

Manitoba Hydro – 2016/17 Resource Planning Assumptions & Analysis

July 25, 2016

EXECUTIVE SUMMARY

The purpose of the 2016 Resource Planning Assumptions and Analysis (RPAA) report is to demonstrate that the supply of power is adequate for the needs of the province based on current assumptions. Further, the report provides a development plan to ensure an adequate supply of power, and documents key assumptions to support the 2016 Integrated Financial Forecast (IFF).

Due to a decrease in forecasted Manitoba load, new generation resources are now required to meet persistent dependable energy shortfalls in 2038/39 which is two years later than the need date forecasted in the 2015 RPAA. Capacity deficits now occur in 2039/40 which is six years later than the need date forecast last year.

Determination of the need for new resources is based on the base load forecast which reflects the best estimate of future load growth, and is produced with the expectation that there is a 50% chance that the actual load will be higher or lower than forecast.

Incremental demand side management (DSM) included 814 MW and 3,527 GWh achieved by 2030/31, which is similar to 2015 (824 MW and 3,498 GWh achieved by 2029/30).

The economic analysis of alternative development plans was not specifically undertaken for this report. The development plan recommended for use in the 2016 IFF is fundamentally the same as 2015 and includes the following:

Committed Resources:

- Keeyask G.S. (695 MW) with a 2019/20 ISD,
- Bipole III completed by 2018/19,
- 2016/17 Demand Side Management Plan,
- A new 500 kV US interconnection with a June 2020 ISD.

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1 INTRODUCTION

The purpose of the 2016 Resource Planning Assumptions and Analysis (RPAA) report is to demonstrate that the supply of power is adequate for the needs of the province based on current assumptions. Further, the report provides a development plan to ensure an adequate supply of power, and documents key assumptions to support the 2016 Integrated Financial Forecast (IFF).

1.1 Resource Planning Criteria

Resource planning is an essential activity that supports Manitoba Hydro's mission as stated in the Corporate Strategic Plan:

“To provide for the continuance of a supply of energy to meet the needs of the province and to promote economy and efficiency in the development, generation, transmission, distribution, supply, and end-use of energy.”

Resource planning is governed by Manitoba Hydro Policy P195, Generation Planning, which includes the following Capacity and Energy criteria:

1. Capacity Criterion

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.

2. Energy Criterion

The Corporation will 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. Imports may be considered as dependable energy resources provided they utilize Firm Transmission Service and are sourced from either an Organized Power Market or a bilateral contract. The total quantity of energy considered as dependable energy from imports shall be limited to that which can be imported during the Off Peak Period, and shall not exceed the quantity of export contracts in effect at the time plus 10% of the Manitoba load.

The North American Electric Reliability Corporation (NERC) is the international regulatory authority responsible to develop and enforce reliability standards. Manitoba Hydro is obligated to report its anticipated Planning Reserve Margins for the upcoming 10 year period to NERC for review. The Planning Reserve Margin is as a function of available capacity divided by peak demand and provides a relative indication of supply or resource adequacy. Manitoba Hydro's resource planning objective is to ensure the Planning Reserve Margin meets the minimum 12% requirement specified in the Capacity Criterion. In addition to the Capacity Criterion, as a predominately hydro system, Manitoba Hydro also has an Energy Criterion which helps ensure sufficient energy resources are available even in the event of a severe drought. Together, the Capacity Criterion and the Energy Criterion provide the basis for determining when new resources are required to ensure an adequate supply of capacity and energy for Manitoba.

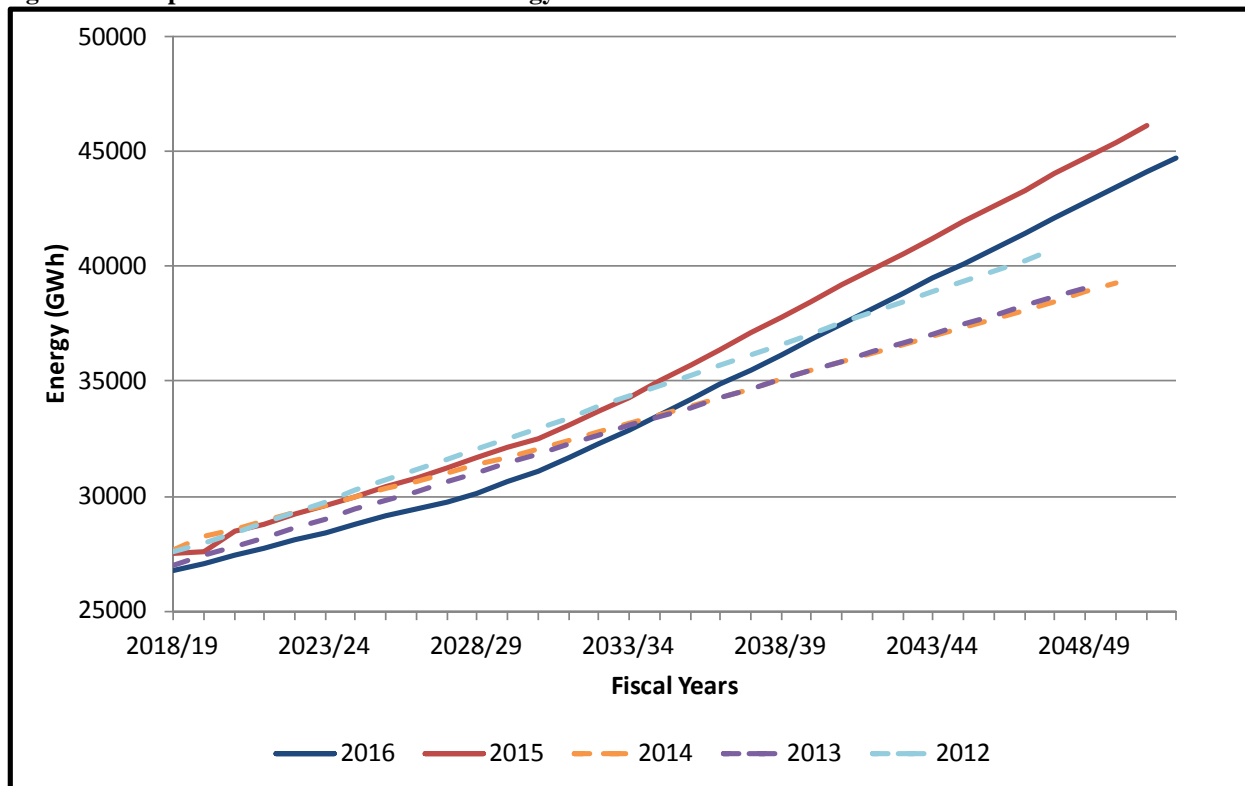
2 DEMAND FOR POWER

Demand for power consists of forecast Manitoba domestic load, which includes residential, commercial and industrial sectors, and requirements from export contracts. Demand Side Management (DSM) plays a significant role in reducing overall demand. The following sections provide a summary of the 2016 energy and capacity forecasts and a discussion of the changes from 2015.

