

## **MANITOBA HYDRO 2009/2010 POWER RESOURCE PLAN**

Date: September 16, 2009

The purpose of this power resource plan is:

- To provide a recommended long-term development plan, and
- To provide an alternative long-term development plan, in recognition of the uncertainties associated with the recommended plan.

### **2009/10 Recommended Power Resource Development Plan**

The recommended development plan for major infrastructure and resources to pursue a new interconnection and facilitate the Wisconsin Public Service (WPS) and Minnesota Power (MP) sales is as follows:

- The 500 MW Sale to WPS and the 250 MW Sale to MP as described in the Term Sheets in effect.
- Keeyask for a 2018/19 ISD (In-Service Date)
- Conawapa for a 2022/23 ISD.
- A 1000 MW export and 750 MW import interconnection with a 2018/19 ISD.
- Additional north-south transmission beyond a 2000 MW Bipole III, as required for both Conawapa and Keeyask with a 2023/24 ISD.
- The 375/500 MW Sale to Northern States Power (NSP) as described in the Term Sheet in effect.
- 300 MW of additional wind generation with a 2010/11 ISD.
- Wuskwatim with a 2011/12 ISD.
- Pointe du Bois rebuilt with a 2016/17 ISD.

Table 1a at the end of this document details the annual dependable energy supply and demand values of this plan. Table 1b details the annual winter peak capacity supply and demand values of this plan.

## **2009/10 Alternative Power Resource Development Plan**

The alternative development plan for major infrastructure and resources to meet Manitoba requirements without a new interconnection and without the WPS or MP sales is as follows:

- Conawapa with a 2021/22 ISD.
- A Combined Cycle Gas Turbine (400 MW) with a 2033/34 ISD.
- The 375/500 MW Sale to NSP as described in the Term Sheet in effect.
- 300 MW of additional wind generation with a 2010/11 ISD.
- Wuskwatim with a 2011/12 ISD.
- Pointe du Bois rebuilt with a 2016/17 ISD.

Table 2a at the end of this document details the annual dependable energy supply and demand values of this plan. Table 2b details the annual winter peak capacity supply and demand values of this plan.

### **Assumptions Common to Both Development Plans**

The following summarizes the characteristics of major infrastructure and additional supply initiatives common to both development plans:

#### New Hydro

Wuskwatim	200 MW gross	200 MW net
Keeyask	695 MW gross	630 MW net
Conawapa	1485 MW gross	1300 MW net

#### Supply-Side Enhancement Projects (SSE)

##### Planned Additional:

Kelsey Rerunning	77 MW /	0 GW.h for 2012/13
Winnipeg River Plants Rerunning	30 MW /	30 GW.h
HVDC Bipole III Line (West)	89 MW /	243 GW.h by 2017/18

##### License Review and Continued Operation:

Selkirk #1-2	132 MW /	953 GW.h
Brandon #5 Licence Review	105 MW /	811 GW.h to 2018/19
Pointe du Bois (rebuilt)	120 MW /	620 GW.h 2016/17 (total plant)

#### Demand Side Management Program (DSM)

Planned additional (by Mar 2025)	269 MW /	1158 GW.h
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## **Summary**

The 2009/10 plan for power resources is the most recent corporately approved update of energy supply and demand for the Manitoba Hydro system and is based on information available prior to August 2009.

The 2009/10 plan for power resources includes the construction of major new resources: Keeyask GS (in-service 2018/19) and Conawapa GS (in-service 2022/23). The construction of Keeyask and Conawapa in close succession meets the demand of Manitoba domestic load and facilitates the new export sales to Wisconsin Public Service (WPS) and Minnesota Power (MP) and the construction of a new interconnection into Minnesota and Wisconsin. The 2009/10 plan includes an extension to the existing export sale and diversity contracts to Northern States Power (NSP) over the existing interconnection.

The 2009/10 plan includes a number of other major generation projects. The next proposed hydroelectric resource is the Wuskwatim project for which construction began in August, 2006 with first power expected in 2011/12.

The plan includes the purchase of power from the existing St. Leon 100 MW wind farm and the purchase of an additional 300 MW of wind generation starting in 2010/11, although recent negotiations with a wind developer are for 138 MW.

