Needs For and Alternatives To

**APPENDIX D**

**2013 Electric Load Forecast**

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# 2013 ELECTRIC LOAD FORECAST

## (For External Use)

**Manitoba Hydro**

# EXECUTIVE SUMMARY

**Overview**

Gross Firm Energy is forecast to grow from weather adjusted value of 24,404 GW.h in 2012/13 to 28,605 GW.h in 2022/23. This average growth is 420 GW.h or 1.6% per year for 10 years. By 2032/33, Gross Firm Energy is forecast to be 32,667 GW.h, a twenty-year growth rate of 413 GW.h or 1.5% per year.

Gross Total Peak is forecast to grow at about the same pace, growing 79 MW or 1.7% a year for the next 10 years, and 76 MW or 1.5% a year for the next 20 years. In 20 years, the peak will grow 1,527 MW to 5,959 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 1.4%, 1.5% and 1.6% respectively.

During the last 10 years, Gross Firm Energy has grown 266 GW.h or 1.2% per year. This ten year period includes the 2009 economic downturn that slowed growth.

The primary driver of growth in Manitoba is the population, with the secondary driver being the economy. Manitoba Hydro's 2013 Economic Outlook provides both the forecast of the population and the resulting forecast of Residential Basic customers that is used in this document. The population of Manitoba has grown from 1,156,600 people in 2002 to 1,267,000 people in 2012 averaging 0.9% growth per year. The forecast is that Manitoba's population will grow to 1,568,500 by 2032, averaging 1.1% per year. The primary reason for the expected increase of population growth in Manitoba is due to government immigration initiatives.

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 0.3% to the growth and is primarily due to increased use of electric space heating and electric water heating in homes.

General Service Mass Market is forecast to grow at an average 1.5% per year, comparable to its historic growth of 1.4% per year over the past ten years.

General Service Top Consumers is forecast to grow at 1.6% per year. This is higher than its 0.5% growth per year during the past ten years which included the loss of a customer and an economic downturn. But it is less than the 3.3% growth per year during the prior ten years. Combined, the 20 year historical growth of the Top Consumers has been 2.0% per year. Short term committed customer plans will amount to 355 GW.h of growth, even after accounting for the expected major load decrease by 2016 of one customer.

**Comparison with the 2012 Forecast**

The Gross Firm Energy forecast is down 495 GW.h in 2013/14 due to initial-year decreases to the GS Mass Market and GS Top Consumers forecasts and associated decreases to losses. The growth of Residential Basic customers has been reduced from the 2012 forecast resulting in a lower Residential and GS Mass Market forecast. Gross Firm Energy is down 717 GW.h (1½ years of load growth) in 2022/23 and down 1159 GW.h (almost 3 years of load growth) in 2031/32.

The reduction in peak in 2022/23 is 54 MW, about 2/3 of a year of load growth. The reduction in peak in 2031/32 of 146 MW amounts to a reduction of almost 2 years of load growth.

**Load Variability and Possible Events**

The forecast presented in this document is Manitoba Hydro's best estimate of Manitoba's future electricity requirements. Analysis of historical variation indicates there is an 80% chance that by 2032/33, the load could vary by ±2,471 GW.h (7.6%) from the forecast.

In addition, Manitoba Hydro examines possible events of interest for their potential impact on system load requirements. These events are deemed to be captured within the overall load variability analysis of the forecast, but are presented so their individual effects may be considered from a sensitivity perspective if the need arises:

|  | Energy Effect (GW.h) | Peak Effect (MW) |
|---|---|---|
| **Climate Change per Degree Celsius Warmer** | +100 | -40 |
| **One New Very Large Industrial Customer** | +1,500 | +180 |
| **One Less Very Large Industrial Customer** | -1,500 | -180 |
| **Additional Load if Electric Vehicles Grow to 70%** | +2,312 | +289 |
| **10% of all Res Customers switch to Electric Heat** | +746 | +246 |
| **10% of all Res Customers switch to Electric Water Heaters** | +198 | +23 |

(For comparison, 1 year of load growth is approximately 420 GW.h or 80 MW)

Table 1 - Gross Energy and Peak

| GROSS FIRM ENERGY AND GROSS TOTAL PEAK | | | | | |
|---|---|---|---|---|---|
| History and Forecast<br>2002/03 - 2032/33 | | | | | |
| | Gross Firm Energy | | Gross Total Peak | | Load Factor |
| Fiscal Year | (GW.h) | Growth (%) | (MW) | Growth (%) | (%) |
| 2002/03 | 22110 | | 3948 | | 63.9% |
| 2003/04 | 22069 | -0.2% | 3994 | 1.2% | 63.1% |
| 2004/05 | 22589 | 2.4% | 4201 | 5.2% | 61.4% |
| 2005/06 | 22757 | 0.7% | 4085 | -2.8% | 63.6% |
| 2006/07 | 23464 | 3.1% | 4208 | 3.0% | 63.7% |
| 2007/08 | 24122 | 2.8% | 4304 | 2.3% | 64.0% |
| 2008/09 | 24417 | 1.2% | 4509 | 4.8% | 61.8% |
| 2009/10 | 23412 | -4.1% | 4393 | -2.6% | 60.8% |
| 2010/11 | 23892 | 2.1% | 4286 | -2.4% | 63.6% |
| 2011/12 | 23605 | -1.2% | 4367 | 1.9% | 61.7% |
| 2012/13 | 24759 | 4.9% | 4559 | 4.4% | 62.0% |
| 2012/13 Wadj | 24404 | -1.4% | 4432 | -2.8% | 62.9% |
| | | | | | |
| 10 Year Avg Gr. | 266 | 1.2% | 48 | 1.2% | |
| | | | | | |
| 2013/14 | 25239 | 3.4% | 4601 | 3.8% | 62.6% |
| 2014/15 | 25676 | 1.7% | 4680 | 1.7% | 62.6% |
| 2015/16 | 26013 | 1.3% | 4742 | 1.3% | 62.6% |
| 2016/17 | 26322 | 1.2% | 4801 | 1.2% | 62.6% |
| 2017/18 | 26606 | 1.1% | 4857 | 1.2% | 62.5% |
| 2018/19 | 27003 | 1.5% | 4930 | 1.5% | 62.5% |
| 2019/20 | 27398 | 1.5% | 5002 | 1.5% | 62.5% |
| 2020/21 | 27789 | 1.4% | 5074 | 1.4% | 62.5% |
| 2021/22 | 28197 | 1.5% | 5147 | 1.5% | 62.5% |
| 2022/23 | 28605 | 1.4% | 5222 | 1.4% | 62.5% |
| | | | | | |
| 10 Year Avg Gr. | 420 | 1.6% | 79 | 1.7% | |
| | | | | | |
| 2023/24 | 29013 | 1.4% | 5296 | 1.4% | 62.5% |
| 2024/25 | 29418 | 1.4% | 5369 | 1.4% | 62.5% |
| 2025/26 | 29822 | 1.4% | 5443 | 1.4% | 62.6% |
| 2026/27 | 30225 | 1.4% | 5516 | 1.3% | 62.6% |
| 2027/28 | 30625 | 1.3% | 5588 | 1.3% | 62.6% |
| 2028/29 | 31041 | 1.4% | 5664 | 1.4% | 62.6% |
| 2029/30 | 31453 | 1.3% | 5739 | 1.3% | 62.6% |
| 2030/31 | 31863 | 1.3% | 5813 | 1.3% | 62.6% |
| 2031/32 | 32265 | 1.3% | 5886 | 1.3% | 62.6% |
| 2032/33 | 32667 | 1.2% | 5959 | 1.2% | 62.6% |
| | | | | | |
| 20 Year Avg Gr. | 413 | 1.5% | 76 | 1.5% | |

**Table** 2 - **Change in Energy and Peak**

| GROSS FIRM ENERGY AND GROSS TOTAL PEAK | | | | | |
|---|---|---|---|---|---|
| Change from Previous Forecast 2013/14 - 2032/33 | | | | | |
| | Gross Firm Energy | | | Gross Total Peak | | |
| Fiscal Year | 2013 Forecast (GW.h) | 2012 Forecast (GW.h) | Change (GW.h) | 2013 Forecast (MW) | 2012 Forecast (MW) | Change (MW) |
| 2012/13 Act | 24759 | | | 4559 | | |
| Weather Adj. | -356 | | | -127 | | |
| 2012/13 Wadj | 24404 | 24961 | (557) | 4432 | 4491 | (59) |
| | | | | | | |
| 2013/14 | 25239 | 25734 | (495) | 4601 | 4609 | (8) |
| 2014/15 | 25676 | 26071 | (395) | 4680 | 4677 | 3 |
| 2015/16 | 26013 | 26393 | (380) | 4742 | 4738 | 4 |
| 2016/17 | 26322 | 26677 | (355) | 4801 | 4794 | 7 |
| 2017/18 | 26606 | 27128 | (522) | 4857 | 4874 | (17) |
| 2018/19 | 27003 | 27616 | (614) | 4930 | 4959 | (29) |
| 2019/20 | 27398 | 27919 | (521) | 5002 | 5024 | (22) |
| 2020/21 | 27789 | 28400 | (611) | 5074 | 5109 | (35) |
| 2021/22 | 28197 | 28859 | (661) | 5147 | 5192 | (45) |
| 2022/23 | 28605 | 29322 | (717) | 5222 | 5276 | (54) |
| | | | | | | |
| 10 Year | 420 | 436 | | 79 | 79 | |
| Avg Gr. | 1.6% | 1.6% | | 1.7% | 1.6% | |
| | | | | | | |
| 2023/24 | 29013 | 29779 | (766) | 5296 | 5360 | (64) |
| 2024/25 | 29418 | 30239 | (821) | 5369 | 5445 | (76) |
| 2025/26 | 29822 | 30691 | (869) | 5443 | 5528 | (85) |
| 2026/27 | 30225 | 31138 | (913) | 5516 | 5611 | (95) |
| 2027/28 | 30625 | 31594 | (968) | 5588 | 5695 | (107) |
| 2028/29 | 31041 | 32053 | (1012) | 5664 | 5779 | (115) |
| 2029/30 | 31453 | 32511 | (1058) | 5739 | 5863 | (124) |
| 2030/31 | 31863 | 32967 | (1104) | 5813 | 5947 | (134) |
| 2031/32 | 32265 | 33425 | (1159) | 5886 | 6032 | (146) |
| | | | | | | |
| 19 Year | 414 | 445 | -32 | 77 | 81 | -5 |
| Avg Gr. | 1.5% | 1.5% | -0.1% | 1.5% | 1.6% | -0.1% |

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# INTRODUCTION

This document is prepared annually as Manitoba Hydro's forecast of its future load requirements for its service area. The service area consists of all of Manitoba (99.83% of sales), as well as two resale customers that supply energy to Creighton, Sask. (0.14% 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. Rate making and accounting require short term forecasts of sales by billing month within rate groups so they can forecast revenue. Operations and power planning require short and long term forecasts of energy and peak by calendar month so they can determine supply requirements.

A "customer" in this document usually 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 home not using electricity for heating might use 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 homes 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 home not using electricity for heating would use a maximum of about 2.5 kW sometime during the year. However, homes will not all be at their maximum use at the same hour. The maximum use at the same hour is known as the coincident load at the system peak hour. A typical home 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 homes not using electricity for heating.

**Components of Manitoba's Electricity Use – 2012/13**

General Consumers Sales (also referred to as Total Sales) includes the energy supplied to all of Manitoba Hydro's individually billed customers. In 2012/13, Manitoba Hydro averaged 545,660 General Consumers Sales customers who used 21,477 GW.h.

The major groups include
    (1) Residential Basic, with 456,130 customers who used 7,223 GW.h or 33.6% of Sales. These are mostly residences that include single-family homes, multi-family homes and apartment suites.
    (2) General Service Mass Market, with 65,974 customers who used 8,434 GW.h or 39.3% of Sales. These are small to large Commercial and Industrial customers.
    (3) General Service Top Consumers, with 31 customers who used 5,560 GW.h or 25.9% of sales. These are 17 high-usage companies (some count as multiple customers) that are forecast individually.

The remaining customers include Seasonal customers (billed twice a year rather than monthly), Diesel customers (four remote towns not connected to the integrated grid system), Flat Rate Water Heating and Area and Roadway Lighting. Their electricity use totals only 260 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 2012/13, Common Bus was 22,699 GW.h or about 5.7% 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 2012/13, Gross Firm Energy was 24,759 GW.h or about 15.3% more than Total Sales.

**Table 3 - Components of Manitoba Electricity Use**

| COMPONENTS OF MANITOBA ELECTRICITY USE 2012/13 (Customers, Consumption and Average Use) | | | |
|---|---|---|---|
| **Forecast Group** | **Cust/Serv** | **GW.h** | **% of Sales** | **kW.h/cust** |
| **Residential Basic** | 456,130 | 7,223 | 33.6% | 15,836 |
| **Residential Diesel** | 577 | 8 | 0.0% | 14,632 |
| **Residential Seasonal** | 20,731 | 81 | 0.4% | 3,911 |
| **Residential Flat Rate Water Heating** | 4,089 | 21 | 0.1% | 5,088 |
| **Total Residential** | 477,438 | 7,334 | 34.1% | |
| **GS Mass Market** | 65,974 | 8,434 | 39.3% | 127,839 |
| **GS Top Consumers** | 31 | 5,560 | 25.9% | 179,345,515 |
| **GS Diesel** | 175 | 5 | 0.0% | 31,069 |
| **GS Seasonal** | 850 | 5 | 0.0% | 6,048 |
| **GS Flat Rate Water Heat** | 408 | 7 | 0.0% | 18,236 |
| **GS Surplus Energy Program** | 28 | 28 | 0.1% | 996,707 |
| **Total General Service** | 67,058 | 14,040 | 65.4% | |
| **Sentinal Flat Rate** | 20,238 | 12 | 0.1% | 568 |
| **Sentinal Rental** | 25,613 | - | 0.0% | - |
| **Street Lighting** | 1,164 | 92 | 0.4% | 78,979 |
| **Total Lighting** | 1,164 | 103 | 0.5% | |
| **Total General Consumer Sales** | 545,660 | 21,477 | 100.0% | |
| **Less Diesel Sales** | | (14) | -0.1% | |
| **Distribution Losses** | | 1,176 | 5.5% | |
| **Construction Power** | | 59 | 0.3% | |
| **Manitoba Load at Common Bus** | | 22,699 | 105.7% | |
| **Transmission Losses** | | 1,952 | 9.1% | |
| **Less Non-Firm Energy** | | (28) | -0.1% | |
| **Station Service** | | 137 | 0.6% | |
| **Gross Firm Energy** | | 24,759 | 115.3% | |

\* flat rate and rental services are shown in yellow, which do not count as customers

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# FORECAST OVERVIEW

## General Consumers Customer Forecast

In 2012/13, there was an average of 545,660 General Consumer Sales customers. These were made up of 456,130 Residential Basic customers, 65,974 General Service Mass Market customers, 31 General Service Top Consumers customers, 28 SEP (Surplus Energy Program, i.e. non-firm) customers, with the rest being Diesel, Seasonal and Area and Roadway Lighting.

During the last 10 years, Residential Basic customers have grown at an average of 4,232 (1.0%) per year. Manitoba Hydro's 2013 Economic Outlook provides the forecast of Residential Basic customers, and this document uses that forecast. It calls for a growth of 5,577 (1.2%) per year over the next ten years and 5,423 (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 571 (0.9%) per year over the last 10 years. They are forecast to grow 545 (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 51 (0.3%) customers per year over the last 10 years. They are forecast to grow at 96 (0.5%) over the next 10 years and 98 (0.5%) over the next 20 years.

Area and Roadway Lighting customers were re-grouped in 2006 when Manitoba Hydro changed its billing system, and the lighting customer counts changed at that time. Area and Roadway Lighting is expected to grow at 4 (0.4%) customers over the next 10 years and 5 (0.4%) over the next 20 years.

Manitoba Hydro purchased Winnipeg Hydro in September 2002. Their customers were integrated into the Manitoba Hydro billing system in June 2004. Historical customer and energy numbers in this document include Winnipeg Hydro customers.