2.1 Electric Load Forecast

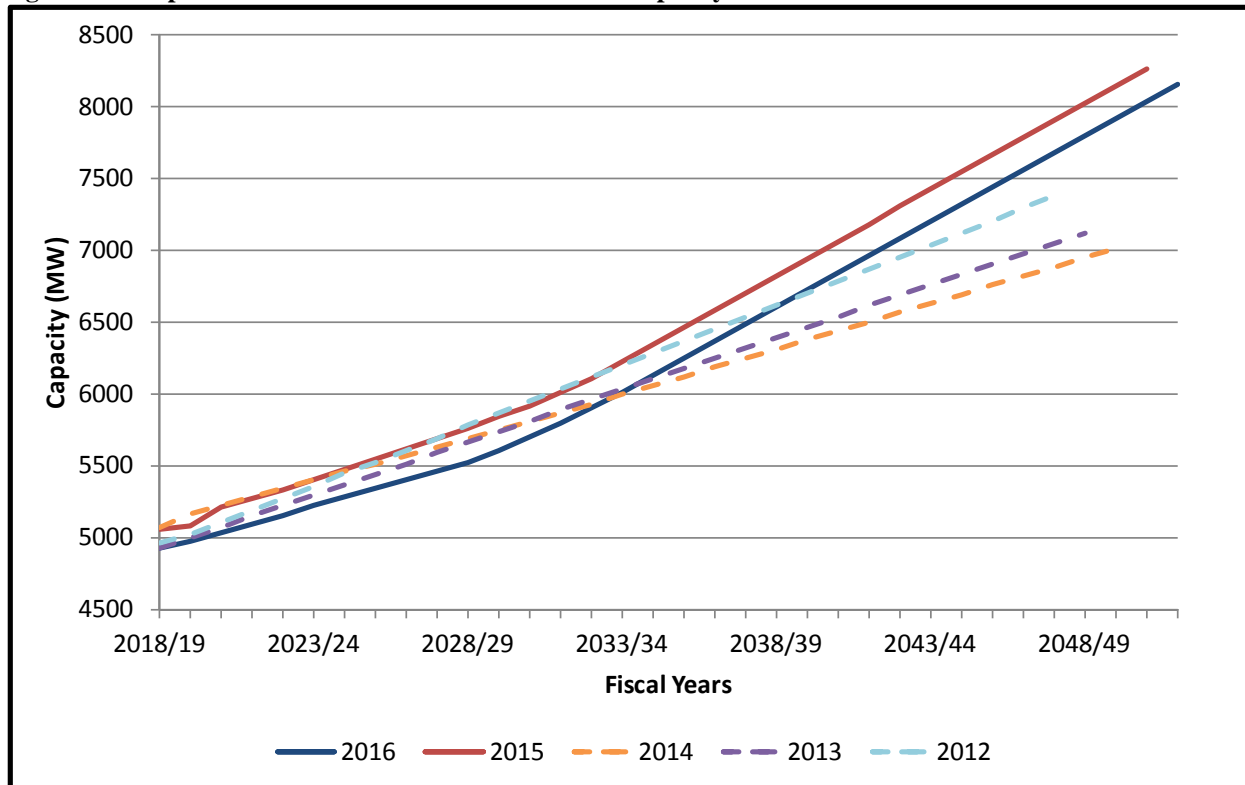
The 2016 Electric Load Forecast, prepared by the Market Forecast Department, provides Manitoba Hydro's forecast of the Manitoba domestic load. As shown in Figure 1, the 2016 forecast is lower than the 2015 forecast, starting down 406 GWh in 2016/17 and being further reduced until it is down 2,051 GWh by 2051/52. The decrease is primarily due to a lower Residential customer forecast from the 2015 forecast, lower starting points for Residential and General Service Mass Market, and changes to the longer term growth forecast of Top Consumers. In 2034/35, the decrease in the 2016 forecast is 1,479 GWh. This equates to a 4.2% decrease in the forecast of 2034/35, which represents a loss of just over three years of load growth (1 year = approximately 442 GWh).

Figure 1: Comparison of Manitoba Load Energy Forecasts



As shown in Figure 2, the 2016 Gross Total Peak demand forecast for 2016/17 is down 86 MW and by 2051/52 is down 237 MW compared to the 2015 demand forecast. The Gross Total Peak demand forecast has decreased for the same reasons that the energy forecast decreased. The decrease is partially offset by a 0.5% reduction to the peak load factor forecast caused by the reduction of the Top Consumers forecast which has a high load factor of 91%. In 2034/35, the decrease is 210 MW (3.3%), representing about 2½ years of peak load growth (1 year = approximately 80 MW).

Figure 2: Comparison of Manitoba Load Winter Peak Capacity Forecast



2.2 Net Manitoba Load

Figures 3 and 4 show the net load resulting from deducting the DSM forecast from the Manitoba Load Forecast which shows an overall decrease in comparison with forecasts from last year.

