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4 The Need for New Resources

4.0 Chapter Overview

This chapter describes how Manitoba Hydro establishes the need for new supply resources in order to meet Manitoba Hydro's expected domestic load and firm export commitments. Both current load, and load growth assumptions, as well as Demand Side Management (DSM) programs are described and, when combined, result in net load in Manitoba. The remainder of the chapter describes Manitoba Hydro's existing sources of supply, which represent the ability of the current system to meet load without new resources. The determination of the need for new resources is then based on a comparison of load and supply. The information here provides the basis for the preparation of development plans, described in ***Chapter 8 — Determination and Description of Development Plans***.

Load information in this chapter is based on the 2012 Electric Load Forecast and supply information is based on the 2012/13 Power Resource Plan. The chapter also includes a discussion of Manitoba Hydro's 2013 - 2016 Power Smart Plan. In terms of DSM, the analysis contained in the NFAT submission is based upon DSM projections prepared early in 2012 as a component of the corporation's regular corporate planning cycle; for the purposes of the submission these projections are referred to as "the 2012 base DSM forecast". The 2012 base DSM forecast is consistent with and formalized under the 2013 - 2016 Power Smart Plan.

4.1 Introduction

As described in ***Chapter 1 —Introduction***, Manitoba Hydro is mandated by *The Manitoba Hydro Act* to provide for the continuance of a supply of power adequate for the needs of the province, and to engage in and to promote economy and efficiency in the development of generation, transmission, distribution supply and end-use of power. Manitoba Hydro conducts a review of the need for new supply resources on an annual basis as part of the resource planning process described in ***Chapter 1 — Introduction***. Manitoba Hydro's commitments include:

- Manitoba domestic electricity load (net of DSM programs)
- long-term firm export sale commitments.

Manitoba's domestic electrical energy consumption has grown, on average, at an annual rate of 1.7% over the past ten years. Observed domestic energy usage includes the effect of energy codes and standards and Manitoba Hydro's past DSM programs. Manitoba's domestic energy usage would have grown another 0.4% per year in the absence of DSM.

Manitoba Hydro's forecast net energy load is determined by considering both domestic energy growth and forecast DSM programs. Over the next 20 years, a growth trend in energy consumption is forecast to continue at an average annual rate of 1.6% (2012 load forecast). This trend takes into account the effects of future savings due to energy efficiency codes and standards but not DSM programs. Projected DSM programs would reduce the energy use growth rate by approximately 0.1% to 1.5%.

Similarly, Manitoba's peak demand has grown, on average, at a rate of 1.4% per year over the past 10 years. The observed domestic demand includes the effect of codes and standards and Manitoba Hydro's past DSM programs. Manitoba's domestic demand would have grown another 0.4% per year if not for the effect of codes and standards and Manitoba Hydro's past DSM programs.

Manitoba Hydro's forecast net peak load is determined by considering both domestic demand growth and forecasted DSM programs. Peak demand is forecast to continue to grow at an average rate of 1.6% per year for the next 20 years. This reflects future savings due to codes and standards but not DSM programs. Forecast DSM programs would reduce the forecasted demand growth rate by approximately 0.1% resulting in an average rate after DSM of 1.5%.

In terms of causes for growth, the province of Manitoba is growing, both in population and economically. Growth in population results in more housing and in increases in related services within the commercial sector to accommodate that growth. Economic growth results in the anticipated expansion associated with commercial and industrial customers. Together, forecast population growth and economic growth result in a Manitoba load that is expected to grow in all sectors.

The electricity demands of a growing Manitoba population and a growing economy can be slowed but not reversed. DSM programs have been used successfully by Manitoba Hydro to reduce customer load in Manitoba, resulting in the deferral of new resources. By the end of fiscal year 2012/13, codes and standards and Power Smart programs were estimated to have achieved an annual load reduction of 1,990[1] gigawatt-hours (GWh) in energy and 586 megawatts (MW) in demand (at generation)[2] and have deferred the need for new resources by approximately four years. These savings are reflected in the historical domestic-load growth rates. Yet, despite the efforts of Manitoba Hydro with its industry-leading DSM programs, Manitoba electricity consumption is growing faster than it can be conserved.

Manitoba Hydro's future DSM strategy involves a continued long-term commitment to pursuing all available economic energy efficiency opportunities. The 2013–2016 Power Smart Plan targets additional energy savings of 1,552 GWh and 490 MW of capacity savings by 2027/28. This represents approximately four years of domestic energy load growth and six years of peak load growth. Forecast DSM defers the requirement for future generation by approximately three to four years.

Manitoba Hydro's primary focus is the provision of power to its Manitoba customers. Manitoba Hydro also exports surplus firm energy and capacity through long-term firm sale agreements,

[1] All load and supply values have been adjusted, as necessary, to reflect a common reference point. This reference is at the point of generation.
[2] Interim estimate as of March 31, 2013.

which form the second component of Manitoba Hydro's firm electricity commitments. However, in order to maintain security and reliability of supply to Manitoba customers, long-term firm sale agreements may contain reduced delivery obligations for example during periods of system emergencies and under certain drought conditions. Contracts which take the form of diversity agreements provide for the seasonal exchange of power between utilities during their respective peak load conditions, helping to optimize operations by having Manitoba Hydro export to customers with peak loads in the summer period while having the ability to import from these same customers during Manitoba's winter peak period. Such arrangements result in lower power costs to both parties by deferring the expansion of generating resources that would otherwise be required to meet peak load.

System supply evaluations are based on Manitoba Hydro's generation planning criteria and are assessed from the perspective of both dependable energy and peak winter capacity. The Manitoba Hydro base supply, including electricity imported from outside the province, is expected to provide 6,244 MW of winter peak capacity and 30,253 GWh of dependable energy in the year 2013/14 resulting in a surplus of 583 MW winter peak capacity and 1,536 GWh of dependable energy.

Based on 2012 planning assumptions, a surplus of dependable energy continues until 2022/23 when the base supply is no longer sufficient to satisfy anticipated energy demand. There continues to be surplus capacity in the system beyond 2022/23. Over the last five years, the requirement for new resources has varied from as early as 2019/20 to as late as 2022/23 and has consistently been due to a need for energy as opposed to capacity.

4.2 Total Demand on the Manitoba Hydro System

4.2.1 Manitoba Hydro's Domestic Electricity Load

Manitoba Hydro's forecast of electrical energy consumption and peak demand is detailed in the report 2012 Electric Load Forecast (hereinafter referred to as the "2012 Load Forecast"). This report is provided in ***Appendix C – 2012 Electric Load Forecast***. The load forecast is reviewed and updated on an annual basis as part of the annual corporate planning cycle.

Manitoba peak demand is defined to be "the maximum average hourly load, measured in MW, in Manitoba to be served by Manitoba Hydro's system". Energy consumption is defined to be "the electrical energy used by a customer, measured in kilowatt-hours (kWh) or megawatt-hours (MWh)".

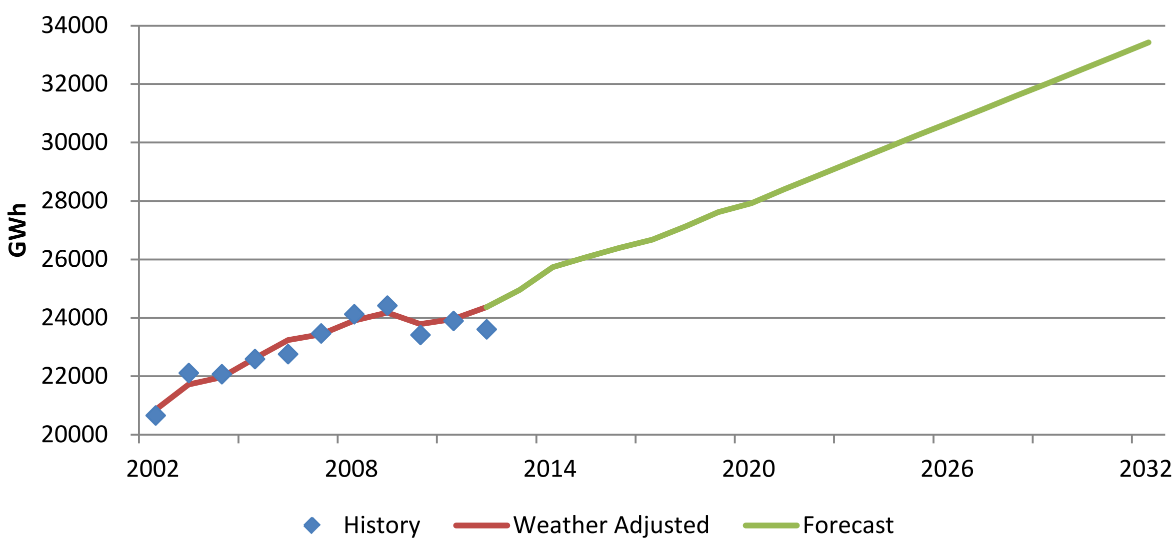
Considerations for the 2012 Load Forecast:

- Historical load values include the effect of Manitoba Hydro's past DSM, including both improvements to energy codes and standards as well as market-based programs.
- Forecasted load values reflect the future impact of implemented energy codes and standards, but not future activity under market-based DSM programs.
- Customer self-generation is recognized as avoided load; the avoided load is not in the load forecast.
- Given that forecast activity under market-based DSM programs has not been removed from the 2012 Load Forecast, Manitoba Hydro's forecast net load is determined by considering both forecast domestic energy growth and projected future DSM program activity.

As established in Table 3.1 of ***Chapter 3 – Trends and Factors Influencing North American Electricity Supply***, overall loads across Canada and the U.S. are projected to grow, with average annual growth rates varying by region, reflecting the unique characteristics of their individual markets.

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

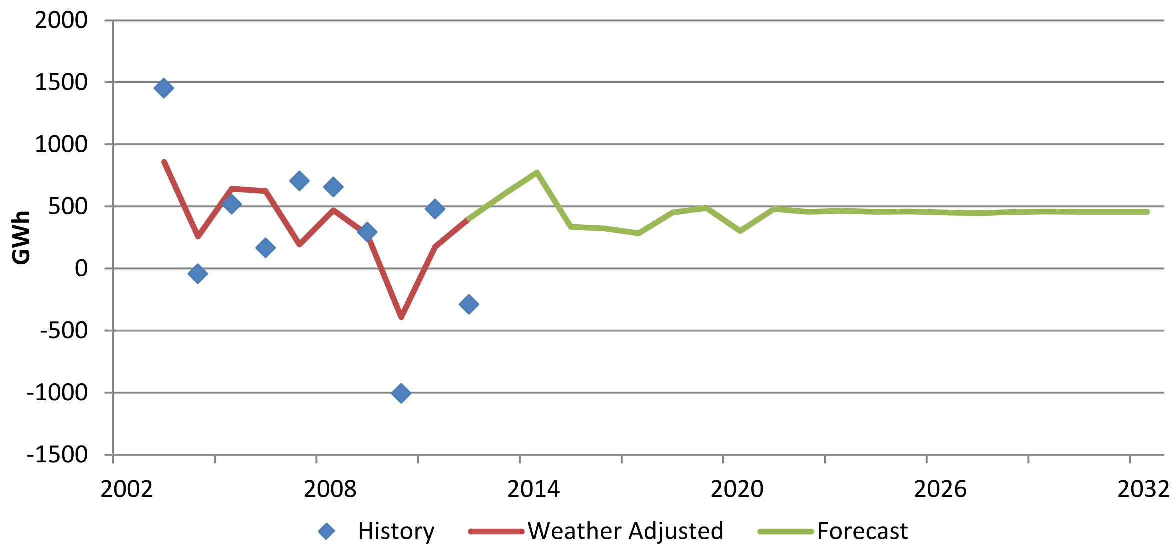
Figure 4.1 MANITOBA ENERGY CONSUMPTION (GWH) – HISTORY & FORECAST



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

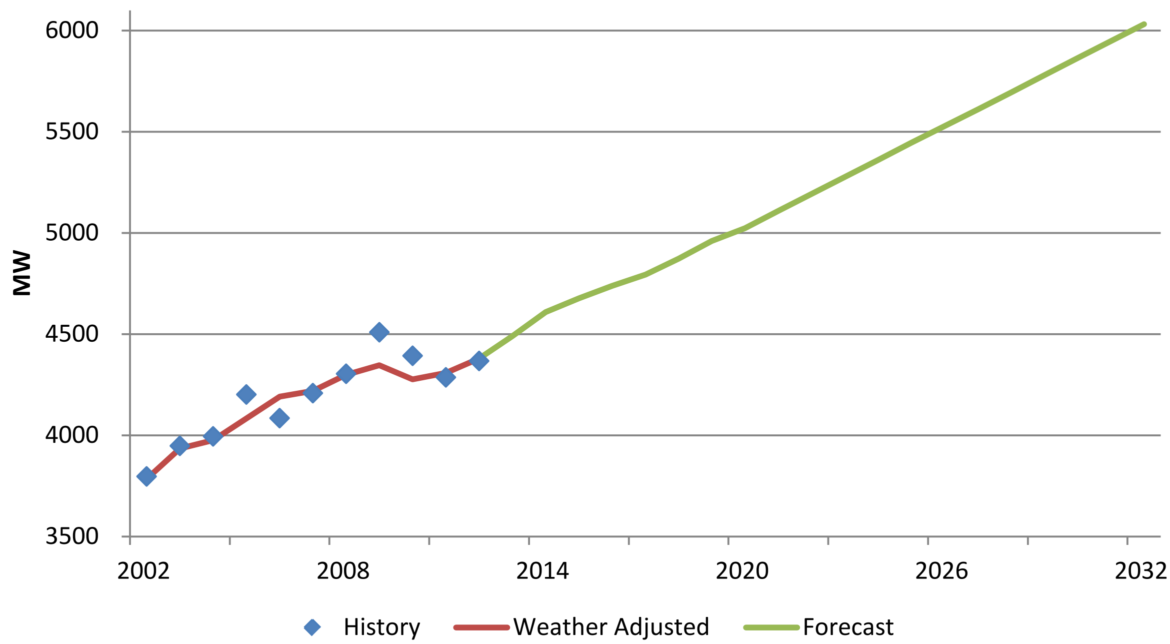
Annual energy growth varies from year to year. The variation is mostly due to increases or decreases in energy consumption by Manitoba's largest electricity customers. The effect of the closure of one of these customers in 2009 can be clearly seen in the weather-adjusted history shown in Figure 4.2. The effect of major expansions by large customers in 2013, the planned closure of a smelter and refinery in 2015, and the drop of some operations in 2019 can be seen in the forecast.