The 2009/10 plan assumes that the Pointe du Bois Generating Station will be redeveloped at a higher capability than the existing facility with first power in 2016/17. Since the completion of the 2009/10 plan a decision was made to reduce the scope of the Pointe du Bois Modernization Project and it will now take the form of a new spillway and new concrete and earth dams. The existing Pointe du Bois powerhouse will continue to operate indefinitely with ongoing maintenance.

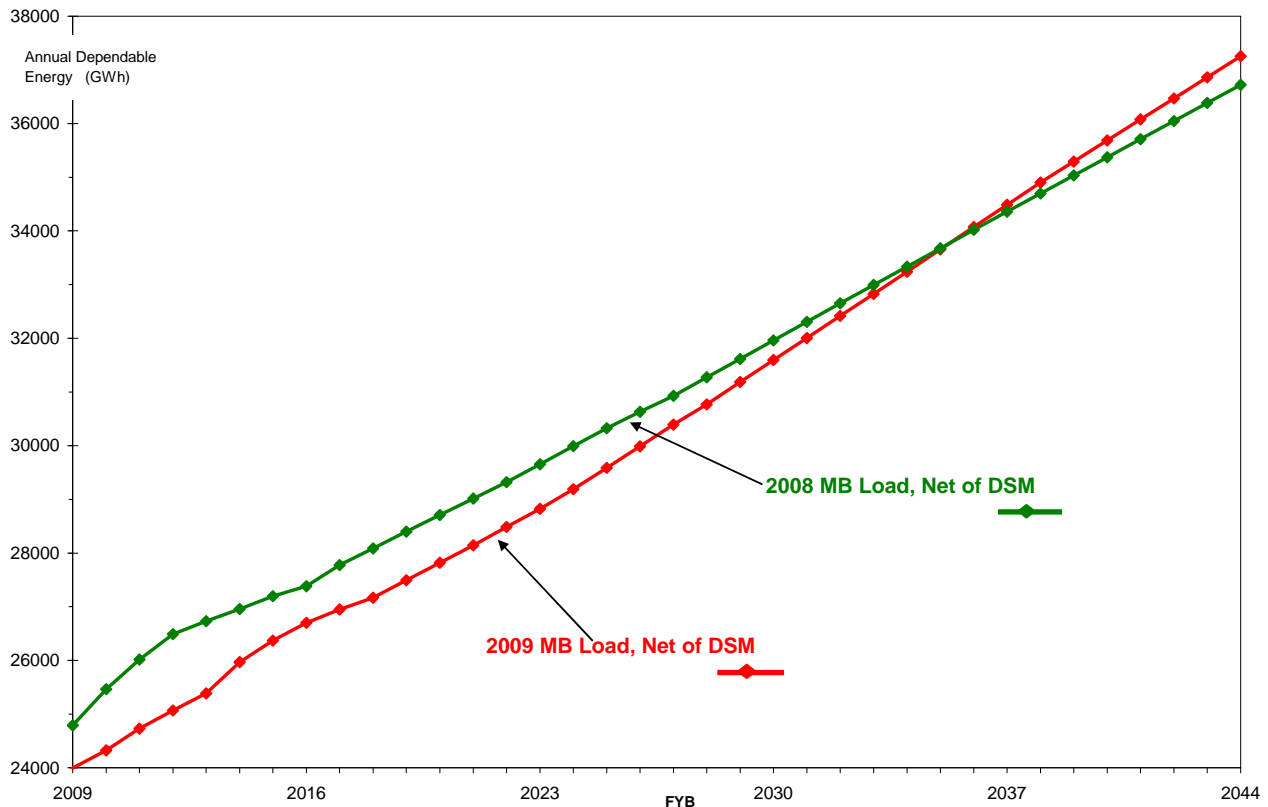
Recent decisions which decrease the amount of wind power and eliminate the 43 MW increase related to Pointe du Bois are not expected to affect the timing of Keeyask GS in 2018/19 and Conawapa GS in 2022/23 in the recommended development plan.

The 2009/10 plan for power resources includes the Bipole III transmission line for system reliability requirements and for transmitting existing and future northern generation. The line is expected to extend from the proposed Conawapa site to the Riel converter station east of Winnipeg, with an in-service date of 2017/18. Concept engineering for the west-side route is being finalized including selection of the overall capacity.

