Load Forecast and Power Smart Plans MFR 1

File most current Load Forecast and Power Smart Plan (incl. 15-year supplement)

The 2015/16 Power Smart Plan was filed as Attachment 2 to Manitoba Hydro's response to COALITION/MH I-69 during the 2015/16 & 2016/17 General Rate Application. Please find the 15-year Supplemental Report to the 2015/16 Power Smart Plan as Attachment 24 and the 2015 Load Forecast as Attachment 25 to the 2016/17 Supplemenal Filing.

2015
ELECTRIC LOAD FORECAST

MARKET FORECAST
JUNE 2015

Manitoba Hydro

EXECUTIVE SUMMARY

Overview

The Gross Firm Energy in Manitoba is forecast to grow from a weather adjusted value of 25,493 GW.h in 2014/15 to 29,999 GW.h in 2024/25. This average growth is 451 GW.h or 1.6% per year for 10 years. By 2034/35, Gross Firm Energy is forecast to be 35,011 GW.h, a twenty-year growth rate of 476 GW.h or 1.6% per year.

Gross Total Peak is forecast to grow at about the same pace, growing 75 MW or 1.5% a year for the next 10 years, and 81 MW or 1.5% a year for the next 20 years. In 20 years, the peak will grow from 4,726 MW to 6,341 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%, 1.8% and 1.9% respectively. During the last 10 years, Gross Firm Energy has grown 283 GW.h or 1.2% per year. This ten year period includes the 2009 economic downturn that slowed growth and also reflects the influence of Manitoba Hydro's Demand Side Management activities.

The primary driver of growth in Manitoba is the population, with the secondary driver being the economy. The population of Manitoba has grown from 1,174,000 people in 2004/05 to 1,286,000 people in 2014/15, averaging 0.9% growth per year. Manitoba's population is forecast to grow to 1,608,000 by 2034/35, averaging 1.1% per year. The Provincial Nominee Program which is expected to help sustain annual growth trhough immigrants. Gross Domestic Product (GDP) in Manitoba is forecast to be 1.8% from 2018/19 to the end of the forecast. Combined Canada and US GDP is forecast to be 2.3% from 2021/22 to the end of the forecast.

Three main components represent the majority of Manitoba's electricity use:

1. **Residential Basic** customer growth is expected to mimic population growth, growing 1.1% per year over the next 20 years. An increase in average use per customer adds 0.1% to the growth and is mainly due to increased use of electric space and water heating in dwellings.

2. **General Service Mass Market** is forecast to grow at an average 1.8% per year, comparable to its historic growth of 1.7% per year over the past twenty years.

3. **General Service Top Consumers** is forecast to grow at 1.9% per year. This is higher than its 0.1% growth per year during the past ten years which included the loss of one Top Consumer and an economic downturn; but it is less than the 4.0% growth per year during the prior ten years. Combined, the 20 year historical growth of the Top Consumers has been 1.9% per year. Expected short term committed loads include 852 GW.h of growth in the Pipeline sector, a Top Consumer load decrease of 326 GW.h, and other Top Consumer increases totaling 265 GW.h.

Change Between the 2014 and 2015 Forecast

The Gross Firm Energy forecast for the first ten years is similar to the 2014 forecast. After 2024/25, the differences begin to increase primarily due to increases in both General Service Mass Market and Residential Basic due to higher average use expectations for GSMM and a higher population forecast in the latter years. By 2033/34 the increase in the 2015 forecast is 1,141 GW.h higher than the 2014 forecast. This equates to a 3.4% increase in the forecast of 2033/34, which is a gain of just over two years of load growth (1 year = approximately 475 GW.h).

The Gross Total Peak forecast in 2033/34 is up 225 MW compared to the 2014 Load Forecast, almost three years of load growth (1 year = approximately 80 MW).

Load Sensitivities and Extreme Events

This information has been quantified for the purpose of sensitivity or scenario analyses:

	Energy (GW.h)	Peak (MW)
1% Increase/Decrease in Population	± 134	± 25
1% Increase/Decrease in Income and GDP	± 132	± 25
1% Increase/Decrease in Electricity Price	∓ 69	∓ 13
1% Increase/Decrease in Gas to Electricity Price Ratio	± 1.7	± 0.3
Climate Change per Degree Celsius Warmer	+ 39	- 48
If 0% or 100% of Residential had Electric Space Heat	-2,822, +4,687	-920, +1,528
If 0% or 100% Residential had Electric Water Heat	1011, +858	-115, +98
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	+ 5,318	+ 665
Illustrated Effect of Grid Parity (e.g. Solar Panels)	-857	-78

(For comparison, 1 year of load growth is approximately 475 GW.h or 80 MW)

Table 1 - Gross Energy and Peak

	GROSS FIRM ENERGY AND GROSS TOTAL PEAK History and Forecast 2004/05 - 2034/35				
	Gross Firm Energy		Gross Total Peak		Load Factor
Fiscal Year	(GW.h)	Growth (%)	(MW)	Growth (%)	(%)
2004/05	22,589		4,201		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%
2014/15	25,505	-0.5%	4,713	-0.6%	61.8%
2014/15 Wadj	25,493	0.0%	4,726	0.3%	61.6%
10 Year Avg Gr.	283	1.2%	60	1.4%	
2015/16	26,145	2.6%	4,829	2.2%	61.8%
2016/17	26,792	2.5%	4,936	2.2%	62.0%
2017/18	27,126	1.2%	5,000	1.3%	61.9%
2018/19	27,486	1.3%	5,063	1.3%	62.0%
2019/20	27,600	0.4%	5,086	0.5%	61.9%
2020/21	28,449	3.1%	5,210	2.4%	62.3%
2021/22	28,786	1.2%	5,267	1.1%	62.4%
2022/23	29,197	1.4%	5,337	1.3%	62.4%
2023/24	29,590	1.3%	5,406	1.3%	62.5%
2024/25	29,999	1.4%	5,476	1.3%	62.5%
10 Year Avg Gr.	451	1.6%	75	1.5%	
2025/26	30,408	1.4%	5,547	1.3%	62.6%
2026/27	30,823	1.4%	5,619	1.3%	62.6%
2027/28	31,243	1.4%	5,692	1.3%	62.7%
2028/29	31,664	1.3%	5,765	1.3%	62.7%
2029/30	32,094	1.4%	5,840	1.3%	62.7%
2030/31	32,531	1.4%	5,915	1.3%	62.8%
2031/32	33,101	1.8%	6,012	1.6%	62.8%
2032/33	33,684	1.8%	6,112	1.7%	62.9%
2033/34	34,317	1.9%	6,220	1.8%	63.0%
2034/35	35,011	2.0%	6,341	1.9%	63.0%
20 Year Avg Gr.	476	1.6%	81	1.5%	

*Note: History and historic growth rates include program-based DSM activities.

Forecast and forecasted growth rates exclude program-based DSM initiatives.

Table 2 - Change in Energy and Peak

	GROSS FIRM ENERGY AND GROSS TOTAL PEAK					
	Change from Previous Forecast					
	2015/16 - 2034/35					
	Gross Firm Energy			Gross Total Peak		
Fiscal Year	**2015 Forecast (GW.h)**	**2014 Forecast (GW.h)**	**Change (GW.h)**	**2015 Forecast (MW)**	**2014 Forecast (MW)**	**Change (MW)**
2014/15 Act	25,505			4,713		
Weather Adj.	-11			13		
2014/15 Wadj	25,493	25,639	(145)	4,726	4,716	10
2015/16	26,145	26,130	16	4,829	4,803	26
2016/17	26,792	26,436	356	4,936	4,861	75
2017/18	27,126	27,174	(48)	5,000	4,985	15
2018/19	27,486	27,662	(176)	5,063	5,068	(5)
2019/20	27,600	28,247	(647)	5,086	5,166	(80)
2020/21	28,449	28,583	(134)	5,210	5,223	(13)
2021/22	28,786	28,937	(151)	5,267	5,284	(17)
2022/23	29,197	29,284	(87)	5,337	5,342	(5)
2023/24	29,590	29,626	(37)	5,406	5,400	6
2024/25	29,999	29,970	28	5,476	5,458	18
10 Year	451	433		75	74	
Avg Gr.	1.6%	1.6%		1.5%	1.5%	
2025/26	30,408	30,316	93	5,547	5,516	31
2026/27	30,823	30,659	164	5,619	5,574	45
2027/28	31,243	31,006	237	5,692	5,632	60
2028/29	31,664	31,352	312	5,765	5,690	75
2029/30	32,094	31,703	391	5,840	5,748	92
2030/31	32,531	32,061	470	5,915	5,808	107
2031/32	33,101	32,424	677	6,012	5,869	143
2032/33	33,684	32,796	888	6,112	5,931	181
2033/34	34,317	33,177	1,141	6,220	5,995	225
19 Year	464	397	68	79	67	11
Avg Gr.	1.6%	1.4%	0.2%	1.5%	1.3%	0.2%

*Note: History includes program-based DSM activities.

    Forecast and forecasted growth rates exclude program-based DSM initiatives.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

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 – 2014/15

General Consumers Sales (also referred to as Total Sales) includes the energy supplied to all of Manitoba Hydro's individually billed customers. Over the 2014/15 fiscal year, Manitoba Hydro averaged 559,059 General Consumers Sales customers who consumed 22,458 GW.h.

The major groups include
  (1) Residential Basic, with 468,499 customers who used 7,658 GW.h or 34.1% of Sales. These are mostly residential dwellings that include single detached, multi attached and individually metered apartment suites.
  (2) General Service Mass Market, with 67,042 customers who used 8,771 GW.h or 39.1% of Sales. These are small to large Commercial and Industrial customers.
  (3) General Service Top Consumers, with 30 customers who used 5,750 GW.h or 25.6% 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 communities not connected to the Integrated System), Flat Rate Water Heating and Area and Roadway Lighting. Their electricity use totals only 278 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 2014/15, Common Bus was 23,450 GW.h or about 4.4% 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 2014/15, Gross Firm Energy was 25,505 GW.h or about 13.6% more than Total Sales.

Table 3 - Components of Manitoba Electricity Use

COMPONENTS OF MANITOBA ELECTRICITY USE 2014/15 (Customers, Actual Consumption and Average Use)				
Forecast Group	**Cust/Serv**	**GW.h**	**% of Sales**	**kW.h/cust**
Residential Basic	468,499	7,658	34.1%	16,345
Residential Diesel	583	9	0.0%	15,193
Residential Seasonal	20,626	102	0.5%	4,963
Residential Flat Rate Water Heating	3,650	19	0.1%	5,081
Total Residential	**489,708**	**7,788**	**34.7%**	
GS Mass Market	67,042	8,771	39.1%	130,832
GS Top Consumers	30	5,750	25.6%	189,049,498
GS Diesel	183	6	0.0%	31,238
GS Seasonal	872	6	0.0%	6,357
GS Flat Rate Water Heat	373	6	0.0%	17,309
GS Surplus Energy Program	28	27	0.1%	947,317
Total General Service	**68,156**	**14,566**	**64.9%**	
Sentinal Flat Rate	20,495	12	0.1%	568
Sentinal Rental	25,853	-	0.0%	-
Street Lighting	1,196	92	0.4%	77,346
Total Lighting	**1,196**	**104**	**0.5%**	
Total General Consumer Sales	**559,059**	**22,458**	**100.0%**	
Less Diesel Sales		(15)	-0.1%	
Distribution Losses		992	4.4%	
Construction Power		15	0.1%	
Manitoba Load at Common Bus		**23,450**	**104.4%**	
Transmission Losses		1,949	8.7%	
Less Non-Firm Energy		(26)	-0.1%	
Station Service		132	0.6%	
Gross Firm Energy		**25,505**	**113.6%**	
* flat rate and rental services are shown in yellow, which do not count as customers				

FORECAST OVERVIEW

General Consumers Customer Forecast

In 2014/15, Manitoba Hydro had an average of 559,059 General Consumer Sales customers. These were made up of 468,499 Residential Basic customers, 67,042 General Service Mass Market customers, 30 General Service Top Consumers customers and 28 SEP (Surplus Energy Program, i.e. non-firm) customers, with the remaining being Diesel, Seasonal and Area and Roadway Lighting.

During the last 10 years, Residential Basic customers have grown at an average of 4,836 (1.1%) per year. Manitoba Hydro's 2015 Economic Outlook provides the forecast of Residential Basic customers, and this document uses that forecast. It calls for a growth of 6,026 (1.2%) per year over the next ten years and 5,913 (1.1%) 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 612 (1.0%) per year over the last 10 years. They are forecast to grow 541 (0.8%) over the next ten years and 512 (0.7%) 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 55 (0.3%) customers per year over the last 10 years. They are forecast to decrease at 60 (0.3%) over the next 10 years and 43 (0.2%) over the next 20 years due to conversions of higher usage seasonal customers to Residential Basic.

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 6 (0.5%) customers annually over the next 10 years and 5 (0.4%) over the next 20 years.

Table 4 - **General Consumers Sales Customers**

Fiscal Year	Residential			General Service					Lighting	Total Custs
	Basic	Diesel	Seas	Mass Mkt	Top Cons	Diesel	Seas	SEP		
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
2014/15	468,499	583	20,626	67,042	30	183	872	28	1196	559,059
10 Year	4,836	8	55	612	0	2	8	0	44	5,565
Avg Gr.	1.1%	1.4%	0.3%	1.0%	1.6%	1.3%	1.0%	-1.0%	4.7%	1.1%
2015/16	474,401	588	20,251	67,561	30	184	878	30	1,207	565,129
2016/17	480,379	596	20,226	68,129	30	186	883	34	1,212	571,674
2017/18	486,539	605	20,201	68,727	30	189	888	34	1,217	578,428
2018/19	492,646	613	20,176	69,319	30	191	893	34	1,222	585,123
2019/20	498,631	622	20,151	69,891	30	193	898	34	1,227	591,676
2020/21	504,583	631	20,126	70,421	30	195	903	34	1,232	598,154
2021/22	510,572	639	20,101	70,930	30	197	908	34	1,237	604,646
2022/23	516,582	648	20,076	71,438	30	200	913	34	1,242	611,162
2023/24	522,641	656	20,051	71,945	30	202	918	34	1,247	617,723
2024/25	528,754	665	20,026	72,453	30	204	923	34	1,252	624,341
10 Year	6,026	8	-60	541	0	2	5	1	6	6,528
Avg Gr.	1.2%	1.3%	-0.3%	0.8%	-0.1%	1.1%	0.6%	1.9%	0.5%	1.1%
2025/26	534,867	674	20,001	72,964	30	206	928	34	1,257	630,960
2026/27	540,902	682	19,976	73,472	30	208	933	34	1,262	637,499
2027/28	546,840	691	19,951	73,972	30	211	938	34	1,267	643,932
2028/29	552,708	699	19,926	74,462	30	213	943	34	1,272	650,286
2029/30	558,509	708	19,901	74,946	30	215	948	34	1,277	656,566
2030/31	564,244	717	19,876	75,422	30	217	953	34	1,282	662,774
2031/32	569,932	725	19,851	75,892	30	219	958	34	1,287	668,928
2032/33	575,584	734	19,826	76,357	30	222	963	34	1,292	675,040
2033/34	581,197	742	19,801	76,817	30	224	968	34	1,297	681,109
2034/35	586,750	751	19,776	77,273	30	226	973	34	1,302	687,114
20 Year	5,913	8	-43	512	0	2	5	0	5	6,403
Avg Gr.	1.1%	1.3%	-0.2%	0.7%	-0.1%	1.1%	0.5%	0.9%	0.4%	1.0%

GENERAL CONSUMERS SALES (Average Customers)
History and Forecast
2004/05 - 2034/35

General Consumers Sales Forecast

During 2014/15, Total General Consumer Sales was 22,458 GW.h. The fiscal billing year (using weather from March 16, 2014 to March 15, 2015) was slightly colder than normal giving a weather adjustment for the year of -151 GW.h, resulting in a weather adjusted Total Sales value of 22,307 GW.h.