Figure 4.2 **MANITOBA ENERGY ANNUAL GROWTH (GWH)**



Historical and forecast peak demand values are shown in Figure 4.3 below. Peak demand grew 15% over the past 10 years from 3,797 MW in 2001/02 to 4,380 MW in 2011/12. Peak demand is forecast to grow another 19% to 5,192 MW by 2021/22, and 38% to 6,032 MW by 2031/32. Forecasts are based on weather-adjusted values.

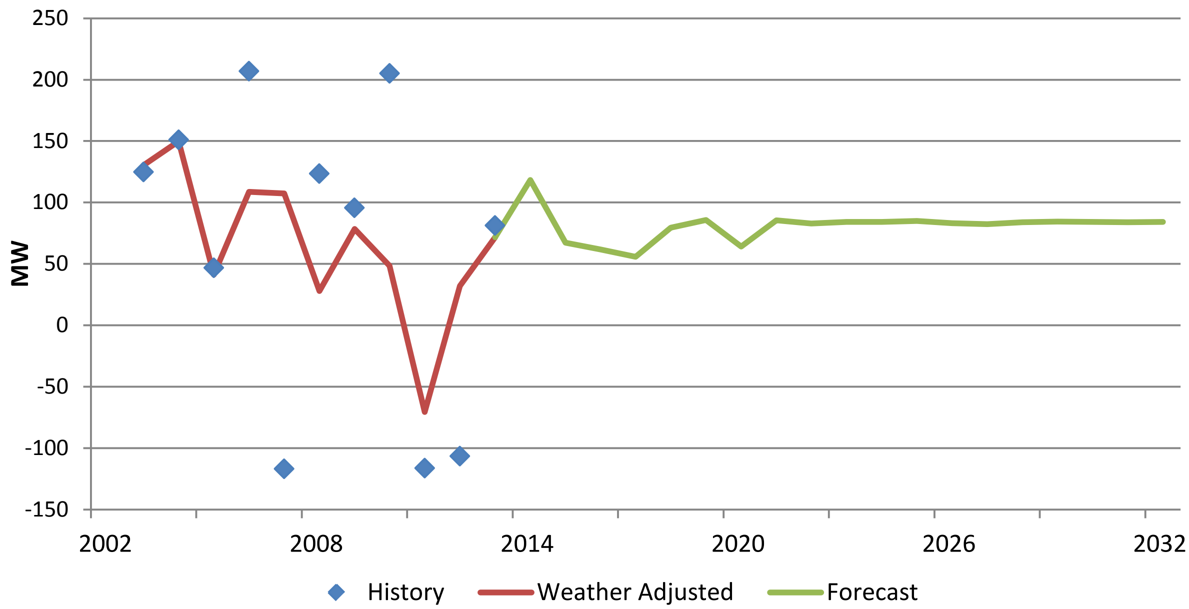
Figure 4.3 MANITOBA PEAK (MW) – HISTORY & FORECAST



As shown in Figure 4.4 below, Manitoba peak demand has grown, on average, at an annual growth rate of 1.4% or 58 MW per year over the past 10 years. It is forecast to grow at an average annual rate of 1.6% or 83 MW for the next 20 years. In the mid-2000s when large electricity customers were expanding, peak demand had been growing at a slower rate than energy consumption. However, increased growth in electric-heat customers is forecast to bring the future peak-demand growth rate up to that of Manitoba energy consumption (1.6%).

Manitoba peak demand tends to grow at a very similar rate to Manitoba energy consumption. It is of note that higher energy use by the largest electricity users in Manitoba, who have relatively constant consumption of energy over the year, causes the peak demand to grow at a slower rate than the requirement for energy. Conversely, electric-heat customers, who peak on the coldest day of the winter, cause peak demand to grow at a faster rate than the requirement for energy.

Figure 4.4 MANITOBA PEAK DEMAND ANNUAL GROWTH (MW)



Over the next 20 years, Manitoba energy consumption is forecast to grow at an average of 453 GWh per year and peak demand is forecast to grow at an average of 83 MW per year, with the expectation that in the future large electricity customers will continue to affect individual years, causing some years to be above and some years to be below that average.

4.2.1.1 Domestic Load Growth by Sector

Domestic load is forecast for the following sectors: Residential Basic, General Service - Mass Market, General Service - Top Consumers, Losses and Station Service, and Miscellaneous. Figure 4.5 and Figure 4.6 show the percentage breakdown by sector for the years 2011/12 and 2031/32 respectively. The sector percentages are not expected to change significantly since all sectors are expected to grow at approximately the same rate.

Figure 4.5 SECTORS OF DOMESTIC LOAD FOR **2011/12**

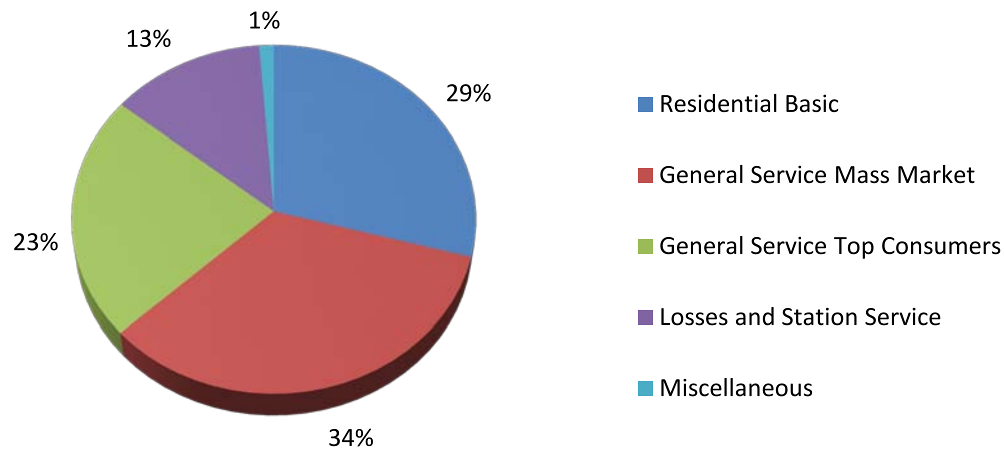
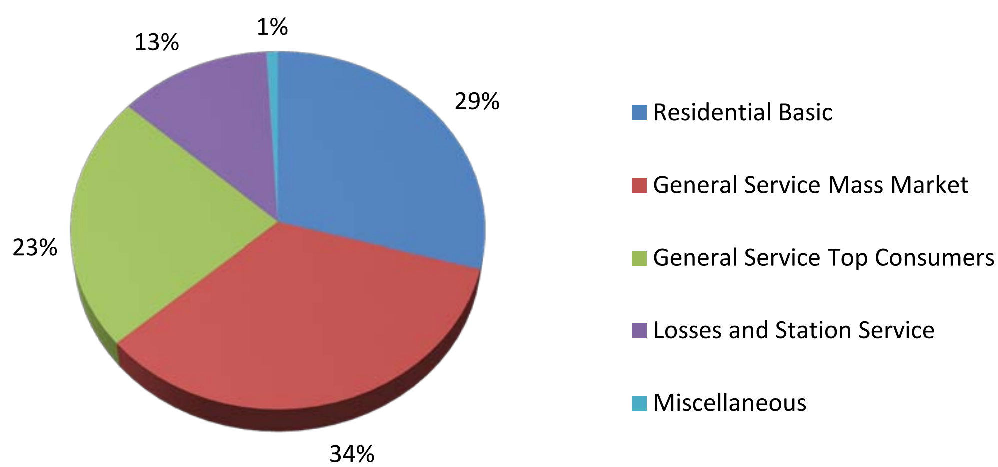


Figure 4.6 SECTORS OF DOMESTIC LOAD FOR **2031/32**



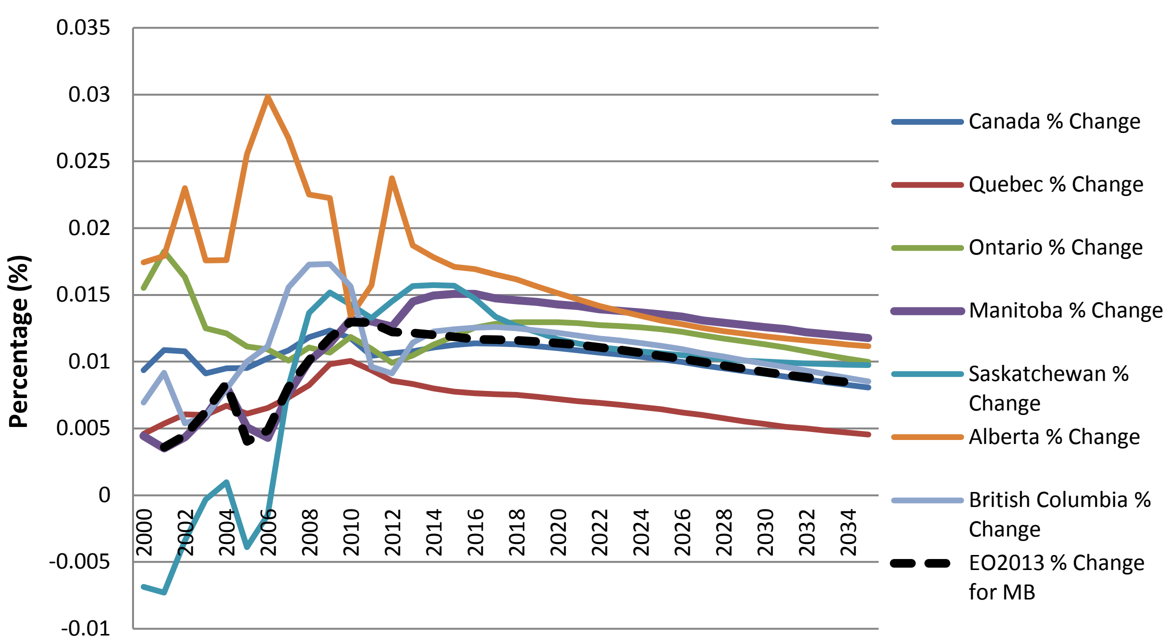
Residential Basic

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

Under Manitoba Hydro's 2012 Economic Outlook, Manitoba's population is forecast to grow from 1,255,000 in 2011/12 to 1,596,000 in 2031/32, representing an average annual growth rate of 1.2%. In the 2012 Load Forecast, the number of Residential Basic customers is expected to grow at an average annual rate of 1.2% over the next 20 years, reaching 576,545 customers by 2031/32.

For the 2013 Load Forecast, the forecast population annual growth rate was reduced from 1.2% per year to 1.1% per year, with the Residential Basic customer forecast correspondingly reduced from 1.2% to 1.1%. Some industry forecasters, as evidenced in Figure 4.7, are projecting population growth in Manitoba to be among the highest in Canada contributing to the overall growth in Manitoba's future energy requirements. The effect of Manitoba Hydro's 2013 Economic Outlook and updated population forecasts, as noted by line EO2013 in Figure 4.7, are reflected in the 2013 Electric Load Forecast as outlined in ***Chapter 12 – Economic Evaluations – 2013 Update on Selected Development Plans***.

Figure 4.7 **ANNUAL POPULATION GROWTH BY PROVINCE (%): COMPARISON TO EO2013**



Source: Conference Board of Canada 2013 Values

Due to the expectation that a larger proportion of customers will continue to choose electricity for space and water heat as well as miscellaneous end-uses, the average energy usage per residential customer is expected to rise by 0.4% /year. Electricity is currently used for space heating by approximately 35% of Residential Basic customers—forecast to grow to approximately 40% by 2031/32 as a progressively higher percentage of new homes and apartments choose electricity for space heating.

Electric water heating is currently used by approximately 47% of Residential Basic customers—forecast to grow to approximately 69% by 2031/32 in the 2012 Load Forecast. The current trend is for new homes to install electric water heaters; in addition, a growing number of existing natural gas water heaters are also being replaced with electric units.

The influence of improved efficiency requirements for natural gas furnaces and resulting impact on the fuel choice for water heating on the average electricity usage per customer will differ from region to region. This difference depends upon the level of saturation of electric space and water heating in a region, building practices, historic and current energy pricing and other market characteristics. These trends in space and water heating in Manitoba are expected to be mitigated through the corporation's planned heating fuel choice initiatives, with the effects reflected in the 2013 Electric Load Forecast as outlined in ***Chapter 12 – Economic Evaluations – 2013 Update on Selected Development Plans***.