## Demand for Power:

The recent economic downturn has resulted in lower energy demands in the short-term, primarily from the industrial sector. This is reflected in the forecast by reduced energy demand of approximately 1000 GW.h/year in the short-term. The 2009/10 load forecast increases at a greater rate than the 2008/09 load forecast. After 2035, Manitoba load is projected to be higher than last year's forecast. Figure 1 below is a comparison of the 2008 and 2009 base case load forecasts, net of Demand Side Management (DSM) projected energy savings. The 2009 Power Smart Plan forecasts Manitoba Hydro's savings up to the current benchmark year of 2024/25 which will be achieved through electricity Power Smart Programs.

**Figure 1:**  
*Comparison of 2008 and 2009 Manitoba Load Forecasts (Net of DSM)*



## Need for New Resources to Meet Existing Obligations

Manitoba Hydro compares the total dependable resources to the firm load, including export commitments, to determine the required date of new resources. Separate energy and capacity tables are analyzed because the shortage in resources could be in either. New resources are required when there is insufficient energy or capacity to serve load. Under dependable energy conditions, new generation is required in 2022/23, compared to a requirement of 2019/20 in the 2008/09 resource plan. Capacity resources are not required until 2024/25, compared to 2022/23 in the 2008/09 resource plan.

## **Supply of Power:**

### Existing System Resources

The existing Manitoba Hydro generating system includes 14 hydro-electric generating stations, two thermal generating stations, and the purchase of the output from one wind farm. The oldest generating station is Pointe du Bois, commissioned in 1911, and the newest hydro-electric station is Limestone, commissioned in 1993. In 2002 natural gas-fired turbines labeled Units 6 and 7 were added at Brandon, and Selkirk was converted from coal-fired generation to natural gas.

In the Manitoba Hydro system, dependable energy is the annual generation from all available resources assuming that the historic drought of record recurs. Average generation is the annual generation assuming that the full range of historic inflows recurs. Table 3 identifies the peak capacity, dependable energy, and average energy for existing hydro, thermal and wind energy sources in the Manitoba Hydro system. Estimates of the dependable energy from the total system reduce by about 15 GW.h each year as it is anticipated that there are increased irrigation and other consumptive uses of water in Saskatchewan and Alberta each year (subject to restrictions under the Prairie Province Apportionment Agreement).

### Potential New Hydro Resources in Manitoba

Potential new hydro resource options in Manitoba are summarized in Table 4. The table includes options considered in this resource plan as well as the other most viable sites on the Nelson, Churchill and Burntwood River systems.

### Conawapa:

Conawapa is a 10 unit plant located downstream of the Limestone Generating Station on the Nelson River. The current design rating for Conawapa is 1485 MW during open water conditions. Initial impoundment of the forebay will reduce Limestone output by 90 MW, resulting in a net increase in system summer capacity of 1395 MW. Downstream ice conditions will reduce Conawapa output by about 55 MW and similarly ice conditions will further reduce Limestone by 35 MW during winter peak conditions resulting in a nominal net system addition of 1300 MW.

The earliest in-service date assumed for Conawapa is 2021/22. The earliest in-service date assumed for Conawapa, if it is constructed in conjunction with Keeyask, is 2022/23. In order to reduce overlap on internal and external skilled labour and other resources, there must be at least four years between the in-service dates of these two plants.

Manitoba Hydro and each of the in-vicinity communities (Fox Lake Cree Nation, York Factory First Nation, Tataskweyak Cree Nation, and War Lake First Nation) have met regularly over the past year to discuss the Conawapa Project and more specifically its Project Description and Environmental components.

The Conawapa physical, aquatic and terrestrial field studies for the environmental assessment of project effects are nearing completion and have involved the participation of the local communities.

Conawapa concept engineering is not as advanced as Keeyask and still requires some key engineering concepts to be finalized, especially regarding environmental regulation.

Keeyask:

Keeyask is a 7 unit plant located upstream of Kettle generating station on the Nelson River. The current design rating for Keeyask is 695 MW, which reflects the maximum generation potential when Stephens Lake is drawn down. The current nominal winter peak rating for Keeyask is 630 MW. Keeyask will not impact the capacity of any other plants and is not significantly affected by ice conditions, therefore, the nominal capacity and net system addition are both 630 MW.

The earliest in-service date assumed for Keeyask is 2018/19. Construction engineering has begun. Keeyask still requires finalization of the design concepts related to environmental protection. Keeyask could be brought in to service approximately four years earlier than Conawapa due to a shorter construction schedule and advanced environmental assessment work being undertaken jointly with the four Keeyask Cree Nations.