Table 4 - General Consumers Sales Customers

| GENERAL CONSUMERS SALES (Ave. Customers) History and Forecast 2002/03 - 2032/33 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Fiscal Year | Residential | | | General Service | | | | | Lighting | Total |
| | Basic | Diesel | Seas | Mass Mkt | Top Cons | Diesel | Seas | SEP | | Custs |
| 2002/03 | 413,812 | 499 | 20,219 | 60,265 | 26 | 148 | 786 | 33 | 755 | 496543 |
| 2003/04 | 416,690 | 500 | 20,056 | 60,672 | 27 | 151 | 788 | 33 | 757 | 499674 |
| 2004/05 | 420,135 | 508 | 20,075 | 60,924 | 26 | 160 | 793 | 31 | 759 | 503411 |
| 2005/06 | 423,742 | 519 | 20,145 | 61,491 | 26 | 168 | 814 | 28 | 793 | 507726 |
| 2006/07 | 427,886 | 525 | 20,312 | 63,596 | 26 | 169 | 783 | 28 | 1129 | 514454 |
| 2007/08 | 432,144 | 531 | 20,437 | 63,855 | 26 | 175 | 798 | 27 | 1,142 | 519135 |
| 2008/09 | 437,263 | 540 | 20,648 | 64,140 | 26 | 178 | 818 | 24 | 1,175 | 524812 |
| 2009/10 | 441,710 | 539 | 20,839 | 64,758 | 26 | 177 | 830 | 24 | 1,191 | 530094 |
| 2010/11 | 445,882 | 550 | 20,950 | 65,193 | 26 | 176 | 842 | 24 | 1,184 | 534827 |
| 2011/12 | 450,748 | 568 | 20,844 | 65,546 | 32 | 174 | 847 | 26 | 1,155 | 539940 |
| 2012/13 | 456,130 | 577 | 20,731 | 65,974 | 31 | 175 | 850 | 28 | 1,164 | 545660 |
| 10 Year | 4232 | 8 | 51 | 571 | 1 | 3 | 6 | -1 | 41 | 4912 |
| Avg Gr. | 1.0% | 1.5% | 0.3% | 0.9% | 1.8% | 1.7% | 0.8% | -1.6% | 4.4% | 0.9% |
| 2013/14 | 461,763 | 581 | 20,786 | 66,568 | 30 | 176 | 851 | 32 | 1,163 | 551950 |
| 2014/15 | 467,291 | 588 | 20,886 | 67,106 | 30 | 178 | 856 | 34 | 1,168 | 558137 |
| 2015/16 | 472,817 | 595 | 20,986 | 67,654 | 30 | 179 | 861 | 36 | 1,173 | 564331 |
| 2016/17 | 478,333 | 602 | 21,086 | 68,224 | 30 | 181 | 866 | 38 | 1,178 | 570538 |
| 2017/18 | 483,871 | 610 | 21,186 | 68,789 | 31 | 182 | 871 | 40 | 1,183 | 576763 |
| 2018/19 | 489,452 | 617 | 21,286 | 69,332 | 31 | 184 | 876 | 40 | 1,188 | 583006 |
| 2019/20 | 495,061 | 624 | 21,386 | 69,862 | 31 | 185 | 881 | 40 | 1,193 | 589263 |
| 2020/21 | 500,681 | 631 | 21,486 | 70,387 | 31 | 187 | 886 | 40 | 1,198 | 595527 |
| 2021/22 | 506,300 | 638 | 21,586 | 70,908 | 31 | 188 | 891 | 40 | 1,203 | 601785 |
| 2022/23 | 511,900 | 645 | 21,686 | 71,426 | 31 | 190 | 896 | 40 | 1,208 | 608022 |
| 10 Year | 5577 | 7 | 96 | 545 | 0 | 2 | 5 | 1 | 4 | 6236 |
| Avg Gr. | 1.2% | 1.1% | 0.5% | 0.8% | 0.0% | 0.8% | 0.5% | 3.6% | 0.4% | 1.1% |
| 2023/24 | 517,463 | 652 | 21,786 | 71,939 | 31 | 191 | 901 | 40 | 1,213 | 614216 |
| 2024/25 | 522,976 | 659 | 21,886 | 72,446 | 31 | 193 | 906 | 40 | 1,218 | 620355 |
| 2025/26 | 528,431 | 666 | 21,986 | 72,945 | 31 | 194 | 911 | 40 | 1,223 | 626427 |
| 2026/27 | 533,822 | 673 | 22,086 | 73,437 | 31 | 196 | 916 | 40 | 1,228 | 632429 |
| 2027/28 | 539,143 | 680 | 22,186 | 73,922 | 31 | 197 | 921 | 40 | 1,233 | 638353 |
| 2028/29 | 544,387 | 687 | 22,286 | 74,397 | 31 | 199 | 926 | 40 | 1,238 | 644191 |
| 2029/30 | 549,550 | 694 | 22,386 | 74,864 | 31 | 200 | 931 | 40 | 1,243 | 649939 |
| 2030/31 | 554,634 | 702 | 22,486 | 75,322 | 31 | 202 | 936 | 40 | 1,248 | 655601 |
| 2031/32 | 559,644 | 709 | 22,586 | 75,771 | 31 | 203 | 941 | 40 | 1,253 | 661178 |
| 2032/33 | 564,585 | 716 | 22,686 | 76,214 | 31 | 205 | 946 | 40 | 1,258 | 666681 |
| 20 Year | 5423 | 7 | 98 | 512 | 0 | 2 | 5 | 1 | 5 | 6051 |
| Avg Gr. | 1.1% | 1.1% | 0.5% | 0.7% | 0.0% | 0.8% | 0.5% | 1.8% | 0.4% | 1.0% |

**General Consumers Sales Forecast**

During 2012/13, Total General Consumer Sales was 21,477 GW.h. The fiscal billing year (using weather from March 16, 2012 to March 15, 2013) was warmer than normal in the winter months resulting in a winter weather adjustment of 98 GW.h, and was hotter than normal in the summer resulting in a summer weather adjustment of -130 GW.h. Overall, the weather adjustment for the year was -32 GW.h giving a weather adjusted Total Sales value of 21,445 GW.h.

During the last 10 years, Total Sales have grown at 258 GW.h (1.3%) per year. The growth was 1.8% per year in Residential Basic, 1.4% per year in General Service Mass Market, but only 0.5% in General Service Top Consumers due to the economic downturn in 2009 that included the loss of one Top Consumer customer. This historical growth includes the effect of past Demand Side Management (DSM) initiatives.

Sales are forecast to grow at 364 GW.h (1.6%) per year over the next 10 years and 361 GW.h (1.5%) over the next 20 years before accounting for future market-based DSM programs as outlined on page 57.

Most of the growth is forecast to occur in General Service Mass Market, growing 144 GW.h (1.5%) per year over the next twenty years, followed by Residential Basic at 112 GW.h (1.4%). Top Consumers are expected to return to their normal growth rate and are forecast to grow at 103 (1.6%) per year.

**Table** 5 - **General Consumers Sales Energy**

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

**Manitoba Energy Forecast**

The actual Gross Firm Energy was 24,759 GW.h in 2012/13. Gross Firm Energy has grown 266 GW.h (1.2%) per year for the past 10 years. This historical growth reflects the effect of past Demand Side Management (DSM) initiatives. Gross Firm energy is forecast to grow to 32,667 GW.h by 2032/33 at an average growth of 413 GW.h or 1.5% per year. This is before accounting for future market-based DSM programs as noted on page 57.

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

Transmission Losses which is the difference between the generators and the substations is forecast to be 9.3% of Total Sales for the entire forecast.

Distribution Losses, Transmission Losses, Construction and Station Service amount to an additional 14% that 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 |
| 2002/03 - 2032/33 |

| 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 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 2002/03 | 19236 | 671 | 3.5% | 46 | 19953 | 2012 | 10.5% | 24 | 170 | 22110 |
| 2003/04 | 19269 | 804 | 4.2% | 43 | 20116 | 1792 | 9.3% | 17 | 179 | 22069 |
| 2004/05 | 19724 | 830 | 4.2% | 46 | 20600 | 1852 | 9.4% | 26 | 163 | 22589 |
| 2005/06 | 19923 | 797 | 4.0% | 42 | 20761 | 1860 | 9.3% | 23 | 158 | 22757 |
| 2006/07 | 20497 | 900 | 4.4% | 45 | 21442 | 1885 | 9.2% | 22 | 159 | 23464 |
| 2007/08 | 21049 | 940 | 4.5% | 47 | 22036 | 1949 | 9.3% | 24 | 161 | 24122 |
| 2008/09 | 21198 | 1052 | 5.0% | 56 | 22305 | 1979 | 9.3% | 22 | 154 | 24417 |
| 2009/10 | 20473 | 813 | 4.0% | 75 | 21361 | 1934 | 9.4% | 20 | 137 | 23412 |
| 2010/11 | 20773 | 947 | 4.6% | 85 | 21806 | 1977 | 9.5% | 25 | 134 | 23892 |
| 2011/12 | 20757 | 736 | 3.5% | 67 | 21560 | 1939 | 9.3% | 25 | 131 | 23605 |
| 2012/13 | 21463 | 1176 | 5.5% | 59 | 22699 | 1952 | 9.1% | 28 | 137 | 24759 |
| Weather Adj. | -32 | -295 | | 0 | -327 | -29 | | 0 | 0 | -356 |
| 2012/13 Wadj | 21431 | 881 | 4.1% | 59 | 22372 | 1923 | 9.0% | 28 | 137 | 24404 |
| | | | | | | | | | | |
| 10 Year Wadj | 258 | 16 | | 1 | 275 | -6 | | 0 | -3 | 266 |
| Avg Gr. | 1.3% | 2.0% | | 2.7% | 1.3% | -0.3% | | 1.4% | -2.1% | 1.2% |
| | | | | | | | | | | |
| 2013/14 | 22062 | 971 | 4.4% | 43 | 23076 | 2058 | 9.3% | 30 | 134 | 25239 |
| 2014/15 | 22446 | 988 | 4.4% | 45 | 23479 | 2094 | 9.3% | 32 | 134 | 25676 |
| 2015/16 | 22759 | 1001 | 4.4% | 29 | 23790 | 2122 | 9.3% | 34 | 134 | 26013 |
| 2016/17 | 23044 | 1014 | 4.4% | 17 | 24075 | 2148 | 9.3% | 36 | 134 | 26322 |
| 2017/18 | 23304 | 1025 | 4.4% | 9 | 24338 | 2171 | 9.3% | 38 | 134 | 26606 |
| 2018/19 | 23661 | 1041 | 4.4% | 0 | 24703 | 2204 | 9.3% | 38 | 134 | 27003 |
| 2019/20 | 24009 | 1056 | 4.4% | 0 | 25065 | 2236 | 9.3% | 38 | 134 | 27398 |
| 2020/21 | 24353 | 1072 | 4.4% | 0 | 25425 | 2268 | 9.3% | 38 | 134 | 27789 |
| 2021/22 | 24712 | 1087 | 4.4% | 0 | 25799 | 2301 | 9.3% | 38 | 134 | 28197 |
| 2022/23 | 25071 | 1103 | 4.4% | 0 | 26174 | 2335 | 9.3% | 38 | 134 | 28605 |
| | | | | | | | | | | |
| 10 Year | 364 | 22 | | -6 | 380 | 41 | | 1 | 0 | 420 |
| Avg Gr. | 1.6% | 2.3% | | -100.0% | 1.6% | 2.0% | | 3.0% | -0.2% | 1.6% |
| | | | | | | | | | | |
| 2023/24 | 25429 | 1119 | 4.4% | 0 | 26548 | 2368 | 9.3% | 38 | 134 | 29013 |
| 2024/25 | 25786 | 1135 | 4.4% | 0 | 26920 | 2401 | 9.3% | 38 | 134 | 29418 |
| 2025/26 | 26141 | 1150 | 4.4% | 0 | 27291 | 2435 | 9.3% | 38 | 134 | 29822 |
| 2026/27 | 26496 | 1166 | 4.4% | 0 | 27661 | 2468 | 9.3% | 38 | 134 | 30225 |
| 2027/28 | 26847 | 1181 | 4.4% | 0 | 28029 | 2500 | 9.3% | 38 | 134 | 30625 |
| 2028/29 | 27213 | 1197 | 4.4% | 0 | 28410 | 2534 | 9.3% | 38 | 134 | 31041 |
| 2029/30 | 27575 | 1213 | 4.4% | 0 | 28788 | 2568 | 9.3% | 38 | 134 | 31453 |
| 2030/31 | 27936 | 1229 | 4.4% | 0 | 29165 | 2602 | 9.3% | 38 | 134 | 31863 |
| 2031/32 | 28290 | 1245 | 4.4% | 0 | 29534 | 2635 | 9.3% | 38 | 134 | 32265 |
| 2032/33 | 28643 | 1260 | 4.4% | 0 | 29903 | 2667 | 9.3% | 38 | 134 | 32667 |
| | | | | | | | | | | |
| 20 Year | 361 | 19 | | -3 | 377 | 37 | | 0 | 0 | 413 |
| Avg Gr. | 1.5% | 1.8% | | -100.0% | 1.5% | 1.7% | | 1.5% | -0.1% | 1.5% |

## Comparison of the 2012 Forecast to Actuals

### Comparison of the 2012 Forecast to the 2012/13 Weather Adjusted Actuals

The weather adjusted General Consumer Sales for 2012/13 was 21,445 GW.h which was 352 GW.h lower than the 2012 forecast of 21,797 GW.h.

The weather adjusted Residential Basic sector for 2012/13 was 7,219 GW.h which was 9 GW.h lower than the 2012 forecast of 7,227 GW.h. The weather adjusted General Service Mass Market sector for 2012/13 was 8,406 GW.h which was 82 GW.h lower than the 2012 forecast of 8,488 GW.h.

The Top Consumers sector for 2012/13 was 5,560 GW.h which was 261 GW.h lower than the 2012 forecast of 5,821 GW.h primarily due to project delays by two Top Consumers. Projected load growth for those specific projects is still expected and is included in the 2013 Forecast.

Distribution losses were forecast to be 950 GW.h, but came in at 1,176 GW.h. Distribution Losses account for the difference between Common Bus and General Consumer Sales. Common Bus is measured month-end to month-end at the substation level, whereas Sales are measured at the customer's meter and by billing cycle, which generally map to mid-month. The extreme warm weather that occurred from March 16 to 31, 2012 combined with the extreme cold weather experienced from March 16 to 31, 2013 resulted in about 300 Heating Degree Days difference between the two measurements. This also caused a very large weather adjustment of -295 GW.h. After accounting for weather adjustment, Distribution Losses were 881 GW.h which was 69 GW.h lower than the 2012 forecast of 950 GW.h.

Weather adjusted transmission losses were 1,923 GW.h which was 112 GW.h less than the 2012 forecast of 2,034 GW.h.

Overall, the weather adjusted Gross Firm Energy was 24,404 GW.h which was 557 GW.h lower than the 2012 forecast of 24,961 GW.h due to delays in the plans of two Top Consumers and lower than normal Distribution and Transmission Losses.

**Table 7 - 2012/13 Forecast to Actual**

| 2012 FORECAST COMPARED TO WEATHER ADJUSTED ACTUALS 2012/13 (GW.h) | | | | | |
|---|---|---|---|---|---|
| **Forecast Group** | **Actuals** | **Weather Adjustment** | **Wthr Adj Actuals** | **2012 Forecast** | **WA Actuals less Forecast** |
| **Residential Basic** | 7,223 | (4) | 7,219 | 7,227 | (8) |
| **Residential Diesel** | 8 | - | 8 | 8 | 0 |
| **Residential Seasonal** | 81 | - | 81 | 85 | (4) |
| **Residential Flat Rate Water Heating** | 21 | - | 21 | 21 | (0) |
| **Total Residential** | **7,334** | **(4)** | **7,330** | **7,341** | **(11)** |
| **GS Mass Market** | 8,434 | (28) | 8,406 | 8,488 | (82) |
| **GS Top Consumers** | 5,560 | - | 5,560 | 5,821 | (261) |
| **GS Diesel** | 5 | - | 5 | 6 | (0) |
| **GS Seasonal** | 5 | - | 5 | 5 | 0 |
| **GS Flat Rate Water Heat** | 7 | - | 7 | 7 | 0 |
| **GS Surplus Energy Program** | 28 | 1 | 29 | 27 | 2 |
| **Total General Service** | **14,040** | **(27)** | **14,012** | **14,353** | **(340)** |
| **Sentinal Flat Rate** | 12 | - | 12 | 12 | (0) |
| **Sentinal Rental** | - | - | - | - | - |
| **Street Lighting** | 92 | - | 92 | 92 | (0) |
| **Total Lighting** | **103** | **-** | **103** | **104** | **(0)** |
| **Total General Consumer Sales** | **21,477** | **(32)** | **21,445** | **21,797** | **(352)** |
| **Less Diesel Sales** | (14) | - | (14) | (14) | (0) |
| **Distribution Losses** | 1,176 | (295) | 881 | 950 | (69) |
| **Construction Power** | 59 | - | 59 | 78 | (18) |
| **Manitoba Load at Common Bus** | **22,699** | **(327)** | **22,372** | **22,812** | **(440)** |
| **Transmission Losses** | 1,952 | (29) | 1,923 | 2,034 | (112) |
| **Less Non-Firm Energy** | (28) | 0 | (28) | (27) | (2) |
| **Station Service** | 137 | - | 137 | 141 | (4) |
| **Gross Firm Energy** | **24,759** | **(356)** | **24,404** | **24,961** | **(557)** |

## Change between the 2012 and 2013 Forecasts

**Change Between the 2012 and 2013 Residential Basic Forecast**

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



**Change of Residential Basic Forecast (GW.h)**

**Fiscal Year Ending**

Changes made (and the 2031/32 effect):

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

Table 8 - Change of Res Basic Forecast

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

**Change Between the 2012 and 2013 GS Mass Market Forecast**

The General Service Mass Market Forecast is down 343 GW.h in 2031/32, primarily due to the reduction in the residential customer forecast, which also affects commercial growth. This represents less than a year of Manitoba system load growth (1 year = approximately 420 GW.h).

Figure 2 - Change of GS Mass Market Forecast
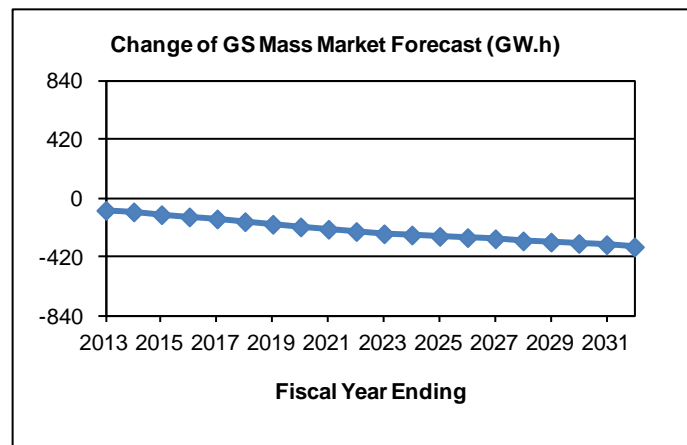


Changes made (and the 2031/32 effect):

1. The residential customer forecast was reduced leading to a reduction in the GS Mass Market customers (-191 GW.h).
2. The average use per customer in each size class was updated and reduced the overall GS Mass Market load. (-107 GW.h).

Table 9 - Change of GS Mass Market Forecast

| CHANGE OF GS MASS MARKET FORECAST (GW.h) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Comparison of 2012 to 2013 forecast | | | | | | | | | |
| Fiscal Year | 2012 Fcst | 2013 Fcst | Change | % | Fiscal Year | 2012 Fcst | 2013 Fcst | Change | % |
| 2012/13 | 8488 | 8406 | (82) | -1.0% | 2022/23 | 10147 | 9898 | (249) | -2.5% |
| 2013/14 | 8643 | 8550 | (93) | -1.1% | 2023/24 | 10298 | 10040 | (258) | -2.5% |
| 2014/15 | 8814 | 8701 | (113) | -1.3% | 2024/25 | 10447 | 10179 | (268) | -2.6% |
| 2015/16 | 8986 | 8858 | (128) | -1.4% | 2025/26 | 10595 | 10318 | (276) | -2.6% |
| 2016/17 | 9161 | 9018 | (143) | -1.6% | 2026/27 | 10741 | 10456 | (285) | -2.7% |
| 2017/18 | 9336 | 9174 | (163) | -1.7% | 2027/28 | 10892 | 10592 | (300) | -2.8% |
| 2018/19 | 9506 | 9325 | (181) | -1.9% | 2028/29 | 11045 | 10736 | (308) | -2.8% |
| 2019/20 | 9670 | 9470 | (200) | -2.1% | 2029/30 | 11197 | 10878 | (319) | -2.8% |
| 2020/21 | 9830 | 9613 | (217) | -2.2% | 2030/31 | 11347 | 11020 | (327) | -2.9% |
| 2021/22 | 9989 | 9756 | (233) | -2.3% | 2031/32 | 11497 | 11154 | (343) | -3.0% |

**Change Between the 2012 and 2013 GS Top Consumers Forecast**

Figure 3 - Change of GS Top Consumer Forecast

The General Service Top Consumers is down 289 GW.h in 2013/14 due to delays in some of the short term committed customer plans. By 2031/32, the decrease is 182 GW.h. This is equal to the loss of slightly less than a half year of Manitoba system load growth (1 year = approximately 420 GW.h).
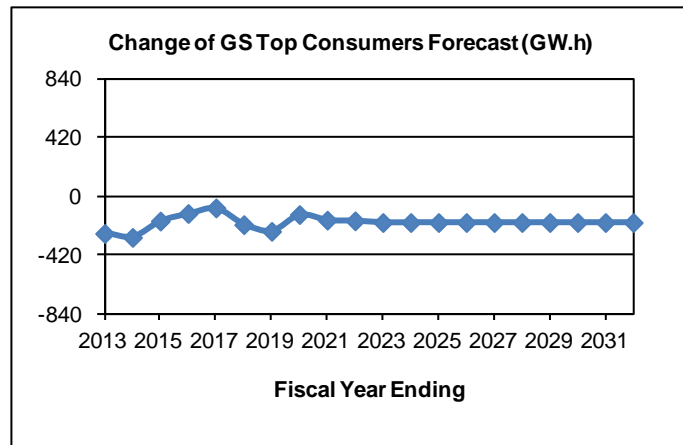


Changes made (and the 2031/32 effect):

1. Short term committed plans of two Top Consumers were delayed with an effect of 305 GW.h in the first two years of the forecast (0 GW.h)
2. Potential Large Industrial Loads begins in the 4th year of the forecast, which in the 2013 forecast is one year later giving one less year of PLIL growth (-100 GW.h).
3. Changes to the forecasts of the Top Consumers up to 2021/22 mostly in the Primary Metals sector (-83 GW.h).