Over the last 10 years, Total Sales have grown at 250 GW.h (1.2%) per year. The growth was 1.8% 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 also reflects the effect of past Demand Side Management (DSM) activities.

Sales are forecast to grow at 403 GW.h (1.7%) per year over the next 10 years and 422 GW.h (1.6%) 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 191 GW.h (1.8%) per year over the next twenty years, followed by Top Consumers at 128 GW.h (1.9%) per year and Residential Basic at 103 GW.h (1.2%) per year.

Table 5 - General Consumers Sales Energy

Fiscal Year	Residential				General Service						Lighting	Total Sales
	Basic	Diesel	Seas	FRWH	Mass Mkt	Top Cons	Diesel	Seas	FRWH	SEP		
GENERAL CONSUMERS SALES (GW.h)												
History and Forecast												
2004/05 - 2034/35												
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
2014/15	7,658	9	102	19	8,771	5,750	6	6	6	27	104	22,458
Weather Adj.	-103	0	0	0	-48	0	0	0	0	-1	0	-151
2014/15 Wadj	7,555	9	102	19	8,724	5,750	6	6	6	26	104	22,307
10 Year Wadj	125	0	4	-1	116	4	0	0	0	0	1	250
Avg Gr.	1.8%	3.0%	5.9%	-5.0%	1.4%	0.1%	1.4%	1.7%	-3.9%	0.8%	1.4%	1.2%
2015/16	7,668	9	98	18	8,878	6,058	6	6	6	29	104	22,879
2016/17	7,773	9	99	17	9,082	6,299	6	6	6	33	105	23,433
2017/18	7,870	9	101	16	9,272	6,308	6	6	6	33	105	23,729
2018/19	7,956	9	102	15	9,433	6,376	6	6	5	33	105	24,046
2019/20	8,047	9	103	14	9,590	6,257	6	6	5	33	106	24,175
2020/21	8,142	10	104	14	9,746	6,771	6	6	5	33	106	24,941
2021/22	8,240	10	105	13	9,903	6,845	6	6	5	33	106	25,270
2022/23	8,337	10	106	12	10,064	6,948	6	6	4	33	106	25,632
2023/24	8,434	10	107	12	10,228	7,031	6	6	4	33	107	25,978
2024/25	8,534	10	108	11	10,397	7,122	6	6	4	33	107	26,338
10 Year	98	0	1	-1	167	137	0	0	0	1	0	403
Avg Gr.	1.2%	1.5%	0.5%	-5.0%	1.8%	2.2%	0.9%	0.6%	-5.0%	2.3%	0.3%	1.7%
2025/26	8,632	10	109	11	10,571	7,209	6	6	4	33	107	26,698
2026/27	8,732	11	110	10	10,749	7,296	6	6	4	33	108	27,063
2027/28	8,830	11	111	10	10,931	7,383	6	6	3	33	108	27,432
2028/29	8,926	11	112	9	11,116	7,472	7	6	3	33	108	27,803
2029/30	9,024	11	113	9	11,306	7,562	7	6	3	33	108	28,181
2030/31	9,122	11	114	8	11,499	7,653	7	6	3	33	109	28,565
2031/32	9,218	11	115	8	11,748	7,810	7	6	3	33	109	29,068
2032/33	9,316	12	116	7	12,004	7,971	7	6	3	33	109	29,583
2033/34	9,445	12	117	7	12,267	8,135	7	6	2	33	109	30,141
2034/35	9,607	12	118	7	12,549	8,302	7	6	2	33	110	30,753
20 Year	103	0	1	-1	191	128	0	0	0	0	0	422
Avg Gr.	1.2%	1.5%	0.7%	-5.0%	1.8%	1.9%	1.0%	0.5%	-5.0%	1.1%	0.3%	1.6%

Manitoba Energy Forecast

The weather adjusted actual Gross Firm Energy was 25,493 GW.h in 2014/15. Gross Firm Energy has grown 283 GW.h (1.2%) per year for the past 10 years. This historical growth reflects the effect of past Demand Side Management (DSM) activities and the effect of an economic downturn in 2009. Gross Firm energy is forecast to grow to 35,011 GW.h by 2034/35 at an average growth of 476 GW.h or 1.6% 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 between 4.5% and 4.6% of Sales for the entire forecast.

Transmission Losses which is the difference between the generators and the substations is forecast to be 9.1% 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** **2004/05 - 2034/35**									
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**
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
2014/15	22,443	992	4.4%	15	23,450	1,949	8.7%	26	132	25,505
Weather Adj.	-151	140		0	-11	0		0	0	-11
2014/15 Wadj	22,292	1,132	5.1%	15	23,439	1,949	8.7%	26	132	25,493
10 Year Wadj	250	30		-3	277	10		0	-3	283
Avg Gr.	1.2%	3.2%		-10.8%	1.3%	0.5%		0.2%	-2.0%	1.2%
2015/16	22,864	1,042	4.6%	56	23,962	2,075	9.1%	29	137	26,145
2016/17	23,418	1,061	4.5%	81	24,560	2,127	9.1%	33	137	26,792
2017/18	23,715	1,079	4.6%	75	24,868	2,153	9.1%	33	137	27,126
2018/19	24,030	1,095	4.6%	75	25,200	2,182	9.1%	33	137	27,486
2019/20	24,160	1,110	4.6%	35	25,304	2,191	9.1%	33	137	27,600
2020/21	24,926	1,126	4.5%	35	26,086	2,259	9.1%	33	137	28,449
2021/22	25,254	1,141	4.5%	0	26,396	2,286	9.1%	33	137	28,786
2022/23	25,616	1,157	4.5%	0	26,773	2,319	9.1%	33	137	29,197
2023/24	25,961	1,174	4.5%	0	27,135	2,350	9.1%	33	137	29,590
2024/25	26,321	1,190	4.5%	0	27,511	2,383	9.1%	33	137	29,999
10 Year	403	6		-1	407	43		1	0	451
Avg Gr.	1.7%	0.5%		-100.0%	1.6%	2.0%		2.2%	0.4%	1.6%
2025/26	26,681	1,207	4.5%	0	27,889	2,415	9.1%	33	137	30,408
2026/27	27,046	1,225	4.5%	0	28,271	2,448	9.1%	33	137	30,823
2027/28	27,415	1,242	4.5%	0	28,657	2,482	9.1%	33	137	31,243
2028/29	27,785	1,259	4.5%	0	29,045	2,515	9.1%	33	137	31,664
2029/30	28,163	1,277	4.5%	0	29,440	2,549	9.1%	33	137	32,094
2030/31	28,547	1,295	4.5%	0	29,842	2,584	9.1%	33	137	32,531
2031/32	29,050	1,317	4.5%	0	30,367	2,630	9.1%	33	137	33,101
2032/33	29,564	1,339	4.5%	0	30,903	2,676	9.1%	33	137	33,684
2033/34	30,123	1,363	4.5%	0	31,486	2,727	9.1%	33	137	34,317
2034/35	30,734	1,391	4.5%	0	32,125	2,782	9.1%	33	137	35,011
20 Year	422	13		-1	434	42		0	0	476
Avg Gr.	1.6%	1.0%		-100.0%	1.6%	1.8%		1.1%	0.2%	1.6%

Comparison of the 2014 Forecast to Actuals

Comparison of the 2014 Forecast to the 2014/15 Weather Adjusted Actuals

The weather adjusted General Consumer Sales for 2014/15 was 22,307 GW.h which was 160 GW.h lower than the 2014 forecast of 22,467 GW.h.

The weather adjusted Residential Basic sector was 175 GW.h greater than the forecast and the weather adjusted General Service Mass Market sector for was 91 GW.h lower than forecast. These differences do not take into account Demand Side Management (DSM) programs that were forecast to be 31 GW.h for Residential Basic and 119 GW.h for General Service Mass Market. With DSM incorporated, Residential Basic was 206 GW.h greater than forecast and General Service Mass Market was 28 GW.h higher than forecast.

The majority of the difference was in the Top Consumers sector for 2014/15 using 5,750 GW.h that was 253 GW.h lower than the 2014 forecast of 6,003 GW.h. Three Top Consumers contributed to the majority of this difference. One customer experience a flood at their facility resulting in a one month shutdown, another customer made a temporary adjustment to their operations and the third customer shutdown their electric drive motors.

Distribution losses were 144 GW.h higher than forecast and Transmission losses were 118 GW.h lower than forecast.

Overall, the weather adjusted Gross Firm Energy for 2014/15 was 25,493 GW.h which was 145 GW.h lower than the 2014 forecast of 25,639 GW.h.

The normalized Gross Total Peak for 2014/15 was 4,726 MW, 10 MW higher than forecast.

Table 7 - 2014/15 Forecast to Actual

| 2014 FORECAST COMPARED TO WEATHER ADJUSTED ACTUALS 2014/15 Energy (GW.h) and Peak (MW)					
Forecast Group	Actuals	Weather Adjustment	Wthr Adj Actuals	2014 Forecast	WA Actuals less Forecast
Residential Basic	7,658	(103)	7,555	7,380	175
Residential Diesel	9	-	9	9	(0)
Residential Seasonal	102	-	102	91	11
Residential Flat Rate Water Heating	19	-	19	19	(0)
Total Residential	**7,788**	**(103)**	**7,685**	**7,499**	**187**
GS Mass Market	8,771	(48)	8,724	8,814	(91)
GS Top Consumers	5,750	-	5,750	6,003	(253)
GS Diesel	6	-	6	6	0
GS Seasonal	6	-	6	5	0
GS Flat Rate Water Heat	6	-	6	7	(0)
GS Surplus Energy Program	27	(1)	26	29	(3)
Total General Service	**14,566**	**(48)**	**14,518**	**14,864**	**(346)**
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	**22,458**	**(151)**	**22,307**	**22,467**	**(160)**
Less Diesel Sales	(15)	-	(15)	(14)	(0)
Distribution Losses	992	140	1,132	988	144
Construction Power	15	-	15	24	(10)
Manitoba Load at Common Bus	**23,450**	**(11)**	**23,439**	**23,464**	**(26)**
Transmission Losses	1,949	(0)	1,949	2,067	(118)
Less Non-Firm Energy	(26)	0	(26)	(29)	3
Station Service	132	-	132	137	(4)
Gross Firm Energy (GW.h)	**25,505**	**(11)**	**25,493**	**25,639**	**(145)**
Gross Total Peak (MW)	**4,713**	**13**	**4,726**	**4,716**	**10**

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

Change between the 2014 and 2015 Forecasts

Change Between the 2014 and 2015 Residential Basic Forecast

Figure 1 - Change of Res Basic Forecast

The 2015 Residential Basic forecast starts in 2015/16 up 187 GW.h from the 2014 forecast primarily due to the 2014/15 actual energy use being higher than forecast. The difference lessens to 100 GW.h by 2019/20 and grows to be 157 GW.h by the end of the forecast. 157 GW.h represents less than 1 year of Manitoba system load growth (1 year = approximately 475 GW.h).
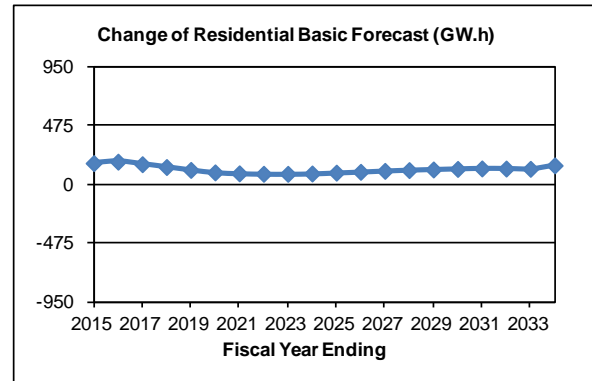
Major changes and their 2033/34 effect:

1. Increase in the customer forecast by 17,538 (+338 GW.h).
2. Changes in the average use forecast (-67 GW.h), primarily from:
    a. Changes to model parameter estimates: +123 GW.h
    b. Decrease in the forecast of real Income: -148 GW.h
    c. Increase in the first 16 years of the forecast of real electricity price: -47 GW.h
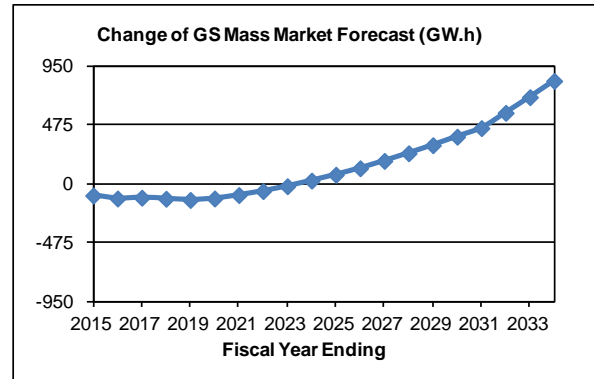3. Increase in the forecast of Codes and Standards (-47 GW.h)

Table 8 - Change of Res Basic Forecast

CHANGE OF RESIDENTIAL BASIC FORECAST (GW.h)									
Comparison of 2014 to 2015 forecast									
Fiscal Year	2014 Fcst	2015 Fcst	Change	%	Fiscal Year	2014 Fcst	2015 Fcst	Change	%
2014/15	7,380	7,555	175	2.4%	2024/25	8,435	8,534	98	1.2%
2015/16	7,481	7,668	187	2.5%	2025/26	8,527	8,632	105	1.2%
2016/17	7,606	7,773	166	2.2%	2026/27	8,619	8,732	113	1.3%
2017/18	7,726	7,870	144	1.9%	2027/28	8,711	8,830	119	1.4%
2018/19	7,836	7,956	120	1.5%	2028/29	8,802	8,926	124	1.4%
2019/20	7,946	8,047	100	1.3%	2029/30	8,895	9,024	128	1.4%
2020/21	8,049	8,142	93	1.2%	2030/31	8,990	9,122	132	1.5%
2021/22	8,151	8,240	89	1.1%	2031/32	9,087	9,218	131	1.4%
2022/23	8,248	8,337	89	1.1%	2032/33	9,186	9,316	129	1.4%
2023/24	8,342	8,434	91	1.1%	2033/34	9,289	9,445	157	1.7%

Change Between the 2014 and 2015 General Service Mass Market Forecast

Figure 2 - Change of GS Mass Market Forecast

The 2015 General Service Mass Market (GSMM) forecast starts in 2015/16 down 115 GW.h from the 2014 forecast primarily due to the 2014/15 actual energy use being lower than forecast. The change proceeds to increase and by 2033/34, the Mass Market forecast is up 834 GW.h, representing almost 2 years of load growth.