The 1.2% annual increase in Residential Basic customers due to population growth combined with the 0.4% annual increase in average electricity use results in an annual growth rate of 1.6% for the Residential Basic sector over the next 20 years.

General Service – Mass Market

The Mass Market sector is made up of commercial and industrial customers, excluding the Top Consumers. This sector had 65,546 customers in 2011/12, whose weather-adjusted energy consumption was 8,270 GWh, or 34% of the total energy consumed in Manitoba. Over the past 10 years, this sector's consumption has grown at a fairly constant rate of 119 GWh (1.6%) per year, and is forecast to grow at a slightly higher rate averaging 161 GWh (1.7%) per year for the next 20 years due to the expected population growth in Manitoba. The number of Mass Market customers themselves is also expected to increase as more commercial entities seek to provide services for the growing population.

This sector is made up of a wide variety of commercial and small-industrial customers, including offices, retail, wholesale, apartment complexes, schools, hospitals, agriculture, and small manufacturing. Their energy use is not as significantly affected by the economy as other sectors as the related facilities continue to use energy between periods of tenancy.

General Service - Top Consumers

The Top Consumers sector is made up of the 17 industrial and commercial companies, which represent the largest energy users in Manitoba. In 2011/12, the Top Consumers used 5,531 GWh, or 23% of the total electricity consumed in Manitoba.

Energy use for Top Consumers is forecast on a per-company basis to include their respective short-term committed plans and expectations—the forecast excludes longer-term plans that are uncommitted or subject to change. The impact of these plans is reflected generally within the first three years of the load forecast.

During the recent economic slow-down, overall sector load declined due to the loss of one customer in the pulp and paper industry; another major reduction is currently projected in 2015 for primary metals. However, growth among other Top Consumers is expected to make up these load losses, primarily in the pipelines and chemical industries. Overall, short-term plans indicate that Top Consumers should grow by 680 GWh (12%) in the next two years, since a number of customers are planning major expansions.

For the longer term, the future energy requirements of individual customers within the Top Consumers sector cannot be reliably forecast: their growth is too dependent on their particular industry, the economy, and their own competitive situation. One company may be in the right industry at the right time and decide to expand; another may be forced, by a number of unforeseen circumstances, to cut back or even shut down.

To estimate the longer-term growth for the Top Consumer sector, the sector is forecast as a whole. The growth for the longer-term is called Potential Large Industrial Loads and includes consideration for company expansions, cutbacks and shutdowns; new startups of 50 GWh a year or more; and the long-term normal incremental growth of all the companies combined. Since short-term customer intentions are known, Potential Large Industrial Loads is not added to the first three years of the forecast.

In the past 20 years, there have been 14 major increases of load of 100 GWh or more, and two major losses of load of 100 GWh or more within the sector. The net effect has been an addition of about 85 GWh per year. Normal company growth among these customers has added another 7 GWh per year. The combined effect is that Top Consumers has grown from 3,783 GWh in 1992/93 to 5,531 GWh in 2011/12, a growth of 92 GWh or 2.0% per year.

Potential Large Industrial Loads are forecast to be 100 GWh per year. By 2031/32, their contribution is forecast to be 1,700 GWh. Including Potential Large Industrial Loads, General Service Top Consumers is forecast to grow from 5,531 GWh in 2011/12 to 7,698 GWh in 2031/32, for an average growth of 108 GWh or 1.7% per year.

In general, the economy continues to have a significant impact on Top Consumers. Their electricity consumption is dependent upon the state of the economy in their specific industries: in robust economic times they expand operations, increasing their electricity consumption;

while in recessionary times, they reduce shifts and cut back production, thereby decreasing consumption.

Manitoba recently went through an economic downturn, and with the loss of a major customer, electricity consumption of the Top Consumers sector still remains below what it was at its peak in 2008/09; however, Manitoba is a growing province in terms of population and gross domestic product. It is therefore not reasonable to expect that the recent experience of no growth in this sector will continue. It would only take one or two large new customers over the next 20 years to provide the entire additional load that is forecast for the Top Consumers sector until 2031/32.

Losses and Station Service

In 2011/12, distribution losses, transmission losses and station service accounted for 3,156 GWh or 13% of the total energy consumed in Manitoba. This percentage is expected to remain generally the same over the duration of the forecast. (The addition of Bipole III will reduce losses but this is captured separately in the Power Resource Plan due to it being a future project at this time.)

Miscellaneous

Miscellaneous sectors—including seasonal, flat rate, diesel and lighting—used a total of 296 GWh, or 1% of the total energy consumption in Manitoba. The growth in these sectors has minimal effect on overall domestic growth.

4.2.1.2 Load Variation and Forecast Accuracy

Load Variation

Uncertainty is an inherent characteristic of forecasting. The load will vary both year to year and in the 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 that an appropriate mid-point value must be chosen as the forecast.

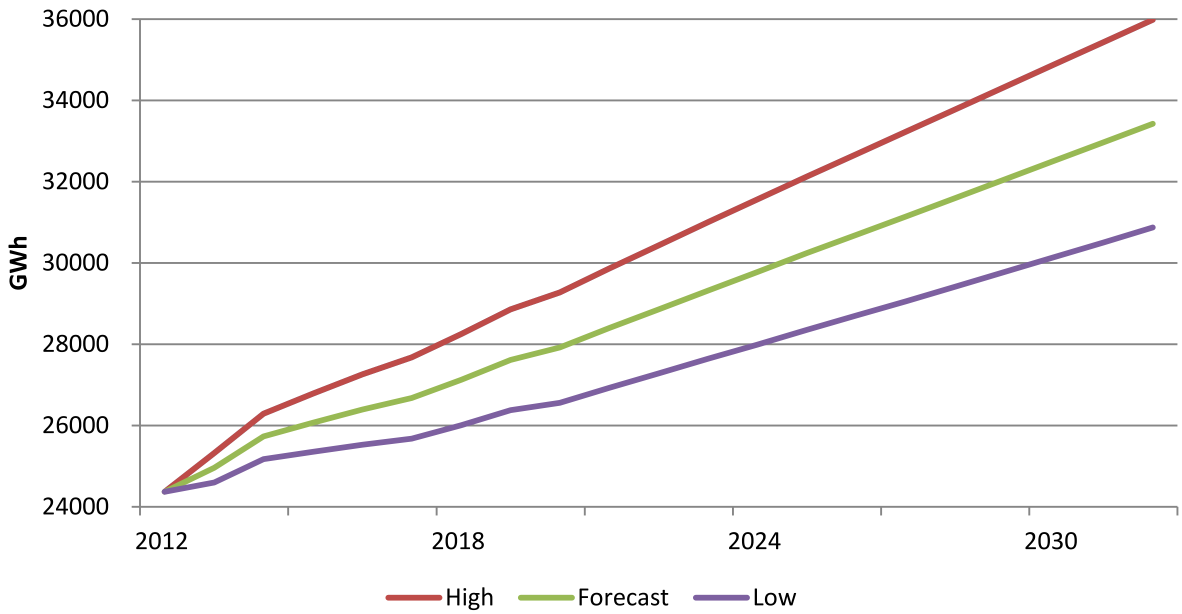
As outlined in section 4.2.1, domestic energy is expected to increase from 24,367 GWh in 2011/12 to 33,425 GWh (+37%) in 2031/32 and, over the same period, peak demand is expected to grow from 4,380 MW to 6,032 MW (+38%). Such a forecast was created as Manitoba Hydro's best estimate of Manitoba's future energy requirement. The load forecast is based on information from the ***Appendix F - Economic Outlook 2012 - 2033***, including the forecasts of economic growth and population. These forecasts represent the best estimate of what will happen, and each has the expectation 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.

Using a mid-value forecast means that a period of high economic growth or higher-than-normal population growth will result in higher electricity consumption than has been forecasted. A period of low economic growth or low population growth will result in lower electricity consumption than forecasted.

To evaluate the potential for variation, historic load variability has been analyzed using a probabilistic-based approach, e.g., variations in annual weather-adjusted load that have occurred in the past are used to estimate future variation. This approach provides an estimate of the magnitude of the potential load variation from the forecast due to population, economy and other effects.

Figure 4.8 shows high and low probability bands of future requirements. Under this analysis, there is a 10% probability of actual loads being lower than the low band and a 10% probability of actual loads being higher than the high band. There is an 80% chance that the actual amount of electricity required will be between the low and high bands. These bands correspond to an annual growth of 1.2% for the low band and 2.0% for the high band, compared to 1.6% for the base forecast (green line). What actually happens and where the load will be relative to the bands will depend on actual population growth and customer activity levels. By 2031/32, the actual amount of electricity required could therefore vary by over 2,500 GWh or ±8%.

Figure 4.8 ENERGY FORECAST PROBABILITY BANDS (GWH)



Forecast Accuracy

Due to the load variation caused by population growth and economic growth previously described, only a certain level of accuracy can be obtained. Looking 10 years ahead, the probability bands vary +/- 1,576 GWh from the forecast of 28,859. This means that there is an 80% chance that the actual load in 2021/22 will be within 5.5% of the forecast.

Recognizing the inherent uncertainty of forecasting, historic forecast variation has been tracked. Manitoba Hydro's objective is that a five-year forecast be within 5% and a 10-year forecast be within 10% of actuals. Generally, this objective has been achieved in more than half the years across 21 previous forecasts for both energy and peak as evidenced in Tables 35 and 36 of ***Appendix C – 2012 Electric Load Forecast***.

Whenever there are unexpected periods of recession or periods of higher than normal growth, previous forecasts will have overestimated or underestimated the load. These periods happen gradually and take a few years before they can be recognized as representing more than just year-to year-random variation.

Every year, a new load forecast is produced to take into account changes in the economy and in customer usage as well as new outlooks into the future. This allows the planning process at Manitoba Hydro to make annual adjustments to account for incremental changes and adjust for longer-term trends.

4.2.2 Demand Side Management

Manitoba Hydro's DSM initiative, Power Smart, consists of energy conservation and load management activities designed to capture energy efficiency and economic opportunities. Manitoba Hydro has been successfully delivering DSM for over 20 years in an effort to meet the energy needs of Manitoba in a more sustainable manner while assisting customers in using energy more efficiently and reducing their energy bills. Manitoba Hydro is committed to DSM with a focus on pursuing all cost-effective energy efficiency opportunities and continually monitoring the market for emerging trends and opportunities, which may become economically viable.

Manitoba Hydro's future DSM efforts and initiatives are provided in the corporation's 2013-2016 Power Smart Plan. Pursuant to s.7(1) of *The Energy Savings Act*, this plan was prepared in consultation with the Minister of Innovation, Energy and Mines and is provided in ***Appendix E – 2013 - 2016 Power Smart Plan***, along with the "2013 - 2016 Power Smart Plan – 15 Year Supplementary Analysis Report". The corporation's DSM plan is typically reviewed and updated on an annual basis as part of Manitoba Hydro's overall integrated planning process. DSM projections were prepared early in 2012 as a component of the regular corporate planning process for inclusion as the base DSM forecast within this submission. The 2012 base DSM forecast represents an update to the approved 2011 Power Smart Plan and is consistent with the current approved 2013 - 2016 Power Smart Plan—the latter being a further update to the 2012 forecast.

The energy savings achieved through DSM is forecast separately from the electric load forecast as described in section 4.2. The energy savings forecast to be achieved through DSM is included as part of the Power Resource Plan and is evaluated utilizing corporate-approved and consistent economic data.

Manitoba Hydro currently offers a broad portfolio of programs in its effort to pursue all economic DSM opportunities. The Power Smart Commercial Lighting Program is one example of an energy efficiency initiative encouraging the installation of more energy-efficient lighting technologies that provide similar or improved lighting levels. A number of other energy efficiency initiatives are currently being offered.

Load-management initiatives are designed to capture available economic opportunities by modifying customer demand for energy at a particular time, or shifting demand from one period to another. Manitoba Hydro's Curtailable Rates Program is an example of a load-management initiative whereby participating customers curtail a contracted amount of load at Manitoba Hydro's request for a specified period of time.

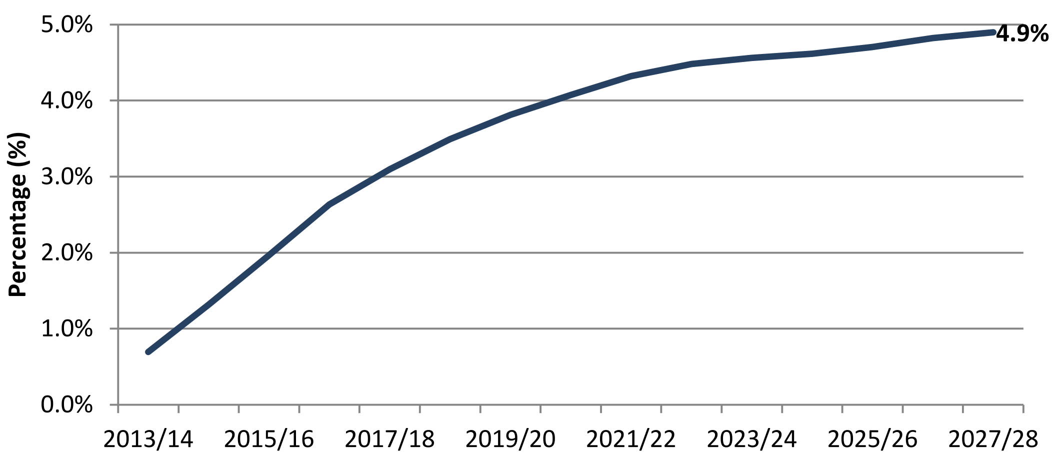
Another significant component of Manitoba Hydro's DSM plan involves permanently capturing energy efficiency opportunities through changes made in codes and standards. As a result of combined utility and government efforts, the market adoption of energy efficient products and activities has resulted in significant changes in manufacturers' performance standards and in efficiency legislation and codes.