Figure 3: Comparison of Net Load Energy Forecasts

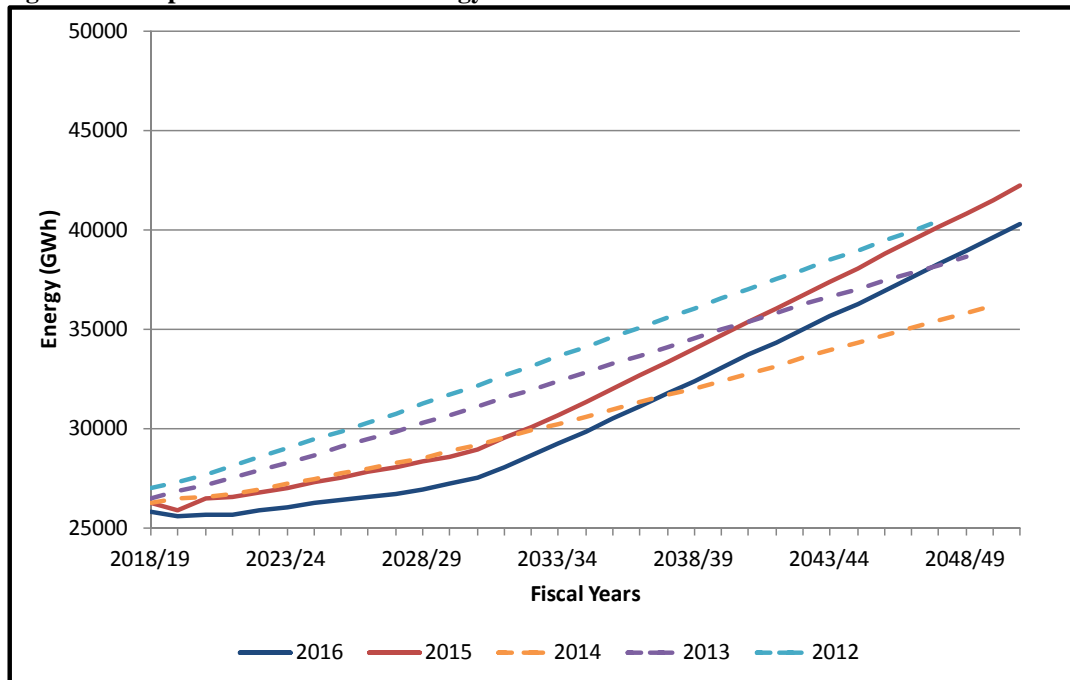
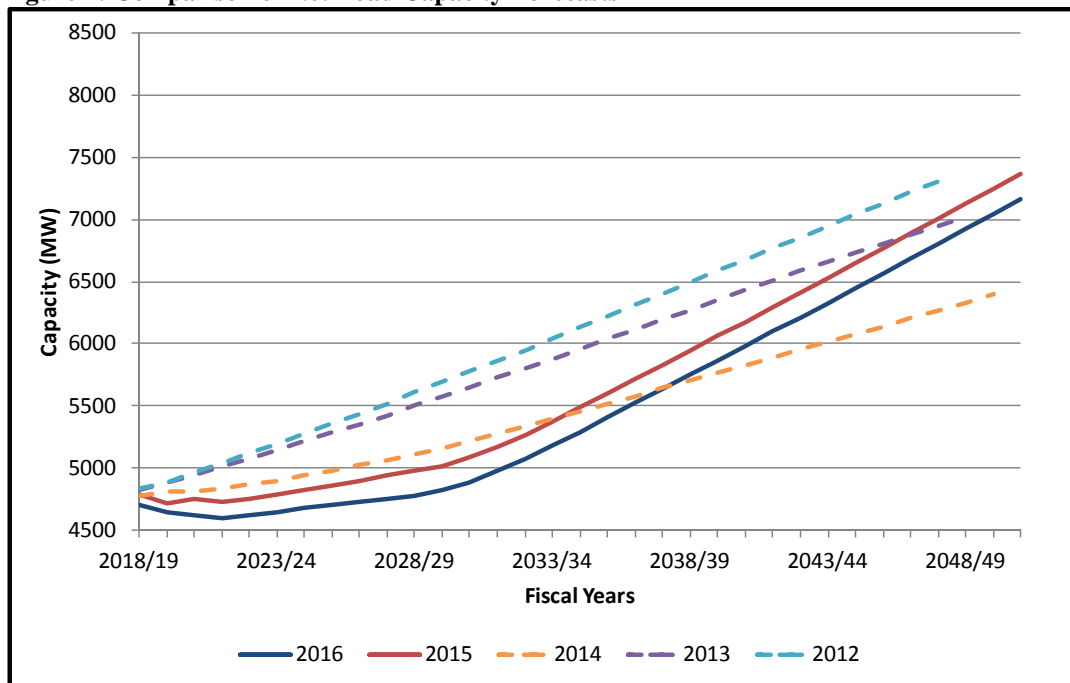


Figure 4: Comparison of Net Load Capacity Forecasts



2.3 Long-Term Export Contracts

Long-term dependable export obligations refer to sales that are sourced from capacity and dependable energy and must be served under all historic water supply conditions including the lowest recorded coincident water supply conditions. Long-term export obligations under dependable flow conditions may be less than the obligation under higher flow conditions and are governed by the terms of each individual contract.

3 SUPPLY OF POWER

This section describes resources that form the base supply of power available to meet Manitoba load requirements.

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 and committed new resources,
- power purchases from non-utility generators in Manitoba,
- imports from adjacent regions,
- projects to replace existing generating resources where plans are in place, and
- reduced losses due to increased HVDC system capacity.

3.1 Manitoba Hydro Operated Facilities – Hydroelectric and Thermal Generation

The following provides a summary of notable assumptions and/or current status updates for specific resources.

Existing System

Over the past year a review of the existing generating resources was undertaken. The review focused on information available from annual generator capacity testing, review of inclusion of station service, expected unit outages, pending additional system studies, and expected new units being installed at facilities. This review resulted in a net decrease to existing hydro capacity resources of 31 MW or 0.53%. Thermal resources were reduced by 9 MW or 2.18% as well as a reduction of 65 GWh of dependable energy.

Manitoba Hydro tests its generators annually in accordance with the MISO Generation Verification Test Capacity (GVTC) requirements. Future generator capacity values are based on seasonally adjusted GVTC test data, as limited by Network Resource Interconnection Service.

Asset Management

It is assumed that sufficient maintenance and investment in rehabilitation will continue to sustain the generating capability of existing resources throughout the long term planning period. Any additional investment expected for the existing system is included in the Integrated Financial Forecast through the capital expenditure forecast. There is a risk that maintenance undertaken may not be sufficient to maintain existing generating capability. In addition, imposed environmental restrictions, such as listing of lake sturgeon as an endangered species, may require operational changes reducing effective output or additional major capital investment to continue generation at these sites. Overall reduced availability of existing generation assets, including the effects of early retirement, may advance the need for new generating resources. Ongoing asset management initiatives undertaken by various planning and operations groups are expected to identify risks and potential changes to expected capability of existing system assets. Results of

these initiatives will continue to be incorporated in future updates to resource planning assumptions.

Brandon Generating Station Unit 5 – Coal-Fired Generation

Availability Assumptions

Brandon Unit 5, Manitoba Hydro's sole remaining coal-fired generating unit, is assumed to remain available until December 31, 2019.