Major changes and their 2033/34 effect:

1. Increase in the forecast of GS Mass Market customers by 1,333 due to a higher GDP forecast and a higher Residential Customer forecast (+173 GW.h).
2. Changes to average use forecast (+640 GW.h), primarily from:
    a. Changes to model parameter estimates: +305 GW.h
    b. Increase due to the splitting of electric prices by customer class: +167 GW.h
    c. Increase in the forecast of real GDP: +75 GW.h
   d. Decrease in the last 4 years of the forecast of real electricity price: +93 GW.h

Table 9 **- Change of GS Mass Market Forecast**

CHANGE OF GS MASS MARKET FORECAST (GW.h)									
Comparison of 2014 to 2015 forecast									
Fiscal Year	2014 Fcst	2015 Fcst	Change	%	Fiscal Year	2014 Fcst	2015 Fcst	Change	%
2014/15	8,814	8,724	(91)	-1.0%	2024/25	10,320	10,397	77	0.7%
2015/16	8,993	8,878	(115)	-1.3%	2025/26	10,442	10,571	129	1.2%
2016/17	9,190	9,082	(108)	-1.2%	2026/27	10,560	10,749	189	1.8%
2017/18	9,388	9,272	(117)	-1.2%	2027/28	10,681	10,931	250	2.3%
2018/19	9,560	9,433	(126)	-1.3%	2028/29	10,801	11,116	315	2.9%
2019/20	9,705	9,590	(115)	-1.2%	2029/30	10,922	11,306	384	3.5%
2020/21	9,833	9,746	(87)	-0.9%	2030/31	11,046	11,499	453	4.1%
2021/22	9,958	9,903	(55)	-0.6%	2031/32	11,172	11,748	576	5.2%
2022/23	10,079	10,064	(16)	-0.2%	2032/33	11,301	12,004	703	6.2%
2023/24	10,199	10,228	29	0.3%	2033/34	11,433	12,267	834	7.3%

Change Between the 2014 and 2015 GS Top Consumers Forecast

Figure 3 - Change of GS Top Consumer Forecast

The General Service Top Consumers is similar to the 2014 forecast. In 2016/17, the 2015 Forecast is higher by 217 GW.h primarily due to the delay of an anticipated customer reduction. By 2019/20, the 2015 Forecast is 602 GW.h lower primarily due to a delay in a pipeline project which is now expected to commence the following year. By 2033/34, the 2015 Forecast is expected to increase by 32 GW.h.
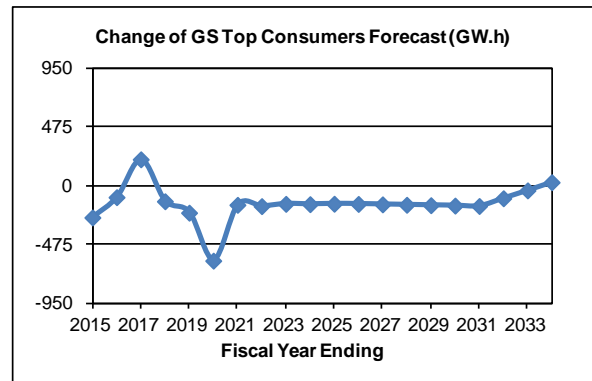
Changes made (and the 2033/34 effect):

1. The Potential Large Industrial Loads forecast increased from an average 91 GW.h per year to 104 GW.h per year due to higher modeled growth because of the actual 308 GW.h increase to Top Consumers in 2014/15. (+157 GW.h)
2. Reassessments of the short term customer planned projects. (-21 GW.h)
3. The Potential Large Industrial Loads (PLIL) forecast begins in the fourth year of the forecast therefore 16 years of PLIL in the 2015 forecast are compared with 17 years of PLIL in the 2014 forecast. (-104 GW.h)

Table 10 - Change of GS Top Consumer Forecast

CHANGE OF GS TOP CONSUMERS FORECAST (GW.h)									
Comparison of 2014 to 2015 forecast									
Fiscal Year	2014 Fcst	2015 Fcst	Change	%	Fiscal Year	2014 Fcst	2015 Fcst	Change	%
2014/15	6,003	5,750	(253)	-4.2%	2024/25	7,264	7,122	(142)	-2.0%
2015/16	6,147	6,058	(89)	-1.4%	2025/26	7,353	7,209	(144)	-2.0%
2016/17	6,082	6,299	217	3.6%	2026/27	7,443	7,296	(147)	-2.0%
2017/18	6,430	6,308	(122)	-1.9%	2027/28	7,534	7,383	(151)	-2.0%
2018/19	6,590	6,376	(214)	-3.3%	2028/29	7,626	7,472	(154)	-2.0%
2019/20	6,859	6,257	(602)	-8.8%	2029/30	7,719	7,562	(157)	-2.0%
2020/21	6,922	6,771	(151)	-2.2%	2030/31	7,813	7,653	(160)	-2.1%
2021/22	7,006	6,845	(161)	-2.3%	2031/32	7,908	7,810	(98)	-1.2%
2022/23	7,091	6,948	(143)	-2.0%	2032/33	8,005	7,971	(34)	-0.4%
2023/24	7,177	7,031	(146)	-2.0%	2033/34	8,103	8,135	32	0.4%

Change Between the 2014 and 2015 Gross Firm Energy Forecast

The Gross Firm Energy forecast in the first few years is primarily different due to the Top Consumers forecast changes and by 2024/25, the differences begin to increase due to increases in both the Residential and General Service Mass Market forecasts. By 2033/34 the 2015 forecast is 1,141 GW.h higher. This equates to a 3.4% increase in the forecast of 2033/34, which is a gain of just over two years of load growth (1 year = approximately 475 GW.h).

Figure 4 - Change of Energy Forecast

Change of Gross Firm Energy Forecast (GW.h)
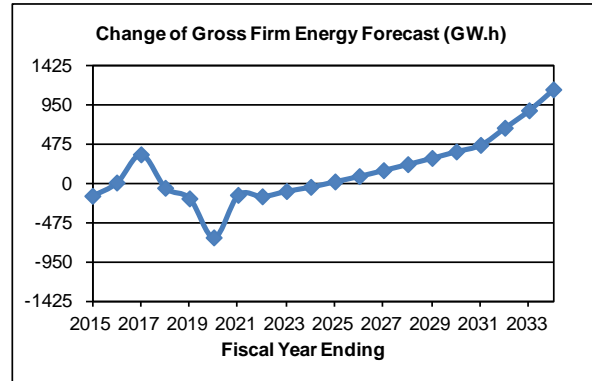
Summary of changes made in each sector (and the 2033/34 effect):

1. Residential Basic forecast, primarily due to an increase in the customer forecast. (+157 GW.h)
2. General Service Mass Market forecast, mostly due to the increase in the average use forecast. (+834 GW.h)
3. General Service Top Consumers forecast. (+32 GW.h)
4. Other Sales and Losses. (+118 GW.h)

Table 11 - Change of Energy Forecast

GROSS FIRM ENERGY (GW.h)									
Comparison of 2014 to 2015 forecast									
Fiscal Year	2014 Fcst	2015 Fcst	Change	%	Fiscal Year	2014 Fcst	2015 Fcst	Change	%
2014/15	25,639	25,493	(145)	-0.6%	2024/25	29,970	29,999	28	0.1%
2015/16	26,130	26,145	16	0.1%	2025/26	30,316	30,408	93	0.3%
2016/17	26,436	26,792	356	1.3%	2026/27	30,659	30,823	164	0.5%
2017/18	27,174	27,126	(48)	-0.2%	2027/28	31,006	31,243	237	0.8%
2018/19	27,662	27,486	(176)	-0.6%	2028/29	31,352	31,664	312	1.0%
2019/20	28,247	27,600	(647)	-2.3%	2029/30	31,703	32,094	391	1.2%
2020/21	28,583	28,449	(134)	-0.5%	2030/31	32,061	32,531	470	1.5%
2021/22	28,937	28,786	(151)	-0.5%	2031/32	32,424	33,101	677	2.1%
2022/23	29,284	29,197	(87)	-0.3%	2032/33	32,796	33,684	888	2.7%
2023/24	29,626	29,590	(37)	-0.1%	2033/34	33,177	34,317	1,141	3.4%

Change Between the 2014 and 2015 Gross Total Peak Forecast

The Gross Total Peak Forecast is up 225 MW (3.8%) by 2033/34 from the 2014 Forecast. The peak forecast very closely follows the energy forecast with the reasons for increase in peak being similar to those for energy.

Figure 5 - Change of Peak Forecast
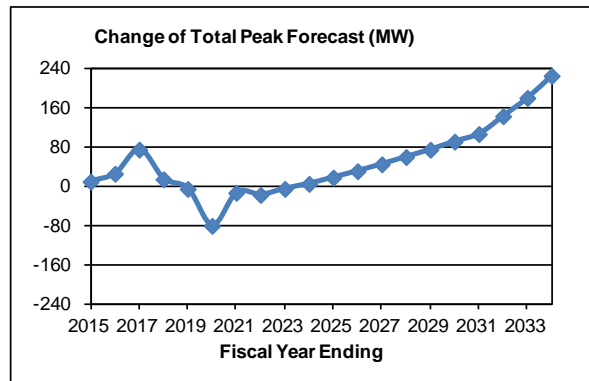
In addition to the energy reasons, the 2033/34 peak forecast is additionally higher than projected in the 2014 forecast because of a small decrease of the expected peak load factor which is forecast to grow to 63.0% compared to 63.2% in the 2014 forecast. The load factor decrease from the 2014 forecast is due to the small change in the Top Consumers forecast (high load factor) compared to the significant increase in the Residential Basic and General Service Mass Market forecasts (low load factors).

The increase in peak in 2033/34 amounts to 225 MW, almost three years of load growth. (1 year = approximately 80 MW).

Table 12 - Change of Peak Forecast

GROSS TOTAL PEAK (MW)									
Comparison of 2014 to 2015 forecast									
Fiscal Year	2014 Fcst	2015 Fcst	Change	%	Fiscal Year	2014 Fcst	2015 Fcst	Change	%
2014/15	4,716	4,726	10	0.2%	2024/25	5,458	5,476	18	0.3%
2015/16	4,803	4,829	26	0.5%	2025/26	5,516	5,547	31	0.6%
2016/17	4,861	4,936	75	1.5%	2026/27	5,574	5,619	45	0.8%
2017/18	4,985	5,000	15	0.3%	2027/28	5,632	5,692	60	1.1%
2018/19	5,068	5,063	(5)	-0.1%	2028/29	5,690	5,765	75	1.3%
2019/20	5,166	5,086	(80)	-1.5%	2029/30	5,748	5,840	92	1.6%
2020/21	5,223	5,210	(13)	-0.2%	2030/31	5,808	5,915	107	1.8%
2021/22	5,284	5,267	(17)	-0.3%	2031/32	5,869	6,012	143	2.4%
2022/23	5,342	5,337	(5)	-0.1%	2032/33	5,931	6,112	181	3.0%
2023/24	5,400	5,406	6	0.1%	2033/34	5,995	6,220	225	3.8%

FORECAST DETAILS

Residential Basic

In 2014/15, there were 468,499 Residential Basic customers. 78 % are single detached, 9% are multi attached, and 13% are 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 110 GW.h (1.7%) per year for the past 20 years and 125 GW.h per year (1.8%) for the past 10 year. This growth reflects the effect of past Demand Side Management (DSM) activities. It is forecast to grow 98 GW.h (1.2%) per year for the next 10 years and 103 GW.h (1.2%) per year for the next 20 years before program-based DSM initiatives.

The primary driver of Residential Basic growth is the population, which is forecast to grow 1.1% per year over the next 20 years. Overall average use is not expected to change significantly.
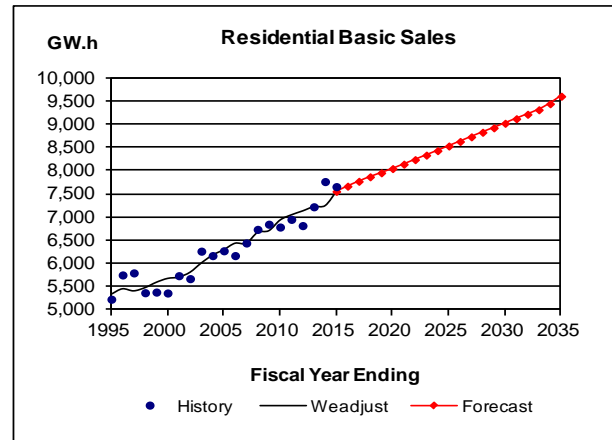
Figure 6- Residential Basic Sales

Table 13 - Residential Sales

RESIDENTIAL BASIC (GW.h) HISTORICAL/WEATHER ADJUSTMENT/FORECAST					
Fiscal Year	Sales	Weather Adjust	Adjusted Sales	Fiscal Year	Forecast Sales
1995/96	5,753	-289	5,464	2015/16	7,668
1996/97	5,797	-377	5,420	2016/17	7,773
1997/98	5,370	118	5,488	2017/18	7,870
1998/99	5,384	219	5,602	2018/19	7,956
1999/00	5,364	322	5,686	2019/20	8,047
2000/01	5,737	-23	5,715	2020/21	8,142
2001/02	5,674	144	5,818	2021/22	8,240
2002/03	6,266	-250	6,016	2022/23	8,337
2003/04	6,170	14	6,185	2023/24	8,434
2004/05	6,275	27	6,301	2024/25	8,534
2005/06	6,171	268	6,439	2025/26	8,632
2006/07	6,443	-4	6,439	2026/27	8,732
2007/08	6,736	-65	6,671	2027/28	8,830
2008/09	6,847	-140	6,708	2028/29	8,926
2009/10	6,786	150	6,936	2029/30	9,024
2010/11	6,952	95	7,047	2030/31	9,122
2011/12	6,818	313	7,131	2031/32	9,218
2012/13	7,223	-1	7,223	2032/33	9,316
2013/14	7,767	-522	7,245	2033/34	9,445
2014/15	7,658	-103	7,555	2034/35	9,607

17

Table 14 - Residential Basic Sales

	RESIDENTIAL BASIC SALES History and Forecast 2014/15 - 2034/35										
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		
2014/15	176,050	4,423	25,122	292,449	3,235	11,062	468,499	7,658	16,345	37.6%	54.1%
2015/16	179,649	4,406	24,527	294,752	3,261	11,065	474,401	7,668	16,163	37.9%	55.2%
2016/17	183,123	4,466	24,386	297,256	3,307	11,125	480,379	7,773	16,180	38.1%	56.1%
2017/18	186,467	4,520	24,242	300,072	3,349	11,162	486,539	7,870	16,175	38.3%	56.9%
2018/19	189,583	4,569	24,101	303,063	3,387	11,176	492,646	7,956	16,150	38.5%	57.6%
2019/20	192,486	4,616	23,982	306,144	3,430	11,205	498,630	8,047	16,137	38.6%	58.1%
2020/21	195,277	4,663	23,879	309,306	3,479	11,248	504,583	8,142	16,136	38.7%	58.5%
2021/22	197,989	4,709	23,786	312,583	3,531	11,295	510,572	8,240	16,138	38.8%	58.8%
2022/23	200,591	4,754	23,699	315,991	3,583	11,340	516,582	8,337	16,139	38.8%	59.1%
2023/24	203,131	4,797	23,615	319,510	3,637	11,382	522,641	8,434	16,137	38.9%	59.4%
2024/25	205,657	4,841	23,538	323,097	3,693	11,429	528,754	8,534	16,139	38.9%	59.6%
2025/26	208,156	4,884	23,463	326,711	3,748	11,472	534,867	8,632	16,139	38.9%	59.9%
2026/27	210,603	4,927	23,395	330,299	3,805	11,519	540,902	8,732	16,143	38.9%	60.1%
2027/28	212,995	4,969	23,331	333,845	3,861	11,564	546,840	8,830	16,147	39.0%	60.3%
2028/29	215,339	5,011	23,269	337,369	3,915	11,605	552,708	8,926	16,150	39.0%	60.5%
2029/30	217,641	5,052	23,213	340,868	3,972	11,652	558,509	9,024	16,157	39.0%	60.7%
2030/31	219,898	5,093	23,162	344,346	4,029	11,700	564,244	9,122	16,167	39.0%	60.9%
2031/32	222,121	5,134	23,112	347,812	4,085	11,744	569,933	9,218	16,174	39.0%	61.0%
2032/33	224,313	5,174	23,066	351,271	4,142	11,790	575,584	9,316	16,185	39.0%	61.2%
2033/34	226,475	5,223	23,060	354,722	4,223	11,905	581,197	9,445	16,252	39.0%	61.3%
2034/35	228,602	5,279	23,093	358,148	4,328	12,085	586,750	9,607	16,374	39.0%	61.5%

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.
2014/15: GW.h and kW.h/cust are not weather adjusted.

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 the requirement for mechanical ventilation 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 2014/15 at an average of 15,193 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 751 and usage is expected to increase 1.5% a year to 12 GW.h by 2034/35 under the assumption that the communities continue to be separate from the Integrated System.

Residential Seasonal

There were 20,626 Residential Seasonal customers that used 102 GW.h in 2014/15 at an average of 4,963 kW.h per customer. The number of customers is expected decrease to 19,776 customers by 2034/35 due to conversions of higher usage seasonal customers to Residential Basic. 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 0.7% a year to 118 GW.h in 2034/35.

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 3,650 remaining services in 2014/15. The number of services and usage is expected to decrease 5% per year throughout the forecast period. Usage was 19 GW.h in 2014/15 and that will decrease to 7 GW.h by 2034/35.