The four Keeyask Cree Nation (KCN) communities all voted to ratify the Joint Keeyask Development Agreement (JKDA) in confidential community ratification processes in 2009.

Wuskwatim:

Wuskwatim Generating Station is a 200 MW generating station, scheduled for a 2011/12 in service date.

Construction commenced in August 2006 and the project is currently on schedule. A major milestone was reached in May 2009 with the first concrete placed. Approximately 65,000 cubic metres of concrete will be placed this year.

Kelsey Rerunning:

The 2009/10 plan for power resources continues to include a major upgrade of the Kelsey GS which consists of the replacement of all seven turbines resulting in greater utilization of water flow at the site. This upgrade is expected to be fully in-service by March 2012 and has the potential to increase the plant rating from 224 MW to approximately 300 MW. The project is proceeding on a unit-by-unit basis, with a review being conducted before undertaking each additional unit replacement.

Upgraded turbines will be able to pass more water and thus capture more of the energy during higher flows periods. While this does not increase dependable energy, there will be an increase in average energy of about 350 GW.h per year. There are seven units at Kelsey GS and each unit is expected to gain about 11 MW. To date, three units have been replaced resulting in a 33 MW increase in capacity.

Pointe du Bois:

Pointe du Bois is the oldest operating generating station in Manitoba. It was commissioned in 1911. For the purposes of the 2009/10 power resource plan, Pointe du Bois is assumed to be rebuilt for a 2016/17 in-service date, and provides 120 MW and 620 GW.h/year of dependable

energy. This is an increase of 43 MW and 150 GW.h over the existing plant. The cost of rebuilding Pointe du Bois has been increasing, therefore a reassessment of the potential options for the Pointe du Bois site was undertaken.

#### Winnipeg River Rerunning:

There are rerunning opportunities on the Winnipeg River, as the plants are aging. When the generator units require a major outage to repair generator windings or major turbine repairs, there are opportunities to upgrade the equipment. Many of these potential upgrades are required to bring the plants back up to the performance levels that are already included in the plan.

Evaluations are ongoing on Pine Falls, Great Falls and Slave Falls for supply-side improvements. It is expected that the work on the remaining three Great Falls units will proceed and add about 10 MW by 2012. It is also expected that Pine Falls Units 1 and 2 will be rerunned for a capacity increase of 10 MW in 2010 and 2011, and Units 3 and 4 in 2012 and 2013 for a further 10 MW. The entire 30 MW of increased capacity is included in this report. It is anticipated that these replacements will provide an improved efficiency, and gain 30 GW.h/year of dependable energy as well.

#### Brandon Generating Station Unit 5 - Climate Change and Emissions Reductions Act

Manitoba's Climate Change and Emissions Reductions Act (Bill 15) was assented to on June 12, 2008 and restricts coal-fired power generation to the support of emergency operations only, starting January 1, 2010. Section 16 of the Act states "Despite any provision of The Manitoba Hydro Act, after December 31, 2009, Manitoba Hydro must not use coal to generate power, except to support emergency operations".

Starting January 1, 2010, power generation from coal at Brandon Generating Station Unit 5 will be restricted to "...support emergency operations" and will occur for two main purposes: mitigation of adverse water conditions commonly referred to as "drought", and to provide system reliability support. In order to maintain the effective power generation capability of Unit 5 for either of these purposes, emergency preparedness activities will be necessary. Activities to maintain the reliable operation of the unit include, but are not limited to, the regular exercising of equipment to test and ensure good working order and the training and practice necessary to maintain operator proficiency. It is estimated that operation for this purpose will occur for 3-4 days every month and will generate approximately 100 GW.h/year. An additional 25 GW.h/year may be required for emergency service resulting in assumed Unit 5 generation to be in the order of 125 GW.h/year.

Brandon Unit 5 will remain available as a source of supply during a drought but it will not be considered available as a source of supply for new sales. In drought years, Brandon Unit 5 can continue to operate up to its maximum capability of 811 GW.h/year (northern equivalent). This value is reduced by 26 GW.h/year from that quoted in the 2008/09 power resource plan to reflect changes in planned maintenance outages which have been increased from 21 to 30 days per year.