The Climate Change and Emissions Reductions Act

Brandon Unit 5 is governed by the provincial *Climate Change and Emissions Reductions Act* and its subsequent *MR 186/2009*, the *Coal-Fired Emergency Operations Regulation* which restricted coal-fired operation to “...support emergency operations”.

Operation of Brandon Unit 5 will occur for two main purposes as defined in *MR 186/2009*, the *Coal-Fired Emergency Operations Regulation*: to mitigate adverse water conditions commonly referred to as “drought”, and to provide system reliability support.

Under these conditions, it can continue to operate up to its maximum capability of 811 GWh/year (northern equivalent). Unit 5 generation is assumed to be available to meet all commitments existing prior to the introduction of the Act but is not considered to be available to supply new sales including future long-term dependable export sales.

Currently, periodic operation of Brandon Unit 5 is necessary to ensure effective emergency power generation capability. It is estimated that operation for this purpose will generate approximately 100 GWh/year. An additional 25 GWh/year may be required for emergency service resulting in estimated Unit 5 generation to be in the order of 125 GWh/year.

Reduction of Carbon Dioxide Emissions from Coal-fired Generation of Electricity Regulations

Environment Canada’s *Reduction of Carbon Dioxide Emissions from Coal-fired Generation of Electricity Regulations* establishes the allowable duration of long-term operation of Brandon Generating Station Unit 5. The federal regulation does not affect operation of Brandon Unit 5 until January 1, 2020. Until that time Brandon will continue to operate as restricted under provincial regulation. Commencing January 1, 2020, the unit can be utilized as a “standby” unit until December 31, 2029. A “standby” unit is permitted to operate to a maximum annual net capacity factor of 9 percent for non-emergency purposes. However starting January 1, 2020, after-the-fact approval of emergency operations is required from the federal Minister of the Environment. Medium term emergencies are limited to a 90 day period but can be extended for another 90 day term. Prolonged, unrestricted operation during a long term, “shortage of fuel” emergency (i.e. drought) after January 1, 2020 is permitted, but requires a declaration by the provincial Minister responsible for the Emergency Measures Act.

Pointe du Bois Generating Station

The Pointe du Bois powerhouse is proceeding with the ongoing civil and safety remediation work and to successively replace the retired generating units with new units where they are justified.

It is assumed that Pointe du Bois plant capacity will vary between 55 MW to 60 MW between 2015/16 and 2020/21. After 2021/22 to end of planning horizon, the plant capacity is expected to degrade to 33 MW and approximately 233 GWh of annual dependable energy.

3.2 Committed Resources

Keeyask Generating Station

The Keeyask G.S. will be located upstream of the Kettle G.S. on the lower Nelson River with 7 units having a maximum rated total power capacity of 695 MW, which occurs when Stephens Lake is drawn down. There will be a net addition of 630 MW to Manitoba Hydro's Integrated Power System once the Keeyask G.S. is added.

Construction of the Keeyask Generation Project began in July 2014, following receipt of all required provincial and federal licenses, authorizations and permits. The first unit is planned to be in-service in late 2019 and with the last unit in-service in 2020.

Demand Side Management

Incremental demand side management (DSM) in the 2016/17 Demand Side Management Plan is 814 MW and 3,527 GWh achieved by 2030/31, which is similar to 2015 (which included 824 MW and 3,498 GWh achieved by 2029/30). Incremental DSM excludes savings already achieved to date, savings achieved through codes and standards which are included in the Load Forecast, and savings from curtailable rates programming beyond existing contracts that do not qualify as winter peak capacity as these are short-term resources.

Figures 5 and 6 show the changes in DSM assumptions for energy and capacity from last year.