General Service Mass Market

General Service Mass Market includes all Commercial and Industrial customers, excluding the General Service Top Consumers. There were 67,042 General Service Mass Market customers in 2014/15. Approximately 85% are Commercial and the others are Industrial.

GS Mass Market has grown 127 GW.h (1.7%) per year for the past 20 years and 116 GW.h per year (1.4%) for the past 10 years. This historical growth reflects the effect of past Demand Side Management (DSM) activities. It is forecast to grow 167 GW.h (1.8%) per year for the next 10 years and 191 GW.h (1.8%) per year for the next 20 years before program-based DSM initiatives.

Figure 7 - General Service Mass Market
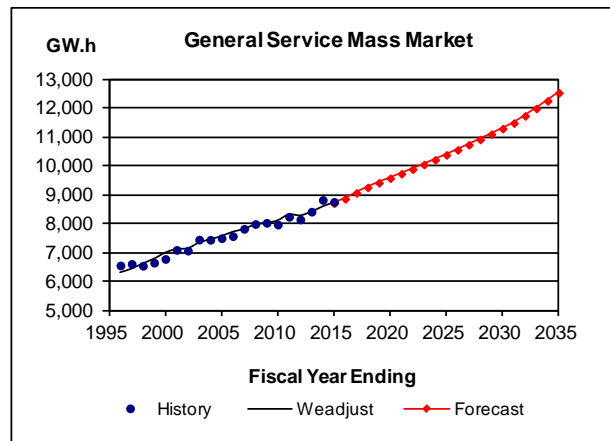
The primary driver for growth in the GS Mass Market is the number of Residential Basic customers. As population grows, commercial and industrial services grow to service the population. The secondary driver is the economy. Changes in the Manitoba, Canada and U.S. Gross Domestic Product (GDP) are reflected 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
1995/96	6,573	-256	6,316	2015/16	8,878
1996/97	6,627	-187	6,440	2016/17	9,082
1997/98	6,562	59	6,621	2017/18	9,272
1998/99	6,668	115	6,783	2018/19	9,433
1999/00	6,796	194	6,990	2019/20	9,590
2000/01	7,110	11	7,121	2020/21	9,746
2001/02	7,084	57	7,141	2021/22	9,903
2002/03	7,467	-131	7,336	2022/23	10,064
2003/04	7,460	-11	7,449	2023/24	10,228
2004/05	7,516	47	7,562	2024/25	10,397
2005/06	7,587	122	7,709	2025/26	10,571
2006/07	7,839	-34	7,806	2026/27	10,749
2007/08	8,006	-42	7,965	2027/28	10,931
2008/09	8,049	-39	8,010	2028/29	11,116
2009/10	7,985	119	8,104	2029/30	11,306
2010/11	8,258	49	8,307	2030/31	11,499
2011/12	8,162	111	8,273	2031/32	11,748
2012/13	8,434	-31	8,403	2032/33	12,004
2013/14	8,839	-256	8,583	2033/34	12,267
2014/15	8,771	-48	8,724	2034/35	12,549

General Service Top Consumers

General Service Top Consumers include the top energy consuming businesses in Manitoba and they represent 26% of all General Consumers Sales. GS Top Consumers includes 17 companies that account for 30 customers in the Primary Metals, Chemicals, Petrol/Oil/Natural Gas, Pulp/Paper, Food/Beverage and Colleges/Universities sectors.

Figure 8 - General Service Top Consumers

GS Top Consumers has grown 91 GW.h (1.9%) per year over the past 20 years 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 137 GW.h (2.2%) per year for the next 10 years and 128 GW.h (1.9%) 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 are expected to grow at a rate dependent on the Canada and U.S. Gross Domestic Product (GDP) projections.
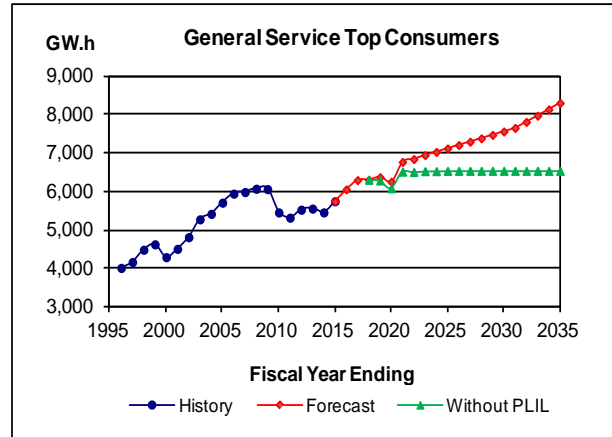
Table 16 - General Service Top Consumers

GENERAL SERVICE TOP CONSUMERS (GW.h) HISTORICAL/FORECAST WITH PLIL					
Fiscal Year	Sales	Fiscal Year	Individual	PLIL	Total
1995/96	4,021	2015/16	6,058	0	6,058
1996/97	4,173	2016/17	6,299	0	6,299
1997/98	4,493	2017/18	6,308	0	6,308
1998/99	4,632	2018/19	6,290	86	6,376
1999/00	4,299	2019/20	6,088	169	6,257
2000/01	4,515	2020/21	6,520	251	6,771
2001/02	4,818	2021/22	6,512	333	6,845
2002/03	5,282	2022/23	6,533	415	6,948
2003/04	5,423	2023/24	6,533	498	7,031
2004/05	5,714	2024/25	6,539	583	7,122
2005/06	5,948	2025/26	6,541	668	7,209
2006/07	5,989	2026/27	6,541	755	7,296
2007/08	6,075	2027/28	6,541	842	7,383
2008/09	6,065	2028/29	6,541	931	7,472
2009/10	5,461	2029/30	6,541	1,021	7,562
2010/11	5,324	2030/31	6,541	1,112	7,653
2011/12	5,531	2031/32	6,541	1,269	7,810
2012/13	5,560	2032/33	6,541	1,430	7,971
2013/14	5,461	2033/34	6,541	1,594	8,135
2014/15	5,750	2034/35	6,541	1,761	8,302

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 planned projects 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 5,750 GW.h in 2014/15 to 6,520 GW.h by 2020/21. This growth of 770 GW.h includes the expected load changes due to company projects, and reflects the expected major load decrease of one customer by 2019.

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 companies that will be added to the Top Consumers classification, and the long term normal incremental growth of all of the Top Consumers combined. Since customer intentions are generally known for the first three years, PLIL is not added until 2018/19, the fourth year of the forecast.

GS Top Consumers have grown an average of 91 GW.h (1.9%) per year over the past twenty years. During that period, there were four new customers all totaling 1,100 GW.h, ten instances of major expansions totaling 1,600 GW.h, and three existing customers who either closed or significantly reduced consumption by a total of 1,100 GW.h. The total of all these occurrences amount to a net 1,600 GW.h increase or 80 GW.h annually over the past 20 years. PLIL is estimated econometrically and averages 104 GW.h (1.5%) per year starting in the fourth year of the forecast and will total 1,761 GW.h by 2034/35.

1,761 GW.h is approximately equivalent to the load of Manitoba Hydro's largest consumer. If only one other customer of similar size establishes itself in Manitoba within the next 20 years, this one new customer alone will consume all of the provision that PLIL has projected.

General Service Diesel, Seasonal, and Flat Rate Water Heat

General Service Diesel

In 2014/15, there were 183 General Service Diesel Full Cost customers. They used 6 GW.h in 2014/15. The group is forecast to use 7 GW.h by 2034/35 under the assumption that the communities continue to be separate from the Integrated System.

General Service Seasonal

There were 872 General Service Seasonal customers in 2014/15. Consumption was 6 GW.h in 2014/15 and is expected to remain at 6 GW.h by 2034/35 under the assumption that the communities continue to be separate from the Integrated System.

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 373 remaining services in 2014/15. The number of services is expected to decrease 5% per year throughout the forecast period. Consumption was 6 GW.h in 2014/15 and that is forecast to decrease to 2 GW.h by 2034/35.

General Service Surplus Energy Program

Participants in the Surplus Energy Program (SEP) used 27 GW.h in 2014/15 and are expected to grow to use 33 GW.h per year by 2016/17 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) Battery Electric Vehicles (BEVs) run only on electric battery power. Pure electric plug-in vehicles include the Nissan Leaf, the Tesla and Mitsubishi MiEV. As of March 1, 2015 there were 48 BEVs registered in Manitoba.

(2) Plug-In Hybrid Electric Vehicles (PHEVs) run on an electric battery but use an internal combustion engine (ICE) when the electricity runs low. An example is the Chevrolet Volt. As of March 1, 2015 there were 50 PHEVs registered in Manitoba.
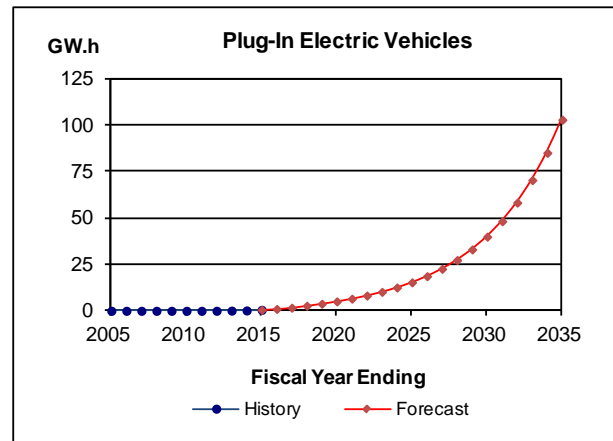
The forecast of electric vehicles does not include non-plug-in Hybrid Electric Vehicles (HEVs). These vehicles, such as the non-plug-in Toyota Prius, have an ICE as well as a battery and electric motor to drive the wheels. The HEV battery is charged with power from the ICE and through regenerative breaking. It is not charged by plugging in and therefore does not affect electricity consumption in Manitoba. As of March 1, 2015 and after 14 years in the market, there were only 4,363 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 German based organization, The Centre for Solar Energy and Hydrogen Research (ZSW) there were 740,000 plug-in vehicles registered worldwide in early 2015. Out of the total global vehicle count of just over one billion, plug-in electric vehicles represent 0.05% of the total. The US accounts for the highest number of total electric vehicle sales at 290,000 vehicles or approximately 40% of all electric vehicles sales. Electric vehicle car makers have experienced low sales at the start of 2015. According to Chevrolet's monthly numbers, in January 2015 the Volt had its worst month for sales since August 2011 with only 592 units sold which is also down 243 units from January 2014. Similarly, Nissan's numbers say the Leaf had 2,268 sales over January and February in 2015 compared with 2,677 in the same time frame from 2014. According to Edmunds.com, about 22 percent of car buyers who have traded in their hybrids and EVs in 2015 bought a new ICE SUV (Sport Utility Vehicle). Overall, only 45 percent of this year's hybrid and EV trade-ins have gone toward the purchase of another non ICE vehicle, down from just over 60 percent in 2012.

The Electric Vehicle Forecast

As of March 1st, 2015, there were 95 plug-in electric passenger vehicles, plus 3 electric buses totaling 98 PEVs registered in Manitoba by the Manitoba Public Insurance Corporation. The 2014 Load Forecast predicted a total of 111 plug-in vehicles to be registered in Manitoba at fiscal year ending 2015. The latest electric vehicle forecast is adjusted to incorporate the lower actual registrations recorded in fiscal year ending 2015. The number of new PEVs is expected to slowly increase until it reaches about 0.6% of new vehicle sales (441 units) in 2024/25 and 3.8% of new vehicle sales (3,172 units) in 2034/35. The total number of electric vehicles on the road is forecasted to be 2,166 (0.2% of total vehicle registrations) in 2024/25 and 17,430 (1.2% of total vehicle registrations) in 2034/35.

Figure 9 - Plug-In Electric Vehicles

The following table shows 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, motor boats 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.

Total energy use for PEVs in Manitoba is forecasted to be 15 GW.h in 2024/25 and 103 GW.h in 2034/35. Peak usage coincident to Manitoba Hydro's system peak is forecasted to be 1.9 MW in 2024/25 and 12.9 MW in 2034/35.

Table 17 - Plug-In Electric Vehicles

PLUG-IN ELECTRIC VEHICLE FORECAST History and Forecast 2004/05 - 2034/35								
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
2004/05	45,429	0	0.0%	652,926	0	0.0%	0	0
2005/06	46,127	0	0.0%	662,344	0	0.0%	0	0
2006/07	46,164	0	0.0%	675,684	0	0.0%	0	0
2007/08	47,953	0	0.0%	692,376	0	0.0%	0	0
2008/09	46,710	0	0.0%	703,987	0	0.0%	0	0
2009/10	45,355	0	0.0%	750,290	0	0.0%	0	0
2010/11	48,546	1	0.0%	766,267	1	0.0%	0	0
2011/12	52,236	8	0.0%	784,885	9	0.0%	0	0
2012/13	56,275	28	0.0%	797,383	37	0.0%	0	0
2013/14	57,783	32	0.1%	827,482	68	0.0%	0	0
2014/15	58,882	29	0.0%	857,029	98	0.0%	1	0
2015/16	60,081	39	0.1%	880,732	137	0.0%	1	0.1
2016/17	61,280	65	0.1%	904,779	203	0.0%	2	0.2
2017/18	62,480	122	0.2%	929,170	325	0.0%	3	0.3
2018/19	63,679	135	0.2%	953,905	459	0.0%	4	0.5
2019/20	64,878	164	0.3%	978,985	623	0.1%	5	0.6
2020/21	66,077	200	0.3%	1,004,408	823	0.1%	7	0.8
2021/22	67,276	243	0.4%	1,030,176	1,067	0.1%	8	1.0
2022/23	68,475	297	0.4%	1,056,288	1,363	0.1%	10	1.3
2023/24	69,675	362	0.5%	1,082,744	1,725	0.2%	13	1.6
2024/25	70,874	441	0.6%	1,109,544	2,166	0.2%	15	1.9
2025/26	72,073	537	0.7%	1,136,689	2,703	0.2%	19	2.3
2026/27	73,272	655	0.9%	1,164,177	3,358	0.3%	23	2.8
2027/28	74,471	798	1.1%	1,192,010	4,156	0.3%	27	3.4
2028/29	75,671	972	1.3%	1,220,187	5,128	0.4%	33	4.1
2029/30	76,870	1,184	1.5%	1,248,708	6,312	0.5%	40	5.0
2030/31	78,069	1,443	1.8%	1,277,573	7,755	0.6%	48	6.0
2031/32	79,268	1,757	2.2%	1,306,783	9,512	0.7%	58	7.3
2032/33	80,467	2,140	2.7%	1,336,336	11,652	0.9%	71	8.8
2033/34	81,666	2,606	3.2%	1,366,234	14,258	1.0%	85	10.7
2034/35	82,866	3,172	3.8%	1,396,476	17,430	1.2%	103	12.9

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. In 2006, a readjustment of the rate classes moved some

Figure 10 - Area & Roadway Lighting

flat rate General Service meters into the Lighting sector. Only Street Lights count as customers.
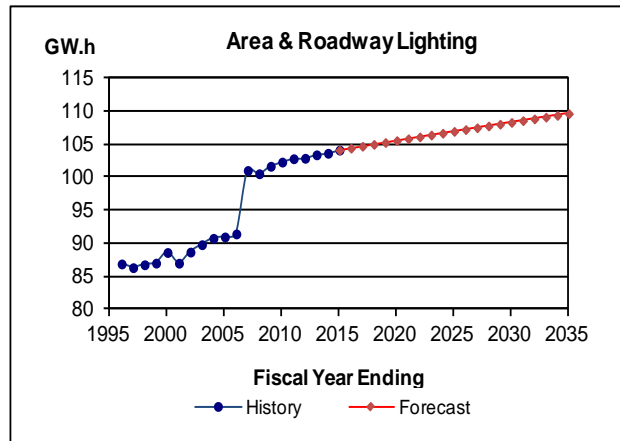
The Area and Roadway Lighting sector is forecast to increase from 104 GW.h in 2014/15 to 110 GW.h by 2034/35 at an average growth rate of 0.3 GW.h or 0.3% per year. This reflects the Corporation's move to more efficient LED lighting in new installations. This does not reflect the Demand Side Management (DSM) lighting program to replace existing lighting with more efficient LEDs which is accounted for separately in Manitoba Hydro's Power Smart Plan and Power Resource Plan.