**Table 10 - Change of GS Top Consumer Forecast**

| CHANGE OF GS TOP CONSUMERS FORECAST (GW.h) Comparison of 2012 to 2013 forecast | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Fiscal Year | 2012 Fcst | 2013 Fcst | Change | % | Fiscal Year | 2012 Fcst | 2013 Fcst | Change | % |
| 2012/13 | 5821 | 5560 | (261) | -4.5% | 2022/23 | 6798 | 6615 | (183) | -2.7% |
| 2013/14 | 6214 | 5925 | (289) | -4.7% | 2023/24 | 6898 | 6715 | (183) | -2.7% |
| 2014/15 | 6208 | 6036 | (172) | -2.8% | 2024/25 | 6998 | 6815 | (183) | -2.6% |
| 2015/16 | 6228 | 6110 | (118) | -1.9% | 2025/26 | 7098 | 6915 | (183) | -2.6% |
| 2016/17 | 6223 | 6145 | (78) | -1.3% | 2026/27 | 7198 | 7015 | (183) | -2.5% |
| 2017/18 | 6338 | 6140 | (198) | -3.1% | 2027/28 | 7298 | 7115 | (183) | -2.5% |
| 2018/19 | 6478 | 6232 | (246) | -3.8% | 2028/29 | 7398 | 7215 | (183) | -2.5% |
| 2019/20 | 6448 | 6322 | (126) | -2.0% | 2029/30 | 7498 | 7315 | (183) | -2.4% |
| 2020/21 | 6578 | 6412 | (166) | -2.5% | 2030/31 | 7598 | 7415 | (183) | -2.4% |
| 2021/22 | 6688 | 6517 | (171) | -2.6% | 2031/32 | 7698 | 7515 | (183) | -2.4% |

**Change Between the 2012 and 2013 Gross Firm Energy Forecast**

Figure 4 - Change of Energy Forecast

The Gross Firm Energy forecast is down 557 GW.h in 2013/14 due to initial-year decreases to the GS Mass Market and GS Top Consumers forecasts and associated decreases to losses. This difference grows to 1159 GW.h by 2031/32 due to the reduction of the Residential Basic customer forecast and its effect on the Residential and GS Mass Market forecasts. This is a 3.5% reduction in the forecast of 2031/32, which is equivalent



to a loss of almost 3 years of load growth (1 year = approximately 420 GW.h).
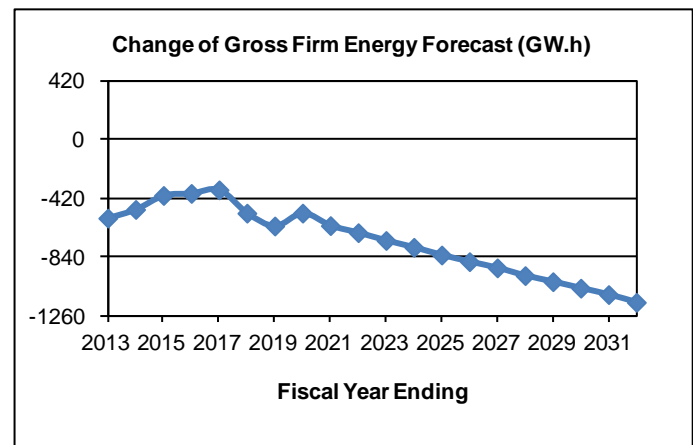
Changes made (and the 2031/32 effect):

1. Residential Basic forecast (-423 GW.h), primarily due to the decrease in the forecast of Residential Basic customers and heating fuel choice initiatives being undertaken by Manitoba Hydro.
2. General Service Mass Market forecast (-343 GW.h), primarily due to the decrease in the forecast of Residential Basic customers.
3. General Service Top Consumers forecast (-183 GW.h), mostly in the Primary Metals sector.
4. Other Sales and Losses (-210 GW.h).

Table 11 - Change of Energy Forecast

| GROSS FIRM ENERGY (GW.h) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Comparison of 2012 to 2013 forecast | | | | | | | | | |
| Fiscal Year | 2012 Fcst | 2013 Fcst | Change | % | Fiscal Year | 2012 Fcst | 2013 Fcst | Change | % |
| 2012/13 | 24961 | 24404 | (557) | -2.2% | 2022/23 | 29322 | 28605 | (717) | -2.4% |
| 2013/14 | 25734 | 25239 | (495) | -1.9% | 2023/24 | 29779 | 29013 | (766) | -2.6% |
| 2014/15 | 26071 | 25676 | (395) | -1.5% | 2024/25 | 30239 | 29418 | (821) | -2.7% |
| 2015/16 | 26393 | 26013 | (380) | -1.4% | 2025/26 | 30691 | 29822 | (869) | -2.8% |
| 2016/17 | 26677 | 26322 | (355) | -1.3% | 2026/27 | 31138 | 30225 | (913) | -2.9% |
| 2017/18 | 27128 | 26606 | (522) | -1.9% | 2027/28 | 31594 | 30625 | (968) | -3.1% |
| 2018/19 | 27616 | 27003 | (614) | -2.2% | 2028/29 | 32053 | 31041 | (1012) | -3.2% |
| 2019/20 | 27919 | 27398 | (521) | -1.9% | 2029/30 | 32511 | 31453 | (1058) | -3.3% |
| 2020/21 | 28400 | 27789 | (611) | -2.2% | 2030/31 | 32967 | 31863 | (1104) | -3.3% |
| 2021/22 | 28859 | 28197 | (661) | -2.3% | 2031/32 | 33425 | 32265 | (1159) | -3.5% |

## Change Between the 2012 and 2013 Gross Total Peak Forecast

**Figure 5 - Change of Peak Forecast**

The Gross Total Peak forecast is down 146 MW (2.4%) by 2031/32 from the 2012 forecast. The peak forecast very closely follows the energy forecast, and the reasons for reduction in peak are similar to those for energy.



Change of Total Peak Forecast (MW)

Fiscal Year Ending
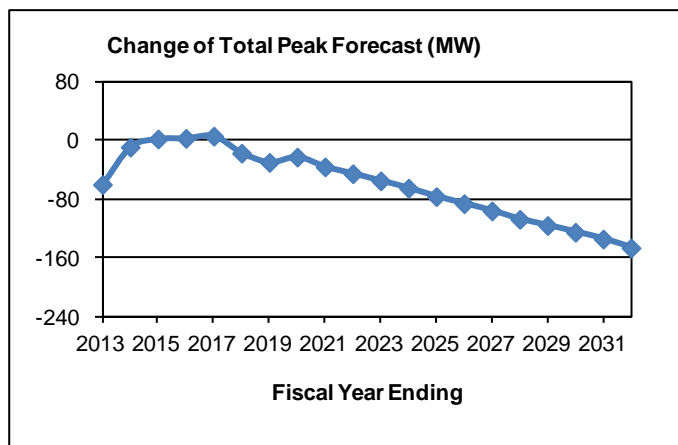
The reduction in peak in 2022/23 amounts to 54 MW, less than one year of load growth. The reduction in peak in 2031/32 of 146 MW amounts to a reduction of almost 2 years of load growth. (1 year = approximately 80 MW).

**Table 12 - Change of Peak Forecast**

| GROSS TOTAL PEAK (MW) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Comparison of 2012 to 2013 forecast | | | | | | | | | |
| Fiscal Year | 2012 Fcst | 2013 Fcst | Change | % | Fiscal Year | 2012 Fcst | 2013 Fcst | Change | % |
| 2012/13 | 4491 | 4432 | (59) | -1.3% | 2022/23 | 5276 | 5222 | (54) | -1.0% |
| 2013/14 | 4609 | 4601 | (8) | -0.2% | 2023/24 | 5360 | 5296 | (64) | -1.2% |
| 2014/15 | 4677 | 4680 | 3 | 0.1% | 2024/25 | 5445 | 5369 | (76) | -1.4% |
| 2015/16 | 4738 | 4742 | 4 | 0.1% | 2025/26 | 5528 | 5443 | (85) | -1.5% |
| 2016/17 | 4794 | 4801 | 7 | 0.1% | 2026/27 | 5611 | 5516 | (95) | -1.7% |
| 2017/18 | 4874 | 4857 | (17) | -0.3% | 2027/28 | 5695 | 5588 | (107) | -1.9% |
| 2018/19 | 4959 | 4930 | (29) | -0.6% | 2028/29 | 5779 | 5664 | (115) | -2.0% |
| 2019/20 | 5024 | 5002 | (22) | -0.4% | 2029/30 | 5863 | 5739 | (124) | -2.1% |
| 2020/21 | 5109 | 5074 | (35) | -0.7% | 2030/31 | 5947 | 5813 | (134) | -2.2% |
| 2021/22 | 5192 | 5147 | (45) | -0.9% | 2031/32 | 6032 | 5886 | (146) | -2.4% |

# FORECAST DETAILS

## Residential Basic

**Figure 6- Residential Basic Sales**

In 2012/13, there were 456,130 Residential Basic customers. 80% are single detached, 7% multi attached, and 13% individually metered apartment suites. 54% are in Winnipeg where natural gas is available, 28% in natural gas available areas outside Winnipeg, and 18% do not have natural gas available.



Residential Basic has grown 99 GW.h (1.6%) per year for the past 20 years and 121 GW.h per year (1.8%) for the past 10 years which includes the effect of past Demand Side Management (DSM) initiatives. It is forecast to grow 107 GW.h (1.4%) per year for the next 10 years and 112 GW.h (1.4%) per year for the next 20 years.

The primary drivers of Residential Basic growth are population and average use per customer. The population is forecast to grow 1.1% per year over both the next 10 and next 20 years. The increase in average use per customer is expected to add another 0.3% to the growth.

**Table 13 - Residential Sales**

| RESIDENTIAL BASIC (GW.h) HISTORICAL/WEATHER ADJUSTMENT/FORECAST | | | | | |
|---|---|---|---|---|---|
| Fiscal Year | Sales | Weather Adjust | Adjusted Sales | Fiscal Year | Forecast Sales |
| 1993/94 | 5467 | -135 | 5332 | 2013/14 | 7339 |
| 1994/95 | 5230 | 107 | 5337 | 2014/15 | 7458 |
| 1995/96 | 5753 | -299 | 5454 | 2015/16 | 7538 |
| 1996/97 | 5797 | -385 | 5412 | 2016/17 | 7624 |
| 1997/98 | 5370 | 111 | 5481 | 2017/18 | 7730 |
| 1998/99 | 5384 | 213 | 5597 | 2018/19 | 7842 |
| 1999/00 | 5364 | 318 | 5682 | 2019/20 | 7953 |
| 2000/01 | 5737 | -26 | 5711 | 2020/21 | 8063 |
| 2001/02 | 5674 | 140 | 5814 | 2021/22 | 8173 |
| 2002/03 | 6266 | -255 | 6011 | 2022/23 | 8290 |
| 2003/04 | 6170 | 10 | 6181 | 2023/24 | 8405 |
| 2004/05 | 6275 | 22 | 6297 | 2024/25 | 8520 |
| 2005/06 | 6171 | 263 | 6434 | 2025/26 | 8635 |
| 2006/07 | 6443 | -9 | 6434 | 2026/27 | 8750 |
| 2007/08 | 6736 | -71 | 6664 | 2027/28 | 8864 |
| 2008/09 | 6847 | -146 | 6701 | 2028/29 | 8983 |
| 2009/10 | 6786 | 144 | 6930 | 2029/30 | 9102 |
| 2010/11 | 6952 | 94 | 7046 | 2030/31 | 9219 |
| 2011/12 | 6818 | 313 | 7131 | 2031/32 | 9337 |
| 2012/13 | 7223 | -4 | 7219 | 2032/33 | 9454 |

**Table 14 - Residential Basic Sales**

| Fiscal Year | Electric Heat Billed | | | Other | | | 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 | | |

**RESIDENTIAL BASIC SALES**
**History and Forecast**
**2011/12 - 2031/32**

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

**Electric Heat Billed:** Customers who have electric space heating included with their electric bill.
**Other:** Customers who do not have electric space heating included with their electric bill.
**% Elec Space Heat:** The proportion of Total Basic customers who are Electric Heat Billed.
**% Elec Water Heat**: The proportion of Total Basic customers who have Electric Water Heaters.

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

## Residential Diesel, Seasonal, and Flat Rate Water Heating

### Residential Diesel

There were 577 Residential Diesel customers that used 8 GW.h in 2012/13 at an average of 14,640 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 716 and usage is expected to increase 2.0% a year to 13 GW.h by 2032/33 under the assumption that the communities continue to be separate from the Integrated System.

### Residential Seasonal

There were 20,731 Residential Seasonal customers in 2012/13. The number of customers is expected increase to 22,686 customers by 2032/33. 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 average use of a seasonal customer is 3,911 kW.h per year. The usage of Residential Seasonal customers is expected to increase 1.9% a year to 118 GW.h in 2032/33.

### 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 4,089 remaining services in 2012/13. The number of services and usage is expected to decrease 5% per year throughout the forecast period. Usage was 21 GW.h in 2012/13 and that will decrease to 7 GW.h by 2032/33.

## General Service Mass Market

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

GS Mass Market has grown 118 GW.h (1.7%) per year for the past 20 years and 107 GW.h per year (1.4%) for the past 10 years. This historical growth includes the effect of past Demand Side Management (DSM) initiatives. It is forecast to grow 149 GW.h (1.6%) per year for the next 10 years and 144 GW.h (1.5%) per year for the next 20 years.
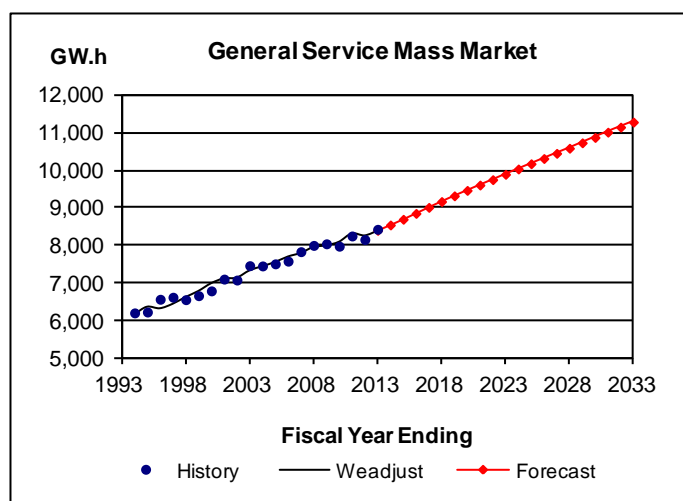
The primary driver for growth in the GS Mass Market is the number of Residential Basic customers. As population grows, commercial and industrial services grow to service the population. The secondary driver is the economy. Changes in the Manitoba Gross Domestic Product (GDP) are reflected in the GS Mass Market's electricity use.

**Figure 7 - General Service Mass Market**



**Table 15 - General Service Mass Market**

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

## General Service Top Consumers

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

**Figure 8 - General Service Top Consumers**

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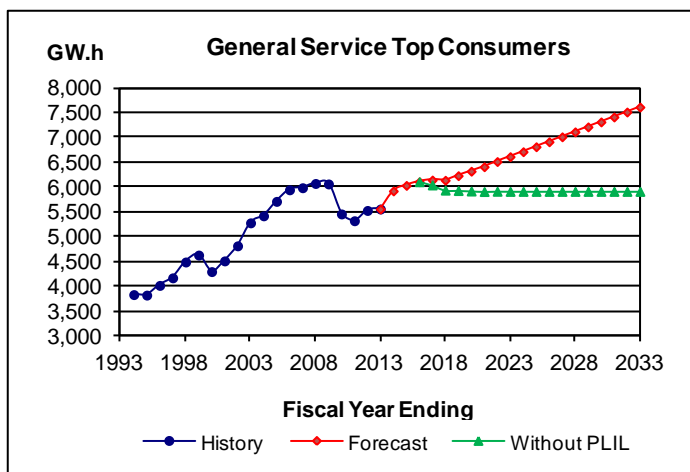
the next 20 years. A loss of a major load is expected by 2016.  This loss is more than offset by confirmed plans and expected increases of other Top Consumers. In the long term, GS Top Consumers is expected to grow at a rate reflective of its historic growth.

**Table 16 - General Service Top Consumers**

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

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

The sum of the individual company forecasts grow from 5,560 GW.h in 2012/13 to 5,915 GW.h by 2022/23. This growth of 355 GW.h includes the load changes due to committed plans of companies, and also includes an expected major load decrease by 2016 of one customer.

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

For the longer term, an average expected growth is included for all customers together. This added growth is called Potential Large Industrial Loads (PLIL). It includes consideration for company expansions, cutbacks and shutdowns, new startups of 100 GW.h a year or more, and the long term normal incremental growth of all the companies within the Top Consumers sector combined. Since customer intentions are generally known for the first three years, PLIL is not added until 2016/17, the fourth year of the forecast.

GS Top Consumers has grown at 91 GW.h (2.0%) per year over the past twenty years. During that time, there were four new customers totaling 1,100 GW.h of consumption, nine instances of customers with major expansions totaling 1,400 GW.h, and two existing customers who closed operations reducing consumption by 700 GW.h. None of these events could have been predicted five years before they occurred. One new customer and four expansions occurred within the past 10 years despite the economic downturn. These major events amount to a net 1,800 GW.h increase in the past 20 years. On this basis, PLIL has been set to be 100 GW.h (1.5%) per year starting in the fourth year of the forecast and will total 1,700 GW.h by 2032/33, the 20th year of the forecast.