Manitoba Hydro's long-term aggressive commitment to DSM has resulted in 90% awareness of the Power Smart brand in Manitoba, with over 60% of residential customers able to recall, unaided, Manitoba Hydro programs available to help manage their energy bills and a third of customers indicating they have participated in at least one program to date. By the end of 2012/13, Power Smart is estimated to have achieved an annual load reduction of 1,990 GWh and 586 MW (at generation)[3].

4.2.2.1 Future DSM Plans

Manitoba Hydro's future DSM strategy involves a continued long-term commitment to pursuing all available economic energy efficiency opportunities. The 2013 - 2016 Power Smart Plan outlines an additional investment of $83 million (2012$) to achieve electricity savings of 510 GWh/year and 280 MW by 2015/16. Beyond 2015/16, Manitoba Hydro has budgeted an investment increasing to $326 million (2012$) overall and expects energy savings to increase to 1,552 GWh/year and 490 MW by 2027/28, which represents 4.9% of the forecast electricity load at the benchmark year. See Figure 4.9.

Figure 4.9 CUMULATIVE DSM ELECTRICAL SAVINGS AS A % OF ANNUAL LOAD



[3] Interim estimate as of March 31, 2013.

Combined with energy savings achieved to date, total electrical savings of 3,113 GWh and 846 MW will be realized by 2027/28, with a cumulative investment of $762 million (2012$). See Figure 4.10 and Figure 4.11.

Figure 4.10 ANNUAL DSM ENERGY SAVINGS 1989 -2027 (GWH AT GENERATION)

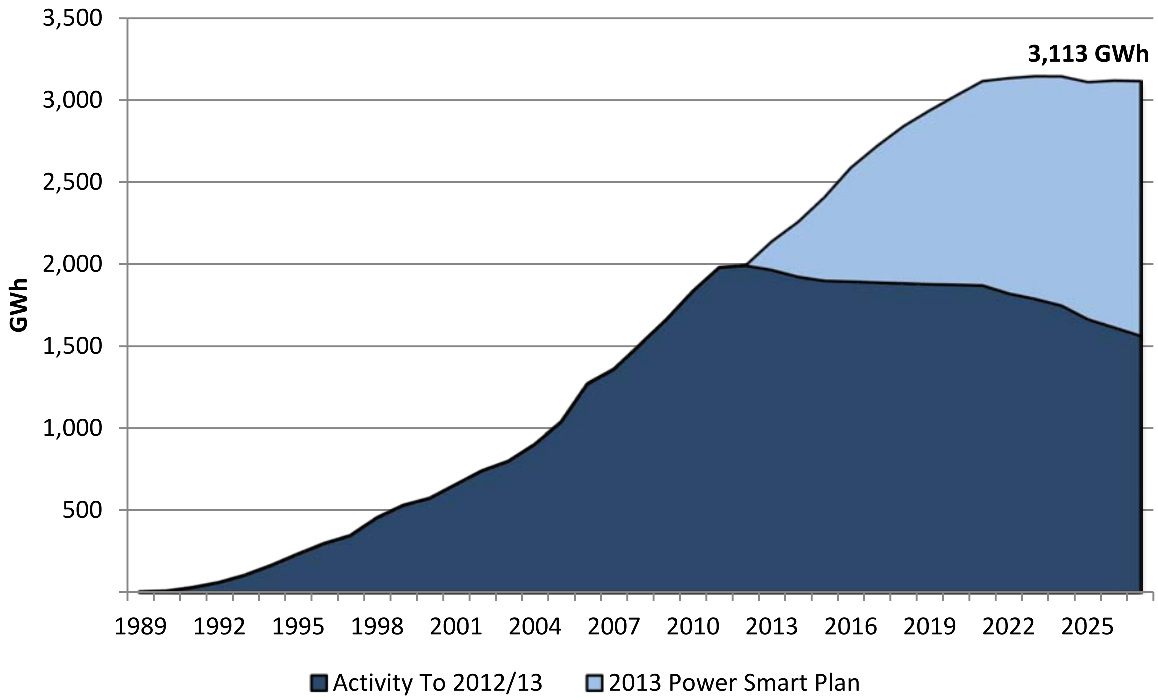
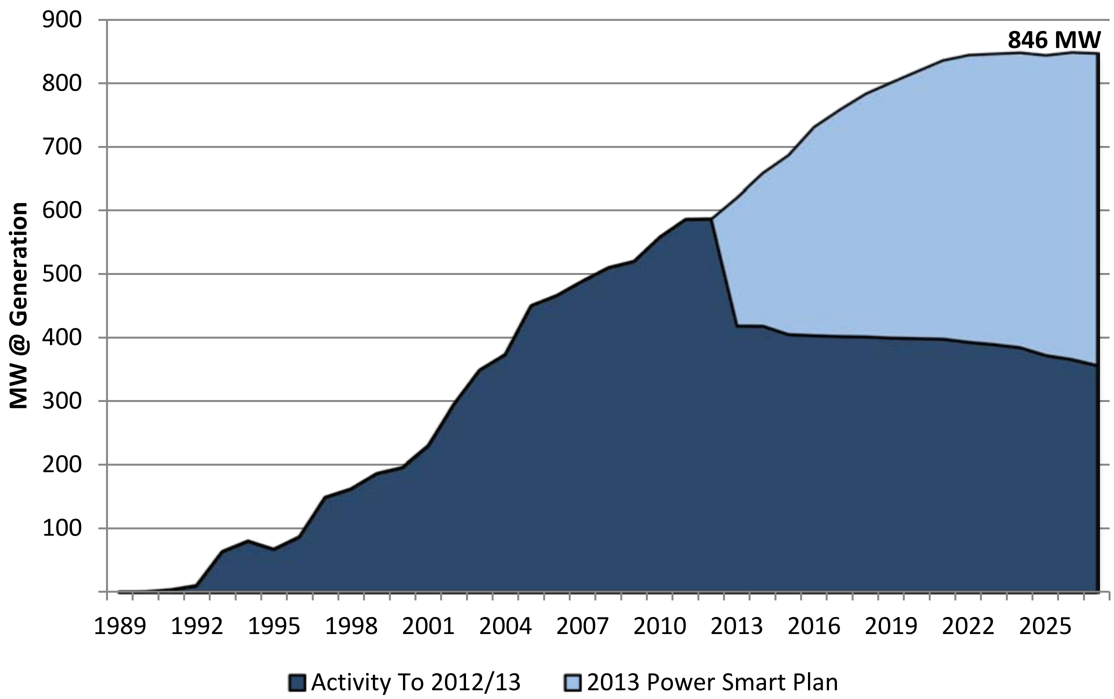


Figure 4.11 ANNUAL DSM CAPACITY SAVINGS 1989 – 2027 (MW AT GENERATION)



Through the planned DSM initiatives, participating customers can expect to save $52 million in 2027/28 and $486 million cumulatively by 2027/28 (2012$) on their electricity bills. When combined with electricity bill reductions achieved to date, participating customers can expect to save $91 million in 2027/28 and over $1.9 billion cumulatively (2012$).

4.2.2.2 Assessing Economic DSM Opportunities

In assessing DSM options, Manitoba Hydro considers the economics associated with DSM opportunities from a number of perspectives, including:

- The economics of implementing a specific DSM opportunity, irrespective of who benefits from and who pays for implementing the DSM initiative. The Marginal Resource Cost (MRC), Total Resource Cost (TRC) and the Societal Resource Cost (SRC) metrics are used for assessing the economics of a DSM opportunity from this perspective.
- The economics of implementing a specific DSM opportunity from an aggregate ratepayers' perspective. The Levelized Utility Cost (LUC) and Rate Impact Measure

metrics are used for assessing the general economics of a DSM opportunity from this perspective. Caution needs to be exercised in using the LUC, as this metric only assesses the costs associated with a DSM opportunity. The LUC for DSM opportunities cannot be simply assessed against alternative LUC's for generation options because the revenue impacts of DSM initiatives and supply-side options are different. In addition, DSM LUC's cannot be measured simply against the corporation's proxy for its marginal value (cost) as a single value due to the timing impacts on marginal values of energy. A proper economic assessment of DSM options relative to alternative supply-side options involves an assessment of the revenue and cost impacts.

- The economics of implementing a specific DSM opportunity from a participating customer's perspective. The Customer Simple Payback metric is used for this purpose.

To assess options for supporting and pursuing a DSM opportunity, Manitoba Hydro considers:

- the economics of the opportunity from all perspectives (e.g., irrespective of who benefits and pays; from the aggregate ratepayer perspective; and from the participating customer perspective)
- the barriers to participation and
- the fairness of all ratepayers (including non-participating) contributing to the paying for a DSM opportunity, which benefits only participating customers, along with the associated non-energy benefits.

To assist in assessing the merits of various approaches to supporting and promoting a DSM opportunity, Manitoba Hydro uses the above-mentioned metrics as guidelines in choosing a particular DSM strategy. In addition to quantitative assessments, Manitoba Hydro also considers various qualitative factors, including equity (e.g., reasonable participation by various ratepayer sectors such as lower income) and overall contribution towards having a balanced energy conservation strategy and plan.

Manitoba Hydro designs DSM programs balancing the following objectives:

- capturing all available economic energy-efficient opportunities
- being fiscally responsible as to how ratepayer dollars are spent and
- being considerate to the net impact on all customers.

In balancing these objectives, Manitoba Hydro attempts to direct or proportion DSM costs to those entities and customers who realize the benefits associated with the DSM initiatives. For example, the benefits/costs associated with a DSM opportunity (irrespective of who benefits and who pays the costs as measured by MRC, TRC and SRC) primarily consist of the benefits/costs of participating customers, non-participating customers and external parties (e.g., social or government agencies in the case of reduced energy bills being paid by Employment Income Assistance).
From the perspective of non-participating customers, the net benefit is the difference between the corporation's marginal value (cost) and the lost domestic revenue associated with the DSM opportunity (see Figure 4.12) and the cost is the DSM program costs associated with the DSM program (e.g., incentives, administration, marketing, etc).

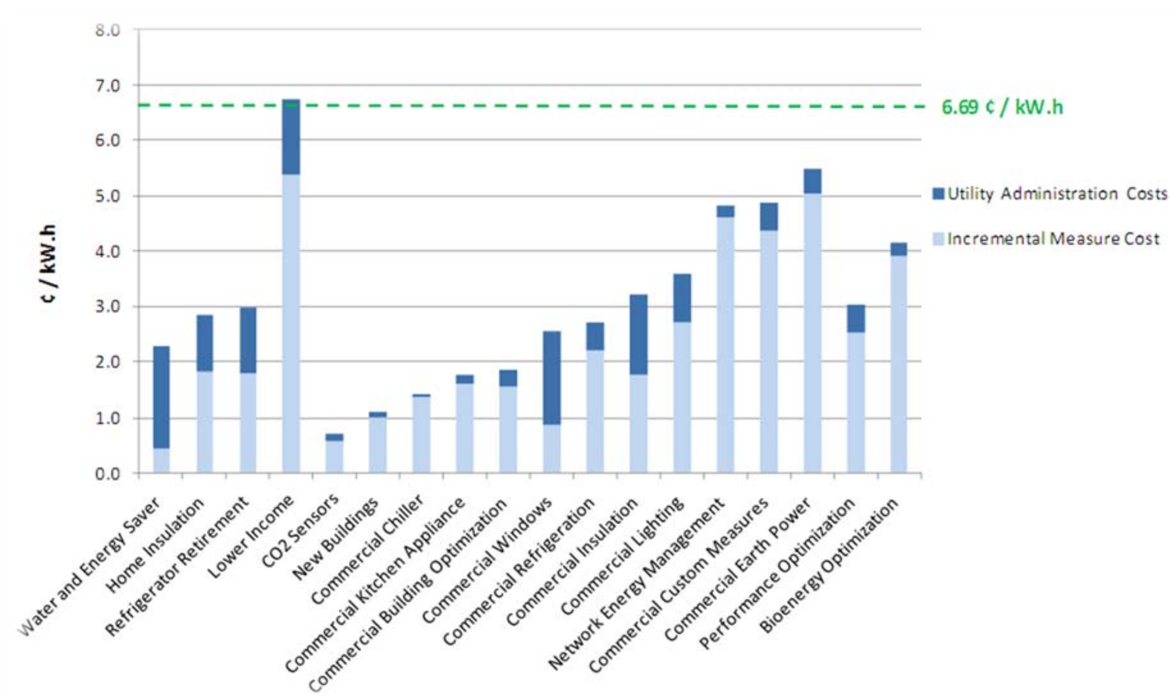
From a participating customer's perspective, the benefits are reduced energy bills and any non-energy benefits (e.g., reduced maintenance cost) while the costs are those associated with installing the DSM opportunity (net of any incentives). The extent to which external parties may benefit from DSM programs varies by program; however, benefiting entities could include government social agencies (e.g., Employment Income Assistance when paying energy bills directly; and Manitoba Housing Authority when retrofits are undertaken in Government-owned homes) and society at large (e.g., environmental benefits).

With DSM opportunities, it is important to recognize that the relevant cost associated with DSM opportunities is the total cost of DSM opportunities, which includes the participating customer's cost in addition to the utility's cost. Similar to supply-side options, ratepayers ultimately pay the entire cost of DSM options; with DSM, the initiatives are paid for by participating customers and by ratepayers via a utility's investment in DSM initiatives.