Figure 5: Comparison of DSM Energy Savings Forecasts

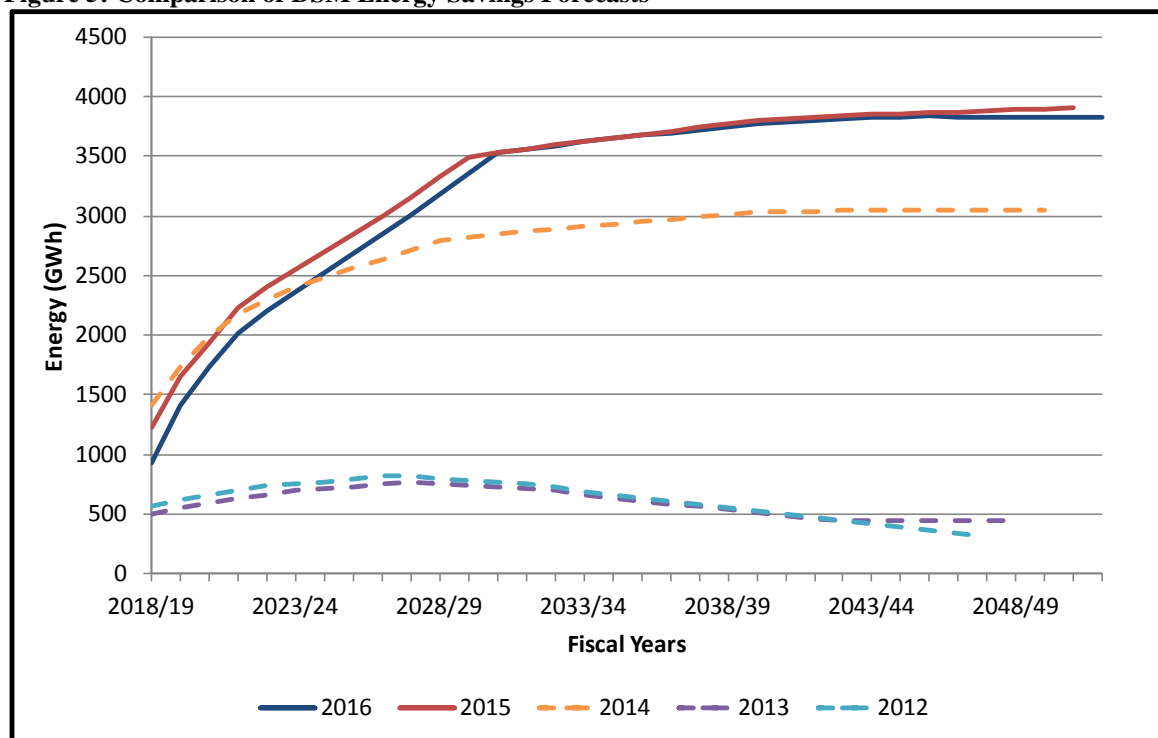
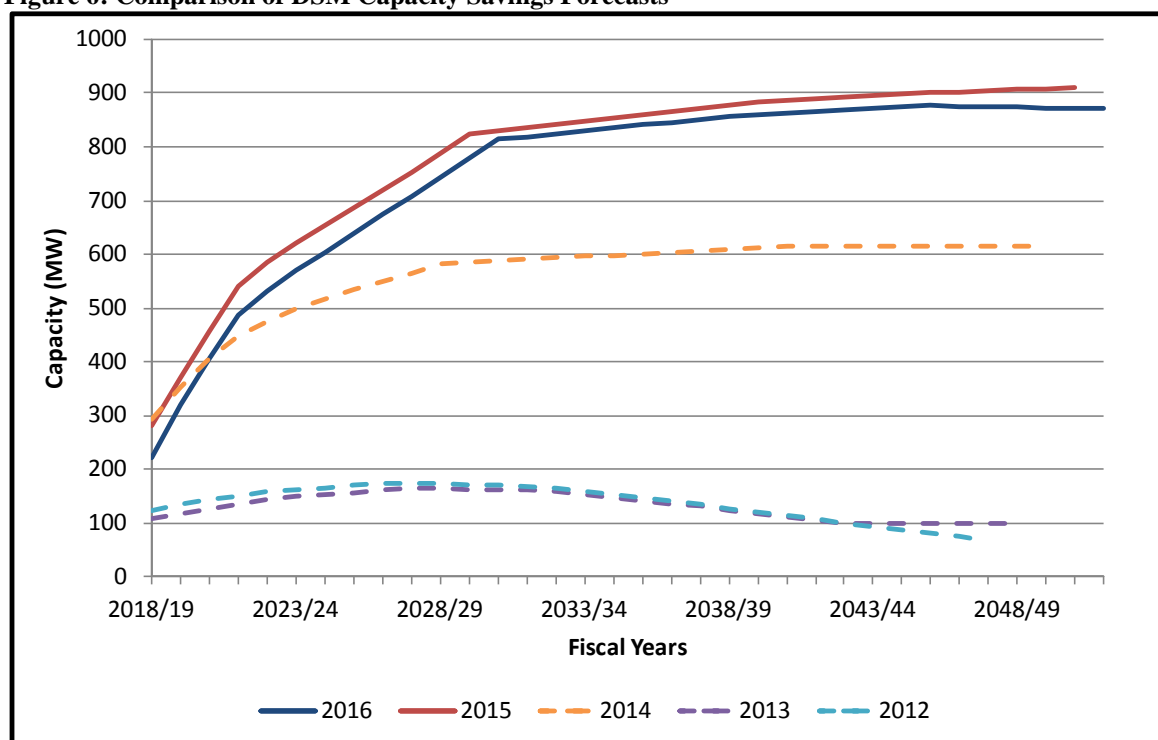


Figure 6: Comparison of DSM Capacity Savings Forecasts



Loss Reduction due to Bipole III

Bipole III continues to be needed to satisfy reliability requirements within Manitoba, and also results in notable reductions in transmission losses prior to new northern generation. Bipole III, routed on the west side of lakes Manitoba and Winnipegosis, continues to be planned for a 2018/19 in-service date.

Bipole III does not provide any new generation, but is expected to reduce the transmission losses which currently occur on the HVDC system. By using all three bipoles to transmit the generation from the lower Nelson River plants, rather than just the existing two bipoles, the losses are reduced and result in 80 MW and 177 GWh/year of reduced losses under drought conditions. This benefit has been included and is adjusted downward as new northern hydroelectric generation increases the loading.

US Interconnection

The new 500 kV US interconnection will be capable of providing firm transmission service of 698 MW for imports and 883 MW for exports. The new interconnection is assumed to have an in-service date of June 1, 2020 which is coincident with the start of the related long term contracts with Minnesota Power. The new interconnection requires several Canadian and US regulatory approvals which are expected to be received by mid-2017. The new interconnection consists of two separate 500 kV transmission line projects. In Canada, the Manitoba Minnesota Transmission Project (MMTP) will run 213 km from the Dorsey station and will be constructed and owned by Manitoba Hydro. In the US, the Great Northern Transmission Line Project (GNTL) will run 224 miles (360 km) from the US/Canada border into the new Blackberry substation near Grand Rapids, Minnesota, and will be constructed and owned by Minnesota Power.

3.3 Power Purchases from Manitoba Generators

Wind Generation

Manitoba Hydro has power purchase agreements (PPAs) with three wind producers, St. Leon Energy LP, Algonquin Power, and Pattern Energy Group. These PPA's provide Manitoba Hydro with 771 GWh of dependable energy on an annual basis. A review of the capacity value of wind for use in resource planning resulted in a winter peak capacity value of 20% of the nameplate capacity (based on operational experience), and a summer peak capacity value of 15.6% (based on the MISO fleet-wide average capacity). For planning purposes, 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 planning horizon.

3.4 Imports from Adjacent Regions

Manitoba Hydro has long-term seasonal diversity contracts with Northern States Power (NSP) and Great River Energy (GRE) which provide for capacity and dependable energy imports during the winter season in exchange for exports of capacity and energy during the summer season. The diversity agreements combined provide for an exchange of capacity of 550 MW in 2015/16, increases to 625 MW in 2016/17, returning to 550 MW from 2020/21 until 2024/25, and then reducing to 200 MW until expiration in 2029/30.

4 NEED FOR NEW RESOURCES TO MEET EXISTING OBLIGATIONS

The need for new resources to meet the expected load requirements is assessed using supply assumptions which include the base supply of power resources including committed resources, and the Manitoba base load forecast net of demand side management (DSM) and export sales requirements. Using the planning criteria, the supply-demand surplus or deficit is determined for each year for 35 years into the future. The year in which significant persistent deficits begin for either dependable energy or peak capacity is the year that new resources are required.

Table 1 shows the changes in the dates that new resources are needed for both dependable energy and capacity compared to the 2015/16 resource planning assumptions and analysis report. The variation in the date new resources are needed is due to changes in the load forecast, DSM, and base resource assumptions including allowable import quantities, wind generation, and existing system capabilities.

For the 2016 planning assumptions, the need for new resources is driven by a sustained dependable energy shortfall beginning in 2038/39. Resources are required to meet sustained capacity deficits beginning in 2039/40.