1,700 GW.h is approximately equivalent to the load of Manitoba Hydro's largest consumer. If only one other customer of similar size starts up in Manitoba within the next 20 years, this one new customer alone would consume all of the provision that PLIL has allowed.

## General Service Diesel, Seasonal, and Flat Rate Water Heat

**General Service Diesel**

In 2012/13, there were 175 General Service Diesel Full Cost customers. They used 5 GW.h in 2012/13. The group is forecast to use 6 GW.h by 2032/33.

**General Service Seasonal**

There were 850 General Service Seasonal customers in 2012/13. Consumption was 5 GW.h in 2012/13 and is expected to grow to 6 GW.h by 2032/33.

**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 408 remaining services in 2012/13. The number of services is expected to decrease 5% per year throughout the forecast period. Consumption was 7 GW.h in 2012/13 and that is forecast to decrease to 3 GW.h by 2032/33.

## General Service Surplus Energy Program

Participants in the Surplus Energy Program (SEP) used 28 GW.h in 2012/13 and are expected to grow to use 38 GW.h per year by 2017/18 and continue at that rate for the remainder of the forecast. This energy is considered to be "interruptible" and thus "non-firm". The energy used by these customers is included in Sales. But it is excluded from the Gross Firm Energy forecast.
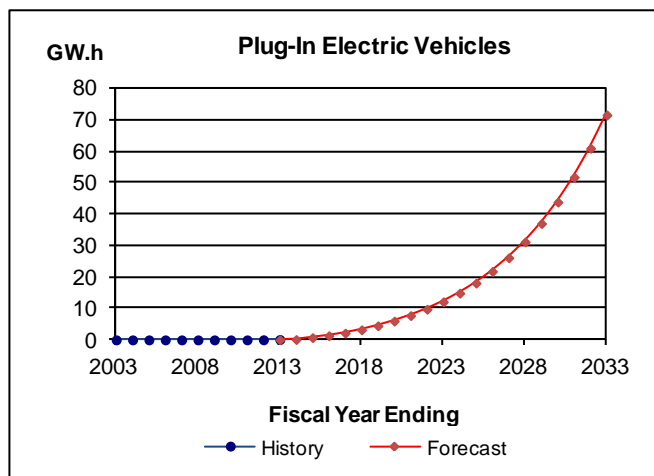
## Plug-In Electric Vehicles

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

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

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

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

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

**The Electric Vehicle Forecast**

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

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

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

**Table 17 - Plug-In Electric Vehicles**

| **PLUG-IN ELECTRIC VEHICLE FORECAST** **History and Forecast** **2002/03 - 2032/33** | | | | | | | |
|---|---|---|---|---|---|---|---|
| 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 |
| 2002/03 | 47770 | - | 0.0% | 634798 | - | 0.0% | 0 | 0 |
| 2003/04 | 44825 | - | 0.0% | 646925 | - | 0.0% | 0 | 0 |
| 2004/05 | 43412 | - | 0.0% | 657773 | - | 0.0% | 0 | 0 |
| 2005/06 | 44931 | - | 0.0% | 665911 | - | 0.0% | 0 | 0 |
| 2006/07 | 45924 | - | 0.0% | 677922 | - | 0.0% | 0 | 0 |
| 2007/08 | 47099 | - | 0.0% | 696186 | - | 0.0% | 0 | 0 |
| 2008/09 | 48029 | - | 0.0% | 711412 | - | 0.0% | 0 | 0 |
| 2009/10 | 43995 | - | 0.0% | 723823 | - | 0.0% | 0 | 0 |
| 2010/11 | 45355 | 1 | 0.0% | 738299 | 1 | 0.0% | 0 | 0 |
| 2011/12 | 48546 | 8 | 0.0% | 762214 | 9 | 0.0% | 0 | 0 |
| 2012/13 | 52236 | 28 | 0.1% | 779935 | 37 | 0.0% | 0 | 0 |
| 2013/14 | 52949 | 66 | 0.1% | 798369 | 103 | 0.0% | 0 | 0.0 |
| 2014/15 | 53669 | 134 | 0.3% | 816707 | 237 | 0.0% | 1 | 0.1 |
| 2015/16 | 54397 | 204 | 0.4% | 834962 | 441 | 0.1% | 1 | 0.2 |
| 2016/17 | 55129 | 276 | 0.5% | 853141 | 717 | 0.1% | 2 | 0.3 |
| 2017/18 | 55867 | 349 | 0.6% | 871253 | 1066 | 0.1% | 3 | 0.4 |
| 2018/19 | 56606 | 425 | 0.8% | 889303 | 1491 | 0.2% | 4 | 0.6 |
| 2019/20 | 57348 | 502 | 0.9% | 907296 | 1992 | 0.2% | 6 | 0.7 |
| 2020/21 | 58089 | 591 | 1.0% | 925233 | 2573 | 0.3% | 8 | 1.0 |
| 2021/22 | 58828 | 697 | 1.2% | 943116 | 3250 | 0.3% | 10 | 1.2 |
| 2022/23 | 59564 | 828 | 1.3% | 960944 | 4038 | 0.4% | 12 | 1.5 |
| 2023/24 | 60296 | 977 | 1.5% | 978715 | 4955 | 0.5% | 15 | 1.9 |
| 2024/25 | 61024 | 1167 | 1.7% | 996427 | 6022 | 0.6% | 18 | 2.3 |
| 2025/26 | 61745 | 1392 | 2.0% | 1014077 | 7264 | 0.7% | 22 | 2.7 |
| 2026/27 | 62461 | 1665 | 2.3% | 1031660 | 8709 | 0.8% | 26 | 3.3 |
| 2027/28 | 63170 | 1980 | 2.7% | 1049176 | 10389 | 1.0% | 31 | 3.9 |
| 2028/29 | 63873 | 2374 | 3.1% | 1066619 | 12343 | 1.2% | 37 | 4.6 |
| 2029/30 | 64571 | 2832 | 3.5% | 1083988 | 14614 | 1.3% | 44 | 5.5 |
| 2030/31 | 65262 | 3370 | 4.0% | 1101280 | 17255 | 1.6% | 52 | 6.5 |
| 2031/32 | 65949 | 3928 | 4.7% | 1118494 | 20323 | 1.8% | 61 | 7.6 |
| 2032/33 | 66471 | 4576 | 5.4% | 1135467 | 23879 | 2.1% | 72 | 9.0 |

## 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 roadway lighting in Manitoba.



Figure 10 - Area & Roadway Lighting
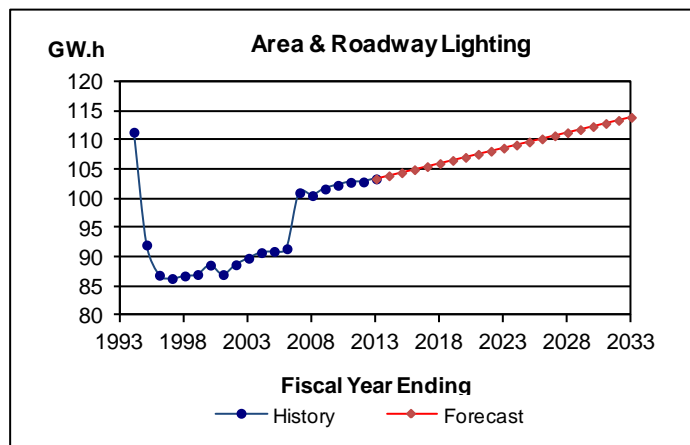
Energy-efficient street lighting initiatives caused the significant drop in usage in the mid 1990's. In 2006, a readjustment of the rate classes moved some flat rate General Service meters into the Lighting sector. Only Street Lights count as customers.

The Area and Roadway Lighting sector is forecast to increase from 103 GW.h in 2012/13 to 114 GW.h by 2032/33 at an average growth rate of 1 GW.h or 0.5% per year.

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 |
| 1993/94 | 111 | 0 | 111 | 2013/14 | 104 |
| 1994/95 | 92 | 0 | 92 | 2014/15 | 104 |
| 1995/96 | 87 | 0 | 87 | 2015/16 | 105 |
| 1996/97 | 86 | 0 | 86 | 2016/17 | 106 |
| 1997/98 | 87 | 0 | 87 | 2017/18 | 106 |
| 1998/99 | 87 | 0 | 87 | 2018/19 | 107 |
| 1999/00 | 89 | 0 | 89 | 2019/20 | 107 |
| 2000/01 | 87 | 0 | 87 | 2020/21 | 108 |
| 2001/02 | 89 | 0 | 89 | 2021/22 | 108 |
| 2002/03 | 90 | 0 | 90 | 2022/23 | 109 |
| 2003/04 | 91 | 0 | 91 | 2023/24 | 109 |
| 2004/05 | 91 | 0 | 91 | 2024/25 | 110 |
| 2005/06 | 91 | 0 | 91 | 2025/26 | 110 |
| 2006/07 | 101 | 0 | 101 | 2026/27 | 111 |
| 2007/08 | 101 | 0 | 101 | 2027/28 | 111 |
| 2008/09 | 102 | 0 | 102 | 2028/29 | 112 |
| 2009/10 | 102 | 0 | 102 | 2029/30 | 112 |
| 2010/11 | 103 | 0 | 103 | 2030/31 | 113 |
| 2011/12 | 103 | 0 | 103 | 2031/32 | 113 |
| 2012/13 | 103 | 0 | 103 | 2032/33 | 114 |

Table 19 - Area &amp; Roadway Lighting

**Table 19 - Area & Roadway Lighting**

| AREA AND ROADWAY LIGHTING<br>History and Forecast<br>2002/03 - 2032/33 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Fiscal | Sentinal Flat Rates | | Sentinal Rentals | | Street Lighting | | Total Lighting | |
| Year | (Services) | (GW.h) | (Services) | (GW.h) | (Custs) | (GW.h) | (Custs) | (GW.h) |
| 2002/03 | 19446 | 10 | 5477 | 0 | 755 | 80 | 755 | 90 |
| 2003/04 | 19527 | 10 | 5505 | 0 | 757 | 81 | 757 | 91 |
| 2004/05 | 19648 | 10 | 5519 | 0 | 759 | 81 | 759 | 91 |
| 2005/06 | 19652 | 10 | 7826 | 0 | 793 | 81 | 793 | 91 |
| 2006/07 | 18669 | 11 | 23994 | 0 | 1129 | 90 | 1129 | 101 |
| 2007/08 | 18947 | 11 | 24272 | 0 | 1142 | 90 | 1142 | 101 |
| 2008/09 | 19228 | 11 | 24542 | 0 | 1175 | 91 | 1175 | 102 |
| 2009/10 | 19539 | 11 | 24886 | 0 | 1191 | 91 | 1191 | 102 |
| 2010/11 | 19835 | 11 | 25216 | 0 | 1184 | 92 | 1184 | 103 |
| 2011/12 | 20033 | 11 | 25427 | 0 | 1155 | 91 | 1155 | 103 |
| 2012/13 | 20238 | 12 | 25613 | 0 | 1164 | 92 | 1164 | 103 |
| 2013/14 | 20472 | 12 | 25862 | 0 | 1163 | 92 | 1163 | 104 |
| 2014/15 | 20705 | 12 | 26130 | 0 | 1168 | 93 | 1168 | 104 |
| 2015/16 | 20938 | 12 | 26398 | 0 | 1173 | 93 | 1173 | 105 |
| 2016/17 | 21171 | 12 | 26666 | 0 | 1178 | 93 | 1178 | 106 |
| 2017/18 | 21404 | 12 | 26934 | 0 | 1183 | 94 | 1183 | 106 |
| 2018/19 | 21637 | 12 | 27202 | 0 | 1188 | 94 | 1188 | 107 |
| 2019/20 | 21870 | 12 | 27470 | 0 | 1193 | 95 | 1193 | 107 |
| 2020/21 | 22103 | 13 | 27738 | 0 | 1198 | 95 | 1198 | 108 |
| 2021/22 | 22336 | 13 | 28006 | 0 | 1203 | 95 | 1203 | 108 |
| 2022/23 | 22569 | 13 | 28274 | 0 | 1208 | 96 | 1208 | 109 |
| 2023/24 | 22802 | 13 | 28542 | 0 | 1213 | 96 | 1213 | 109 |
| 2024/25 | 23035 | 13 | 28810 | 0 | 1218 | 97 | 1218 | 110 |
| 2025/26 | 23268 | 13 | 29078 | 0 | 1223 | 97 | 1223 | 110 |
| 2026/27 | 23501 | 13 | 29346 | 0 | 1228 | 97 | 1228 | 111 |
| 2027/28 | 23734 | 13 | 29614 | 0 | 1233 | 98 | 1233 | 111 |
| 2028/29 | 23967 | 14 | 29882 | 0 | 1238 | 98 | 1238 | 112 |
| 2029/30 | 24200 | 14 | 30150 | 0 | 1243 | 99 | 1243 | 112 |
| 2030/31 | 24433 | 14 | 30418 | 0 | 1248 | 99 | 1248 | 113 |
| 2031/32 | 24666 | 14 | 30686 | 0 | 1253 | 99 | 1253 | 113 |
| 2032/33 | 24899 | 14 | 30954 | 0 | 1258 | 100 | 1258 | 114 |

## 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.
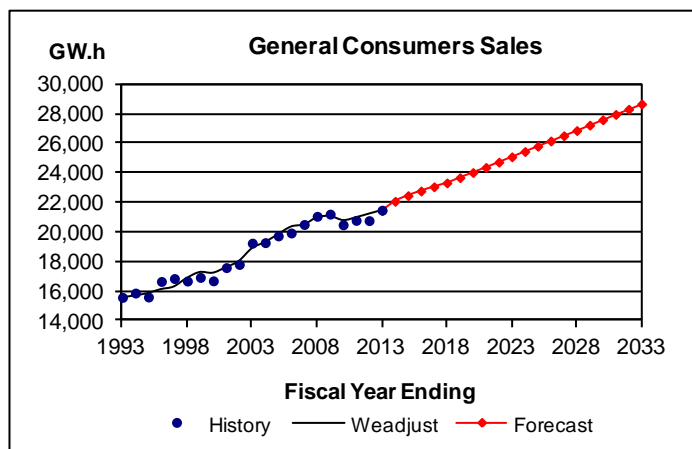


Weather adjusted General Consumers Sales has grown 303 GW.h (1.7%) per year for the past 20 years and 258 GW.h (1.3%) per year over the past 10 years. This historical growth includes the effect of past Demand Side Management (DSM) initiatives. Sales are forecast to grow 364 GW.h (1.6%) per year for the next 10 years and 361 GW.h (1.5%) per year for the next 20 years.

**Table 20 - General Consumers Sales**

| GENERAL CONSUMERS SALES (GW.h) HISTORICAL/WEATHER ADJUSTMENT/FORECAST | | | | | |
|---|---|---|---|---|---|
| Fiscal Year | Sales | Weather Adjust | Adjusted Sales | Fiscal Year | Forecast Sales |
| 1993/94 | 15870 | -190 | 15681 | 2013/14 | 22076 |
| 1994/95 | 15600 | 236 | 15836 | 2014/15 | 22460 |
| 1995/96 | 16654 | -550 | 16104 | 2015/16 | 22774 |
| 1996/97 | 16851 | -572 | 16279 | 2016/17 | 23059 |
| 1997/98 | 16681 | 172 | 16852 | 2017/18 | 23319 |
| 1998/99 | 16929 | 329 | 17258 | 2018/19 | 23677 |
| 1999/00 | 16696 | 517 | 17213 | 2019/20 | 24024 |
| 2000/01 | 17590 | -12 | 17578 | 2020/21 | 24369 |
| 2001/02 | 17805 | 201 | 18006 | 2021/22 | 24728 |
| 2002/03 | 19246 | -384 | 18862 | 2022/23 | 25087 |
| 2003/04 | 19280 | 2 | 19282 | 2023/24 | 25446 |
| 2004/05 | 19735 | 69 | 19804 | 2024/25 | 25802 |
| 2005/06 | 19935 | 389 | 20323 | 2025/26 | 26158 |
| 2006/07 | 20510 | -39 | 20471 | 2026/27 | 26513 |
| 2007/08 | 21061 | -111 | 20950 | 2027/28 | 26865 |
| 2008/09 | 21210 | -184 | 21026 | 2028/29 | 27230 |
| 2009/10 | 20486 | 269 | 20755 | 2029/30 | 27593 |
| 2010/11 | 20786 | 169 | 20956 | 2030/31 | 27954 |
| 2011/12 | 20771 | 432 | 21202 | 2031/32 | 28308 |
| 2012/13 | 21477 | -32 | 21445 | 2032/33 | 28662 |

## Diesel Sales

Figure 12 - Diesel Sales

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



Between 1997 and 1999, eleven communities previously served by diesel generation were connected to the Integrated System resulting in the drop in overall 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.
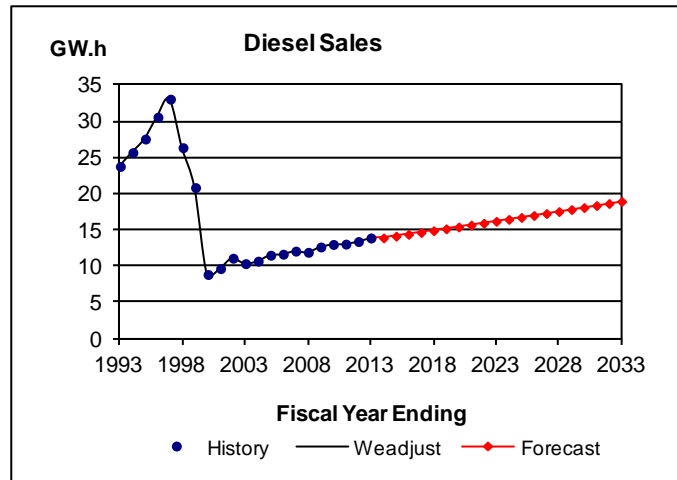
Table 21 - Diesel Sales

| DIESEL SALES (GW.h) HISTORICAL/WEATHER ADJUSTMENT/FORECAST | | | | | |
|---|---|---|---|---|---|
| Fiscal Year | Sales | Weather Adjust | Adjusted Sales | Fiscal Year | Forecast Sales |
| 1993/94 | 26 | 0 | 26 | 2013/14 | 14 |
| 1994/95 | 28 | 0 | 28 | 2014/15 | 14 |
| 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 | 17 |
| 2005/06 | 12 | 0 | 12 | 2025/26 | 17 |
| 2006/07 | 12 | 0 | 12 | 2026/27 | 17 |
| 2007/08 | 12 | 0 | 12 | 2027/28 | 18 |
| 2008/09 | 13 | 0 | 13 | 2028/29 | 18 |
| 2009/10 | 13 | 0 | 13 | 2029/30 | 18 |
| 2010/11 | 13 | 0 | 13 | 2030/31 | 18 |
| 2011/12 | 13 | 0 | 13 | 2031/32 | 19 |
| 2012/13 | 14 | 0 | 14 | 2032/33 | 19 |

## Distribution Losses

Figure 13 - Distribution Losses

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



**Distribution Losses**

GW.h

1. The offset between cycle billing (General Consumers Sales) and actual calendar month usage (Common Bus).
2. Customer Accounting adjustments,
3. Inaccuracies associated with estimated billing (including flat rate estimates),
4. The metered but unbilled consumption of Manitoba Hydro offices, and
5. Energy lost due to theft.
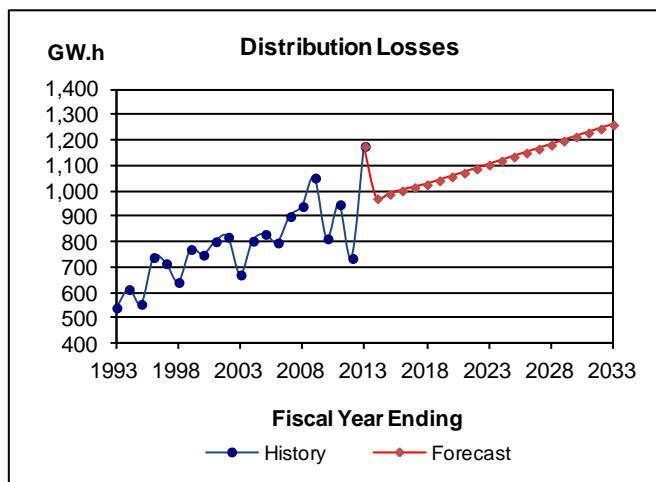
Distribution Losses are forecast in 2013/14 to be 4.4% of the General Consumers Sales less Diesel and remain at about that level throughout the forecast.