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
1995/96	87	0	87	2015/16	104
1996/97	86	0	86	2016/17	105
1997/98	87	0	87	2017/18	105
1998/99	87	0	87	2018/19	105
1999/00	89	0	89	2019/20	106
2000/01	87	0	87	2020/21	106
2001/02	89	0	89	2021/22	106
2002/03	90	0	90	2022/23	106
2003/04	91	0	91	2023/24	107
2004/05	91	0	91	2024/25	107
2005/06	91	0	91	2025/26	107
2006/07	101	0	101	2026/27	108
2007/08	101	0	101	2027/28	108
2008/09	102	0	102	2028/29	108
2009/10	102	0	102	2029/30	108
2010/11	103	0	103	2030/31	109
2011/12	103	0	103	2031/32	109
2012/13	103	0	103	2032/33	109
2013/14	104	0	104	2033/34	109
2014/15	104	0	104	2034/35	110

Table 19 - Area & Roadway Lighting

Fiscal Year	Sentinal Flat Rates		Sentinal Rentals		Street Lighting		Total Lighting	
	(Services)	(GW.h)	(Services)	(GW.h)	(Custs)	(GW.h)	(Custs)	(GW.h)
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	20,495	12	25,853	0	1,196	92	1,196	104
2015/16	20,635	12	25,994	0	1,207	93	1,207	104
2016/17	20,789	12	26,188	0	1,212	93	1,212	105
2017/18	20,943	12	26,381	0	1,217	93	1,217	105
2018/19	21,097	12	26,573	0	1,222	93	1,222	105
2019/20	21,251	12	26,767	0	1,227	93	1,227	106
2020/21	21,405	12	26,960	0	1,232	94	1,232	106
2021/22	21,559	12	27,152	0	1,237	94	1,237	106
2022/23	21,713	12	27,346	0	1,242	94	1,242	106
2023/24	21,867	12	27,539	0	1,247	94	1,247	107
2024/25	22,021	13	27,731	0	1,252	94	1,252	107
2025/26	22,175	13	27,925	0	1,257	95	1,257	107
2026/27	22,329	13	28,118	0	1,262	95	1,262	108
2027/28	22,483	13	28,311	0	1,267	95	1,267	108
2028/29	22,637	13	28,504	0	1,272	95	1,272	108
2029/30	22,791	13	28,697	0	1,277	95	1,277	108
2030/31	22,945	13	28,890	0	1,282	96	1,282	109
2031/32	23,099	13	29,083	0	1,287	96	1,287	109
2032/33	23,253	13	29,276	0	1,292	96	1,292	109
2033/34	23,407	13	29,469	0	1,297	96	1,297	109
2034/35	23,561	13	29,662	0	1,302	96	1,302	110

Table heading (within table):

AREA AND ROADWAY LIGHTING
History and Forecast
2004/05 - 2034/35

Total General Consumers Sales

Figure 11 - 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.
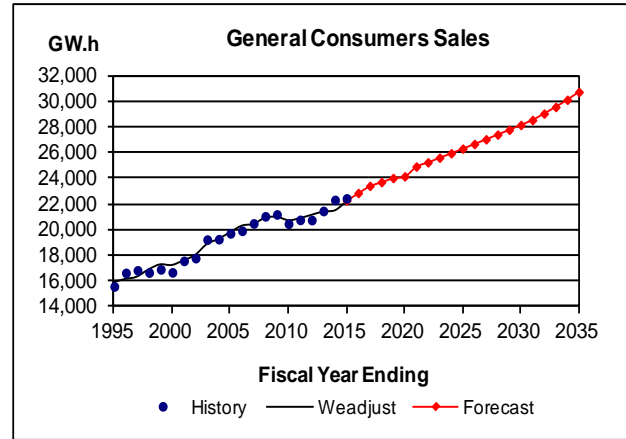
Weather adjusted General Consumers Sales has grown 326 GW.h (1.7%) per year for the past 20 years and 250 GW.h (1.2%) per year over the past 10 years. This historical growth reflects the 2009 economic downturn and includes the effect of past Demand Side Management (DSM) activities. Sales are forecast to grow 403 GW.h (1.7%) per year for the next 10 years and 422 GW.h (1.6%) per year for the next 20 years before program-based DSM initiatives.

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
1995/96	16,654	-546	16,107	2015/16	22,879
1996/97	16,851	-565	16,286	2016/17	23,433
1997/98	16,681	177	16,858	2017/18	23,729
1998/99	16,929	335	17,263	2018/19	24,046
1999/00	16,696	518	17,214	2019/20	24,175
2000/01	17,590	-12	17,578	2020/21	24,941
2001/02	17,805	203	18,007	2021/22	25,270
2002/03	19,246	-382	18,865	2022/23	25,632
2003/04	19,280	4	19,284	2023/24	25,978
2004/05	19,735	72	19,807	2024/25	26,338
2005/06	19,935	392	20,326	2025/26	26,698
2006/07	20,510	-37	20,473	2026/27	27,063
2007/08	21,061	-107	20,955	2027/28	27,432
2008/09	21,210	-180	21,031	2028/29	27,803
2009/10	20,486	268	20,755	2029/30	28,181
2010/11	20,786	145	20,931	2030/31	28,565
2011/12	20,771	426	21,196	2031/32	29,068
2012/13	21,477	-31	21,446	2032/33	29,583
2013/14	22,338	-781	21,557	2033/34	30,141
2014/15	22,458	-151	22,307	2034/35	30,753

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

Figure 12 - Diesel Sales

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.
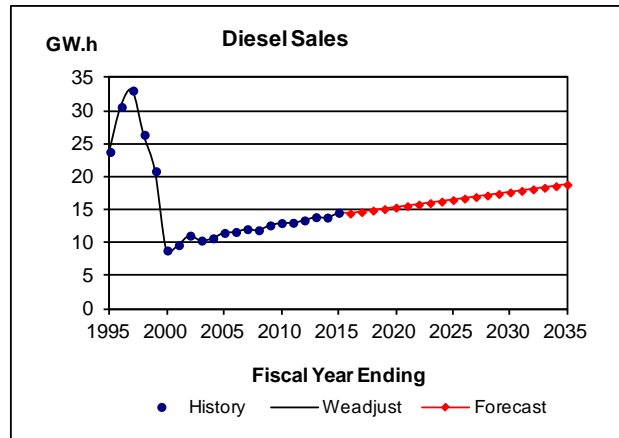
Table 21 - Diesel Sales

DIESEL SALES (GW.h) HISTORICAL/WEATHER ADJUSTMENT/FORECAST					
Fiscal Year	Sales	Weather Adjust	Adjusted Sales	Fiscal Year	Forecast Sales
1995/96	31	0	31	2015/16	14
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	15
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	16
2004/05	12	0	12	2024/25	16
2005/06	12	0	12	2025/26	17
2006/07	12	0	12	2026/27	17
2007/08	12	0	12	2027/28	17
2008/09	13	0	13	2028/29	17
2009/10	13	0	13	2029/30	18
2010/11	13	0	13	2030/31	18
2011/12	13	0	13	2031/32	18
2012/13	14	0	14	2032/33	18
2013/14	14	0	14	2033/34	19
2014/15	15	0	15	2034/35	19

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:

Figure 13 - Distribution Losses

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.
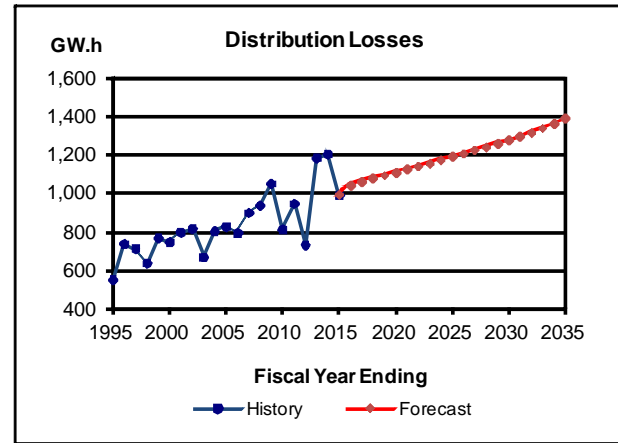
Distribution Losses are forecast in 2015/16 to be 4.6% of the General Consumers Sales less Diesel and remain between 4.5% and 4.6% throughout the forecast.

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
1995/96	740	16,623	4.4%	2015/16	1,042	22,864	4.6%
1996/97	715	16,818	4.3%	2016/17	1,061	23,418	4.5%
1997/98	641	16,655	3.9%	2017/18	1,079	23,715	4.6%
1998/99	771	16,908	4.6%	2018/19	1,095	24,030	4.6%
1999/00	749	16,687	4.5%	2019/20	1,110	24,160	4.6%
2000/01	802	17,580	4.6%	2020/21	1,126	24,926	4.5%
2001/02	819	17,793	4.6%	2021/22	1,141	25,254	4.5%
2002/03	671	19,236	3.5%	2022/23	1,157	25,616	4.5%
2003/04	804	19,269	4.2%	2023/24	1,174	25,961	4.5%
2004/05	830	19,724	4.2%	2024/25	1,190	26,321	4.5%
2005/06	797	19,923	4.0%	2025/26	1,207	26,681	4.5%
2006/07	900	20,497	4.4%	2026/27	1,225	27,046	4.5%
2007/08	940	21,049	4.5%	2027/28	1,242	27,415	4.5%
2008/09	1,052	21,198	5.0%	2028/29	1,259	27,785	4.5%
2009/10	813	20,473	4.0%	2029/30	1,277	28,163	4.5%
2010/11	947	20,773	4.6%	2030/31	1,295	28,547	4.5%
2011/12	736	20,757	3.5%	2031/32	1,317	29,050	4.5%
2012/13	1,184	21,463	5.5%	2032/33	1,339	29,564	4.5%
2013/14	1,205	22,324	5.4%	2033/34	1,363	30,123	4.5%
2014/15	992	22,443	4.4%	2034/35	1,391	30,734	4.5%

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.

Figure 14 - Construction Power
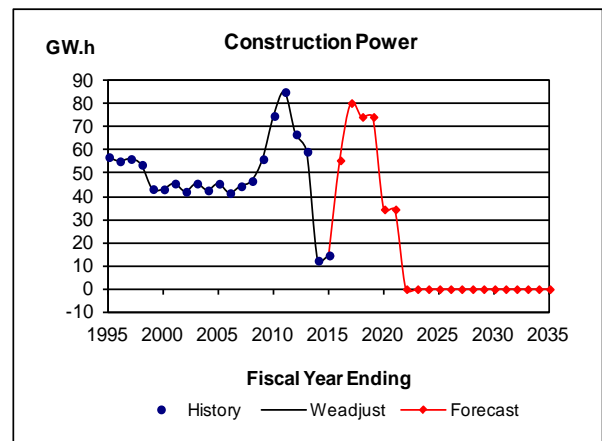
The Construction Power forecast includes: (1) the Pointe Du Bois spillway replacement started in April 2013 with expected completion in the Fall of 2015, (2) the Keewatinoow Converter Station, started in January 2012 with expected completion in the Fall of 2018 and (3) the construction of the Keeyask Generating Station.

Table 23 - Construction Power

CONSTRUCTION POWER (GW.h) HISTORICAL/WEATHER ADJUSTMENT/FORECAST					
Fiscal Year	Usage	Weather Adjust	Adjusted Usage	Fiscal Year	Forecast Usage
1995/96	55	0	55	2015/16	56
1996/97	56	0	56	2016/17	81
1997/98	54	0	54	2017/18	75
1998/99	43	0	43	2018/19	75
1999/00	43	0	43	2019/20	35
2000/01	46	0	46	2020/21	35
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
2014/15	15	0	15	2034/35	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
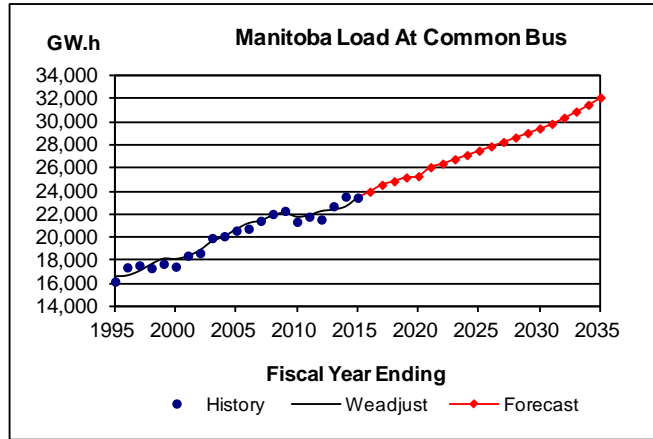
Common Bus is metered and totaled to correspond exactly to each calendar month. Weather adjustment is done on a calendar month basis.

Weather adjusted Common Bus has grown 358 GW.h (1.8%) per year for the past 20 years and 277 GW.h (1.3%) per year during the past 10 years reflecting the recent economic downturn. This historical growth includes the effect of past Demand Side Management (DSM) activities. Common Bus is forecast to grow 407 GW.h (1.6%) per year for the next 10 years and 434 GW.h (1.6%) per year for the next 20 years before program-based DSM initiatives.

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
1995/96	17,418	-790	16,628	2015/16	23,962
1996/97	17,590	-573	17,017	2016/17	24,560
1997/98	17,350	269	17,619	2017/18	24,868
1998/99	17,722	376	18,098	2018/19	25,200
1999/00	17,479	595	18,074	2019/20	25,304
2000/01	18,428	-112	18,316	2020/21	26,086
2001/02	18,655	181	18,836	2021/22	26,396
2002/03	19,953	-337	19,616	2022/23	26,773
2003/04	20,116	-85	20,030	2023/24	27,135
2004/05	20,600	70	20,669	2024/25	27,511
2005/06	20,761	431	21,192	2025/26	27,889
2006/07	21,442	-14	21,428	2026/27	28,271
2007/08	22,036	-173	21,863	2027/28	28,657
2008/09	22,305	-194	22,111	2028/29	29,045
2009/10	21,361	389	21,750	2029/30	29,440
2010/11	21,806	91	21,897	2030/31	29,842
2011/12	21,560	688	22,248	2031/32	30,367
2012/13	22,706	-323	22,383	2032/33	30,903
2013/14	23,541	-891	22,650	2033/34	31,486
2014/15	23,450	-11	23,439	2034/35	32,125

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.

Figure 16 - Transmission Losses
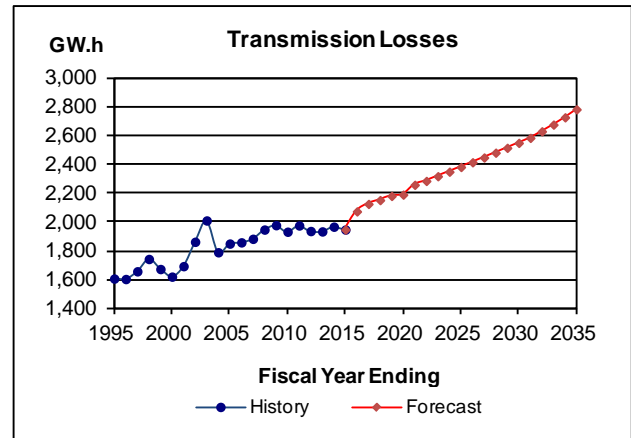
Transmission Losses are forecast to be 9.1% of the General Consumers Sales less Diesel Sales.