Table 1: Changes to Supply-Demand Balances

Changes to Dependable Energy (GWh)									
Fiscal Year	2032/33	2033/34	2034/35	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41
System Surplus (Deficit) 2015, No New Resources	1750	1137	470	68	(589)	(1236)	(1844)	(2441)	(3063)
System Surplus (Deficit) 2016, No New Resources	3146	2543	1935	1574	994	424	(157)	(728)	(1324)

Changes to Winter Peak Capacity (MWs)									
Fiscal Year	2032/33	2033/34	2034/35	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41
System Surplus (Deficit) 2015, No New Resources	12	(103)	(232)	(86)	(224)	(353)	(481)	(609)	(630)
System Surplus (Deficit) 2016, No New Resources	479	360	238	388	261	133	5	(123)	(143)

5 2016 RESOURCE DEVELOPMENT PLAN

The development plan recommended for use in the 2016 IFF includes the following:

Committed Resources:

- Keeyask G.S. (695 MW) with a 2019/20 ISD,
- Bipole III completed by 2018/19,
- 2016/17 Demand Side Management Plan,
- A new 500 kV US interconnection with a June 2020 ISD.

APPENDIX A: DEPENDABLE SUPPLY & DEMAND

System Firm Winter Peak Demand and Capacity Resources (MW) @ generation 2016 Planning Assumptions No New Resources																	
Fiscal Year	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35
Power Resources																	
New Power Resources																	
New Hydro																	
1	Total New Hydro																
New Thermal																	
SCGT																	
CCGT																	
2	Total New Thermal																
3	Total New Power Resources	1+2															
Base Supply Power Resources																	
Existing Hydro		5 150	5 255	5 690	5 771	5 766	5 766	5 766	5 766	5 766	5 766	5 766	5 766	5 766	5 766	5 766	5 766
Existing Thermal																	
Brandon Coal - Unit 5		92															
Selkirk Gas		33	33	33	125	125	125	125	125	125	125	125	125	125	125	125	125
Brandon Units 6-7 SCGT		278	278	278	278	278	278	278	278	278	278	278	278	278	278	278	278
Contracted Imports		688	688	605	605	605	605	605	220	220	220	220	220				
Proposed Imports														220	220	220	220
Exisitng Wind		52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52
Generation Outages Over System Peak																	
Bipole III Reduced Losses		90	90	80	80	80	80	80	80	80	80	80	80	80	80	80	80
4	Total Base Supply Power Resources	6 383	6 396	6 738	6 911	6 906	6 906	6 906	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521
5	Total Power Resources	3+4	6 383	6 396	6 738	6 911	6 906	6 906	6 906	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521
Peak Demand																	
2016 Base Load Forecast		4 905	4 948	5 010	5 066	5 131	5 195	5 259	5 318	5 379	5 435	5 497	5 585	5 673	5 773	5 882	5 994
Less: 2016 DSM Forecast		- 222	- 321	- 406	- 487	- 532	- 569	- 603	- 638	- 673	- 708	- 744	- 779	- 814	- 819	- 825	- 830
6	Manitoba Net Load	4 683	4 627	4 604	4 579	4 599	4 626	4 656	4 680	4 706	4 727	4 753	4 806	4 859	4 954	5 057	5 273
Contracted Exports		727	727	889	1 018	990	990	990	495	495	385	385	385	385	385	385	385
Proposed Exports																	
7	Total Exports	727	727	889	1 018	990	990	990	495	495	385	385	385	385	385	385	385
8	Total Peak Demand	6+7	5 410	5 354	5 493	5 597	5 589	5 616	5 646	5 175	5 201	5 112	5 138	5 191	5 244	5 339	5 658
9	Reserves	552	545	546	544	546	550	553	555	558	559	563	569	575	587	599	612
10	System Surplus	5-8-9	421	497	699	770	771	740	707	791	762	850	820	761	702	595	238

System Firm Winter Peak Demand and Capacity Resources (MW) @ generation 2016 Planning Assumptions No New Resources																	
Fiscal Year	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41	2041/42	2042/43	2043/44	2044/45	2045/46	2046/47	2047/48	2048/49	2049/50	2050/51	2051/52
Power Resources																	
New Power Resources																	
New Hydro																	
1	Total New Hydro																
New Thermal																	
SCGT																	
CCGT																	
2	Total New Thermal																
3	Total New Supply Resources1+2																
Base Supply Power Resources																	
Existing Hydro		5 766	5 766	5 766	5 766	5 766	5 766	5 766	5 766	5 766	5 766	5 766	5 766	5 766	5 766	5 766	5 766
Existing Thermal																	
Brandon Coal - Unit 5																	
Selkirk Gas		125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
Brandon Units 6-7 SCGT		278	278	278	278	278	278	278	278	278	278	278	278	278	278	278	278
Contracted Imports																	
Proposed Imports		220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220
Exisiting Wind		52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52
Generation Outages Over System Peak																	
Bipole III Reduced Losses		80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
4	Total Base Supply Power Resources	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521
5	Total Power Resources3+4	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521	6 521
Peak Demand																	
2016 Base Load Forecast		6 227	6 346	6 465	6 584	6 703	6 822	6 941	7 060	7 179	7 298	7 417	7 536	7 655	7 774	7 893	8 012
Less: 2016 DSM Forecast		- 840	- 845	- 850	- 855	- 860	- 863	- 866	- 869	- 873	- 875	- 878	- 876	- 874	- 873	- 872	- 872
6	Manitoba Net Load	5 387	5 501	5 615	5 729	5 843	5 959	6 075	6 191	6 306	6 423	6 539	6 660	6 781	6 901	7 021	7 140
Contracted Exports		110	110	110	110	110											
Proposed Exports																	
7	Total Exports	110	110	110	110	110											
8	Total Peak Demand6+7	5 497	5 611	5 725	5 839	5 953	5 959	6 075	6 191	6 306	6 423	6 539	6 660	6 781	6 901	7 021	7 140
9	Reserves	636	649	663	677	690	703	717	731	745	759	773	787	802	816	831	845
10	System Surplus5-8-9	388	261	133	5	- 122	- 141	- 271	- 401	- 530	- 661	- 791	- 926	- 1 062	- 1 196	- 1 331	- 1 464