Table 22 - Distribution Losses

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

## 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
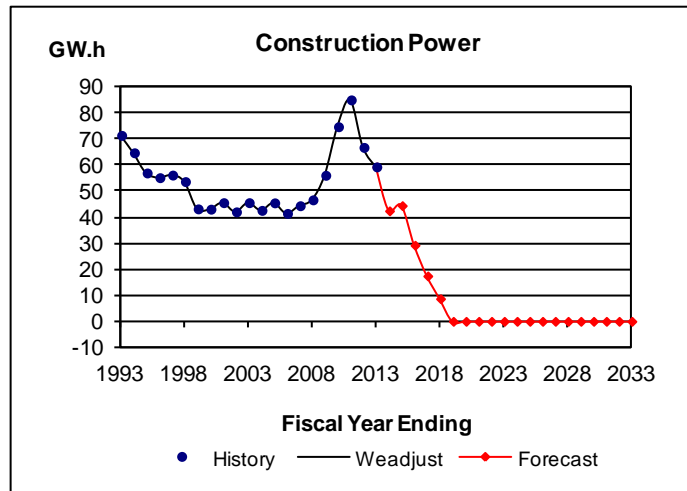
The Construction Power forecast includes: (1) the Wuskwatim generating station, now in-service with completion expected in 2013/14, (2) the Pointe Du Bois spillway replacement started in April 2013 with expected completion in January 2015, and (3) the Keewatinoow Converter Station, started in January 2012 with expected completion in December 2017. Construction Power does not include construction power estimates for any sites that do not yet have a committed inservice date (e.g. Keeyask and Conawapa).

Table 23 - Construction Power

| CONSTRUCTION POWER (GW.h) HISTORICAL/WEATHER ADJUSTMENT/FORECAST | | | | | |
|---|---|---|---|---|---|
| Fiscal Year | Usage | Weather Adjust | Adjusted Usage | Fiscal Year | Forecast Usage |
| 1993/94 | 65 | 0 | 65 | 2013/14 | 43 |
| 1994/95 | 57 | 0 | 57 | 2014/15 | 45 |
| 1995/96 | 55 | 0 | 55 | 2015/16 | 29 |
| 1996/97 | 56 | 0 | 56 | 2016/17 | 17 |
| 1997/98 | 54 | 0 | 54 | 2017/18 | 9 |
| 1998/99 | 43 | 0 | 43 | 2018/19 | 0 |
| 1999/00 | 43 | 0 | 43 | 2019/20 | 0 |
| 2000/01 | 46 | 0 | 46 | 2020/21 | 0 |
| 2001/02 | 42 | 0 | 42 | 2021/22 | 0 |
| 2002/03 | 46 | 0 | 46 | 2022/23 | 0 |
| 2003/04 | 43 | 0 | 43 | 2023/24 | 0 |
| 2004/05 | 46 | 0 | 46 | 2024/25 | 0 |
| 2005/06 | 42 | 0 | 42 | 2025/26 | 0 |
| 2006/07 | 45 | 0 | 45 | 2026/27 | 0 |
| 2007/08 | 47 | 0 | 47 | 2027/28 | 0 |
| 2008/09 | 56 | 0 | 56 | 2028/29 | 0 |
| 2009/10 | 75 | 0 | 75 | 2029/30 | 0 |
| 2010/11 | 85 | 0 | 85 | 2030/31 | 0 |
| 2011/12 | 67 | 0 | 67 | 2031/32 | 0 |
| 2012/13 | 59 | 0 | 59 | 2032/33 | 0 |

## 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**
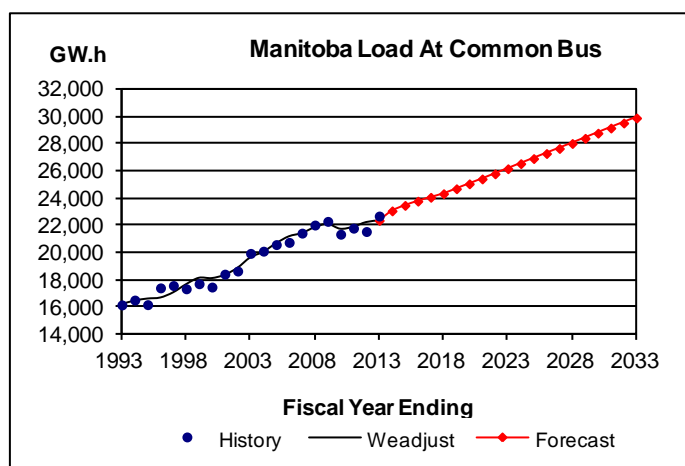


Common Bus is metered and totaled to correspond exactly to each calendar month. Weather adjustment is done on a calendar month basis.

Weather adjusted Common Bus has grown 314 GW.h (1.6%) per year for the past 20 years and 275 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) initiatives. Common Bus is forecast to grow 380 GW.h (1.6%) per year for the next 10 years and 377 GW.h (1.5%) per year for the next 20 years.

**Table 24 - Manitoba Load at Common Bus**

| MANITOBA LOAD AT COMMON BUS (GW.h) HISTORICAL/WEATHER ADJUSTMENT/FORECAST | | | | | |
|---|---|---|---|---|---|
| Fiscal Year | Energy | Weather Adjust | Adjusted Energy | Fiscal Year | Forecast Energy |
| 1993/94 | 16523 | -124 | 16399 | 2013/14 | 23076 |
| 1994/95 | 16185 | 366 | 16550 | 2014/15 | 23479 |
| 1995/96 | 17418 | -792 | 16626 | 2015/16 | 23790 |
| 1996/97 | 17590 | -579 | 17011 | 2016/17 | 24075 |
| 1997/98 | 17350 | 264 | 17614 | 2017/18 | 24338 |
| 1998/99 | 17722 | 374 | 18096 | 2018/19 | 24703 |
| 1999/00 | 17479 | 595 | 18073 | 2019/20 | 25065 |
| 2000/01 | 18428 | -111 | 18316 | 2020/21 | 25425 |
| 2001/02 | 18655 | 185 | 18839 | 2021/22 | 25799 |
| 2002/03 | 19953 | -335 | 19618 | 2022/23 | 26174 |
| 2003/04 | 20116 | -83 | 20033 | 2023/24 | 26548 |
| 2004/05 | 20600 | 67 | 20667 | 2024/25 | 26920 |
| 2005/06 | 20761 | 426 | 21187 | 2025/26 | 27291 |
| 2006/07 | 21442 | -14 | 21429 | 2026/27 | 27661 |
| 2007/08 | 22036 | -175 | 21861 | 2027/28 | 28029 |
| 2008/09 | 22305 | -196 | 22109 | 2028/29 | 28410 |
| 2009/10 | 21361 | 390 | 21751 | 2029/30 | 28788 |
| 2010/11 | 21806 | 94 | 21900 | 2030/31 | 29165 |
| 2011/12 | 21560 | 688 | 22247 | 2031/32 | 29534 |
| 2012/13 | 22699 | -327 | 22372 | 2032/33 | 29903 |

## Transmission Losses

**Figure 16 - Transmission Losses**

Transmission Losses are the amount of energy lost while delivering power from the generation stations to all of the distribution substations that make up Common Bus. Transmission Losses only contains losses associated with supplying Manitoba customers. Losses attributable to exports and the gains attributable to imports are excluded. Transmission Losses are substantial because most of the
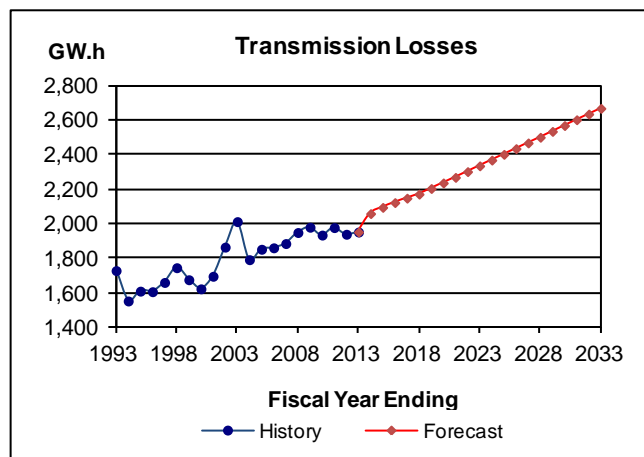


northern generation is transmitted to southern distribution points 900 kilometers away. Transmission Losses vary year to year depending on water conditions, system configuration, outages and the magnitude of the load. Losses were up significantly in 2002/03 due to two High Voltage Direct Current (HVDC) transformer failures.

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

**Table 25 - Transmission Losses**

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

## Station Service

Station Service is the energy used by power plants to generate power and service their own load. Station Service energy was not measured prior to 1993/94 but was previously included within Transmission Losses.

Station Service energy is forecast to be 134 GW.h from 2013/14 to 2032/33. Station Service for non-committed sites (e.g. Conawapa and Keeyask) is not included in the forecast.
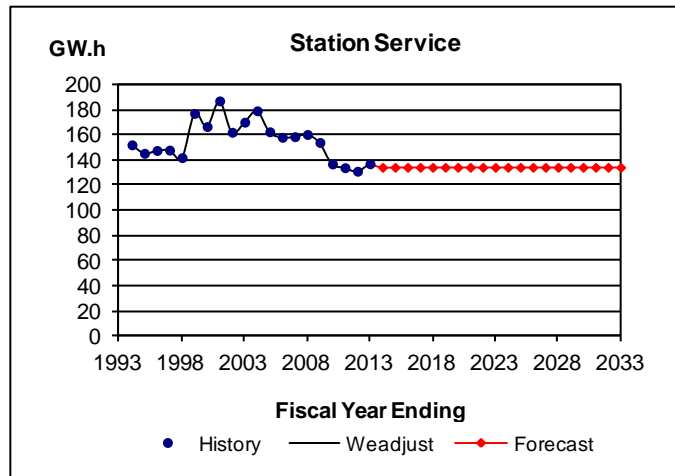
**Figure 17 - Station Service**



**Table 26 - Station Service**

| STATION SERVICE (GW.h) HISTORICAL/WEATHER ADJUSTMENT/FORECAST | | | | | |
|---|---|---|---|---|---|
| Fiscal Year | Usage | Weather Adjust | Adjusted Usage | Fiscal Year | Forecast Usage |
| 1993/94 | 152 | 0 | 152 | 2013/14 | 134 |
| 1994/95 | 146 | 0 | 146 | 2014/15 | 134 |
| 1995/96 | 148 | 0 | 148 | 2015/16 | 134 |
| 1996/97 | 148 | 0 | 148 | 2016/17 | 134 |
| 1997/98 | 142 | 0 | 142 | 2017/18 | 134 |
| 1998/99 | 177 | 0 | 177 | 2018/19 | 134 |
| 1999/00 | 167 | 0 | 167 | 2019/20 | 134 |
| 2000/01 | 187 | 0 | 187 | 2020/21 | 134 |
| 2001/02 | 162 | 0 | 162 | 2021/22 | 134 |
| 2002/03 | 170 | 0 | 170 | 2022/23 | 134 |
| 2003/04 | 179 | 0 | 179 | 2023/24 | 134 |
| 2004/05 | 163 | 0 | 163 | 2024/25 | 134 |
| 2005/06 | 158 | 0 | 158 | 2025/26 | 134 |
| 2006/07 | 159 | 0 | 159 | 2026/27 | 134 |
| 2007/08 | 161 | 0 | 161 | 2027/28 | 134 |
| 2008/09 | 154 | 0 | 154 | 2028/29 | 134 |
| 2009/10 | 137 | 0 | 137 | 2029/30 | 134 |
| 2010/11 | 134 | 0 | 134 | 2030/31 | 134 |
| 2011/12 | 131 | 0 | 131 | 2031/32 | 134 |
| 2012/13 | 137 | 0 | 137 | 2032/33 | 134 |

**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** |
| 2002/03 | 15.5 | 13.9 | 9.4 | 13.8 | 8.6 | 8.2 | 11.3 | 14.0 | 17.6 | 19.9 | 18.6 | 19.4 | 170.3 |
| 2003/04 | 16.0 | 11.6 | 9.7 | 11.7 | 12.5 | 12.7 | 13.3 | 17.7 | 18.6 | 23.2 | 16.8 | 15.6 | 179.4 |
| 2004/05 | 11.8 | 10.4 | 8.1 | 8.1 | 8.0 | 9.6 | 12.0 | 15.9 | 21.2 | 21.6 | 17.9 | 18.0 | 162.7 |
| 2005/06 | 12.6 | 11.0 | 10.0 | 11.1 | 10.1 | 9.6 | 11.8 | 15.2 | 18.4 | 16.7 | 17.0 | 14.9 | 158.3 |
| 2006/07 | 10.2 | 8.9 | 8.4 | 10.3 | 9.3 | 8.6 | 13.4 | 16.1 | 16.7 | 18.6 | 19.7 | 18.7 | 158.8 |
| 2007/08 | 15.7 | 12.1 | 9.1 | 8.2 | 8.4 | 7.3 | 8.7 | 14.7 | 19.2 | 18.6 | 19.7 | 18.8 | 160.5 |
| 2008/09 | 13.8 | 9.4 | 7.5 | 9.5 | 10.4 | 7.1 | 10.6 | 15.1 | 20.1 | 20.4 | 14.9 | 15.5 | 154.2 |
| 2009/10 | 11.8 | 10.3 | 7.9 | 7.2 | 7.4 | 7.2 | 10.8 | 14.2 | 18.8 | 15.5 | 13.3 | 12.7 | 137.1 |
| 2010/11 | 10.2 | 9.9 | 7.3 | 6.7 | 7.2 | 7.4 | 9.5 | 12.9 | 16.4 | 17.1 | 14.4 | 15.0 | 134.1 |
| 2011/12 | 12.0 | 9.9 | 7.5 | 7.1 | 7.3 | 6.7 | 9.5 | 13.1 | 15.1 | 16.0 | 13.8 | 13.1 | 131.3 |
| 2012/13 | 11.0 | 9.4 | 7.7 | 7.0 | 6.7 | 8.0 | 11.5 | 14.3 | 16.2 | 16.6 | 13.7 | 15.2 | 137.2 |
| 2013/14 - 2032/33 | 11.1 | 9.7 | 7.5 | 6.9 | 7.1 | 7.4 | 10.2 | 13.5 | 15.9 | 16.6 | 14.0 | 14.5 | 134.4 |

**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** |
| 2012/13 Actual | 19 | 14 | 9 | 9 | 8 | 10 | 16 | 26 | 26 | 25 | 26 | 24 | 26 |
| 2013/14 - 2032/33 | 18 | 14 | 9 | 11 | 8 | 10 | 17 | 23 | 24 | 25 | 24 | 23 | 24 |

## 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 non-committed plants.

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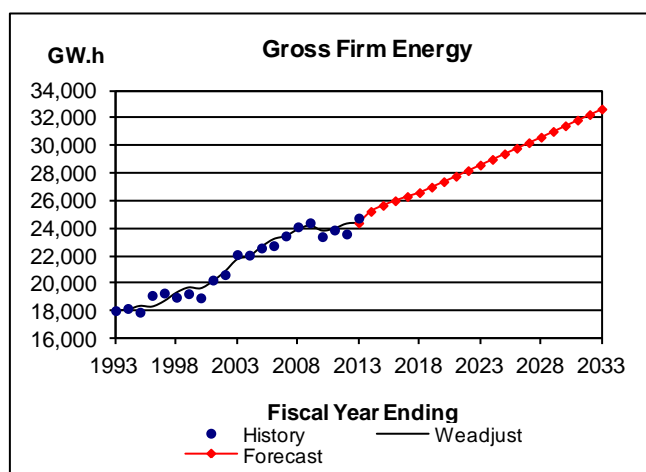


Weather adjusted Gross Firm Energy has grown 334 GW.h (1.6%) per year for the past 20 years and 266 GW.h (1.2%) per year during the past 10 years reflecting the recent economic downturn. This historical growth includes the effect of past Demand Side Management (DSM) initiatives. Energy is forecast to grow 420 GW.h (1.6%) per year for the next 10 years and 413 GW.h (1.5%) per year for the next 20 years.