As each DSM opportunity is an independent decision, Manitoba Hydro assesses the economics of pursuing each energy efficiency opportunity individually. This approach is consistent with assessing each supply-side option on its own merits. However, due to concerns regarding reasonable participation by specific market sectors such as the lower-income market, Manitoba Hydro also assesses the merits of pursuing energy efficiency opportunities within specific market sectors through a broader analysis, which includes fairness considerations.

Figure 4.12 presents the levelized resource costs for individual Power Smart opportunities included under the 2013 - 2016 Power Smart Plan.

Figure 4.12 LEVELIZED RESOURCE COST (2012$) 2013-2016 POWER SMART PLAN



The levelized Total Resource Costs for programs presented under this plan range from 1 cent/kWh to 6.7 cents/kWh, with an overall average levelized resource cost of 3.9 cents/kWh. The range in resource costs demonstrates Manitoba Hydro's commitment to pursue all those

DSM opportunities with a levelized resource cost less than the corporation's marginal cost value.

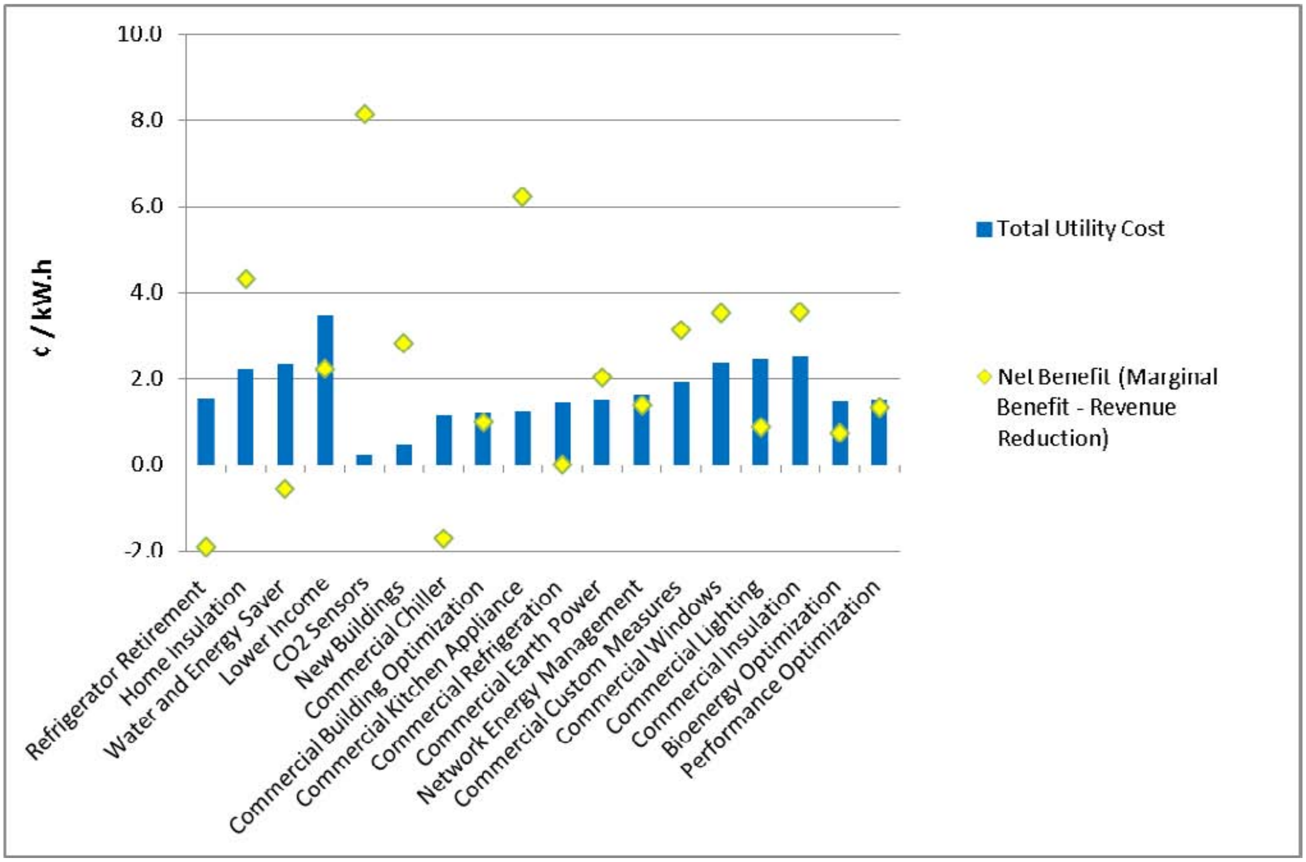
Manitoba Hydro is also committed to finding additional economic DSM opportunities and, as such, the corporation monitors technologies and programs being offered in other regions on an ongoing basis to assess their potential fit for Manitoba, while giving consideration to Manitoba's load characteristics, climate, and marginal values. The following are a select, but not exhaustive, list of technologies that have been assessed but are not being pursued at this time:

- Heat-pump water heaters are not suited to Manitoba's marketplace. The technology pulls heat out of the space in which the water heaters are located and puts that heat into the water. This technology is popular in more moderate climates and in regions where the water heater is not located in a conditioned space (e.g., mechanically heated or cooled). In Manitoba, due to our long heating season, water heaters are located inside our homes and buildings.
- With a levelized marginal-resource cost of 14 cents/kWh, solar water heaters are not cost effective in Manitoba.
- With a levelized cost of 24 cents/kWh, ductless heat pumps are not cost effective in Manitoba.
- With a levelized cost of 9 cents/kWh, initiatives promoting individuals to conserve energy through bill comparison challenges are not cost effective. Manitoba Hydro is currently monitoring the results of this opportunity within other regions and intends to maintain this option as a possible opportunity to consider in the future.

The approach and strategy undertaken by Manitoba Hydro to pursue each DSM opportunity is determined after undertaking a detailed assessment of each opportunity. The subsequent approach taken by Manitoba Hydro may consist of an incentive-based program, an education/awareness initiative, a code/regulation initiative or a combination of the available approaches. The degree and context of Manitoba Hydro's support for a specific opportunity is dependent on many factors, including the economics of the DSM opportunity from the various perspectives and at what stage within the customer market-acceptance curve the specific opportunity is at within a particular time. For example, if an energy efficiency opportunity is not economic—irrespective of who benefits or pays (e.g., an emerging technology such as solar-assisted hot water tanks)—then Manitoba Hydro's approach for supporting the DSM opportunity may simply be through education, awareness and research initiatives. If a technology is at the latter stage of a market acceptance curve (e.g., Energy Star appliances), Manitoba Hydro support may be through awareness and education initiatives.

Figure 4.13 presents the levelized utility costs for individual Power Smart opportunities included under the 2013 - 2016 Power Smart Plan, with the net benefit to the utility (e.g., ratepayer) being the difference between the marginal cost and the foregone domestic revenues associated with each Power Smart opportunity. The average levelized utility cost of Manitoba Hydro's aggregate Power Smart plan is in the range of 2.4 cents/kWh, with individual DSM opportunities having levelized utility costs ranging from 0.2 to 3.5 cents/kWh.

Figure 4.13 LEVELIZED UTILITY COST (2012$) - 2013 - 2016 POWER SMART PLAN



4.2.2.3 Additional DSM Opportunities

Manitoba Hydro's DSM Plan only includes those technology initiatives identified as being available and economic today (e.g., energy savings are demonstrated and are economic under the current incremental installed cost compared to the forecast benefits to be realized over the expected life of the technology). As such, Manitoba Hydro recognizes its future DSM plan is conservative in nature. There are a number of possible initiatives and program strategies currently being explored that, once program implementation is approved, will be included in future DSM plans. Initiatives currently being investigated include, but are not limited to, a new home program, residential LED lighting program and LED street lighting conversion program. Recently, Manitoba Hydro approved a community-based residential geothermal program, which will be included in the next update of the corporation's Power Smart Plan.

To complement Manitoba Hydro's ongoing and internal efforts to identify and quantify potential DSM opportunities and energy savings, Manitoba Hydro hired a third-party consultant to undertake a DSM Market Potential Study in Manitoba in concert with the corporation. The study broadly examines, at a conceptual level, the market potential of existing energy-efficient technologies, which are economic in Manitoba and those technologies that may be "on the horizon". A copy of this study is provided in ***Appendix 4.3 – Demand Side Management Potential Study***.

For purposes of the study, DSM potential is defined within four contexts: 1) technical, 2) economic, 3) market and 4) achievable.

1. The absolute level of DSM without regard for cost and other barriers is defined as the technical potential.
2. "Economic potential" represents the adoption of all energy efficient measures that are cost-effective from a resource perspective (MRC > 1). Technical and economic potential both represent theoretical limits to efficiency savings.
3. Estimating market potential involves the inherent uncertainty of predicting human behaviors and responses to market conditions. This recognizes that any estimate of electricity consumption or potential savings that spans a 15-20 year period is necessarily subject to uncertainty. Numerous external factors create this uncertainty underlying the estimate, including varying levels of market barriers to adoption and factors beyond the influence of Manitoba Hydro (e.g., the levels of complementary support for energy efficiency provided by the federal or provincial governments). Market potential represents the absolute level of energy and demand savings that are technically feasible, economically attractive assuming ideal market conditions. These ideal market conditions could be characterized by the presence of a focused and coordinated effort across organizations/governments (federal, provincial and utilities) eliminating all material market barriers to adoption, such as product availability and market capacity, product awareness and knowledge, price differentials, etc. The probability of these ideal

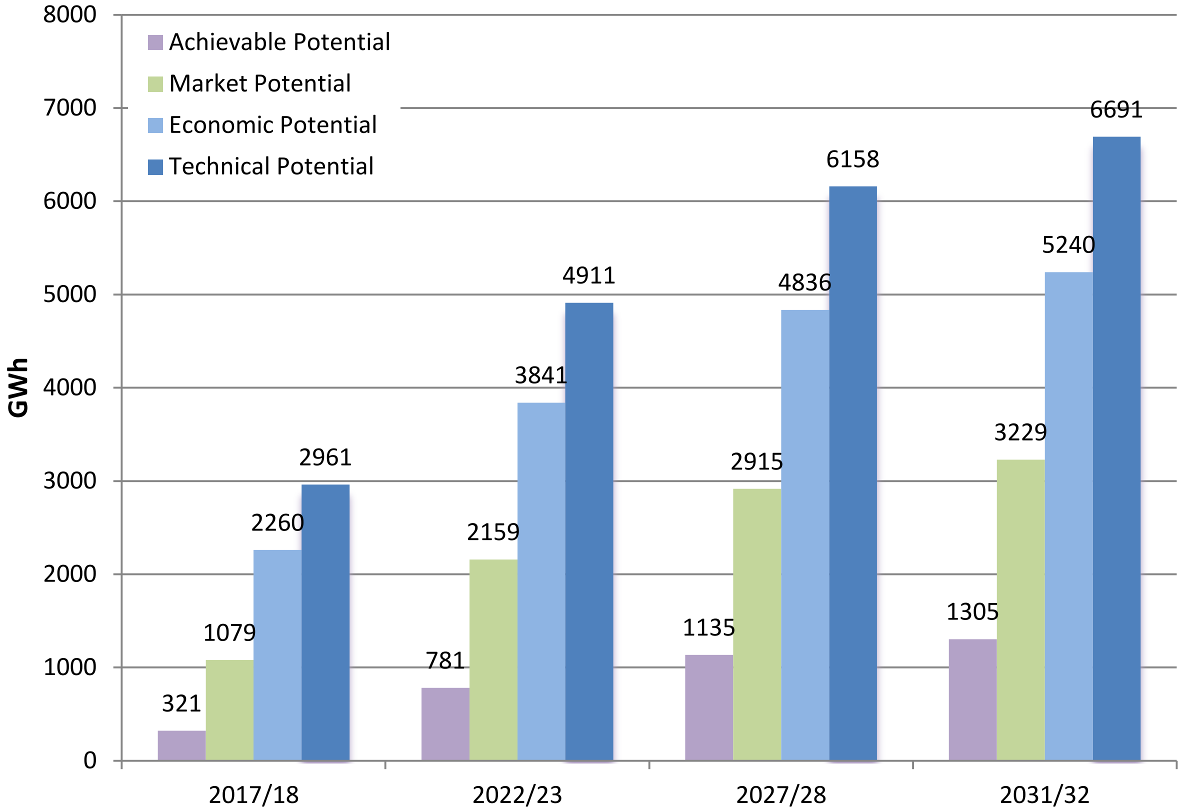
market conditions being present in combination is doubtful and therefore represents a theoretical limit.

4. "Achievable potential" recognizes that market conditions are not ideal and projects energy savings that may be reasonably captured recognizing that there are material market barriers to address.

Caution must be exercised in interpreting the results of a DSM market potential study: the estimates are forecast at a high level and do not account for the investment or the specific strategies required to support the market intervention required to eliminate market barriers, such as education, research and demonstrations, training, capacity-building, incentives, advertising, etc. The setting of specific Power Smart targets involves more detailed and market-specific analysis beyond the scope of the market potential study. The key to developing a sustainable realistic DSM program and overall plan is to recognize the real market constraints and to work within existing market channels (e.g., trade allies, retailers, distributors) to create an effective market change over time.

Figure 4.14 presents the conceptual-level projections of energy efficiency potential in Manitoba.