System Firm Summer Peak Demand and Capacity Resources (MW) @ generation 2016 Planning Assumptions No New Resources																	
Fiscal Year	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35
Power Resources																	
New Power Resources																	
New Hydro																	
1	Total New Hydro																
New Thermal																	
SCGT																	
CCGT																	
2	Total New Thermal																
3	Total New Power Resources	1+2															
Base Supply Power Resources																	
Existing Hydro		5 160	5 175	5 520	5 781	5 776	5 776	5 776	5 776	5 776	5 776	5 776	5 776	5 776	5 776	5 776	5 776
Existing Thermal																	
Brandon Coal - Unit 5		92	92														
Selkirk Gas		33	33	33	125	125	125	125	125	125	125	125	125	125	125	125	125
Brandon Units 6-7 SCGT		269	269	269	269	269	269	269	269	269	269	269	269	269	269	269	269
Contracted Imports																	
Proposed Imports																	
Exisitng Wind		40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Generation Outages Over System Peak		- 102	- 102	- 102	- 102	- 102	- 102	- 102	- 102	- 102	- 102	- 102	- 102	- 98	- 98	- 98	- 98
Bipole III Reduced Losses		90	90	80	80	80	80	80	80	80	80	80	80	80	80	80	80
4	Total Base Supply Power Resources	5 582	5 597	5 840	6 193	6 188	6 188	6 188	6 188	6 188	6 188	6 188	6 188	6 192	6 192	6 192	6 192
5	Total Power Resources	3+4	5 582	5 597	5 840	6 193	6 188	6 188	6 188	6 188	6 188	6 188	6 188	6 192	6 192	6 192	6 192
Peak Demand																	
2016 Base Load Forecast		3 451	3 503	3 565	3 609	3 656	3 703	3 749	3 791	3 835	3 877	3 922	3 987	4 053	4 126	4 206	4 287
Less: 2016 DSM Forecast		- 113	- 166	- 204	- 238	- 267	- 297	- 325	- 355	- 385	- 418	- 453	- 489	- 524	- 529	- 533	- 538
6	Manitoba Net Load	3 338	3 337	3 361	3 371	3 389	3 406	3 424	3 436	3 450	3 459	3 469	3 498	3 529	3 597	3 673	3 749
Contracted Exports		1 470	1 470	1 549	1 678	1 650	1 650	1 650	715	715	605	605	605	605	605	605	605
Proposed Exports																	
7	Total Exports	1 470	1 470	1 549	1 678	1 650	1 650	1 650	715	715	605	605	605	605	605	605	605
8	Total Peak Demand	6+7	4 808	4 807	4 910	5 049	5 039	5 056	5 074	4 151	4 165	4 064	4 074	4 103	4 134	4 202	4 278
9	Reserves	405	405	410	412	414	416	418	410	411	411	412	416	419	428	437	446
10	System Surplus	5-8-9	369	385	520	732	735	716	696	1 627	1 612	1 713	1 702	1 669	1 639	1 562	1 477

System Firm Summer Peak Demand and Capacity Resources (MW) @ generation 2016 Planning Assumptions No New Resources																	
Fiscal Year	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41	2041/42	2042/43	2043/44	2044/45	2045/46	2046/47	2047/48	2048/49	2049/50	2050/51	2051/52
Power Resources																	
New Power Resources																	
New Hydro																	
1 Total New Hydro																	
New Thermal																	
SCGT																	
CCGT																	
2 Total New Thermal																	
3 Total New Power Resources	1+2																
Base Supply Power Resources																	
Existing Hydro	5 776	5 776	5 776	5 776	5 776	5 776	5 776	5 776	5 776	5 776	5 776	5 776	5 776	5 776	5 776	5 776	5 776
Existing Thermal																	
Brandon Coal- Unit 5																	
Selkirk Gas	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
Brandon Units 6-7 SCGT	269	269	269	269	269	269	269	269	269	269	269	269	269	269	269	269	269
Contracted Imports																	
Proposed Imports																	
Existing Wind	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Generation Outages Over System Peak	- 98	- 98	- 98	- 98	- 98	- 135	- 135	- 135	- 135	- 135	- 135	- 135	- 135	- 135	- 135	- 135	- 135
Bipole III Reduced Losses	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
4 Total Base Supply Power Resources	6 192	6 192	6 192	6 192	6 192	6 155	6 155	6 155	6 155	6 155	6 155	6 155	6 155	6 155	6 155	6 290	6 290
5 Total Power Resources	3+4	6 192	6 192	6 192	6 192	6 192	6 155	6 155	6 155	6 155	6 155	6 155	6 155	6 155	6 155	6 290	6 290
Peak Demand																	
2016 Base Load Forecast	4 457	4 544	4 630	4 717	4 803	4 890	4 977	5 063	5 150	5 236	5 323	5 409	5 496	5 582	5 669	5 756	5 842
Less: 2016 DSM Forecast	- 545	- 549	- 553	- 557	- 561	- 563	- 566	- 569	- 572	- 574	- 576	- 575	- 575	- 574	- 573	- 573	- 573
6 Manitoba Net Load	3 912	3 995	4 077	4 160	4 242	4 327	4 411	4 494	4 578	4 662	4 747	4 834	4 921	5 008	5 096	5 183	5 269
Contracted Exports	330	330	330	330	330	220	220	220	220	220	220	220	220	220	220	220	220
Proposed Exports																	
7 Total Exports	330	330	330	330	330	220	220	220	220	220	220	220	220	220	220	220	220
8 Total Peak Demand	6+7	4 242	4 325	4 407	4 490	4 572	4 547	4 631	4 714	4 798	4 882	4 967	5 054	5 141	5 228	5 316	5 489
9 Reserves	462	472	482	492	502	511	521	531	541	551	561	572	582	593	603	614	624
10 System Surplus	5-8-9	1 488	1 395	1 303	1 210	1 118	1 097	1 003	910	816	722	627	529	432	334	236	177