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
1995/96	1,606	16,623	9.7%	2015/16	2,075	22,864	9.1%
1996/97	1,660	16,818	9.9%	2016/17	2,127	23,418	9.1%
1997/98	1,745	16,655	10.5%	2017/18	2,153	23,715	9.1%
1998/99	1,675	16,908	9.9%	2018/19	2,182	24,030	9.1%
1999/00	1,623	16,687	9.7%	2019/20	2,191	24,160	9.1%
2000/01	1,696	17,580	9.6%	2020/21	2,259	24,926	9.1%
2001/02	1,864	17,793	10.5%	2021/22	2,286	25,254	9.1%
2002/03	2,012	19,236	10.5%	2022/23	2,319	25,616	9.1%
2003/04	1,792	19,269	9.3%	2023/24	2,350	25,961	9.1%
2004/05	1,852	19,724	9.4%	2024/25	2,383	26,321	9.1%
2005/06	1,860	19,923	9.3%	2025/26	2,415	26,681	9.1%
2006/07	1,885	20,497	9.2%	2026/27	2,448	27,046	9.1%
2007/08	1,949	21,049	9.3%	2027/28	2,482	27,415	9.1%
2008/09	1,979	21,198	9.3%	2028/29	2,515	27,785	9.1%
2009/10	1,934	20,473	9.4%	2029/30	2,549	28,163	9.1%
2010/11	1,977	20,773	9.5%	2030/31	2,584	28,547	9.1%
2011/12	1,939	20,757	9.3%	2031/32	2,630	29,050	9.1%
2012/13	1,936	21,463	9.0%	2032/33	2,676	29,564	9.1%
2013/14	1,969	22,324	8.8%	2033/34	2,727	30,123	9.1%
2014/15	1,949	22,443	8.7%	2034/35	2,782	30,734	9.1%

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 energy is forecast to be 137 GW.h and Station Service peak is forecast to be 25 MW from 2015/16 to 2034/35.

Figure 17 - Station Service
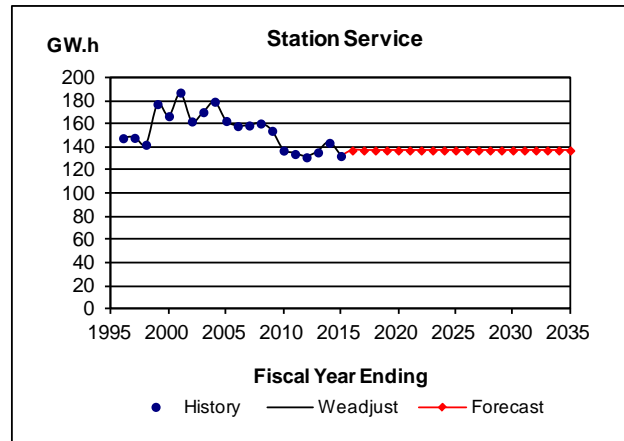
Station Service for Keeyask and for future non-committed plants is excluded from this forecast.

Table 26 - Station Service

STATION SERVICE (GW.h) HISTORICAL/WEATHER ADJUSTMENT/FORECAST					
Fiscal Year	Usage	Weather Adjust	Adjusted Usage	Fiscal Year	Forecast Usage
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
2014/15	132	0	132	2034/35	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
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	12.1	9.6	7.7	7.5	7.2	7.0	8.9	13.2	14.4	16.1	15.0	13.7	132.4
2015/16 - 2034/35	11.9	10.0	7.5	7.3	7.1	6.8	10.5	13.7	16.1	16.6	14.8	14.9	137.2

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
2014/15 Actual	19	11	12	14	8	10	17	21	22	25	29	27	29
2015/16 - 2034/35	20	14	10	11	10	10	19	23	24	24	26	24	25

Gross Firm Energy

Figure 18 - 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.
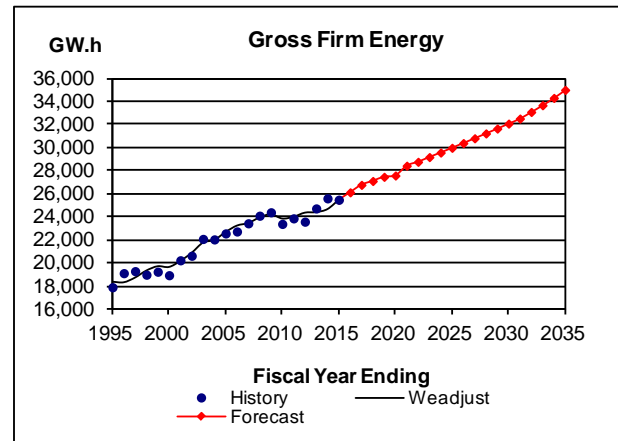
Weather adjusted Gross Firm Energy has grown 379 GW.h (1.8%) per year for the past 20 years and 283 GW.h (1.2%) per year during the past 10 years reflecting the recent economic downturn. This historical growth includes the effect of past Demand Side Management (DSM) activities. Energy is forecast to grow 451 GW.h (1.6%) per year for the next 10 years and 476 GW.h (1.6%) per year for the next 20 years before program-based DSM initiatives.

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
1995/96	19,148	-862	18,286	2015/16	26,145
1996/97	19,321	-624	18,697	2016/17	26,792
1997/98	19,014	295	19,309	2017/18	27,126
1998/99	19,273	410	19,683	2018/19	27,486
1999/00	18,971	651	19,622	2019/20	27,600
2000/01	20,262	-119	20,143	2020/21	28,449
2001/02	20,656	198	20,854	2021/22	28,786
2002/03	22,110	-370	21,740	2022/23	29,197
2003/04	22,069	-96	21,974	2023/24	29,590
2004/05	22,589	77	22,665	2024/25	29,999
2005/06	22,757	468	23,225	2025/26	30,408
2006/07	23,464	-16	23,448	2026/27	30,823
2007/08	24,122	-186	23,936	2027/28	31,243
2008/09	24,417	-208	24,208	2028/29	31,664
2009/10	23,412	425	23,837	2029/30	32,094
2010/11	23,892	102	23,994	2030/31	32,531
2011/12	23,605	747	24,351	2031/32	33,101
2012/13	24,750	-352	24,398	2032/33	33,684
2013/14	25,625	-958	24,666	2033/34	34,317
2014/15	25,505	-11	25,493	2034/35	35,011

Table 30 - Monthly Gross Firm Energy

| MONTHLY GROSS FIRM ENERGY (GW.h) History and Forecast 2004/05 - 2034/35 | | | | | | | | | | | | |
Fiscal Year	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total
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
2014/15	2,048	1,837	1,690	1,788	1,778	1,703	1,909	2,424	2,638	2,770	2,581	2,339	25,505
14/15 Wadj	1,928	1,784	1,733	1,836	1,753	1,710	1,966	2,280	2,750	2,874	2,424	2,454	25,493
2015/16	1,982	1,869	1,774	1,861	1,820	1,753	2,024	2,362	2,792	2,940	2,507	2,461	26,145
2016/17	2,038	1,923	1,819	1,906	1,866	1,796	2,073	2,417	2,858	3,009	2,567	2,520	26,792
2017/18	2,063	1,947	1,841	1,928	1,886	1,817	2,098	2,449	2,896	3,049	2,601	2,552	27,126
2018/19	2,091	1,972	1,865	1,953	1,910	1,841	2,126	2,482	2,935	3,090	2,636	2,586	27,486
2019/20	2,096	1,978	1,871	1,963	1,926	1,848	2,133	2,490	2,948	3,104	2,647	2,596	27,600
2020/21	2,163	2,046	1,929	2,022	1,998	1,914	2,203	2,562	3,027	3,186	2,722	2,675	28,449
2021/22	2,188	2,070	1,953	2,047	2,023	1,937	2,229	2,592	3,063	3,223	2,754	2,706	28,786
2022/23	2,219	2,100	1,981	2,077	2,051	1,965	2,261	2,629	3,107	3,269	2,793	2,745	29,197
2023/24	2,249	2,128	2,007	2,104	2,078	1,991	2,291	2,664	3,149	3,314	2,831	2,782	29,590
2024/25	2,280	2,157	2,035	2,134	2,107	2,019	2,323	2,701	3,193	3,360	2,870	2,821	29,999
2025/26	2,311	2,187	2,063	2,163	2,135	2,046	2,355	2,738	3,237	3,406	2,909	2,859	30,408
2026/27	2,343	2,216	2,091	2,192	2,164	2,074	2,387	2,775	3,281	3,453	2,949	2,898	30,823
2027/28	2,375	2,246	2,119	2,222	2,193	2,102	2,419	2,813	3,326	3,501	2,990	2,938	31,243
2028/29	2,407	2,276	2,147	2,251	2,222	2,130	2,452	2,851	3,372	3,548	3,030	2,978	31,664
2029/30	2,439	2,307	2,176	2,282	2,252	2,158	2,485	2,890	3,418	3,597	3,072	3,018	32,094
2030/31	2,472	2,338	2,206	2,313	2,282	2,187	2,518	2,930	3,465	3,646	3,114	3,059	32,531
2031/32	2,516	2,379	2,245	2,353	2,322	2,226	2,563	2,981	3,525	3,710	3,168	3,113	33,101
2032/33	2,561	2,421	2,285	2,395	2,362	2,266	2,608	3,034	3,587	3,775	3,223	3,168	33,684
2033/34	2,609	2,467	2,328	2,440	2,406	2,308	2,657	3,091	3,654	3,845	3,284	3,227	34,317
2034/35	2,662	2,517	2,375	2,490	2,454	2,355	2,711	3,153	3,728	3,923	3,350	3,292	35,011

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
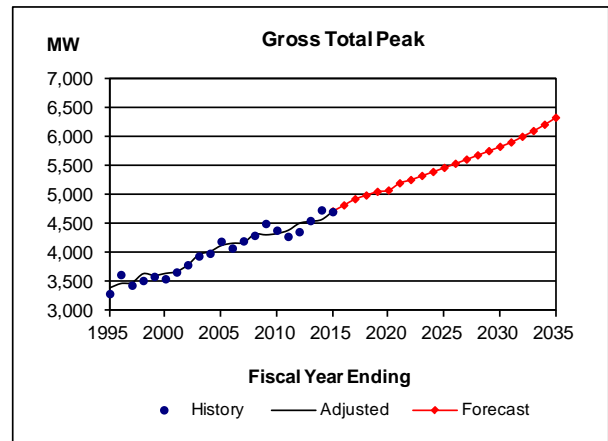
The adjusted Gross Total Peak has grown from 3,472 MW in 1995/96 to 4,726 MW in 2014/15 at an average growth of 66 MW or 1.6% per year. It is forecast to grow to 6,349 MW at 81 MW (1.5%) per year by 2034/35.

Table 31 – Gross Total Peak

GROSS TOTAL PEAK (MW) HISTORICAL/ADJUSTED/FORECAST					
Fiscal Year	Peak	Adjustment	Adjusted Peak	Fiscal Year	Forecast Peak
1995/96	3,628	-156	3,472	2015/16	4,829
1996/97	3,444	44	3,488	2016/17	4,936
1997/98	3,525	117	3,642	2017/18	5,000
1998/99	3,596	16	3,612	2018/19	5,063
1999/00	3,555	93	3,648	2019/20	5,086
2000/01	3,672	7	3,679	2020/21	5,210
2001/02	3,797	-1	3,795	2021/22	5,267
2002/03	3,948	26	3,974	2022/23	5,337
2003/04	3,994	33	4,027	2023/24	5,406
2004/05	4,201	-70	4,131	2024/25	5,476
2005/06	4,085	86	4,170	2025/26	5,547
2006/07	4,208	-25	4,183	2026/27	5,619
2007/08	4,304	23	4,327	2027/28	5,692
2008/09	4,509	-192	4,317	2028/29	5,765
2009/10	4,393	-54	4,339	2029/30	5,840
2010/11	4,286	109	4,395	2030/31	5,915
2011/12	4,367	149	4,516	2031/32	6,012
2012/13	4,559	-10	4,550	2032/33	6,112
2013/14	4,743	-162	4,581	2033/34	6,220
2014/15	4,713	13	4,726	2034/35	6,341

Table 32 - Monthly Gross Total Peak

Fiscal Year	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Annual
MONTHLY GROSS TOTAL PEAK (MW)													
History and Forecast													
2004/05 - 2034/35													
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
2014/15	3,754	2,955	2,967	3,094	3,190	2,938	3,382	4,391	4,532	4,713	4,573	4,390	4,713
14/15 Norm	**3,399**	**3,040**	**3,134**	**3,225**	**3,238**	**3,012**	**3,339**	**4,121**	**4,596**	**4,716**	**4,655**	**4,294**	**4,726**
2015/16	3,473	3,107	3,202	3,296	3,309	3,078	3,412	4,211	4,696	4,818	4,757	4,388	4,829
2016/17	3,566	3,193	3,280	3,372	3,388	3,152	3,492	4,307	4,800	4,925	4,863	4,490	4,936
2017/18	3,613	3,234	3,321	3,414	3,428	3,191	3,537	4,365	4,862	4,989	4,926	4,550	5,000
2018/19	3,661	3,277	3,365	3,459	3,474	3,233	3,584	4,424	4,924	5,052	4,988	4,611	5,063
2019/20	3,675	3,289	3,382	3,482	3,506	3,249	3,600	4,446	4,945	5,075	5,010	4,635	5,086
2020/21	3,784	3,395	3,477	3,577	3,621	3,356	3,709	4,563	5,067	5,198	5,137	4,763	5,210
2021/22	3,828	3,435	3,520	3,622	3,666	3,397	3,754	4,616	5,122	5,254	5,193	4,818	5,267
2022/23	3,882	3,484	3,571	3,674	3,718	3,445	3,807	4,682	5,191	5,325	5,262	4,887	5,337
2023/24	3,935	3,531	3,619	3,723	3,768	3,492	3,858	4,745	5,257	5,393	5,329	4,953	5,406
2024/25	3,989	3,580	3,669	3,775	3,819	3,540	3,912	4,811	5,326	5,464	5,399	5,022	5,476
2025/26	4,044	3,629	3,720	3,827	3,871	3,588	3,965	4,878	5,395	5,535	5,469	5,091	5,547
2026/27	4,099	3,678	3,770	3,879	3,924	3,637	4,019	4,945	5,466	5,607	5,539	5,162	5,619
2027/28	4,155	3,728	3,822	3,932	3,977	3,686	4,074	5,013	5,537	5,680	5,611	5,233	5,692
2028/29	4,212	3,778	3,874	3,985	4,031	3,736	4,129	5,081	5,608	5,753	5,683	5,304	5,765
2029/30	4,269	3,830	3,926	4,040	4,086	3,787	4,185	5,151	5,680	5,828	5,756	5,377	5,840
2030/31	4,327	3,882	3,980	4,095	4,141	3,838	4,242	5,222	5,754	5,904	5,830	5,451	5,915
2031/32	4,403	3,950	4,050	4,166	4,212	3,905	4,316	5,312	5,849	6,001	5,926	5,545	6,012
2032/33	4,480	4,019	4,121	4,239	4,285	3,974	4,392	5,405	5,945	6,101	6,024	5,642	6,112
2033/34	4,565	4,095	4,198	4,319	4,365	4,048	4,474	5,506	6,052	6,210	6,131	5,747	6,220
2034/35	4,657	4,178	4,283	4,406	4,452	4,130	4,565	5,618	6,169	6,331	6,250	5,863	6,341

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)

    = Hourly Total Generation (t)

    - Hourly Metered Exports (t)   +   Hourly Metered Imports (t)

    - Losses Associated with Exports (t)   +   Gains Associated with Imports (t)

    + Curtailments (t)

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:

Weather Adjustment = DDH weather effect * (DDH actual - DDH normal)
                 + DDC weather effect * (DDC actual - DDC normal)

Weather Adjusted Actual = Actual - 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, 0.9 GW.h / DDC

General Consumers Sales: 0.9 GW.h / DDH, 1.9 GW.h / DDC

Gross Firm Energy: 1.1 GW.h / DDH, 2.7 GW.h / DDC

Gross Total Peak: 48 MW / degree (at -30 degrees Celsius),

                112 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	**Normal**		**Record Warm**			**Record Cold**		
	1.1	**DDH**	**GW.h**	**DDH**	**GW.h**	**Effect**	**DDH**	**GW.h**	**Effect**
Year:	**2015/16**	4,569	26,145	3,678	25,127	-4%	5,439	27,140	4%
Month:	**Jan 2016**	951	2,940	663	2,611	-11%	1,261	3,295	12%
Day:	**Jan 2016**	31	95	6	67	-29%	56	124	31%

		Effect of Weather due to Summer Extremes on Gross Firm Energy								
	GW.h/DDC	**Normal**		**Record Cool Summer**			**Record Hot Summer**		
	2.7	**DDC**	**GW.h**	**DDC**	**GW.h**	**Effect**	**DDC**	**GW.h**	**Effect**
Year:	**2015/16**	179	26,145	69	25,849	-1%	364	26,642	2%
Month:	**July 2015**	66	1,861	6	1,700	-9%	142	2,064	11%
Day:	**July 2015**	2	60	0	54	-10%	14	92	53%

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.