#### Brandon Generating Station Unit 5 - Environment Act Licence Review

As part of an on-going public licence review by Manitoba Conservation, Manitoba Hydro submitted an Environmental Impact Statement (EIS) to the Department in December 2006. The

EIS indicated there are no significant environmental or human health effects anticipated with continued unit operation. Due to the unit's small size, pollution control equipment, voluntary emissions management programs for greenhouse gas and mercury, and the use of ultra-low sulfur coal, continued operations will not have measurable, incremental long-term adverse effects on either the environment or human health.

Progress on the licence review was halted pending the Manitoba Cabinet adoption of a regulation pursuant to the Climate Change and Emissions Reductions Act. The licence review process will resume following formal adoption of the new regulation.

#### Brandon Generating Station Units 6 & 7

Brandon Units 6 & 7 operating characteristics have not changed from the 2008/09 power resource plan.

#### Selkirk - Cooling Water Restrictions

The estimate of dependable energy from the Selkirk Generating Station has been revised from 1060 GW.h/year to 953 GW.h/year (northern equivalent) due to cooling water restrictions.

The Selkirk Generating Station is assumed to remain in operation to the end of the planning horizon assuming only routine major capital investment.

#### Natural Gas-Fired Turbines - Potential Resources

Consistent with the 2008/09 power resource plan, the natural gas-fired resource options include a 43 MW LM 6000 which is an aero-derivative simple cycle gas turbine (SCGT) and a 400 MW S107H which is a combined cycle gas turbine (CCGT). Both are manufactured by General Electric.

#### Existing St. Leon Wind Farm

The St. Leon wind farm is 100 MW, and is expected to operate at a 39% capacity factor (the average generation is 39% of the theoretical maximum generation).

Only 85% of the expected annual generation from wind resources is relied upon as dependable energy. Because the wind generation is not assured to be available during system peak loads, and in fact is likely to be off due to cold weather limitations, wind is not assigned any capacity for the purposes of meeting peak loads.

#### Proposed St. Joseph Wind Farm

The proposed St. Joseph wind farm is assumed to be 300 MW for the 2009/10 power resource plan. It is expected to operate at a 38% capacity factor.

#### Bipole III

Bipole III continues to be needed to satisfy reliability requirements within Manitoba. Bipole III, routed on the west side of the Interlake, is planned for a 2017/18 in-service date. This is the earliest date that it could be available, based on anticipated planning and regulatory requirements. Concept engineering for the Bipole is being finalized including selection of the overall capacity.



Bipole III does not provide any new generation, but is expected to reduce the transmission losses which exist on the HVDC system. By using all three bipoles to transmit the lower Nelson River generation, rather than just the existing two, the losses are reduced, resulting in 89 MW and 243 GW.h/year of reduced losses prior to new northern generation. This benefit has been included and is adjusted as new generation increases the loading.

As Bipole III is required to provide acceptable reliability for existing generation, the cost is not included as part of either Keeyask or Conawapa capital requirements.

Additional North-South Transmission in Manitoba:

A 2000 MW Bipole III may not provide sufficient transmission to address potential reliability issues. Several potential options to increase the north-south transmission are being considered. These options include increasing the size of Bipole III beyond 2000 MW, upgrading the existing AC system, and building a new AC link.

## **Sales Opportunities - Signed Term Sheets**

### **Northern States Power (NSP) 375/500 MW Sale**

The Northern States Power (NSP) 375/500 MW Sale is included in the 2009/10 power resource plan. This contract would replace the existing contract with NSP, and does not require new infrastructure. The sale is nearly neutral with respect to dependable energy as a result of the terms which address periods when Manitoba Hydro is experiencing adverse water conditions.

The duration of the NSP sale is from May 1, 2015 through April 30, 2025. The Term Sheet, signed October 2006, includes a System Participation Sale for 375 MW ramping up to 500 MW in 2021 with new major hydro development in Manitoba. The sale also includes a 350 MW System Participation Diversity Sale for the seasonal exchange of energy.

### **Wisconsin Public Service (WPS) 500 MW Sale and Minnesota Power (MP) 250 MW Sale**

Manitoba Hydro signed term sheets for the sale of system participation power with Wisconsin Public Service (WPS), and with Minnesota Power (MP). Both term sheets are contingent on a new interconnection and 1800 MW of new hydro generation in Manitoba. Definitive agreements are being negotiated and are expected to be completed and submitted for Manitoba Hydro-Electric Board approval in 2010.