**Table 29 - Gross Firm Energy**

| GROSS FIRM ENERGY (GW.h) HISTORICAL/WEATHER ADJUSTMENT/FORECAST | | | | | |
|---|---|---|---|---|---|
| Fiscal Year | Energy | Weather Adjust | Adjusted Energy | Fiscal Year | Forecast Energy |
| 1993/94 | 18201 | -134 | 18067 | 2013/14 | 25239 |
| 1994/95 | 17929 | 404 | 18334 | 2014/15 | 25676 |
| 1995/96 | 19148 | -864 | 18284 | 2015/16 | 26013 |
| 1996/97 | 19321 | -631 | 18690 | 2016/17 | 26322 |
| 1997/98 | 19014 | 290 | 19304 | 2017/18 | 26606 |
| 1998/99 | 19273 | 408 | 19681 | 2018/19 | 27003 |
| 1999/00 | 18971 | 651 | 19622 | 2019/20 | 27398 |
| 2000/01 | 20262 | -118 | 20144 | 2020/21 | 27789 |
| 2001/02 | 20656 | 202 | 20859 | 2021/22 | 28197 |
| 2002/03 | 22110 | -367 | 21743 | 2022/23 | 28605 |
| 2003/04 | 22069 | -93 | 21976 | 2023/24 | 29013 |
| 2004/05 | 22589 | 75 | 22663 | 2024/25 | 29418 |
| 2005/06 | 22757 | 463 | 23220 | 2025/26 | 29822 |
| 2006/07 | 23464 | -15 | 23449 | 2026/27 | 30225 |
| 2007/08 | 24122 | -188 | 23934 | 2027/28 | 30625 |
| 2008/09 | 24417 | -210 | 24207 | 2028/29 | 31041 |
| 2009/10 | 23412 | 426 | 23838 | 2029/30 | 31453 |
| 2010/11 | 23892 | 105 | 23998 | 2030/31 | 31863 |
| 2011/12 | 23605 | 746 | 24351 | 2031/32 | 32265 |
| 2012/13 | 24759 | -356 | 24404 | 2032/33 | 32667 |

**Table 30 - Monthly Gross Firm Energy**

| MONTHLY GROSS FIRM ENERGY (GW.h) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **History and Forecast** | | | | | | | | | | | | |
| **2002/03 - 2032/33** | | | | | | | | | | | | |
| **Fiscal Year** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Total** |
| 2002/03 | 1727 | 1629 | 1538 | 1617 | 1554 | 1535 | 1811 | 1964 | 2149 | 2341 | 2142 | 2104 | 22110 |
| 2003/04 | 1657 | 1579 | 1520 | 1573 | 1685 | 1548 | 1688 | 2024 | 2198 | 2479 | 2088 | 2029 | 22069 |
| 2004/05 | 1699 | 1683 | 1545 | 1579 | 1575 | 1574 | 1793 | 1952 | 2411 | 2539 | 2098 | 2140 | 22589 |
| 2005/06 | 1727 | 1698 | 1660 | 1735 | 1649 | 1610 | 1781 | 2045 | 2301 | 2240 | 2171 | 2139 | 22757 |
| 2006/07 | 1712 | 1690 | 1681 | 1826 | 1746 | 1622 | 1870 | 2092 | 2303 | 2458 | 2304 | 2159 | 23464 |
| 2007/08 | 1842 | 1701 | 1663 | 1820 | 1727 | 1650 | 1836 | 2108 | 2490 | 2584 | 2427 | 2273 | 24122 |
| 2008/09 | 1881 | 1737 | 1662 | 1730 | 1787 | 1681 | 1874 | 2154 | 2652 | 2702 | 2226 | 2331 | 24417 |
| 2009/10 | 1861 | 1744 | 1671 | 1667 | 1644 | 1672 | 1888 | 1935 | 2560 | 2524 | 2213 | 2032 | 23412 |
| 2010/11 | 1699 | 1692 | 1611 | 1716 | 1698 | 1638 | 1778 | 2129 | 2563 | 2682 | 2322 | 2364 | 23892 |
| 2011/12 | 1862 | 1751 | 1603 | 1789 | 1741 | 1643 | 1814 | 2125 | 2435 | 2526 | 2251 | 2064 | 23605 |
| 2012/13 | 1802 | 1698 | 1693 | 1870 | 1727 | 1606 | 1941 | 2265 | 2665 | 2765 | 2342 | 2386 | 24759 |
| 11/12 Wadj | 1856 | 1746 | 1700 | 1716 | 1731 | 1583 | 1906 | 2215 | 2618 | 2757 | 2343 | 2233 | 24404 |
| **10 Year Hist** | 19 | 18 | 18 | 15 | 14 | 6 | 24 | 28 | 34 | 39 | 32 | 18 | 266 |
| **Avg Growth** | 1.1% | 1.1% | 1.1% | 0.9% | 0.8% | 0.4% | 1.4% | 1.3% | 1.4% | 1.6% | 1.5% | 0.9% | 1.1% |
| 2013/14 | 1914 | 1813 | 1734 | 1845 | 1808 | 1734 | 1955 | 2228 | 2704 | 2772 | 2385 | 2347 | 25239 |
| 2014/15 | 1947 | 1845 | 1764 | 1877 | 1840 | 1764 | 1989 | 2267 | 2750 | 2820 | 2426 | 2387 | 25676 |
| 2015/16 | 1972 | 1869 | 1787 | 1902 | 1865 | 1788 | 2015 | 2296 | 2786 | 2857 | 2458 | 2418 | 26013 |
| 2016/17 | 1996 | 1891 | 1809 | 1925 | 1887 | 1809 | 2039 | 2323 | 2819 | 2890 | 2486 | 2446 | 26322 |
| 2017/18 | 2017 | 1912 | 1829 | 1947 | 1908 | 1829 | 2061 | 2348 | 2849 | 2921 | 2513 | 2473 | 26606 |
| 2018/19 | 2047 | 1940 | 1856 | 1976 | 1937 | 1857 | 2092 | 2383 | 2891 | 2964 | 2550 | 2509 | 27003 |
| 2019/20 | 2077 | 1969 | 1883 | 2005 | 1966 | 1884 | 2122 | 2417 | 2933 | 3008 | 2588 | 2546 | 27398 |
| 2020/21 | 2106 | 1997 | 1910 | 2034 | 1994 | 1911 | 2153 | 2452 | 2975 | 3051 | 2625 | 2582 | 27789 |
| 2021/22 | 2137 | 2026 | 1938 | 2064 | 2023 | 1939 | 2184 | 2488 | 3019 | 3095 | 2663 | 2620 | 28197 |
| 2022/23 | 2168 | 2055 | 1967 | 2093 | 2052 | 1967 | 2216 | 2524 | 3063 | 3140 | 2702 | 2658 | 28605 |
| **10 Year Fcst** | 31 | 31 | 27 | 38 | 32 | 38 | 31 | 31 | 44 | 38 | 36 | 42 | 420 |
| **Avg Growth** | 1.6% | 1.6% | 1.5% | 2.0% | 1.7% | 2.2% | 1.5% | 1.3% | 1.6% | 1.3% | 1.4% | 1.8% | 1.6% |
| 2023/24 | 2199 | 2085 | 1995 | 2123 | 2081 | 1995 | 2247 | 2560 | 3106 | 3185 | 2740 | 2696 | 29013 |
| 2024/25 | 2230 | 2114 | 2022 | 2153 | 2111 | 2023 | 2279 | 2596 | 3150 | 3229 | 2779 | 2734 | 29418 |
| 2025/26 | 2260 | 2143 | 2050 | 2183 | 2140 | 2051 | 2310 | 2631 | 3193 | 3274 | 2817 | 2771 | 29822 |
| 2026/27 | 2291 | 2172 | 2078 | 2212 | 2168 | 2079 | 2341 | 2667 | 3236 | 3318 | 2855 | 2809 | 30225 |
| 2027/28 | 2321 | 2201 | 2105 | 2241 | 2197 | 2106 | 2372 | 2702 | 3279 | 3362 | 2893 | 2846 | 30625 |
| 2028/29 | 2353 | 2230 | 2134 | 2272 | 2227 | 2135 | 2404 | 2739 | 3323 | 3407 | 2932 | 2884 | 31041 |
| 2029/30 | 2384 | 2260 | 2162 | 2302 | 2257 | 2163 | 2436 | 2775 | 3367 | 3453 | 2971 | 2923 | 31453 |
| 2030/31 | 2415 | 2290 | 2191 | 2332 | 2286 | 2191 | 2468 | 2811 | 3411 | 3498 | 3010 | 2961 | 31863 |
| 2031/32 | 2446 | 2318 | 2218 | 2361 | 2315 | 2219 | 2499 | 2847 | 3454 | 3542 | 3048 | 2998 | 32265 |
| 2032/33 | 2476 | 2347 | 2246 | 2391 | 2344 | 2246 | 2530 | 2882 | 3497 | 3586 | 3085 | 3036 | 32667 |
| **20 Year Fcst** | 31 | 30 | 27 | 34 | 31 | 33 | 31 | 33 | 44 | 41 | 37 | 40 | 413 |
| **Avg Growth** | 1.5% | 1.5% | 1.4% | 1.7% | 1.5% | 1.8% | 1.4% | 1.3% | 1.5% | 1.3% | 1.4% | 1.5% | 1.5% |

## Gross Total Peak

Figure 19 - 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.

Weather adjusted Gross Total Peak has grown from 3,547 MW in 1993/94 to 4,559 MW in 2012/13 at an average growth of 44 MW or 1.2% per year. It is forecast to grow to 5,959 MW at 76 MW (1.5%) per year by 2032/33.
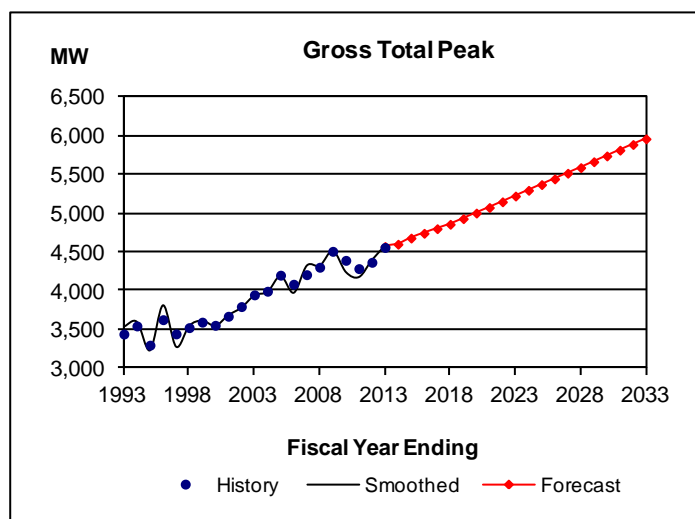
Table 31 – Gross Total Peak

| GROSS TOTAL PEAK (MW) HISTORICAL/WEATHER ADJUSTMENT/FORECAST | | | | | |
|---|---|---|---|---|---|
| Fiscal Year | Peak | Weather Adjust | Adjusted Peak | Fiscal Year | Forecast Peak |
| 1993/94 | 3547 | 0 | 3546 | 2013/14 | 4601 |
| 1994/95 | 3299 | 251 | 3550 | 2014/15 | 4680 |
| 1995/96 | 3628 | -126 | 3502 | 2015/16 | 4742 |
| 1996/97 | 3444 | 83 | 3528 | 2016/17 | 4801 |
| 1997/98 | 3525 | 73 | 3598 | 2017/18 | 4857 |
| 1998/99 | 3596 | 20 | 3616 | 2018/19 | 4930 |
| 1999/00 | 3555 | 20 | 3575 | 2019/20 | 5002 |
| 2000/01 | 3672 | -7 | 3665 | 2020/21 | 5074 |
| 2001/02 | 3797 | -1 | 3795 | 2021/22 | 5147 |
| 2002/03 | 3948 | 2 | 3950 | 2022/23 | 5222 |
| 2003/04 | 3994 | 0 | 3994 | 2023/24 | 5296 |
| 2004/05 | 4201 | -82 | 4119 | 2024/25 | 5369 |
| 2005/06 | 4085 | 136 | 4220 | 2025/26 | 5443 |
| 2006/07 | 4208 | 46 | 4254 | 2026/27 | 5516 |
| 2007/08 | 4304 | 43 | 4347 | 2027/28 | 5588 |
| 2008/09 | 4509 | -108 | 4401 | 2028/29 | 5664 |
| 2009/10 | 4393 | -55 | 4338 | 2029/30 | 5739 |
| 2010/11 | 4286 | 73 | 4359 | 2030/31 | 5813 |
| 2011/12 | 4367 | 56 | 4423 | 2031/32 | 5886 |
| 2012/13 | 4559 | -127 | 4432 | 2032/33 | 5959 |

**Table 32 - Monthly Gross Total Peak**

| MONTHLY GROSS TOTAL PEAK (MW) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| History and Forecast | | | | | | | | | | | | |
| 2002/03 - 2032/33 | | | | | | | | | | | | |
| **Fiscal Year** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Annual** |
| 2002/03 | 3079 | 2820 | 2781 | 2911 | 2738 | 2691 | 3039 | 3397 | 3660 | 3848 | 3948 | 3813 | 3948 |
| 2003/04 | 3242 | 2587 | 2871 | 2877 | 2921 | 2901 | 2988 | 3467 | 3791 | 3994 | 3743 | 3465 | 3994 |
| 2004/05 | 2868 | 2773 | 2713 | 2893 | 2632 | 2748 | 2980 | 3598 | 4057 | 4201 | 3843 | 3577 | 4201 |
| 2005/06 | 2959 | 2845 | 3052 | 3116 | 3050 | 2837 | 2948 | 3672 | 3912 | 3630 | 4085 | 3498 | 4085 |
| 2006/07 | 3092 | 2821 | 3015 | 3141 | 3040 | 2954 | 3220 | 3789 | 4011 | 4208 | 4203 | 3847 | 4208 |
| 2007/08 | 3494 | 2736 | 3042 | 3294 | 3033 | 2777 | 2979 | 3996 | 4078 | 4304 | 4289 | 4095 | 4304 |
| 2008/09 | 3221 | 2893 | 2952 | 2920 | 3110 | 2726 | 3159 | 3804 | 4427 | 4509 | 4196 | 4223 | 4509 |
| 2009/10 | 3196 | 2933 | 3000 | 2758 | 2933 | 2982 | 3054 | 3297 | 4393 | 4256 | 4092 | 4235 | 4393 |
| 2010/11 | 2905 | 2843 | 2805 | 2991 | 3163 | 2709 | 3056 | 3927 | 4195 | 4286 | 4250 | 4169 | 4286 |
| 2011/12 | 3183 | 2886 | 3056 | 3278 | 3189 | 3045 | 3129 | 3756 | 4095 | 4367 | 4270 | 3608 | 4367 |
| 2012/13 | 3328 | 2775 | 3161 | 3260 | 3253 | 2870 | 3312 | 4087 | 4410 | 4559 | 4543 | 4013 | 4559 |
| **10 Year Hist Avg Growth** | 25 0.8% | -5 -0.2% | 38 1.3% | 35 1.1% | 51 1.7% | 18 0.6% | 27 0.9% | 69 1.9% | 75 1.9% | 71 1.7% | 60 1.4% | 20 0.5% | 61 1.5% |
| 2013/14 | 3320 | 2991 | 3110 | 3290 | 3224 | 3046 | 3260 | 3931 | 4530 | 4577 | 4493 | 4107 | 4601 |
| 2014/15 | 3373 | 3040 | 3157 | 3340 | 3275 | 3103 | 3319 | 4002 | 4611 | 4658 | 4573 | 4182 | 4680 |
| 2015/16 | 3417 | 3080 | 3200 | 3384 | 3319 | 3143 | 3363 | 4054 | 4671 | 4719 | 4633 | 4237 | 4742 |
| 2016/17 | 3458 | 3117 | 3239 | 3423 | 3361 | 3181 | 3403 | 4103 | 4726 | 4775 | 4688 | 4288 | 4801 |
| 2017/18 | 3496 | 3152 | 3277 | 3462 | 3401 | 3216 | 3441 | 4148 | 4777 | 4826 | 4739 | 4335 | 4857 |
| 2018/19 | 3549 | 3199 | 3326 | 3509 | 3458 | 3264 | 3492 | 4209 | 4848 | 4897 | 4809 | 4399 | 4930 |
| 2019/20 | 3601 | 3246 | 3375 | 3561 | 3509 | 3312 | 3543 | 4271 | 4919 | 4969 | 4880 | 4464 | 5002 |
| 2020/21 | 3652 | 3292 | 3423 | 3612 | 3559 | 3359 | 3593 | 4332 | 4989 | 5040 | 4950 | 4527 | 5074 |
| 2021/22 | 3706 | 3341 | 3473 | 3664 | 3611 | 3408 | 3646 | 4395 | 5063 | 5114 | 5022 | 4594 | 5147 |
| 2022/23 | 3759 | 3389 | 3524 | 3717 | 3663 | 3458 | 3699 | 4459 | 5136 | 5188 | 5095 | 4660 | 5222 |
| **10 Year Fcst Avg Growth** | 43 1.2% | 61 2.0% | 36 1.1% | 46 1.3% | 41 1.2% | 59 1.9% | 39 1.1% | 37 0.9% | 73 1.5% | 63 1.3% | 55 1.2% | 65 1.5% | 66 1.4% |
| 2023/24 | 3813 | 3437 | 3574 | 3770 | 3715 | 3507 | 3751 | 4522 | 5209 | 5262 | 5167 | 4726 | 5296 |
| 2024/25 | 3866 | 3485 | 3624 | 3823 | 3767 | 3556 | 3804 | 4585 | 5282 | 5336 | 5240 | 4792 | 5369 |
| 2025/26 | 3919 | 3533 | 3673 | 3875 | 3819 | 3605 | 3856 | 4648 | 5354 | 5409 | 5311 | 4858 | 5443 |
| 2026/27 | 3972 | 3581 | 3723 | 3928 | 3871 | 3653 | 3908 | 4711 | 5427 | 5482 | 5383 | 4924 | 5516 |
| 2027/28 | 4025 | 3628 | 3772 | 3980 | 3922 | 3702 | 3959 | 4773 | 5499 | 5554 | 5454 | 4989 | 5588 |
| 2028/29 | 4079 | 3677 | 3823 | 4034 | 3975 | 3752 | 4013 | 4838 | 5573 | 5630 | 5528 | 5056 | 5664 |
| 2029/30 | 4133 | 3726 | 3874 | 4087 | 4028 | 3802 | 4066 | 4902 | 5647 | 5704 | 5602 | 5123 | 5739 |
| 2030/31 | 4187 | 3775 | 3924 | 4140 | 4080 | 3851 | 4119 | 4966 | 5721 | 5779 | 5675 | 5190 | 5813 |
| 2031/32 | 4240 | 3823 | 3974 | 4193 | 4132 | 3900 | 4171 | 5028 | 5793 | 5852 | 5747 | 5255 | 5886 |
| 2032/33 | 4293 | 3870 | 4023 | 4245 | 4183 | 3948 | 4223 | 5091 | 5865 | 5925 | 5818 | 5321 | 5959 |
| **20 Year Fcst Avg Growth** | 48 1.3% | 55 1.7% | 43 1.2% | 49 1.3% | 47 1.3% | 54 1.6% | 46 1.2% | 50 1.1% | 73 1.4% | 68 1.3% | 64 1.2% | 65 1.4% | 70 1.3% |

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

Hourly Gross Total Peak (t)

= 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 due to the peak being possible in any of the winter months and must be higher than the peak of the other months. 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 by regressing the last 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.