Summer	**Winter**	Effect of Change in Temperature on Gross Total Peak							
MW/Deg	**MW/Deg**	**Normal**		**Warm Winter, Cool Summer**			**Cold Winter, Hot Summer**		
112	**48**	**Temp**	**MW**	**Temp**	**MW**	**Effect**	**Temp**	**MW**	**Effect**
Summer	**2015/16**	30	3,296	25	2,736	-17%	35	3,855	17%
Winter:	**2015/16**	-30	4,829	-25	4,591	-5%	-35	5,067	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 and an 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 (50th Percentile) or Base 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:

> Load = Base Forecast -/+ 1.28 x 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 and if a combined variance is desired, then 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 2034/35, the Load Forecast has an 80% probability of being accurate to within ±2,104 GW.h or ±6.0%. Due to the inherent variability of the load, this is the best level of accuracy possible.

The overall economic standard deviation in 2034/35 is 1,642 GW.h or 4.7% of the forecast energy. Analyzed individually, the economic standard deviation of the Top Consumers sector is 1,139 GW.h (13.7%), Residential is 481 GW.h (5.0%) and Mass Market is also 457 GW.h (3.6%), showing that the Top Consumers sector is the majority of the variance.
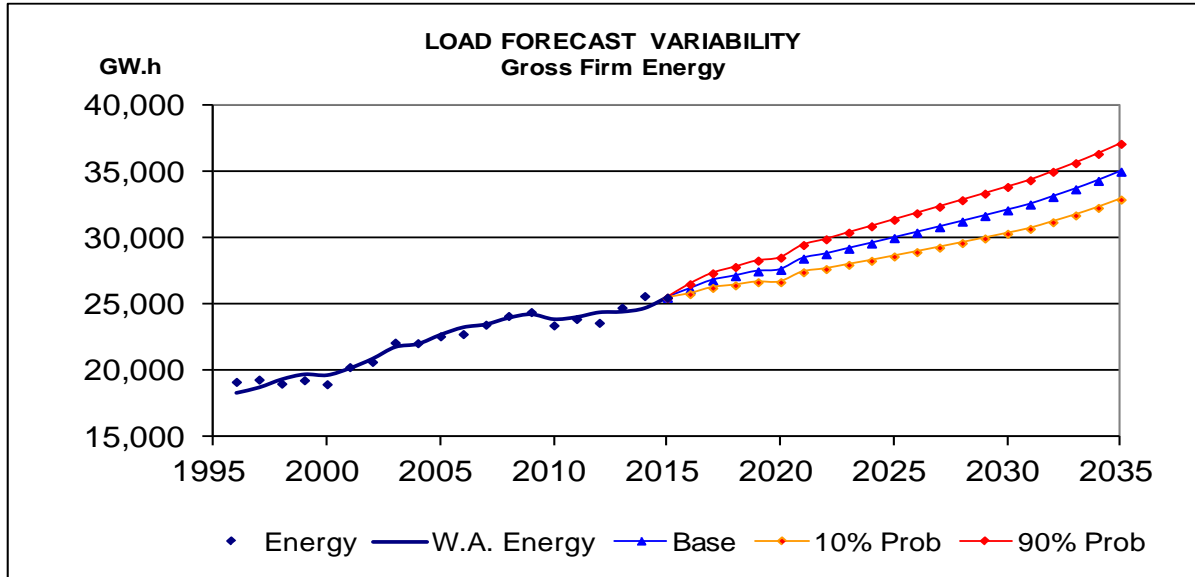
Figure 20 - Energy Variability

Table 33 – Energy Variability

Fiscal Year	Gross Firm Base Fcst	Long Term Economic Std Dev	10.0% Prob Point	90.0% Prob Point
2015/16	26,145	292	25,771	26,519
2016/17	26,792	430	26,240	27,343
2017/18	27,126	540	26,434	27,819
2018/19	27,486	636	26,671	28,301
2019/20	27,600	722	26,674	28,525
2020/21	28,449	802	27,422	29,477
2021/22	28,786	877	27,663	29,910
2022/23	29,197	948	27,982	30,411
2023/24	29,590	1,015	28,288	30,891
2024/25	29,999	1,080	28,614	31,383
2025/26	30,408	1,143	28,943	31,873
2026/27	30,823	1,204	29,280	32,366
2027/28	31,243	1,263	29,624	32,861
2028/29	31,664	1,321	29,972	33,357
2029/30	32,094	1,377	30,330	33,859
2030/31	32,531	1,432	30,696	34,366
2031/32	33,101	1,486	31,197	35,005
2032/33	33,684	1,539	31,712	35,656
2033/34	34,317	1,591	32,279	36,355
2034/35	35,011	1,642	32,907	37,115

Figure 21 - Peak Variability
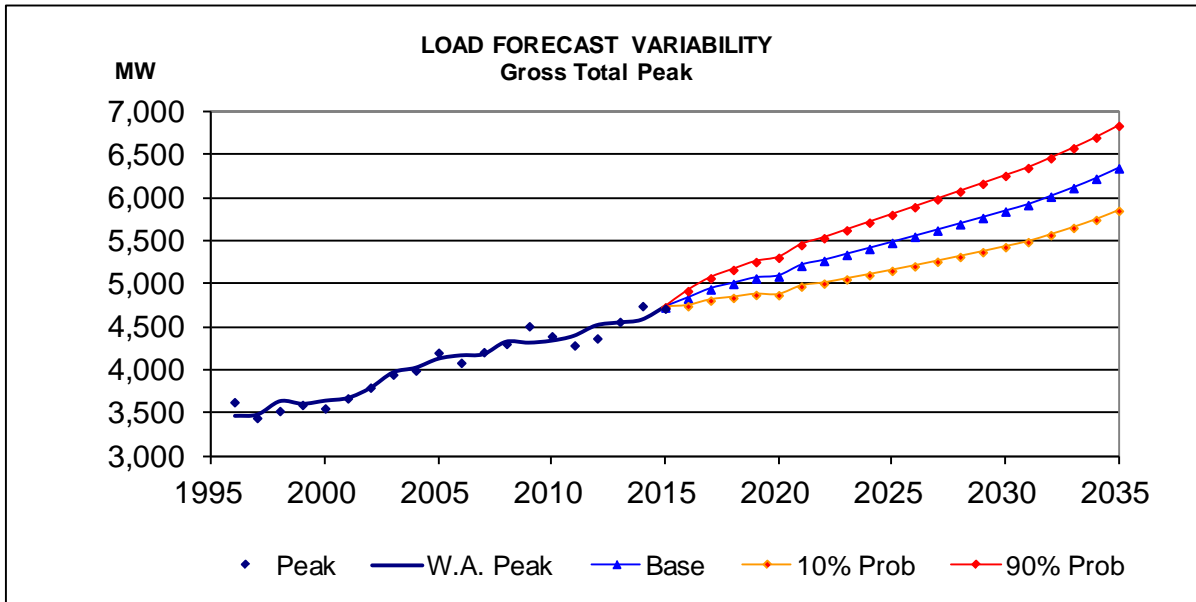
Table 34 – Peak Variability

Fiscal Year	Gross Total Peak Base Fcst	Long Term Economic Std Dev	10.0% Prob Point	90.0% Prob Point
2015/16	4,829	68	4,741	4,917
2016/17	4,936	101	4,807	5,065
2017/18	5,000	127	4,838	5,162
2018/19	5,063	149	4,872	5,254
2019/20	5,086	169	4,869	5,303
2020/21	5,210	188	4,969	5,451
2021/22	5,267	205	5,004	5,530
2022/23	5,337	222	5,052	5,622
2023/24	5,406	238	5,101	5,711
2024/25	5,476	253	5,152	5,800
2025/26	5,547	268	5,204	5,890
2026/27	5,619	282	5,257	5,981
2027/28	5,692	296	5,313	6,071
2028/29	5,765	309	5,368	6,162
2029/30	5,840	323	5,427	6,253
2030/31	5,915	335	5,485	6,345
2031/32	6,012	348	5,566	6,458
2032/33	6,112	361	5,650	6,574
2033/34	6,220	373	5,742	6,698
2034/35	6,341	385	5,848	6,834

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 only an 80% chance that a 5 year energy forecast will be within 3.4% of the actual, and an 80% chance that a 10 year energy forecast will be within 4.6% of the actual.

Recognizing this 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 remaining difference is taken as an estimate of 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 as 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, thus causing periods of over- or under-forecasting.

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

FORECAST ACCURACY
Gross Firm Energy
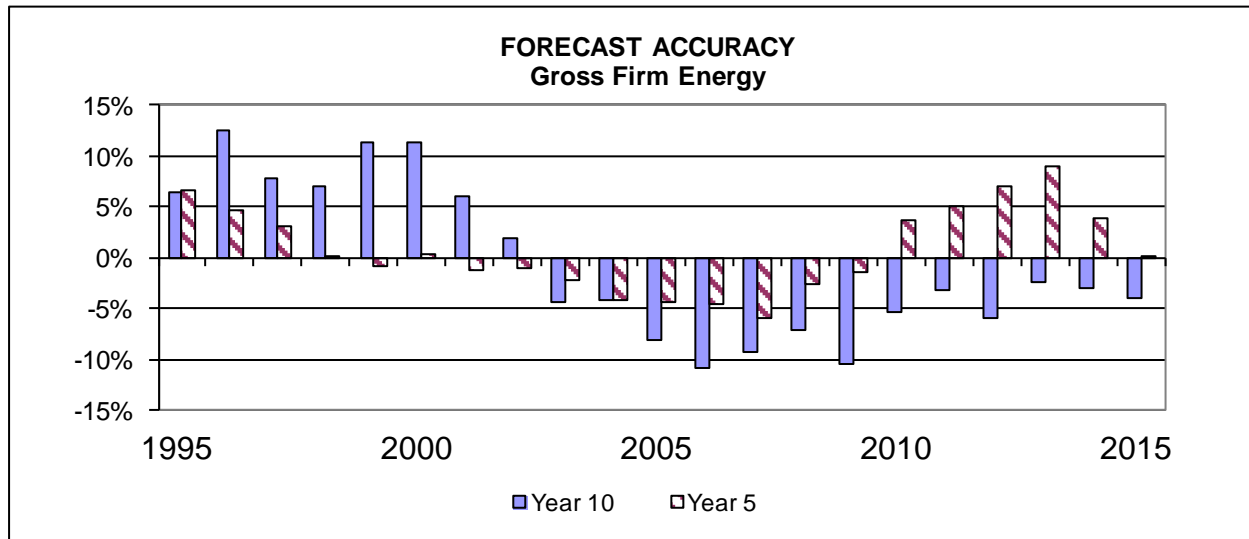
Table 35 - Energy Accuracy

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
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	25,239	24,020	5.1%	23,299	24,071	-3.2%
2011/12	23,605	25,909	24,202	7.1%	22,924	24,376	-6.0%
2012/13	24,750	26,464	24,270	9.0%	23,844	24,433	-2.4%
2013/14	25,625	25,512	24,538	4.0%	23,938	24,696	-3.1%
2014/15	25,505	25,506	25,469	0.1%	24,470	25,508	-4.1%

Figure 23 - Peak Accuracy

FORECAST ACCURACY
Gross Total Peak
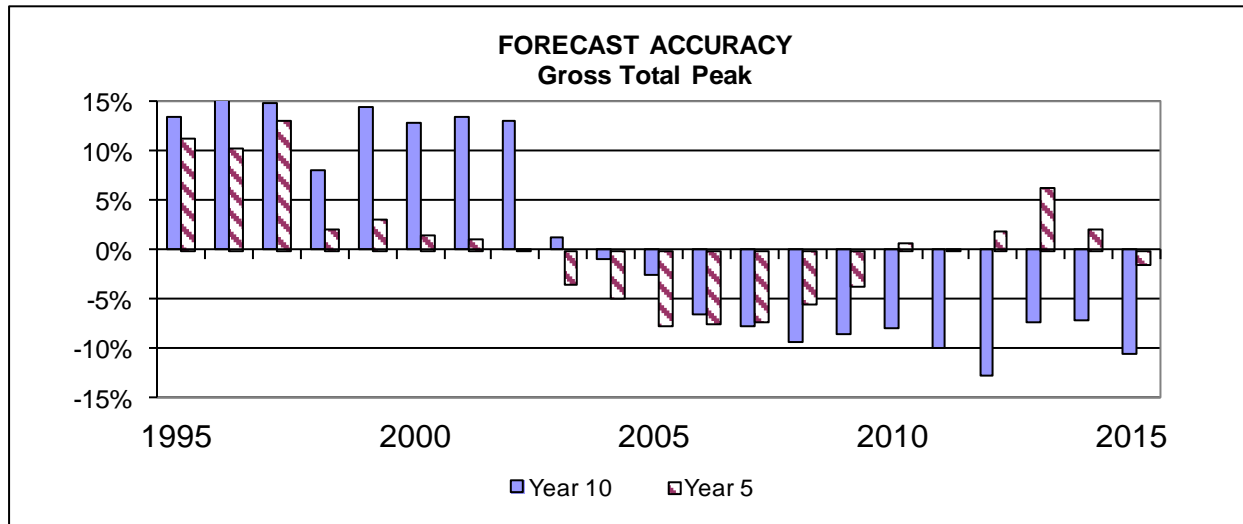
Table 36 - Peak Accuracy

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
1994/95	3,299	3,829	3,441	11.3%	3,904	3,441	13.5%
1995/96	3,628	3,850	3,493	10.2%	4,081	3,493	16.8%
1996/97	3,444	3,906	3,452	13.2%	3,962	3,452	14.8%
1997/98	3,525	3,768	3,690	2.1%	3,990	3,690	8.1%
1998/99	3,596	3,703	3,588	3.2%	4,108	3,588	14.5%
1999/00	3,555	3,738	3,681	1.6%	4,152	3,681	12.8%
2000/01	3,672	3,758	3,713	1.2%	4,210	3,713	13.4%
2001/02	3,797	3,759	3,758	0.0%	4,251	3,758	13.1%
2002/03	3,948	3,801	3,941	-3.6%	3,989	3,941	1.2%
2003/04	3,994	3,833	4,027	-4.8%	3,990	4,027	-0.9%
2004/05	4,201	3,817	4,131	-7.6%	4,023	4,131	-2.6%
2005/06	4,085	3,860	4,171	-7.5%	3,899	4,171	-6.5%
2006/07	4,208	3,894	4,196	-7.2%	3,868	4,196	-7.8%
2007/08	4,304	4,097	4,331	-5.4%	3,927	4,331	-9.3%
2008/09	4,509	4,161	4,317	-3.6%	3,948	4,317	-8.5%
2009/10	4,393	4,371	4,339	0.7%	3,993	4,339	-8.0%
2010/11	4,286	4,398	4,395	0.1%	3,959	4,395	-9.9%
2011/12	4,367	4,606	4,516	2.0%	3,942	4,516	-12.7%
2012/13	4,559	4,705	4,424	6.3%	4,098	4,424	-7.4%
2013/14	4,743	4,524	4,426	2.2%	4,107	4,426	-7.2%
2014/15	4,713	4,665	4,739	-1.6%	4,240	4,739	-10.5%

LOAD SENSITIVITES 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.

The sensitivity of the load to changes in forecast assumptions and the evaluation of extreme events are summarized below. Details are provided in the sections that follow.