The duration of the WPS Sale is from June 1, 2018 through May 31, 2032. The Term Sheet, signed March 2008, is for a 500 MW System Participation Sale. The capacity of the sale ramps up from; 150 MW in 2018, to 300 MW in 2019, to 500 MW in 2020, ramps down to 250 MW in 2030, and terminates in 2032.

The duration of the firm portion of the MP Sale is from May 1, 2022 through April 30 2035. Non-firm energy is to be sold, as it is available, beginning May 1, 2008. The Term Sheet, signed December 2007, is for a 250 MW System Participation Sale (throughout 2022 to 2035).

The WPS and MP Term Sheets require the development of definitive agreements for Manitoba Hydro to import 500 MW and 250 MW, respectively.

Both term sheets are subject to:

- approval by the appropriate corporate, federal, provincial, and state authorities;
- approvals, permits and licenses for the required facilities; and
- in the case of the WPS Term Sheet, is conditional upon a change in a Renewable Portfolio Standard (RPS) definition in Wisconsin to recognize large hydro.

### **New Interconnection**

The WPS and MP Sales are contingent on having a new transmission interconnection with transfer capability of at least 750 MW north and 650 MW south (there is currently capability for 100 MW south). Detailed design of the line, including route location, voltage, and line capability

has not yet begun. The WPS and MP Term Sheets include the provisions for 500 MW and 250 MW of imports to Manitoba Hydro, respectively. A new transmission interconnection to the US would increase market access in perpetuity, well beyond the term of the sales agreements.

### **Conclusions**

New generation is required by 2022/23 to meet the demand of Manitoba domestic load.

The recommended development plan meets the demand of Manitoba domestic load and facilitates the strategic interest in the building of a new interconnection to Wisconsin and Minnesota in conjunction with long-term power sales to Wisconsin Public Service and Minnesota Power.

In recognition of the uncertainties associated with the recommended plan, an alternative long-term development plan is also provided.

# Tables 1a - 1b – Recommended Development Plan Supply - Demand Tables

Table 1a - Recommended Development Plan  
System Firm Energy Demand and Dependable Resources (GW.h)  
2009 Base Load Forecast

Fiscal Year	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	
<b>Power Resources</b>																			
<b>Manitoba Hydro Plants</b>																			
Existing	21110	21080	21080	21060	21040	21030	20920	20900	20880	20870	20850	20840	20830	20820	20820	20810	20660	20560	
Wuskwatim			550	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	
Conawapya (net addition)																		4650	
Keeyask (net addition)										1371	2900	2900	2900	2900	2900	2900	2900	2900	
Bipole III HVDC LINE									243	243	258	258	258	258	162	162	162	162	
<b>Manitoba Thermal Plants</b>																			
Brandon Unit 5 (Drought Operation)	811	811	811	811	811	811	811	811	811	811	953	953	953	953	953	953	953	953	
Selkirk	953	953	953	953	953	953	953	953	953	953	2354	2354	2354	2354	2354	2354	2354	2354	
Brandon Units 6-7 SCCT	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	
<b>New Thermal</b>																			
CCGT																			
CCGT																			
<b>Wind Power: 400 MW</b>																			
	320	818	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	
<b>Demand Side Management</b>																			
	244	440	606	719	819	842	798	825	890	949	993	1037	1082	1115	1151	1158	1133	1100	
<b>Major Rerunning (incremental to existing)</b>																			
Railway Rerunning																			
Pontiac du Bois Redeveloped																			
<b>Imports</b>																			
Total	2796	2796	2796	2796	2705	2705	2410	2414	2414	2797	3258	3846	3948	4652	4715	4715	4014	3876	
<b>TOTAL POWER RESOURCES</b>	<b>28588</b>	<b>29282</b>	<b>30404</b>	<b>31197</b>	<b>31186</b>	<b>31199</b>	<b>30750</b>	<b>30821</b>	<b>31198</b>	<b>33001</b>	<b>34220</b>	<b>34842</b>	<b>34979</b>	<b>37857</b>	<b>40259</b>	<b>40256</b>	<b>39280</b>	<b>39109</b>	
<b>Demand</b>																			
<b>2009 Base Load Forecast</b>	24239	24759	25323	25763	26177	26783	27137	27486	27808	28088	28452	28818	29186	29555	29927	30300	30681	31063	
Non-Committed Construction Power			10	30	55	90	100	120	125	100	80	80	100	90	30	5	0	0	
<b>Exports</b>																			
Total	3626	3404	3385	3259	3156	3156	1560	1352	1352	1926	2614	3494	3648	4992	5086	5086	3589	3589	
<b>Total Demand</b>	<b>27865</b>	<b>28163</b>	<b>28718</b>	<b>29052</b>	<b>29388</b>	<b>30029</b>	<b>28797</b>	<b>28967</b>	<b>29285</b>	<b>30114</b>	<b>31146</b>	<b>32392</b>	<b>32933</b>	<b>34637</b>	<b>35043</b>	<b>35391</b>	<b>34270</b>	<b>34652</b>	
<b>SURPLUS (w/ BPS)</b>	723	1099	1686	2145	1798	1171	1953	1854	1913	2888	3074	2450	2046	3220	5216	4865	5011	4457	
<b>EXPORTABLE SURPLUS</b>	288	288	875	1334	987	380	1142	1043	1102	2077	3074	2450	2046	3220	5216	4865	5011	4457	