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. Assigning them a weather affect and weather adjusting them will not improve their forecast.

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: 0.6 GW.h / DDH, 1.1 GW.h / DDC
GS Mass Market: 0.3 GW.h / DDH, 0.9 GW.h / DDC
General Consumers Sales: 0.8 GW.h / DDH, 2.0 GW.h / DDC
Gross Firm Energy: 1.1 GW.h / DDH, 2.3 GW.h / DDC
Gross Total Peak: 40 MW / degree (at -30 degrees Celsius),
120 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:** 2013/14 | 4541 | 25239 | 3678 | 24289 | -4% | 5439 | 26227 | 4% |
| **Month:** Jan 2014 | 944 | 2772 | 663 | 2463 | -11% | 1261 | 3122 | 13% |
| **Day:** Jan 2014 | 30 | 89 | 6 | 63 | -30% | 56 | 118 | 31% |

| | Effect of Weather due to Summer Extremes on Gross Firm Energy | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **GW.h/DDC** | **Normal** | | **Record Cool Summer** | | | **Record Hot Summer** | | |
| **2.3** | **DDC** | **GW.h** | **DDC** | **GW.h** | **Effect** | **DDC** | **GW.h** | **Effect** |
| **Year:** 2013/14 | 190 | 25239 | 69 | 24960 | -1% | 364 | 25639 | 2% |
| **Month:** July 2013 | 71 | 1845 | 6 | 1695 | -8% | 142 | 2007 | 9% |
| **Day:** July 2013 | 2 | 60 | 0 | 54 | -9% | 14 | 86 | 45% |

The residential sector has a larger proportional effect of weather, varying from an increase of 7% in a record cold winter to a decrease of 7% in a record warm winter, and a possible additional increase of 3% due to a record hot summer and a 2% decrease due to a record cool summer.

| | Effect of Weather due to Winter Extremes on Residential Energy | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **GW.h/DDH** | **Normal** | | **Record Warm** | | | **Record Cold** | | |
| **0.6** | **DDH** | **GW.h** | **DDH** | **GW.h** | **Effect** | **DDH** | **GW.h** | **Effect** |
| **Year:** 2013/14 | 4541 | 7339 | 3678 | 6821 | -7% | 5439 | 7878 | 7% |
| **Month:** Jan 2014 | 944 | 996 | 663 | 827 | -17% | 1261 | 1187 | 19% |
| **Day:** Jan 2014 | 30 | 32 | 6 | 18 | -45% | 56 | 47 | 48% |

| | Effect of Weather due to Summer Extremes on Residential Energy | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **GW.h/DDC** | **Normal** | | **Record Cool Summer** | | | **Record Hot Summer** | | |
| **1.1** | **DDC** | **GW.h** | **DDC** | **GW.h** | **Effect** | **DDC** | **GW.h** | **Effect** |
| **Year:** 2013/14 | 190 | 7339 | 69 | 7206 | -2% | 364 | 7531 | 3% |
| **Month:** July 2013 | 71 | 426 | 6 | 355 | -17% | 142 | 504 | 18% |
| **Day:** July 2013 | 2 | 14 | 0 | 11 | -18% | 14 | 27 | 94% |

## 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. An economic boom will increase it. Cycles cannot be predicted in advance so some appropriate midpoint must be chosen as the forecast.

This forecast was created as Manitoba Hydro's best estimate of Manitoba's future energy requirement. The expectation is that there will be 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.

To evaluate the potential for variation, historic load variability has been analyzed using a probabilistic-based approach. Variations in annual weather adjusted load that have occurred in the past are used to estimate future variation. 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) 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.

If variability due to weather is needed, the standard deviation of annual energy or annual peak due to weather has been found to be approximately 2% of the load. This 2% of load can be used as the standard deviation in a probability point calculation. The resulting variance can be added to the economic-based variance if a combined variance is needed. A straight addition of variances can be done because the weather is mostly independent of the economy.

The following four charts and tables summarize the variability for energy and peak. By 2032/33, the Load Forecast has an 80% probability of being accurate to within ±2,471 GW.h or ±7.6%. Due to the inherent variability of the load, this is the best level of accuracy possible.
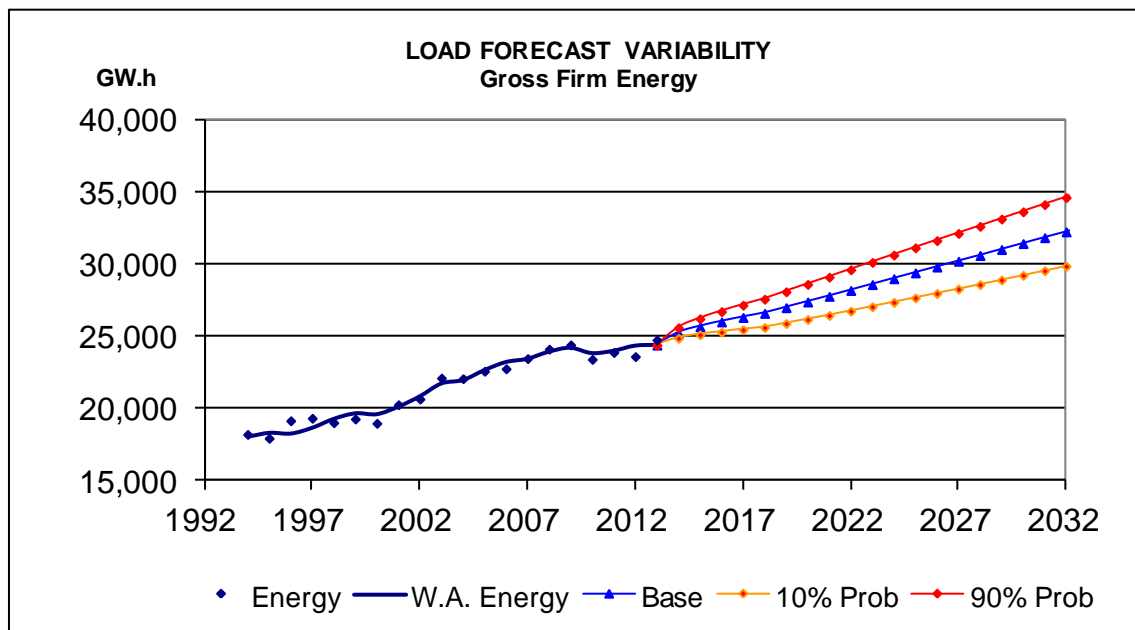
LOAD FORECAST VARIABILITY
Gross Firm Energy

| Fiscal Year | Gross Firm Base Fcst | Long Term Economic Std Dev | 10.0% Prob Point | 90.0% Prob Point |
|---|---|---|---|---|
| 2013/14 | 25239 | 284 | 24875 | 25603 |
| 2014/15 | 25676 | 434 | 25119 | 26232 |
| 2015/16 | 26013 | 557 | 25299 | 26727 |
| 2016/17 | 26322 | 667 | 25468 | 27176 |
| 2017/18 | 26606 | 767 | 25623 | 27589 |
| 2018/19 | 27003 | 862 | 25898 | 28107 |
| 2019/20 | 27398 | 951 | 26178 | 28617 |
| 2020/21 | 27789 | 1038 | 26460 | 29119 |
| 2021/22 | 28197 | 1121 | 26761 | 29634 |
| 2022/23 | 28605 | 1202 | 27065 | 30145 |
| 2023/24 | 29013 | 1280 | 27372 | 30654 |
| 2024/25 | 29418 | 1357 | 27679 | 31157 |
| 2025/26 | 29822 | 1433 | 27986 | 31658 |
| 2026/27 | 30225 | 1507 | 28295 | 32156 |
| 2027/28 | 30625 | 1579 | 28602 | 32649 |
| 2028/29 | 31041 | 1651 | 28925 | 33156 |
| 2029/30 | 31453 | 1721 | 29246 | 33659 |
| 2030/31 | 31863 | 1791 | 29568 | 34159 |
| 2031/32 | 32265 | 1860 | 29882 | 34649 |
| 2032/33 | 32667 | 1928 | 30196 | 35138 |

Figure 21 - Peak Variability

**LOAD FORECAST VARIABILITY**
**Gross Total Peak**
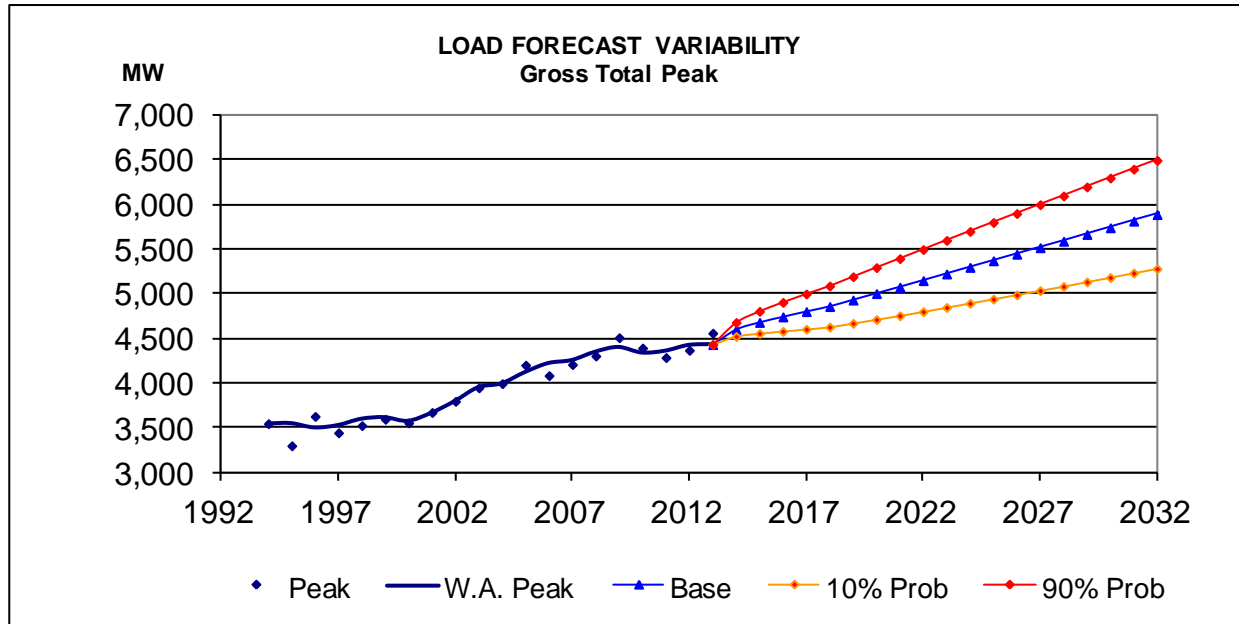


Table 34 – Peak Variability

| Fiscal Year | Gross Total Peak Base Fcst | Long Term Economic Std Dev | 10.0% Prob Point | 90.0% Prob Point |
|---|---|---|---|---|
| 2013/14 | 4601 | 61 | 4522 | 4679 |
| 2014/15 | 4680 | 97 | 4556 | 4804 |
| 2015/16 | 4742 | 127 | 4579 | 4904 |
| 2016/17 | 4801 | 154 | 4603 | 4998 |
| 2017/18 | 4857 | 179 | 4628 | 5087 |
| 2018/19 | 4930 | 204 | 4669 | 5191 |
| 2019/20 | 5002 | 227 | 4711 | 5293 |
| 2020/21 | 5074 | 249 | 4754 | 5393 |
| 2021/22 | 5147 | 271 | 4800 | 5495 |
| 2022/23 | 5222 | 293 | 4846 | 5597 |
| 2023/24 | 5296 | 314 | 4893 | 5698 |
| 2024/25 | 5369 | 335 | 4940 | 5798 |
| 2025/26 | 5443 | 355 | 4988 | 5898 |
| 2026/27 | 5516 | 375 | 5035 | 5997 |
| 2027/28 | 5588 | 395 | 5082 | 6095 |
| 2028/29 | 5664 | 415 | 5132 | 6195 |
| 2029/30 | 5739 | 434 | 5182 | 6295 |
| 2030/31 | 5813 | 454 | 5232 | 6395 |
| 2031/32 | 5886 | 473 | 5280 | 6492 |
| 2032/33 | 5959 | 492 | 5329 | 6590 |

## 5 and 10 Year Forecast Accuracy

Due to the load variation caused by population growth and economic growth, there is only a certain level of accuracy possible. Recognizing the inherent uncertainty of forecast, historic forecast variation has been tracked. Manitoba Hydro's objective is that a five year forecast is within 5% and a ten year forecast is within 10%.

The following four figures and tables compare previous load forecasts to actual results 5 and 10 years later.

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

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

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

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

Figure 22 - Energy Accuracy



FORECAST ACCURACY
Gross Firm Energy

Figure 22 - Energy Accuracy
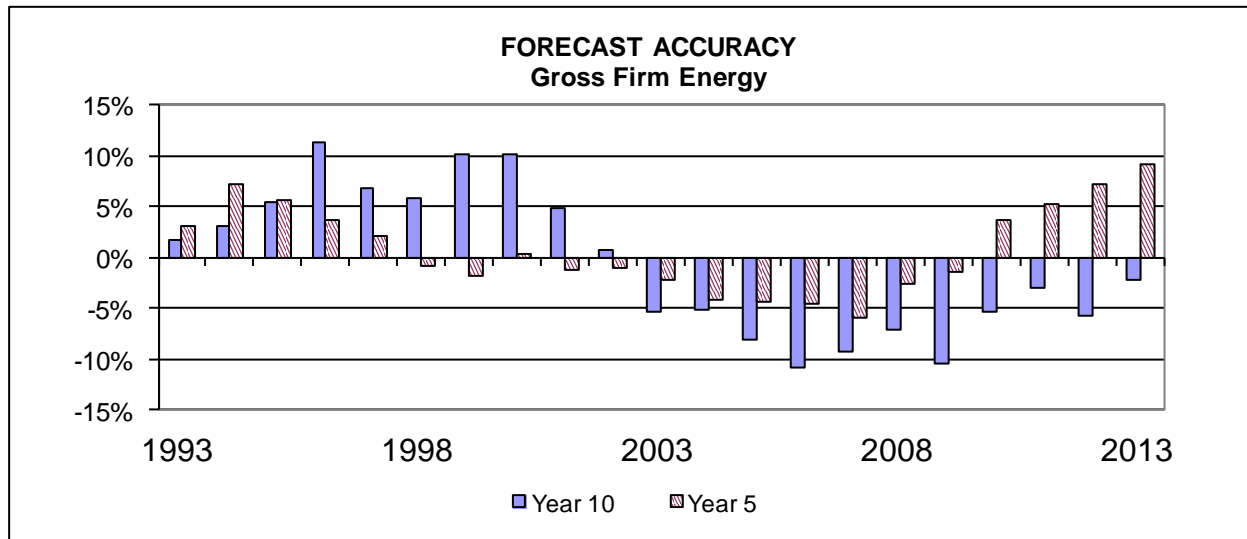
Table 35 - Energy Accuracy

| Fiscal Year | Actual Gross Firm Energy | Forecast Prepared 5 Years Previous | W.A. Gross Firm Energy | 5 Year Percent Accuracy | Forecast Prepared 10 Years Previous | W.A. Gross Firm Energy | 10 Year Percent Accuracy |
|---|---|---|---|---|---|---|---|
| 1992/93 | 17894 | 18533 | 17974 | 3.1% | 18253 | 17950 | 1.7% |
| 1993/94 | 18201 | 19440 | 18113 | 7.3% | 18674 | 18101 | 3.2% |
| 1994/95 | 17929 | 19400 | 18365 | 5.6% | 19357 | 18365 | 5.4% |
| 1995/96 | 19148 | 18985 | 18318 | 3.6% | 20450 | 18370 | 11.3% |
| 1996/97 | 19321 | 19198 | 18810 | 2.1% | 19970 | 18716 | 6.7% |
| 1997/98 | 19014 | 19258 | 19429 | -0.9% | 20452 | 19320 | 5.9% |
| 1998/99 | 19273 | 19476 | 19818 | -1.7% | 21696 | 19708 | 10.1% |
| 1999/00 | 18971 | 19767 | 19703 | 0.3% | 21611 | 19629 | 10.1% |
| 2000/01 | 20262 | 20018 | 20241 | -1.1% | 21083 | 20103 | 4.9% |
| 2001/02 | 20656 | 20783 | 20980 | -0.9% | 21146 | 20979 | 0.8% |
| 2002/03 | 22110 | 21395 | 21861 | -2.1% | 20703 | 21868 | -5.3% |
| 2003/04 | 22069 | 21134 | 22062 | -4.2% | 20975 | 22107 | -5.1% |
| 2004/05 | 22589 | 21693 | 22664 | -4.3% | 20870 | 22714 | -8.1% |
| 2005/06 | 22757 | 22216 | 23277 | -4.6% | 20812 | 23346 | -10.9% |
| 2006/07 | 23464 | 22107 | 23489 | -5.9% | 21395 | 23595 | -9.3% |
| 2007/08 | 24122 | 23353 | 23962 | -2.5% | 22328 | 24034 | -7.1% |
| 2008/09 | 24417 | 23926 | 24259 | -1.4% | 21756 | 24320 | -10.5% |
| 2009/10 | 23412 | 24734 | 23850 | 3.7% | 22611 | 23892 | -5.4% |
| 2010/11 | 23892 | 25270 | 24020 | 5.2% | 23330 | 24071 | -3.1% |
| 2011/12 | 23605 | 25951 | 24202 | 7.2% | 22966 | 24376 | -5.8% |
| 2012/13 | 24759 | 26522 | 24280 | 9.2% | 23902 | 24443 | -2.2% |

