, usually the hour of system peak. A load factor of 25% means that the average energy is one-quarter of what is used at system peak. A load factor greater than 100% means that the average hourly energy is more than what is used at system peak. Given a specific energy, a lower load factor means a higher peak. The equation is:

$$\text{Load Factor} = (\text{Total Energy} / \text{Hours}) / (\text{Energy over the hour of system peak})$$

Manitoba Load at Common Bus - is the total load measured from all the distribution points (i.e. substations) within Manitoba. It includes all energy supplied to General Consumers Sales customers plus associated Distribution Losses, but excludes diesel customers, Transmission Losses and Station Service.

MW (megawatt): The unit of peak demand primarily used in this document. One MW is a million watts. One thousand MW of peak demand for one hour equals one GW.h of energy. Alternatively, one MW for a thousand hours also equals one GW.h of energy.

Net Firm Energy and **Net Total Peak** - are the same as Gross Firm Energy and Gross Total Peak except they exclude Station Service. The reporting of Manitoba Load in the Load Forecast used "Net" until 2008. It presented both until 2011. Starting with the 2012 forecast, only the "Gross" is presented. Net can be calculated when needed by subtracting Station Service from the Gross.

Residential Basic – is the primary residential customer group made up of single detached and multi-family dwellings as well as individually metered apartment suites.

Residential sector - made up of sales to residential customers for non-business operations. The Residential sector is comprised of four rate groups (Basic, Diesel, Seasonal, and Flat Rate Water Heating).

Station Service - is the energy used by power plants to generate power and service their own load.