Numbers are rounded to the nearest whole number

Table 1a - Recommended Development Plan  
**System Firm Energy Demand and Dependable Resources (GW.h)**  
 2009 Base Load Forecast

Fiscal Year	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41	2041/42	2042/43	2043/44	2044/45		
<b>Power Resources</b>																				
<b>Manitoba Hydro Plants</b>																				
Existing	20550	20540	20540	20530	20530	20520	20510	20510	20500	20490	20480	20480	20480	20470	20460	20460	20450	20440		
Waskewan	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250		
Conawapa (net addition)	4550	4550	4550	4550	4550	4550	4550	4550	4550	4550	4550	4550	4550	4550	4550	4550	4550	4550		
Keeyask (net addition)	2900	2900	2900	2900	2900	2900	2900	2900	2900	2900	2900	2900	2900	2900	2900	2900	2900	2900		
Bipole III HVDC LINE	162	162	162	162	162	162	162	162	162	162	162	162	162	162	162	162	162	162		
<b>Manitoba Thermal Plants</b>																				
Brandon Unit 5 (Drought Operation)	953	953	953	953	953	953	953	953	953	953	953	953	953	953	953	953	953	953		
Seikirk	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354		
Brandon Units 6-7 SCCT																				
<b>New Thermal</b>																				
CCGT																				
COGT																				
SCGT																				
<b>Wind Power: 400 MW</b>	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	
<b>Demand Side Management</b>	1066	1070	1046	1027	1009	990	970	949	925	901	877	855	855	855	855	855	855	855	855	
<b>Major Rerunning (incremental to existing)</b>																				
Keisey Rerunning	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	
Pointe du Bois Redeveloped																				
<b>Imports</b>	3876	3876	3876	3237	3109	2470	2342	2342	2342	2342	2342	2342	2342	2342	2342	2342	2342	2342	2342	
<b>TOTAL POWER RESOURCES</b>	<b>39065</b>	<b>39069</b>	<b>39035</b>	<b>38368</b>	<b>38221</b>	<b>37553</b>	<b>37395</b>	<b>37374</b>	<b>37340</b>	<b>37306</b>	<b>37282</b>	<b>37250</b>	<b>37250</b>	<b>37240</b>	<b>37230</b>	<b>37673</b>	<b>38106</b>	<b>38539</b>	<b>38539</b>	
<b>Demand</b>																				
<b>2009 Base Load Forecast</b>	31450	31838	32230	32622	33014	33405	33797	34189	34581	34973	35364	35756	36148	36540	36932	37323	37715	38107	38107	
Non-Committed Construction Power	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Exports</b>	3589	3589	3589	2633	2441	1485	1293	1293	239	145	145	145	145	145	145	145	145	145	145	145
<b>Total Demand</b>	<b>35039</b>	<b>35427</b>	<b>35819</b>	<b>35255</b>	<b>35455</b>	<b>34890</b>	<b>35090</b>	<b>35482</b>	<b>34820</b>	<b>35118</b>	<b>35509</b>	<b>35901</b>	<b>36293</b>	<b>36685</b>	<b>37077</b>	<b>37468</b>	<b>37860</b>	<b>38252</b>	<b>38252</b>	
<b>SURPLUS (w/ B#s)</b>	4027	3632	3216	3113	2766	2662	2305	1892	2521	2189	1772	1349	957	555	153	204	246	287	287	287
<b>EXPORTABLE SURPLUS</b>	4027	3632	3216	3113	2766	2662	2305	1892	2521	2189	1772	1349	957	555	153	204	246	287	287	287

numbers are rounded to the nearest whole number.