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Figure 23 - Peak Accuracy



FORECAST ACCURACY
Gross Total Peak
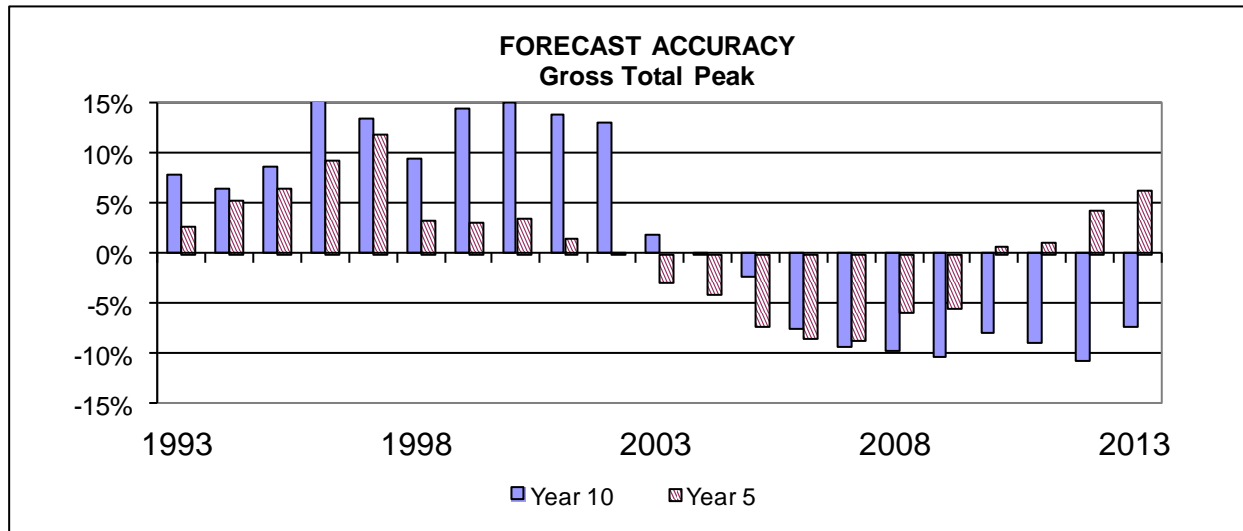
Table 36 - Peak Accuracy

| Fiscal Year | Actual Gross Total Peak | Forecast Prepared 5 Years Previous | W.A. Gross Total Peak | 5 Year Percent Accuracy | Forecast Prepared 10 Years Previous | W.A. Gross Total Peak | 10 Year Percent Accuracy |
|---|---|---|---|---|---|---|---|
| 1992/93 | 3443 | 3621 | 3523 | 2.8% | 3799 | 3523 | 7.8% |
| 1993/94 | 3547 | 3754 | 3567 | 5.3% | 3799 | 3567 | 6.5% |
| 1994/95 | 3299 | 3829 | 3593 | 6.6% | 3904 | 3593 | 8.7% |
| 1995/96 | 3628 | 3850 | 3523 | 9.3% | 4081 | 3523 | 15.8% |
| 1996/97 | 3444 | 3906 | 3491 | 11.9% | 3962 | 3491 | 13.5% |
| 1997/98 | 3525 | 3768 | 3646 | 3.3% | 3990 | 3646 | 9.4% |
| 1998/99 | 3596 | 3703 | 3592 | 3.1% | 4108 | 3592 | 14.4% |
| 1999/00 | 3555 | 3738 | 3608 | 3.6% | 4152 | 3608 | 15.1% |
| 2000/01 | 3672 | 3758 | 3699 | 1.6% | 4210 | 3699 | 13.8% |
| 2001/02 | 3797 | 3759 | 3758 | 0.0% | 4251 | 3758 | 13.1% |
| 2002/03 | 3948 | 3801 | 3917 | -3.0% | 3989 | 3917 | 1.8% |
| 2003/04 | 3994 | 3833 | 3994 | -4.0% | 3990 | 3994 | -0.1% |
| 2004/05 | 4201 | 3817 | 4119 | -7.3% | 4023 | 4119 | -2.3% |
| 2005/06 | 4085 | 3860 | 4221 | -8.5% | 3899 | 4221 | -7.6% |
| 2006/07 | 4208 | 3894 | 4267 | -8.7% | 3868 | 4267 | -9.4% |
| 2007/08 | 4304 | 4097 | 4351 | -5.8% | 3927 | 4351 | -9.8% |
| 2008/09 | 4509 | 4161 | 4401 | -5.4% | 3948 | 4401 | -10.3% |
| 2009/10 | 4393 | 4371 | 4338 | 0.8% | 3993 | 4338 | -8.0% |
| 2010/11 | 4286 | 4406 | 4359 | 1.1% | 3967 | 4359 | -9.0% |
| 2011/12 | 4367 | 4616 | 4423 | 4.4% | 3952 | 4423 | -10.6% |
| 2012/13 | 4559 | 4715 | 4434 | 6.3% | 4108 | 4434 | -7.3% |

# POSSIBLE EVENTS

Manitoba Hydro examines possible events of interest for their potential impact on system load requirements. These events are deemed to be captured within the overall load variability analysis of the forecast. Although not specifically identified within the analysis, they are presented so their individual effects may be considered from a sensitivity perspective if the need arises. These events are summarized in the following table.

|  | Energy Effect (GW.h) | Peak Effect (MW) |
| --- | --- | --- |
| **Climate Change per Degree Celsius Warmer** | +100 | -40 |
| **One New Very Large Industrial Customer** | +1,500 | +180 |
| **One Less Very Large Industrial Customer** | -1,500 | -180 |
| **Additional Load if Electric Vehicles Grow to 70%** | +2,312 | +289 |
| **10% of all Res Customers switch to Electric Heat** | +746 | +246 |
| **10% of all Res Customers switch to Electric Water Heaters** | +198 | +23 |

To provide context for the previous table, one year of energy growth is approximately 420 GW.h and one year of peak growth is approximately 80 MW.

**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 4500 to 5000 each year. A 25 year moving average has been selected 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 ➔ -200 GW.h and -40 MW in the winter
Increase of 100 DDC ➔ +300 GW.h and +120 MW in the summer

The resulting total effect of every one degree increase in temperature would be:
An increase of 100 GW.h to annual energy and a decrease of 40 MW to system peak.

|  | Energy (GW.h) | Peak (MW) |
|---|---|---|
| **Climate Change per Degree Celsius Warmer** | +100 | -40 |

**Potential 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 1,700 GW.h to GS Top Consumers by 2031/32. 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 category.

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 1,700 GW.h of energy that has been reserved in the Potential Large Industrial Loads category.

Similarly, there is a chance that one or more very large customers can close down. This could also be the equivalent of losing Manitoba Hydro's largest customer.

|  | Energy (GW.h) | Peak (MW) |
|---|---|---|
| **Additional Load for one new very large customer** | +1,500 | +180 |
| **Loss of Load for the loss of our largest customer** | -1,500 | -180 |

**Potential Load from High Adoption of Electric Vehicle Technology**

This forecast already assumes there will be a noticeable impact due to adoption of electric vehicles within Manitoba over the next twenty years. The specifics have been detailed in the Plug-In Electric Vehicles section of this document.

But there is a possibility 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. Under this assumption, electric vehicles may grow to be 70% of the market share in 20 years.

Assuming 70% of all vehicles in Manitoba in 2032/33 are Plug-In Electric Vehicles (PEVs), then these vehicles would use 2,384 GW.h and 298 MW.  Currently, the forecast includes 72 GW.h and 9 MW for PEVs, therefore 70% saturation would be an increase of 2,312 GW.h (5½ years of load growth) and 289 MW (about 3½ years of peak growth).

|  | Energy (GW.h) | Peak (MW) |
|---|---|---|
| **Additional Load with 70% Electric Vehicle Saturation Rate** | +2,312 | +289 |

**Increased Residential Use of Electricity for Space heat**

Under current natural gas prices, it is cheaper to heat one's home with a high efficiency natural gas furnace than with electricity. This forecast assumes that natural gas will retain its price advantage over electricity over the next 20 years. The forecast is that by 2032/33, 221,868 or 39.3% of Residential Basic customers will heat their home with electricity.

However, there is a possibility that more customers could switch to electric space heat. If the percentage of electric heat billed customers rises by 10% to 49.3%, then by 2032/33, 278,341 electric heat customers would use 24,869 kW.h each, and 286,245 other customers would use 11,487 each. Total usage would be 746 GW.h higher than forecast (almost 2 years of load growth) in 2032/33. At a 35% load factor, this would add 246 MW to the peak (3 years of peak growth).

|  | Energy (GW.h) | Peak (MW) |
|---|---|---|
| **10% of all Res Customers switch to Electric Heat** | +756 | +246 |

**Increased Residential Use of Electricity for Water heat**

New homes are now primarily built with electric water heaters rather than natural gas water heaters regardless of their space heat fuel choice. In existing homes, as standard and mid-efficiency gas furnaces are being replaced with a high efficiency gas furnace, some homeowners are choosing to replace their existing natural gas water heaters with electric water heaters.

However, there is a possibility that more customers could switch to electric water heaters. If the percentage of customers with electric water heaters rises by 10% to 72.5%, then by 2032/33, 56,459 additional electric water heaters would use 3,500 kW.h each. Additional usage would be 198 GW.h (about ½ year of load growth). At a 100% load factor, this would add 23 MW to the peak (about ¼ of a year of peak growth).

|  | Energy (GW.h) | Peak (MW) |
|---|---|---|
| **10% of all Res Customers switch to Electric Water Heaters** | +198 | +23 |

# ASSUMPTIONS

## Economic Assumptions

Economic forecast assumptions are taken from the 2013 Economic Outlook and the 2013 Energy Price Outlook. These documents contain Manitoba Hydro's forecasts of economic variables including prices of electricity, natural gas and oil, Gross Domestic Product (GDP), Manitoba population and residential customers.

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

**Residential Customers** - The number of Residential Basic customers in Manitoba is forecast to increase by 1.2% (5,633 units) in 2013/14 and averages 1.1% per year over the forecast period. This compares to a historical average increase of 1.0% per year over the last ten years. This is used in the Residential and GS Mass Market customer forecasts.

**Electricity Prices** - The electricity price forecast is based on CPI and rate increase projections contained in the Integrated Financial Forecast. The real electricity price is forecast to increase by 1.7% in 2013/14, and then increase by 2.0% per year throughout the rest of the forecast period.

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

**Gross Domestic Product (GDP)** - Real economic growth in Manitoba is forecast to be 2.4% in 2013/14. It is expected to stay at approximately that level for several years, then decline to 1.7% by 2019/20 and remain at that level for the remainder of the forecast period. This is used in the GS Mass Market customer forecast.

## 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 1988 to March 2013.

The 25 year weather normals used for every year of this forecast are 4,541.3 DDH and 190.1 DDC. This is an increase of 22.9 DDH from last year's normal of 4,518.4 DDH, and an increase of 2.0 DDC from last year's normal of 188.1 DDC.

The range of DDH from 1988 to 2013 was from a warm winter of 3,677.6 DDH in 2011/12 (863.7 DDH below normal) to a cold winter of 5,439.3 DDH in 1995/96 (898.0 DDH above normal).

The range of DDC from 1988 to 2013 was from a cool summer of 71.8 DDC in 2004/05 (118.3 DDC below normal) to a hot summer of 364.1 DDC in 1988/89 (174.0 DDC above normal).

## Demand Side Management (DSM) in the Forecast

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

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

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

For customers involved in DSM initiatives such as the Load Displacement and Alternative Energy, the most recent years of history are used as the basis of their forecast. Any increase or loss to their alternative energy supply will not be included in the forecast, and are accounted for with the other DSM initiatives within the Power Smart Plan.

# METHODOLOGY

## Residential Basic Methodology

The Residential Basic forecast was determined using a combined electricity and natural gas end use approach. The end use assumptions include usage information and efficiency improvement information. The number of appliances and their estimated usage were multiplied together to calculate an energy forecast for each end use, and then all uses were combined to calculate the total use for the Residential End Use Forecast. The following steps were used:

1. **Total Number of Residential Customers** - The forecast of the total number of Residential Basic customers for the 2013/14 to 2032/33 period is taken from Manitoba Hydro's 2003 Economic Outlook that is produced by the Economic Analysis Department. This customer forecast was the primary input for the Residential End Use Model.

2. **Residential Survey Data** – The 2009 Residential Survey was used to provide estimates as of November 2009 of the following:

   a) **Customers by Dwelling Type and Area:** Dwelling types include: Single Detached, Multi-family Attached, and Individually-Metered Apartments. Single detached dwelling types are sub classified into three Areas: Winnipeg, Gas Available Areas Outside of Winnipeg, and Gas Unavailable Areas.

   b) **Customers by Heating Type** - Each combination of Dwelling Type and Area are divided into three Heating Types: Electric Heat Billed customers, Natural Gas Heat Billed customers and Other Heat customers. Electric Heat Billed customers pay for their space heat with their electricity bill. Natural Gas Heat Billed customers pay for their space heat with their natural gas bill. Other Heat customers may use fuel oil, propane or wood, or may use electric or natural gas heat but are not billed on their own electricity or natural gas bill for their heat.

   c) **Age of Home and Heating System** – Home age was used to determine new home construction rates by dwelling type, area and heating type. Heating system age was used to determine heating system replacement rates.

d) **Appliance Saturations and Ages** – Appliance saturations were used to estimate the number of various types of appliances, and appliance ages were used to estimate their replacement rates.

3. **Determination of Average Use** – Conditional Demand Analysis was then performed on the Residential Survey data combined with the Billing data to derive the average annual energy use per appliance calibrated to the whole-house usage. Usage of newer appliances can differ from that of older appliance. Average use for new appliances was determined where there was a difference.

4. **Calibrate Starting Year** – Customers, saturations and average usage were combined to give starting values for the 2009/10 fiscal year corresponding to the 2009 Residential Survey results. These were also calibrated to the billing data for 2009/10.

5. **Calibrate History** – Growth and replacement rates from the Survey were applied to starting year values to derive values for 2010/11, 2011/12 and 2012/13. These were calibrated to billing data for those same years.

6. **Future Growth** – Forecasts of the number of homes, heating systems and appliances, their average usage and their total use were calculated as follows:

a) **New Construction** - The percentage of newly constructed homes choosing electric space heat was forecast for each area using the 2009 Residential Survey estimate. This estimate was adjusted to reflect Manitoba Hydro's initiatives being undertaken to reduce the number of customers choosing electricity for space and water heat.

b) **Appliance Forecast** - Historical saturation and age distribution data was collected from the 2009 Manitoba Hydro Residential Survey. Saturations were forecast using a birth/death/replacement model.

c) **New Appliance Usage** - Average use for new appliances was taken from Conditional Demand Analysis.

d)  **Total Energy Use -** The forecast number of appliances was multiplied by the forecast average use to get the total forecast usage for each appliance. The appliance usages were summed to get the total forecast energy use for the Residential Basic rate class.

7. **Final Adjustments** – Electric Vehicles were added, and savings from Standards and Codes are subtracted.

Ninety percent of the Plug-In Electric Vehicle forecast was added to the Residential GW.h. (The other ten percent of the electric vehicle forecast was allocated to the General Service Mass Market forecast.)

Estimates of improvements due to future Codes and Standards that were not handled by the new appliance average usages were obtained from the Power Smart Planning and Evaluation Research Department and were subtracted.

## General Service Mass Market Methodology

### A)  General Service Mass Market Customer Forecast

Econometric analysis of sales data is used to develop models for the number of customers. Forecasts of Manitoba GDP and Manitoba Hydro Residential Customers from the Manitoba Hydro 2013 Economic Outlook are then input into the models, which generate forecasts for the number of customers for each year of the forecast period.

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

Number of Customers (t)
    = 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 customers was modeled using yearend historical customer data from 1984/85 to 2012/13. The resulting model and parameters are as follows:

Percentage Change in Number of Customers (t)

= -0.003 + 0.132 x CGDP + 0.660 x CRES

CGDP      - Annual Percentage Change in Manitoba Gross Domestic Product

CRES      - Annual Percentage Change in Residential Basic Customers

R-squared: 58.9%

T-stats:

    Constant      : -1.58

    CGDP      : 3.72

    CRES      : 4.05

General Service Mass Market customer growth is allocated to Medium and Large classes using their 10 year average percentage of Mass Market customer growth, the Small Non-Demand class is allocated 10% of new customers, and the rest of the growth is allocated to the Small Demand class.

## B) General Service Mass Market Average Use Forecast

Average use for new customers in each rate class is forecast to be the five year average use of its respective class for the duration of the forecast period. Specifically these are:

i) Small Non-Demand - 31,075 kW.h per year

ii) Small Demand – 166,315 kW.h per year

iii) Medium - 1,572,917 kW.h per year

iv) Large - 5,834,523 kW.h per year

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

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

## C) General Service Mass Market Total Use Forecast

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 per customer in each rate class. The total number of customers in the GS Mass Market sector is forecast using econometric models, and then the total is allocated among the rate classes based on historical data. The average use per customer is forecast using the five year average for each rate class.

Ten percent of the Plug-In Electric Vehicle forecast is added to the GW.h for the Small Non-Demand rate class. (The other ninety percent of the electric vehicle forecast is allocated to the Residential forecast.) Forecast savings from future Codes and Standards are taken off of the forecast to calculate the Total Use.

Total Use (t) in GW.h
        = Weather Adjusted Actual Usage for the Current Year
        + Number of New Small Non-Demand Customers (t)
                x Average Annual Use of Small Non-Demand Customers (t)
                + 10% of Plug-in Electric Vehicle Forecast
        + Number of New Small Demand Customers (t)
                x Average Annual Use of Small Customers (t)
        + Number of New Medium Customers (t)
                x Average Annual Use of Medium Customers (t)
        + Number of New Large Customers (t) x Average Annual Use of Large Customers (t)
        - Forecast Savings from Codes and Standards (t)

## General Service Top Consumers Methodology

Top Consumers is made up of the largest electricity users of Manitoba Hydro. The general criterion is that a company needs to have used 80 GW.h in a year, or have the potential to consume 80 GW.h in a year. A Top Consumer is not necessarily located in one place, but may consist of services at number of locations throughout the Province. A Top Consumer will be one company, but may count as multiple billing customers.

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 representatives. This information is used to prepare company specific forecasts.

Normally, information is only available over the next 3 to 5 years for any company. These short term considerations are taken into account, and then the company's individual forecast is held constant.

To account for longer term growth 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 consumer individually for the long term. It represents the natural growth of all the top consumers as a group, as well as unexpected major expansions, new customers, or loss of customers from GS Top Consumers.

Starting in 2014/15, 100 GW.h a year is forecast for PLIL to account for unforeseen expansion, contraction and growth. This will result in the addition of 1,700 GW.h of PLIL after 20 years.

## Electric Vehicles

The methodology for forecasting Electric Vehicles was to research relevant recent literature and to apply appropriate assumptions from this literature to Manitoba's situation. Historical data on automobile registrations per year in Manitoba was used to help estimate future trends. The forecast section on Electric Vehicles provides the details.

## Other Sectors

**Seasonal, Water Heating, Lighting**

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

**Diesel**

Each of the diesel towns was individually forecast and included in the forecast under the assumption that the diesel towns will not be part of 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 then 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 and annual energy to get the peaks for the remaining energy.  The Top Consumer peaks are added using an 85% Load Factor applied to the Top Consumer monthly and annual energy.

A 10 year average Load Factor is used instead of a 5 year average due to its variability from year to year.  Historical weather adjusted energy is used to calculate Load Factors.  The number of hours in the month is used to calculate monthly Load Factors and the number of hours in the year is used to calculate annual Load Factors.

# 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 home 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 homes not using electricity for heating, or 40 homes 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-family dwellings as well as individually metered apartment suites.

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

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