System Firm Energy Demand and Dependable Resources (GWh) @ generation 2016 Planning Assumptions No New Resources																	
Fiscal Year	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35
Power Resources																	
New Power Resources																	
New Hydro																	
1 Total New Hydro																	
New Thermal																	
SCGT																	
CCGT																	
2 Total New Thermal																	
3 New Wind																	
4 Total New Power Resources 1+2+3																	
Base Supply Power Resources																	
Existing Hydro	21 880	22 356	24 790	24 778	24 746	24 746	24 736	24 726	24 726	24 716	24 706	24 706	24 696	24 696	24 686	24 676	24 676
Existing Thermal																	
Brandon Coal - Unit 5	706	515															
Selkirk Gas	899	899	899	899	899	899	899	899	899	899	899	899	899	899	899	899	899
Brandon Units 6-7 SCGT	2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343
Contracted Imports	2 809	2 809	3 502	3 688	3 688	3 688	3 688	2 321	2 050	2 050	2 050	2 050	1 268	1 113	1 113	1 113	1 113
Proposed Imports													781	936	936	936	936
Hydro Adjustment	903	903	844	844	844	844	844	406	307	307	307	307	307	307	307	307	307
Market Purchases	258	258	957	1 050	1 050	1 050	1 050	2 417	2 688	2 680	2 614	2 646	2 679	2 688	2 688	2 688	2 689
Additional Market Resources																	
Existing Wind	780	780	780	780	780	780	780	780	780	780	780	780	780	780	780	780	780
Bipole III Reduced Losses	101	101	177	177	177	177	177	177	177	177	177	177	177	177	177	177	177
5 Total Base Supply Power Resources	30 679	30 964	34 292	34 559	34 527	34 527	34 517	34 069	33 970	33 952	33 876	33 908	33 931	33 940	33 930	33 920	33 921
6 Total Power Resources 4+5	30 679	30 964	34 292	34 559	34 527	34 527	34 517	34 069	33 970	33 952	33 876	33 908	33 931	33 940	33 930	33 920	33 921
Manitoba Domestic Load																	
2016 Base Load Forecast	26 785	27 060	27 410	27 729	28 082	28 435	28 785	29 110	29 447	29 762	30 106	30 602	31 108	31 666	32 273	32 896	33 532
Non-Committed Construction Power																	
Less: 2016 DSM Forecast	- 934	-1 416	-1 732	-2 020	-2 201	-2 369	-2 526	-2 688	-2 845	-3 010	-3 182	-3 356	-3 527	-3 558	-3 590	-3 620	-3 648
7 Manitoba Net Load	25 851	25 644	25 678	25 709	25 881	26 066	26 259	26 422	26 602	26 752	26 924	27 246	27 581	28 108	28 683	29 276	29 884
Contracted Exports	3 441	3 412	4 451	5 155	5 054	5 027	5 027	2 744	2 600	2 185	2 102	2 102	2 102	2 102	2 102	2 102	2 102
Proposed Exports																	
Less: Adverse Water	- 370	- 370	- 370	- 489	- 512	- 512	- 512	- 85									
8 Total Net Exports	3 071	3 042	4 081	4 666	4 542	4 515	4 515	2 659	2 600	2 185	2 102	2 102	2 102	2 102	2 102	2 102	2 102
9 Total Energy Demand 7+8	28 922	28 686	29 759	30 375	30 423	30 581	30 774	29 081	29 202	28 937	29 026	29 348	29 683	30 210	30 785	31 378	31 986
10 System Surplus 6-9	1 757	2 279	4 533	4 184	4 104	3 946	3 743	4 988	4 768	5 015	4 850	4 560	4 248	3 730	3 145	2 542	1 935

System Firm Energy Demand and Dependable Resources (GWh) @ generation 2016 Planning Assumptions No New Resources																			
Fiscal Year	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41	2041/42	2042/43	2043/44	2044/45	2045/46	2046/47	2047/48	2048/49	2049/50	2050/51	2051/52		
Power Resources																			
New Power Resources																			
New Hydro																			
1	Total New Hydro																		
New Thermal																			
SCGT																			
CCGT																			
2	Total New Thermal																		
3	New Wind																		
4	Total New Power Resources	1+2+3																	
Base Supply Power Resources																			
Existing Hydro		24 666	24 656	24 656	24 646	24 646	24 636	24 626	24 626	24 616	24 606	24 606	24 596	24 586	24 586	24 576	24 576	24 566	
Existing Thermal																			
Brandon Coal - Unit 5																			
Selkirk Gas		899	899	899	899	899	899	899	899	899	899	899	899	899	899	899	899	899	
Brandon Units 6-7 SCGT		2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343	2 343	
Contracted Imports		186																	
Proposed Imports		936	936	936	936	936	936	936	936	936	936	936	936	936	936	936	936	936	
Hydro Adjustment		307	307	307	307	307	307	307	307	307	307	307	307	307	307	307	307	307	
Market Purchases		2 865	2 906	2 970	3 033	3 097	2 703	2 676	2 741	2 806	2 871	2 936	3 003	3 069	3 135	3 202	3 268	3 334	
Additional Market Resources																			
Existing Wind		780	780	780	780	780	780	780	780	780	780	780	780	780	780	780	780	780	
Bipole III Reduced Losses		177	177	177	177	177	177	177	177	177	177	177	177	177	177	177	177	177	
5	Total Base Supply Power Resources	33 159	33 004	33 068	33 121	33 185	32 781	32 744	32 809	32 864	32 919	32 984	33 041	33 097	33 163	33 220	33 286	33 342	
6	Total Power Resources	4+5	33 159	33 004	33 068	33 121	33 185	32 781	32 744	32 809	32 864	32 919	32 984	33 041	33 097	33 163	33 220	33 286	33 342
Manitoba Domestic Load																			
2016 Base Load Forecast		34 193	34 853	35 514	36 174	36 835	37 495	38 156	38 816	39 477	40 137	40 798	41 458	42 119	42 779	43 440	44 100	44 761	
Non-Committed Construction Power																			
Less: 2016 DSM Forecast		-3 674	-3 701	-3 727	-3 754	-3 780	-3 789	-3 800	-3 811	-3 822	-3 830	-3 839	-3 835	-3 831	-3 828	-3 826	-3 826	-3 825	
7	Manitoba Net Load	30 519	31 152	31 787	32 420	33 055	33 706	34 356	35 005	35 655	36 307	36 959	37 623	38 288	38 951	39 614	40 274	40 936	
Contracted Exports		1 066	858	858	858	858	399	307	307	307	307	307	307	307	307	307	307	307	
Proposed Exports																			
Less: Adverse Water																			
8	Total Net Exports	1 066	858	858	858	858	399	307	307	307	307	307	307	307	307	307	307	307	
9	Total Energy Demand	7+8	31 585	32 010	32 645	33 278	33 913	34 105	34 663	35 312	35 962	36 614	37 266	37 930	38 595	39 258	39 921	40 581	41 243
10	System Surplus	6-9	1 574	994	423	- 157	- 728	-1 324	-1 919	-2 503	-3 098	-3 695	-4 282	-4 889	-5 498	-6 095	-6 701	-7 295	-7 901