Figure 4.14 ENERGY EFFICIENCY POTENTIAL PROJECTIONS

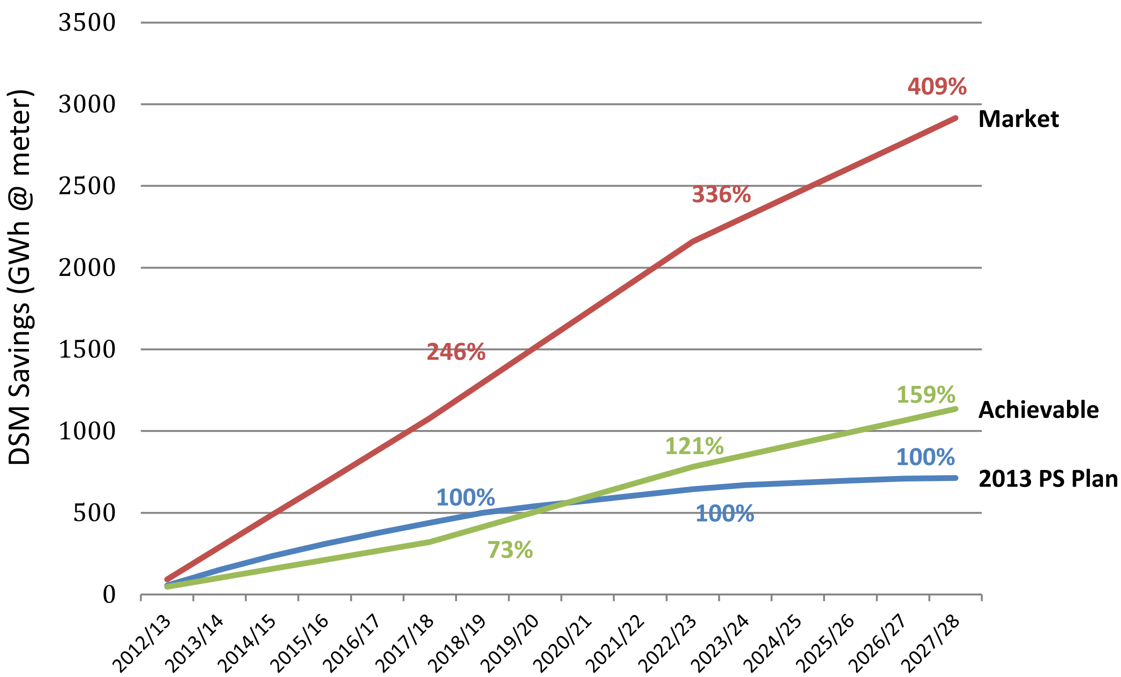


The DSM Market Potential Study undertaken for Manitoba Hydro indicated that, across all sectors, the energy savings range from 321 GWh for achievable potential to 1,079 GWh for market potential in 2017/18 and from 1,135 GWh for achievable potential to 2,915 GWh for market potential in 2027/28. Current projected savings under Manitoba Hydro's 2013 - 2016 Power Smart Plan represent approximately 62% of the forecast achievable potential in 2027/28.

For the purposes of this submission, a sensitivity analysis for increased DSM was undertaken, including increasing Manitoba Hydro energy savings through DSM by 1.5 times, and, similarly, a stress test for increased DSM was undertaken at 4 times the current planned DSM. Based on the results of the market potential study and as evidenced in the following graph, the sensitivity analyses capture the potential for increasing Manitoba Hydro's DSM plans to include both reasonable additional and "ideal" market-threshold energy savings through DSM initiatives. As

Figure 4.15, shows the Achievable Potential of 1,135 GWh and Market Potential of 2,915 GWh represents 159% and 409% respectively of the current planned savings for 2027/28.

Figure 4.15 COMPARISON OF THRESHOLDS FOR POTENTIAL ADDITIONAL DSM 2012/13 TO 2027/28



In accordance with Manitoba Hydro's planning cycle, the corporation's Power Smart Plan will be updated by March 31, 2014. The updated plan will be prepared in consultation with the Minister of Innovation, Energy and Mines and responsible for Manitoba Hydro as directed in *The Manitoba Energy Savings Act*.

4.2.3 Manitoba Net Load

Manitoba net load results from combining the load forecast for Manitoba with the expected savings from planned DSM programs. Figure 4.16 and Figure 4.17 show the Manitoba net load from the perspective of peak demand and energy, respectively.

Figure 4.16 MANITOBA NET LOAD – WINTER PEAK DEMAND

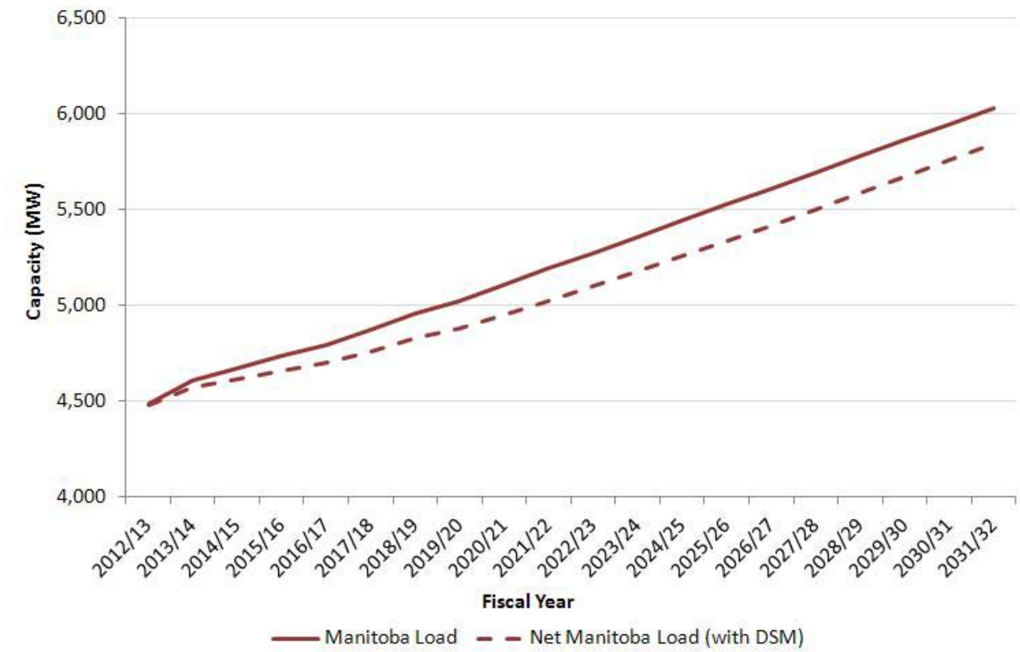
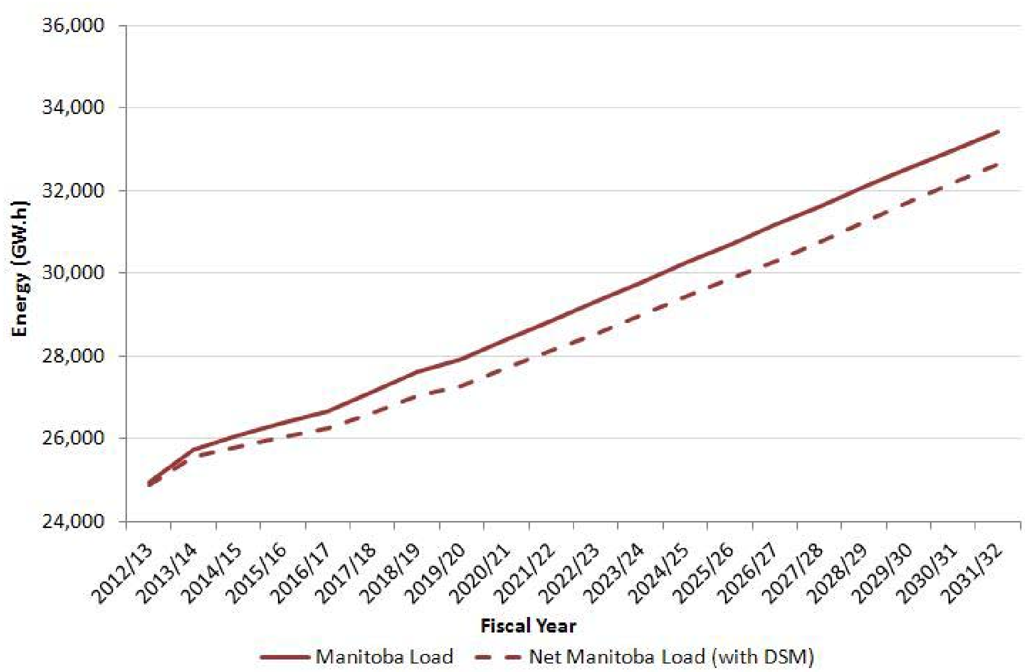


Figure 4.17 MANITOBA NET LOAD – ENERGY



4.2.4 Export Commitments

Manitoba Hydro exports firm energy and capacity surplus to the needs of Manitobans through long-term sale agreements with neighboring utilities. A calculation of the total demand on the Manitoba Hydro system must include—in addition to determining Manitoba net load—the requirements of long-term firm export sale commitments.

From the perspective of winter peak demand, the total of Manitoba Hydro's long-term firm export obligations during winter peak is currently 605 MW, reduces to 358 MW in 2015/16 and continues at this level until 2024/25 when the last contract expires.

The total of Manitoba Hydro's energy export obligations is 3,156 GWh in 2013/14. This obligation reduces to 1,804 GWh in 2016/17 and continues annually at this level to 2024/25. From 2025/26 to the end of the study period the firm export obligation is 145 GWh per year.

Manitoba Hydro currently has a portfolio of 500 MW of seasonal diversity contracts, which provide for the exchange of power between utilities during their respective peak load conditions. These contracts help to optimize operation of the utilities' respective systems and to minimize capital investment. Diversity arrangements allow Manitoba Hydro to purchase power in the winter season to meet peak heating demand and require Manitoba Hydro to sell power to U.S. utilities in the summer season to meet their peak air-conditioning load.

In addition, under certain circumstances, export contracts allow Manitoba Hydro to reduce its delivery obligations, for example, under low-water conditions.

4.2.5 Total Demand

The combined total of all demand components is shown in Table 4.1 and Table 4.4 below from the perspective of capacity and energy, respectively. In Section 4.4, the total demand will be compared to the total base supply.

Table 4.1 TOTAL WINTER PEAK DEMAND FOR SELECT YEARS (MW) @ GENERATION

Winter Peak Demand, MW				
Fiscal Year	2013/14	2021/22	2022/23	2026/27
Manitoba Load	4,609	5,192	5,276	5,611
2012 Base DSM Forecast	(36)	(165)	(176)	(194)
Manitoba Net Load	**4,573**	**5,027**	**5,100**	**5,417**
Existing Long-term Firm Export Sale Commitments	605	358	358	0
Total Peak Demand	**5,178**	**5,385**	**5,458**	**5,417**

Table 4.2 TOTAL ENERGY DEMAND FOR SELECT YEARS (GWH) @ GENERATION

Energy Demand, GWh				
Fiscal Year	2013/14	2021/22	2022/23	2026/27
Manitoba Domestic Load	25,734	28,859	29,322	31,158
2012 Base DSM forecast	(173)	(740)	(782)	(865)
Manitoba Net Load	**25,561**	**28,119**	**28,540**	**30,293**
Existing Long-term Firm Export Sale Commitments	3,156	1,804	1,804	145
Total Energy Demand	**28,717**	**29,923**	**30,344**	**30,438**

4.3 Manitoba Hydro System Supply

4.3.1 Manitoba Hydro's Generation Planning Criteria

Manitoba Hydro's generation planning criteria, as described in ***Appendix 4.1 Manitoba Hydro Generation Planning Criteria***, provides the basis for determining when new resources are required to ensure an adequate supply of capacity and energy for Manitoba. All development plans evaluated in this submission meet or exceed these planning criteria.

The generation planning criteria consist of two components, both of which must be satisfied. First, there is a capacity criterion, used to determine the minimum quantity of generation capacity required. Second, there is an energy criterion, used to determine the minimum quantity of energy required. These two criteria are outlined in the following sections.

4.3.1.1 Capacity Criterion

Manitoba Hydro's capacity criterion, as described in ***Appendix 4.1 – Manitoba Hydro Generation Planning Criteria***, requires that:

> Manitoba Hydro will plan to carry a minimum reserve against breakdown of plant and increase in demand above forecast of 12% of the Manitoba forecast peak demand each year plus the reserve required by any export contract in effect at the time."

The reserve is intended to protect against capacity shortfalls resulting from breakdown of generation equipment, or increases in winter peak load due to unexpected load growth or extreme weather conditions. The reserve is calculated as 12% of the Manitoba forecast peak winter demand plus the reserve required by any export contract in effect at the time for each year that is forecasted.

The maximum demand for capacity in Manitoba occurs in the winter season, and therefore the reserve margin of 12% is applied to the winter peak demand.

Historically, the reserve margin of 12% has been adequate for Manitoba Hydro's predominantly hydro-electric generation based system because of relatively low outage rates combined with the relatively small size of hydro-generating units. In comparison, reserve margins in predominantly thermal generation based systems are typically in the 15% range.