Sensitivity of the Load to a Change In Assumptions	Energy (GW.h)	Peak (MW)
1% Increase/Decrease in Population	± 134	± 25
1% Increase/Decrease in Income	± 21	± 4
1% Increase/Decrease in GDP	± 111	± 21
1% Increase/Decrease in Electricity Price	∓ 69	∓ 13
1% Increase/Decrease in Gas to Electricity Price Ratio	± 1.7	± 0.3
Climate Change per Degree Celsius Warmer	+ 39	- 48

Evaluation of Extreme Events	Energy (GW.h)	Peak (MW)
If 0% or 100% of Residential had Electric Space Heat	-2,822, +4,687	-920, +1,528
If 0% or 100% Residential had Electric Water Heat	1011, +858	-115, +98
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	+ 5,318	+ 665
Illustrated Effect of Grid Parity (e.g. Solar Panels)	-857	-78

For context, one year of energy growth is 475 GW.h and one year of peak growth is 80 MW.

Population / Economic / Price Changes

The population, economy and prices are the most significant drivers of the load in Manitoba. The effect of each driver based on their coefficients from the models is summarized below.

Population: A 1% increase in population (12,859 people) results in a 1% increase in the number of Residential Basic customers (4,685 customers representing 77 GW.h) and a 0.58% change in the number of GS Mass Market Small and Medium customers (387 customers representing 41 GW.h). The total effect on Manitoba Gross Firm Energy would be 134 GW.h (0.52%).

Income: A 1% increase in real income results in a 0.24% increase in Residential average use (39 kW.h per customer and 18 GW.h overall). On Manitoba Gross Firm Energy it is 21 GW.h (0.08%)

GDP: A 1% increase in Manitoba GDP results in a 0.60% increase in GS Mass Market Small and Medium average use (631 kW.h per customer totaling 42 GW.h). A 1% increase in Canada/US GDP results in 0.27% increase in GS Large Customer average use (15,008 kW.h per customer totaling 5 GW.h) and a 0.88% change in Top Consumers use (51 GW.h). The total effect of a 1% increase in GDP on Manitoba Gross Firm Energy is 111 GW.h (0.52%).

Electricity Price: A 1% increase in real electricity price results in a 0.25% decrease in Residential average use (-41 kW.h per customer totaling -19 GW.h). It will also result in a 0.15% decrease in GS Mass Market Small and Medium average use (-158 kW.h per customer totaling -11 GW.h), a 0.31% decrease in GS Mass Market Large average use (-17,232 kW.h per customer totaling -6 GW.h) and a 0.44% decrease in GS Top Consumers use (-25 GW.h). The total effect of a 1% increase in real electricity price on Manitoba Gross Firm Energy is -69 GW.h (-0.27%).

Gas to Electricity Price Ratio: The gas to electricity price ratio is only modeled to affect new Residential construction and the effect is small. A 1% decrease in the ratio results in 89 fewer electrically heated dwellings reducing the energy requirements by 1.7 GW.h.

	Energy (GW.h)	Peak (MW)
1% Increase/Decrease in Population	± 134	± 25
1% Increase/Decrease in Income	± 21	± 4
1% Increase/Decrease in GDP	± 111	± 21
1% Increase/Decrease in Electricity Price	∓ 69	∓ 13
1% Increase/Decrease in Gas to Electricity Price Ratio	± 1.7	± 0.3

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 ➔ -229 GW.h and -48 MW in the winter
    Increase of 100 DDC ➔ +268 GW.h and +112 MW in the summer

The resulting total effect of every one degree increase in temperature would be:
    An increase of 39 GW.h to annual energy and a decrease of 48 MW to system peak.

	Energy (GW.h)	Peak (MW)
Climate Change per Degree Celsius Warmer	+39	-48

Change in Residential Use of Electricity for Space heat

Currently, 37.6% or 176,050 out of 468,499 Residential Basic customers heat their dwelling with electricity. An increase of 1% in the percentage of customers with electric space heat would result in a change of 4,685 customers with electric space heat at 25,122 kW.h per customer, and a change of -4,685 customers without electric space at 11,062 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 24 MW at Peak.

If all Residential customers had electric space heat, then the additional load would be 4,687 GW.h. If no residential customers had electric space heat, then the reduction in load would be 2,822 GW.h

	Energy (GW.h)	Peak (MW)
If 0% or 100% of Residential had Electric Space Heat	-2,822, +4,687	-920, +1,528

Change in Residential Use of Electricity for Water heat

Currently, 54.1% or 253,454 out of 468,499 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 4,685 customers with electric water heat using 3,500 kW.h per customer. The total Residential Basic increase would be 16 GW.h and 19 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 858 GW.h. If no residential customers had electric space heat, then the reduction in load would be 1011 GW.h

	Energy (GW.h)	Peak (MW)
If 0% or 100% Residential had Electric Water Heat	-1011, +858	-115, +98

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 1,761 GW.h to GS Top Consumers by 2034/35. 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) is 5,421 GW.h and 678 MW. Currently, the forecast for 2034/35 is 103 GW.h and 13 MW for PEVs, therefore the maximum additional load possible for 100% saturation would be an increase of 5,318 GW.h (11 years of load growth) and 665 MW (about 8 years of peak growth).

	Energy (GW.h)	Peak (MW)
Additional Load if 100% Electric Vehicle Saturation Rate	+5,318	+665

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 generation of solar panels added by 100,000 residential (2 kW system) and 10,000 commercial customers (50 kW system) at a 125% load factor:

	Energy (GW.h)	Peak (MW)
Illustrated Effect of Grid Parity (e.g. Solar Panels)	-857	-78

ASSUMPTIONS

Economic Assumptions

Economic forecast assumptions are taken from the economic variables that become part of Manitoba Hydro's 2015 Economic Outlook and the 2015 Energy Price Outlook.

Residential Customers - The number of Residential Basic customers in Manitoba is forecast to increase by 1.3% (5,902 units) in 2015/16 and averages 1.1% per year over the forecast period. This compares to a historical average increase of 1.1% per year over the last ten years. This is used in the Residential and GS Mass Market customer forecasts.

Electricity to Gas Price Ratio - The electricity price forecast is based on the Consumer Price Index (CPI) and rate increase projections contained in the Integrated Financial Forecast. The real electricity price is forecast to increase by 2.8% in 2015/16, increase between 1.8% and 2.0% from 2016/17 to 2030/31 and then decrease by 0.1% throughout the remaining four years of the forecast. 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. The ratio of prices is used in the Residential Basic forecast.

Manitoba Disposable Income - Real Manitoba disposable income per Res Basic customer grew 1.2% for the past 10 years and 0.9% for the past 20 years. It is forecast to grow 0.8% annually for the next 20 years. This is used in the Res Basic forecast.

Gross Domestic Product (GDP) - Real economic growth in Manitoba is forecast to be 2.5% in 2015/16. It is expected to be 2.5% in 2016/17, 2.2% in 2017/18 and then drop to 1.8% by 2018/19 and then stay at that level for the remainder of the forecast period. This is used in the GS Mass Market Small and Medium.

Gross Domestic Product (Canadian and US GDP) – Real economic growth in Canada and US combined is forecast to be 2.9% in 2015/16. It is expected to drop to 2.3% by 2021/22 and then stay at that level for the remainder of the forecast period. This is used in the GS Mass Market Large and GS Top Consumer forecasts.

Price / Income / GDP Elasticity

The economic effects of price, income and GDP have been incorporated into the 2015 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	-0.25	0.24	
GS Mass Mkt Small/Medium	-0.15		0.60
GS Mass Mkt Large	-0.31		0.27
GS Top Consumers	-0.44		0.88
Gross Firm Energy	-0.27	0.08	0.44

Demand Side Management (DSM) in the Forecast

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

Savings due to DSM activities 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 Plan and Power Resource Plan.

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

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

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:

DDH = sum (max(0, 14 - (Daily high + Daily low) / 2))
DDC = sum (max(0, (Daily high + 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 1990 to March 2015.

The 25 year weather normals used for every year of this forecast are 4,568.6 DDH and 179.1 DDC. This is a decrease of 1.2 DDH from last year's normal of 4,569.8 DDH, and a decrease of 3.8 DDC from last year's normal of 182.9 DDC.

The range of DDH from 1990 to 2015 was from a warm winter of 3,677.6 DDH in 2011/12 (891.0 DDH less than normal) to a cold winter of 5,439.3 DDH in 1995/96 (870.7 DDH more than normal).

The range of DDC from 1990 to 2015 was from a cool summer of 71.8 DDC in 2004/05 (107.3 DDC less than normal) to a hot summer of 267.3 DDC in 1995/96 (88.2 DDC more than normal).

METHODOLOGY

Residential Basic Methodology

Several different models and forecasts were used to determine the Residential Basic Model. These are the steps to produce the forecast:

1. **Forecast Residential Dwellings** - The forecast of Manitoba residential customers in Manitoba Hydro's 2015 Economic Outlook was used for the total number of Residential Basic customers for the 2015/16 to 2034/35 period. The customer forecast was 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 was reduced by about 0.5% to account for customers with multiple services to obtain the forecast of individual dwellings.

2. **Forecast Existing Dwellings** – Existing dwellings were broken down by dwelling type (single detached, multi attached, and Individually metered apartment suites) within each fuel region (Winnipeg, Gas Available outside Winnipeg and No Gas Available). Demolitions were estimated and customer switches of their space heating fuel were taken into account.

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 Heat Pump, 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. Percentages of each heat type in existing dwellings were taken from the 2014 Residential Energy Use 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))
= -4.06 + 0.92 * PGEFF (lag(t))	Single Detached, Winnipeg
= -1.60 + 2.48 * PGEFF (lag(t))	Single Detached, South Gas
= -9.97 + 11.55 * PGEFF (lag(t))	Multi Attached, Winnipeg

$$= -2.35 + 4.58 * PGEFF (lag(t)) \qquad \text{Multi Attached, South Gas}$$

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 (40%, 30%, 40%) of the 3, 4 and 5 year lags

R-squared: 78.5%, 86.1%, 50.1%, 65.2%

T-stats:

      Constant: -2.45, -2.21, -4.12, -3.35

      PGEFF: 0.45, 2.54, 3.37, 4.77

The 2014 Residential Energy Use Survey was used to break the forecast of new electric heat dwellings and new non-electric-heat dwellings within single detached, multi attached and individually metered apartment suites by Winnipeg, South Gas and No Gas areas into specific furnace types.

5. **Forecast of Space Heating Systems in Existing Dwellings** – The average age of heating systems in existing dwellings was determined from the 2014 Residential Energy Use Survey. The number of replacements was estimated using a Weibull distribution based on the average age of each furnace type from the survey. Switches of furnace types were estimated using survey respondents in older dwellings with newer heating systems and included saving estimates from the Heating Fuel Choice initiative. Their former heating system was verified using billing system information.

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 and 2014 Residential Energy Use Surveys. 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. Saving estimates from the Heating Fuel Choice initiative were included.

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 Residential Energy Use Surveys.

8. **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 dependent variable in the econometric linear model. Historical data from 1989/90 to 2014/15 was modeled. The resulting model and parameters are:

(Total Usage + DSM programs + C&S savings) / Customers
    = 3448.01 + 33186.90 x Saturation - 546.15 x Price + 0.05 x Income + 67.32 x Trend

Saturation	- Electric Heat Customer Count / Total Res Basic Customer Count
Price	- Manitoba Real Residential Electricity Price lagged 2.5 yrs
Income	- Manitoba Real Income per Res Basic Customer

R-squared: 99.3%

T-stats:

Constant:	2.77
Saturation:	4.08
Price:	-3.06
Income:	2.25
Trend:	3.86

9. **Appliance Use and Balancing** – Conditional Demand Analysis using the 2009 Residential Survey data combined with 2009/10 customer annual use from billing data was used to derive average annual energy use by type of heating system and appliance for existing and new dwellings. These average uses were multiplied by the number of each type of system and appliance to get the total energy use. This was balanced against Step 8 results to ensure reasonableness.

10. **Determine Total GW.h used** – The forecast number of dwellings multiplied by the overall average use determined the GW.h forecast. 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 initiatives.

General Service Mass Market Methodology

A) General Service Mass Market Customer Forecast

Econometric analysis of historical sales data was used to develop models to forecast the number of General Service Mass Market customers. Forecasts of Manitoba GDP and Manitoba Hydro Residential Basic Customers were then input into the models, which generated forecasts for the number of customers for each year of the forecast period.

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

Number of Customers (t)

       = Number of Customers (t-1)

       + Change in the Number of Customers (t)

Change in the Number of Customers (t)

       = Number of Customers (t-1)

       x Percentage Change in Number of Customers (t)

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 2014/15. The resulting model and parameters are as follows:

Percentage Change in Number of Customers (t)

       = -0.002 + 0.129 x LCGDP + 0.582 x CRES

       LCGDP   - Annual Lagged Percentage Change in Manitoba Gross Domestic Product

       CRES   - Annual Percentage Change in Residential Basic Customers

       R-squared: 59.9%

       T-stats:

              Constant   : -1.41

              LCGDP   : 4.13

              CRES   : 4.17

The number of General Service Large customers was modeled using yearend historical customer data from 1989/90 to 2014/15. The resulting model and parameters are as follows:

Number of GS Large Customers (t)

= 10.152 + 0.006 x GDP

R-squared: 98.0%

T-stats:

Constant : 1.43

GDP : 34.46

B) General Service Mass Market Average Use Forecast

Historical Average Use per General Service customer was calculated after removing the effects of DSM and Codes & Standards. The average use of the combined Small Non-Demand, Small Demand and Medium classes were forecast using an econometric linear regression model that included Electricity Price and Manitoba GDP. Historical data from 1989/90 to 2014/15 was used. The resulting model and parameters are as follows:

Average Use per SND, SD and Medium

= 59915.07 - 2164.94 x Elec Price + 1.30 x GDP - 4000.60 x Dummy

Elec Price   - SND, SD and Medium Average Real Electricity Price

GDP   - 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: 98.9%

T-stats:

Constant : 9.24

Elec Price : -3.52

GDP : 18.37

Dummy : -4.42

The Average Use for Large Mass Market customers was modeled using historical data from 1989/90 to 2014/15. The resulting model and parameters are as follows:

Average Use per GS Large
= 6111026.10 - 342186.30 x Elec Price + 218.82 x CGDP

Elec Price   - GS Large Average Real Electricity Price
CGDP   - Cross Real Gross Domestic Product (combined Canadian and US GDP)

R-squared: 93.0%
T-stats:
    Constant   : 9.14
    Elec Price   : -3.60
    CGDP   : 6.99

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 and 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 was assigned to Small Non Demand, Small Demand and Medium classes by using their 3 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. These tend to cover 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.

An econometric model of Top Consumers was used to forecast PLIL. The model was developed by fitting historical Top Consumers annual energy from 1983/84 to 2014/15 to the Top Consumer Electricity Price and to a combined Canadian and US Real GDP.

The resulting model and parameters are as follows:

Log Total Load

    = 1.367 - 0.438 x Log Top Price + 0.878 x Log CGDP

    Log Top Price - Natural Log of Manitoba Top Consumers Real Electricity Price
    Log CGDP   - Natural Log of Cross Real Gross Domestic Product (combined
                      Canadian and US GDP)

    R-squared: 98.2%
    T-stats:
        Constant: 2.57
        Log Top Price: -3.62
        LCGDP: 20.04

The forecasted growth in years 4 through 20 from this model was used as PLIL.

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 forecast by analysis of the 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 a 92% Load Factor applied to the Top Consumer monthly energy.

The annual Gross Total Peak is calculated using the 3 winter months of December, January and February when the actual peak has typically occurred and applied a ratio from the January peak to be used as the annual peak.

Historical weather adjusted energy is used to calculate the annual Load Factor. The historical trend of the load factor increasing 0.08% per year is applied to the forecast in the winter months when the annual system peak occurs. The number of hours in each month is used to calculate monthly Load Factors.

Growth Rates

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

Annual percentage growth rates in this document are compound growth rates calculated as:
    (final GW.h / initial GW.h) ^ (1 / 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.

Curtailable - 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.

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

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.

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

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:

Load Factor = (Total Energy / Hours) / (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 attached 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.