Manitoba Hydro is a member of the North American Electric Reliability Corporation (NERC), whose mission is to ensure the reliability of the North American bulk power system. Manitoba

Hydro's capacity criterion is in alignment with recommendations provided by NERC on this subject as per the following:

> "Achieving reliability in the bulk electric systems requires, among other things, that the amount of generating capacity resources exceed customer demands by some amount. That amount (expressed as a percent of peak demand is termed a reserve margin and when expressed as a percent of generating capacity is termed capacity margin) must be sufficient to cover planned maintenance and unplanned or forced outages of generating equipment, de-ratings in the capability of demand-side and supply-side resources, system effects due to reasonably anticipated variations in weather, variations in customer demands or forecast demand uncertainty, delays in the construction of generating capacity, and other system operating requirements." (NERC Resource and Transmission Adequacy Recommendations, June 15, 2004, page 10).

4.3.1.2 Energy Criterion

In addition to a capacity criterion, Manitoba Hydro has an energy criterion which recognizes the energy-constrained limitation of a hydro-electric generating system during drought conditions.

Such an energy criterion is typical for a predominately hydro region as noted by NERC. Manitoba Hydro's system is another example of an energy constrained system:

> "In areas where the majority of supply-side resources are energy-constrained (such as the hydro-dominated Northwest[4]), achieving reliability may also require that the energy available to the area is, at least, equal to the customer demand and some reserve requirement during a certain critical design period for the constrained resources." (NERC Resource and Transmission Adequacy Recommendations, June 15, 2004, page 10)

[4] Manitoba Hydro notes that Manitoba, like the Northwest region of the U.S., is also energy constrained.

Manitoba Hydro's energy criterion, as described in more detail in ***Appendix 4.1 — Manitoba Hydro Generation Planning Criteria***, requires that the corporation plan to have adequate energy resources to supply the firm energy demand in the event that the lowest recorded coincident water supply conditions are repeated (e.g., "dependable energy"). Historic system inflows are derived from the available record of river flows (1912-2010), which have been adjusted to represent present-use conditions and to account for systemic changes due to expected future water use and withdrawals upstream of Manitoba.

Dependable energy available in the Manitoba Hydro system is the total energy supplied from:

- hydro-electric generating stations
- thermal generating stations
- wind generation (energy only)
- planned DSM
- imports from neighbouring utilities.

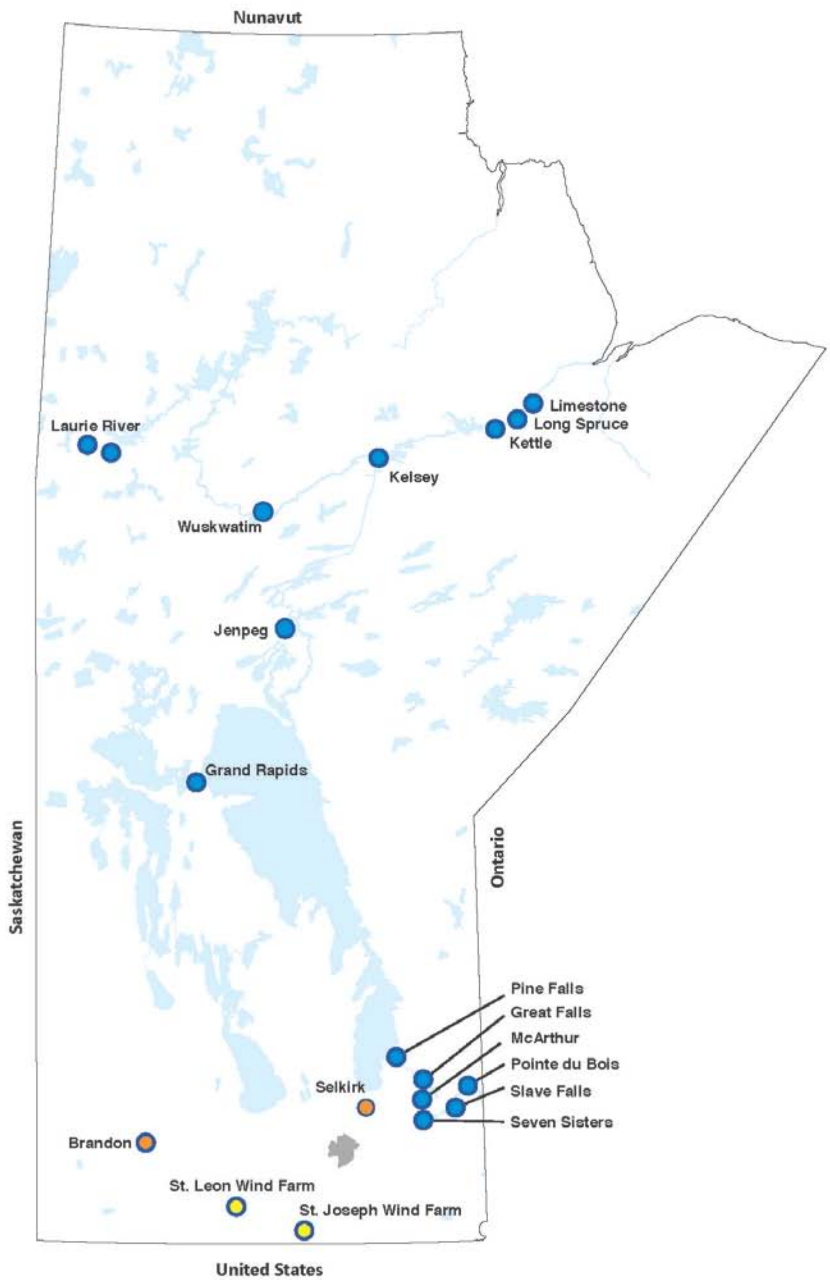
Imports may be considered as dependable energy resources under certain conditions. The total quantity of energy considered as dependable energy from imports is limited to that which can be imported during the off-peak period, and will not exceed the quantity of export contracts in effect at the time, plus 10% of the Manitoba load. The Midcontinent Independent System Operator, Inc. (MISO) market footprint has in the order of 130,000 MW of generating resources. In the off-peak period, MISO market loads are on the order of 60,000 MW or less, leaving ample surplus resources capable of generating energy for import to Manitoba.

4.3.2 Manitoba Hydro's Base Supply of Power – Planning Assumptions

This section provides an overview of the resources that form the base supply of power available to meet Manitoba Hydro's electricity load commitments. The base supply of power is comprised of the following system resources that are common to all development plans being evaluated:

- generating resources owned/operated by Manitoba Hydro including any planned upgrades
- power purchases from Manitoba wind generators
- imports from neighbouring U.S. utilities
- projects to replace existing generating resources where plans are in place
- reduced losses due to increased bipole capacity.

Figure 4.18 MANITOBA HYDRO'S BASE SUPPLY OF POWER



The following describes the resources that contribute to the base supply of power available to meet Manitoba Hydro load and firm export commitments.

Manitoba Hydro-Operated Facilities – Hydro and Thermal Generation

Manitoba Hydro currently operates facilities with a total generating capacity of approximately 5,700 MW. Hydro-electric power is the predominant generation resource in the Manitoba Hydro generating system, providing on average over 90% of the total generating capacity and 98% of electric energy.

Approximately 5,200 MW of renewable hydro-electric generating capacity is available from 15 stations on the Nelson, Winnipeg, Saskatchewan, Burntwood and Laurie rivers. The three hydro-electric generating stations located along the lower Nelson River—Limestone, Long Spruce and Kettle, account for approximately three-quarters of Manitoba Hydro's current hydro-electric capacity.

The remaining 500 MW of Manitoba Hydro generating capacity utilizes thermal technology. The Selkirk Generating Station (G.S.) consists of two natural gas-fired steam turbine generating units. At the Brandon G.S., there are two natural gas-fired combustion turbine generating units and one coal-fired steam turbine unit. For planning purposes, it is assumed that Manitoba Hydro’s last coal-fired steam turbine unit, of approximately 100 MW, will be retired in 2019/20 reducing the total generating capacity to approximately 5,600 MW.

Manitoba Hydro Power Purchases - Wind Generation

Manitoba Hydro purchases power through contracts from privately owned wind facilities in southern Manitoba – St. Leon Wind Energy LP in St. Leon and Pattern Energy in St. Joseph with a total installed capacity of approximately 250 MW. For planning purposes, it is assumed these contracts will provide a combined total of 777 GWh of dependable energy each year. Contracted purchases of wind generation are assumed to be renewed using the same terms and conditions after the expiration of the current contracts and to extend through to the end of the study period.

Wind turbines have operating restrictions during extremely cold weather, the very period in which the Manitoba load reaches its annual winter peak. Therefore, wind generation is not considered a capacity resource for the purpose of meeting winter peak loads as it is not assured to be available at the time of system peak loads.

Manitoba Hydro Power Purchases – Imports

As described in Section 4.2.4 Export Commitments, Manitoba Hydro currently has a portfolio of 500 MW of seasonal diversity contracts which provide for the seasonal exchange of power between utilities during their respective peak load seasons. The diversity agreements provide for an exchange of capacity of up to 500 MW in 2013/14, increasing to 550 MW in 2014/15 and remaining at that quantity until 2024/25 when the last of these contracts expires. In addition to the diversity agreements, Manitoba Hydro has a 500 MW Energy Service Agreement, which provides access to energy throughout the year, but as the contract does not have a capacity component it is not guaranteed for any particular hour.

Under these agreements, for planning purposes Manitoba Hydro can rely on 2,705 GWh of energy in 2013/14. The value reduces to 2,575 GWh by 2016/17 and continues at this quantity until 2024/25.

Although Manitoba Hydro has access to large quantities of energy under contract there are limitations to the amount of imports that can be relied upon for planning purposes. As described in more detail in ***Appendix 4.1 Manitoba Hydro Generation Planning Criteria***, Manitoba Hydro's long-term firm import limit on existing transmission lines from the U.S. is 700 MW. As a result, Manitoba Hydro cannot import the total amount of energy available to it under its import contracts, which in 2014/15 totals 1,050 MW—the situation will not change until new transmission interconnections are built or existing transmission is upgraded. However, the excess of import capability under the contracts provides flexibility in choosing the source of its imports and recognizes that short-term import limits can be higher than the long-term firm limit of 700 MW.

There is no firm import capability from either Ontario or Saskatchewan that Manitoba Hydro can rely upon for planning purposes.

Manitoba Hydro also relies on market purchases up to the prescribed import limit to the extent permitted under the energy criterion described in Section 4.3.1.2 – Energy Criterion, for planning purposes. These purchased imports from the market are in addition to imports available under the long-term agreements described above.

Supply-Side Enhancements

The Manitoba Hydro system is continuously reviewed for opportunities to upgrade infrastructure that will result in increased output from existing facilities. These upgrades, referred to as "supply-side enhancement" projects, go beyond routine maintenance required to maintain supply and, from an efficiency perspective, are typically timed with major maintenance projects. In 2012 the Kelsey Rerunnering Project was in its final stages which, when completed, will add a total of 77 MW of winter capacity to the Manitoba Hydro generating system and will increase the amount of energy available, on average, from this plant.

Pointe du Bois Generating Station

No decision has been made on the future of the Pointe du Bois powerhouse. For planning purposes, the assumption has been made that the Pointe du Bois powerhouse will be rebuilt, resulting in an increase of 43 MW and 150 GWh over the existing plant ratings with first power to be delivered in 2030/31. Until Pointe du Bois is rebuilt, it is assumed that the existing facility will be maintained to continue to operate at or near full capacity. This assumption is common to all development plans in this submission.

Reduced Losses due to Increased Bipole Capacity

Bipole III is a new high-voltage direct-current (HVDC) transmission project required to improve overall system reliability with a planned in-service date of 2017/18.

As a transmission project, Bipole III does not provide any new generation but will reduce the transmission losses that exist on the HVDC system by transmitting power over three bipoles rather than two, making more power available for use. The reduction in losses is expected to result in 90 MW of additional capacity and 239 GWh/year of energy under drought conditions. For planning purposes, the savings from reduced losses are included as part of the base supply of power. It is recognized that the loss savings would decrease as new northern generation is connected to the HVDC system.

4.3.3 Summary of Manitoba Hydro System Supply

Manitoba Hydro plans its system supply in accordance with the Generation Planning Criteria as described in Section 4.3.1. Since the demand on the Manitoba Hydro system peaks in the winter, primarily due to heating requirements, Manitoba Hydro plans its system capacity to meet the Manitoba winter peak. Manitoba Hydro plans its system supply to provide a supply of energy that is dependable under a repeat of the lowest recorded water supply conditions.

Summaries of Manitoba Hydro's system supply in terms of winter peak capacity and dependable energy are provided below.

Winter Peak Capacity

As shown in Table 4.3 below, the Manitoba Hydro system is capable of providing 6,244 MW of capacity at winter peak in 2013/14. For planning purposes, the winter peak capacity is reduced to 5,679 MW by 2026/27 due to the anticipated retirement of the Brandon G.S.'s last coal-fired unit in 2019 and the expiration of certain import contracts. Reductions in transmission losses due to the construction of the Bipole III HVDC transmission line are expected to provide an additional 90 MW by 2017/18.

Table 4.3 TOTAL WINTER PEAK CAPACITY FOR SELECT YEARS (MW) @ GENERATION

Winter Peak Capacity, MW				
Fiscal Year	2013/14	2021/22	2022/2	2026/27
Hydro	5,177	5,177	5,177	5,177
Thermal	517	412	412	412
Wind (Power Purchase Agreements)	0	0	0	0
Imports	550	605	605	0
Bipole III Loss Reduction (2017/18 in-service date)	0	90	90	90
Total Base Supply	**6,244**	**6,284**	**6,284**	**5,679**

Dependable Energy

As shown in Table 4.4 below, the Manitoba Hydro system is capable of providing 30,253 GWh of dependable energy in 2013/14. For planning purposes, dependable energy is reduced to 29,176 GWh by 2026/27 due to the anticipated retirement of the Brandon G.S.'s last coal-fired unit in 2019 and the expiration of certain import contracts.

Table 4.4 TOTAL DEPENDABLE ENERGY FOR SELECT YEARS (GWH) @ GENERATION

Dependable Energy, GWh				
Fiscal Year	2013/14	2021/22	2022/23	2026/27
Hydro	22,290	22,684	22,674	21,810
Thermal	4,118	3,307	3,307	3,307
Wind (Power Purchase Agreements)	777	777	777	777
Imports	3,068	3,068	3,068	3,043
Bipole III Loss Reduction (2017/18 in-service date)	0	239	239	239
Total Base Supply	**30,253**	**30,075**	**30,065**	**29,176**

4.4 Need for New Resources

The need for new resources is determined by comparing annual supply and annual demand values for each year of the 35-year study period. This comparison determines the surplus or deficit of both winter peak capacity and dependable energy on an annual basis. The need for and timing of major new resources to address a deficit in either winter peak capacity or dependable energy is established when persistent deficits occur. Intermittent or short-term deficits would likely be met with imports, which would be arranged closer to, but in advance of the need.

The Need for Winter Capacity Resources

Figure 4.19 shows the capacity balance as either a surplus or deficit for the next 20 years (2012/13 to 2031/32), assuming no further resource additions to the system and no change to DSM. Similarly, Figure 4.20 compares the Manitoba Hydro base supply to the Manitoba net load and total demand to further demonstrate the need for and timing of new capacity resources.

Based on the current supply and demand assumptions for capacity, as described throughout this chapter, the Manitoba Hydro system will have a winter peak capacity surplus until the year 2025/26 at which time there will no longer be sufficient capacity in the winter available to meet the forecast Manitoba winter peak demand and export commitments. Without the savings from Manitoba Hydro's DSM programs, new resources would have been required earlier, in 2023/24.

Figure 4.19 CAPACITY BALANCE – WINTER PEAK CAPACITY

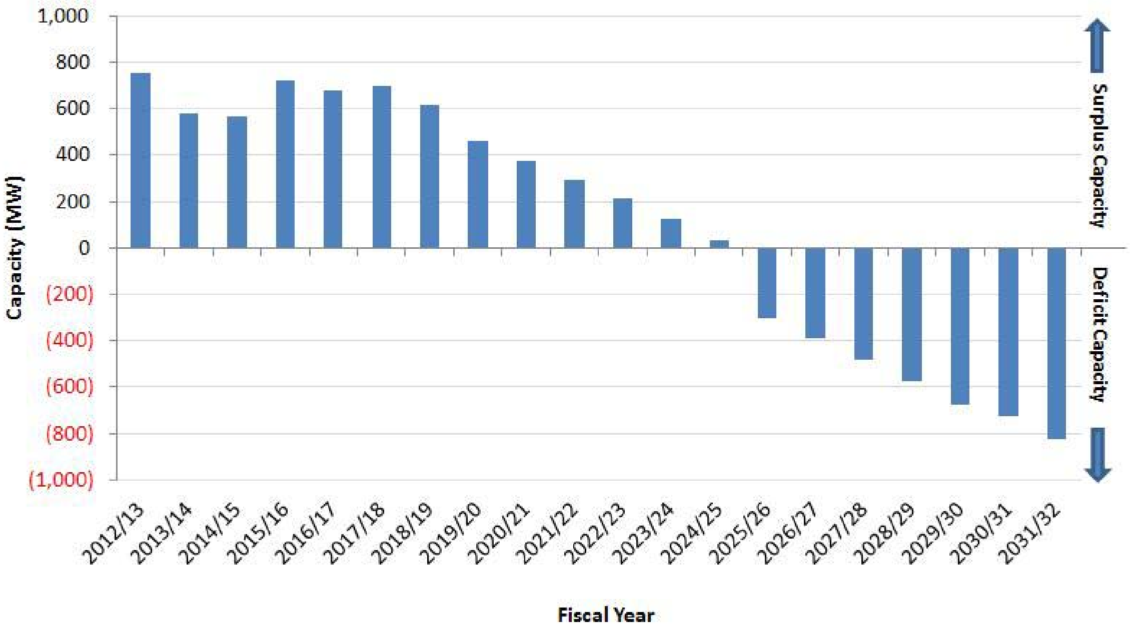
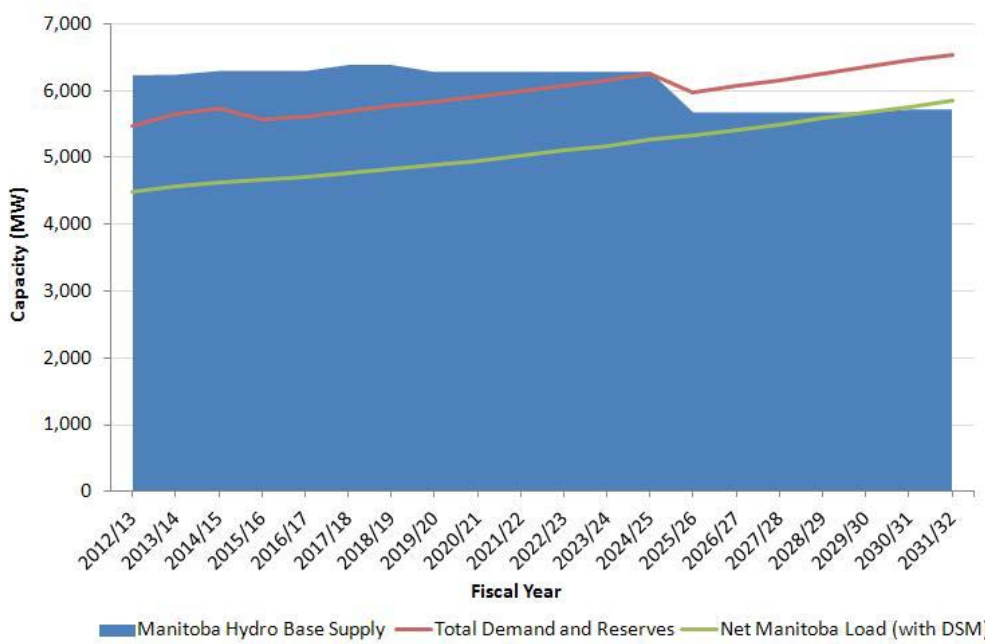


Figure 4.20 NEED FOR NEW RESOURCES – WINTER PEAK CAPACITY



The Need for Dependable Energy Resources

Figure 4.21 shows the dependable energy balance as either a surplus or deficit for the next 20 years (2012/13 to 2031/32), assuming no further resource additions to the system supply and no change to DSM. Similarly, Figure 4.22 compares the Manitoba Hydro base supply to the Manitoba net load and total demand to further demonstrate the need for and timing of new energy resources.

Based on the current supply and demand assumptions for energy, the Manitoba Hydro system will have a dependable energy surplus until the year 2022/23 at which time there will no longer be sufficient dependable energy available to meet the forecasted Manitoba energy demand and export commitments. Without the savings from Manitoba Hydro's DSM programs, new resources would have been required earlier, in 2020/21.

Figure 4.21 ENERGY BALANCE – DEPENDABLE ENERGY

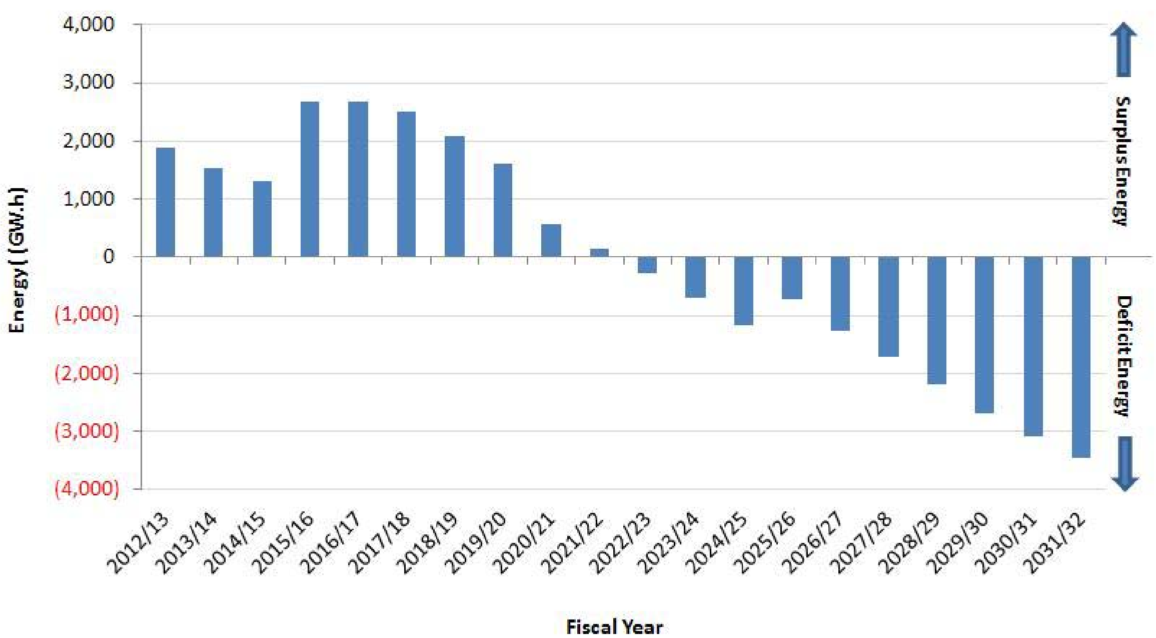
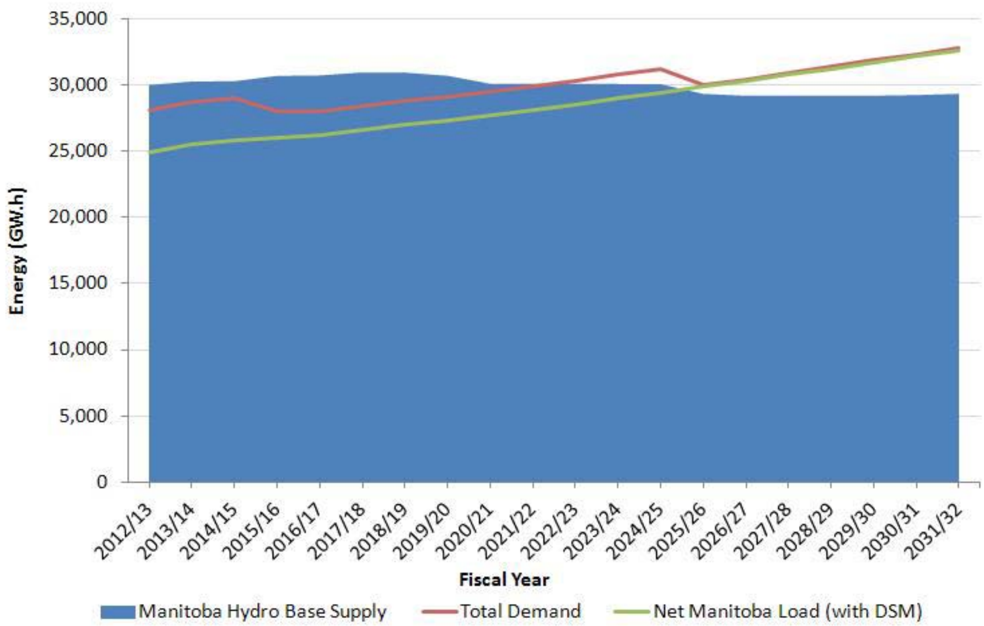


Figure 4.22 NEED FOR NEW RESOURCES – DEPENDABLE ENERGY



Since persistent dependable energy deficits begin earlier than persistent capacity deficits, it is the shortfall of dependable energy which drives the need for new resources in the year 2022/23.

The above analysis is based on 2012/13 resource planning assumptions. It is recognized that there is inherent variability in the assumptions, particularly due to the length of the planning horizon, which is 35 years. As a result, Manitoba Hydro updates this analysis each year incorporating the most current information, including updates to the load forecast, fuel price forecast, electricity export price forecast, capital cost estimates, plant assumptions, economic factors, and other planning assumptions as part of the power resource planning process as described in ***Chapter 1 – Introduction***.

Tables 4.5 and 4.6 summarize the supply and demand values for key dates from the 35-year study period to demonstrate whether a surplus or deficit is expected. More detailed versions of these tables showing each year of the study period are included in ***Appendix 4.2 – Manitoba Hydro Supply and Demand Tables.***

Table 4.5 WINTER PEAK CAPACITY BALANCE FOR SELECT YEARS (MW) @ GENERATION

Winter Peak Capacity, MW				
Fiscal Year	2013/14	2021/22	2022/23	2026/27
Total Base Supply (From Table 4.3)	6,244	6,284	6,284	5,679
Total Peak Demand (from Table 4.1)	5,178	5,385	5,458	5,417
Reserves	483	603	612	650
System Surplus (Deficit)	583	296	214	(388)

Table 4.6 DEPENDABLE ENERGY BALANCE FOR SELECT YEARS (GWH) @ GENERATION

Dependable Energy, GWh				
Fiscal Year	2013/14	2021/22	2022/23	2026/27
Total Base Supply (from Table 4.4)	30,253	30,075	30,065	29,176
Total Energy Demand (from Table 4.2)	28,717	29,923	30,344	30,438
System Surplus (Deficit)	1,536	152	(279)	(1,262)