Table 1b - Recommended Development Plan  
**System Firm Capacity (Winter Peak) Demand and Resources (MW)**  
 2009 Base Load Forecast

Fiscal Year	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
<b>Power Resources</b>																		
<b>Manitoba Hydro Plants</b>																		
Existing	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900
Wuskwatim																		
Conawapa (net addition)																		
Keeyask (net addition)																		
Bipole III HVDC LINE								89	89	79	79	79	79	79	10	10	10	10
<b>Manitoba Thermal Plants</b>																		
Brandon Unit 5 (Drought Operation)	105	105	105	105	105	105	105	105	105	105	132	132	132	132	132	132	132	132
Selkirk	132	132	132	132	132	132	132	132	132	132	298	298	298	298	298	298	298	298
Brandon Units 6-7 SCCT	298	298	298	298	298	298	298	298	298	298	298	298	298	298	298	298	298	298
<b>New Thermal</b>																		
CCGT																		
SCGT																		
<b>Wind Power: 400 MW</b> (Wind has no dependable capacity for Winter Peak)																		
<b>Demand Side Management</b>																		
Major Rerunning (incremental to existing)																		
Keisey Rerunning																		
Pointe du Bois Redeveloped																		
<b>Imports</b>																		
Total	616	616	616	616	616	616	616	385	385	385	385	385	385	385	385	385	385	385
<b>TOTAL POWER RESOURCES</b>	6090	6150	6414	6487	6443	6447	6285	6333	6435	6537	6792	6982	6992	7520	7980	8244	7851	7839
<b>Demand</b>																		
<b>2009 Base Load Forecast</b>	4363	4437	4530	4601	4664	4765	4820	4876	4924	4973	5038	5103	5168	5233	5299	5365	5432	5500
Non-Committed Construction Power																		
<b>Exports</b>																		
Total	693	638	638	605	605	605	413	413	413	578	743	963	963	1375	1375	1375	825	825
<b>Total Demand</b>	5056	5075	5168	5206	5269	5370	5232	5288	5336	5551	5780	6065	6130	6608	6674	6740	6257	6325
Reserve	445	448	454	459	472	483	510	516	520	524	531	538	544	551	558	565	572	630
<b>TOTAL PEAK DEMAND</b>	5501	5522	5622	5665	5741	5853	5742	5804	5856	6075	6311	6603	6674	7159	7232	7305	6878	6955
<b>SURPLUS (W/B#5)</b>	589	627	792	823	702	594	543	528	579	462	481	379	318	361	748	938	973	884
<b>EXPORTABLE SURPLUS</b>	484	522	687	718	597	489	438	423	474	357	481	379	318	361	748	938	973	884

numbers are rounded to the nearest whole number

Table 1b - Recommended Development Plan  
**System Firm Capacity (Winter Peak) Demand and Resources (MW)**  
 2009 Base Load Forecast

Fiscal Year	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41	2041/42	2042/43	2043/44	2044/45
<b>Power Resources</b>																		
<b>Manitoba Hydro Plants</b>																		
Wisking	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900
Muskwaam	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
Conawapa (net addition)	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300
Keeyask (net addition)	630	630	630	630	630	630	630	630	630	630	630	630	630	630	630	630	630	630
Bipole III HVDC LINE	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
<b>Manitoba Thermal Plants</b>																		
Brown Unit 5 (Drought Operation)	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132
Saskik	298	298	298	298	298	298	298	298	298	298	298	298	298	298	298	298	298	298
Brandon Units 6-7 SCCT																		
<b>New Thermal</b>																		
CCGT																		
SCGT																		
<b>Wind Power: 400 MW</b> (Wind has no dependable capacity for Winter Peak)																		
<b>Demand Side Management</b>	235	236	230	226	224	221	217	212	208	203	198	194	194	194	194	194	194	194
<b>Major Renumbering</b> (incremental to existing)	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77
Kelsey Renumbering	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Pointe du Bois Redeveloped																		
<b>Imports</b>																		
Total	7825	7828	7820	7816	7814	7811	7807	7802	7798	7793	7788	7784	7784	7784	7784	7837	7890	7943
<b>TOTAL POWER RESOURCES</b>																		
<b>Demand</b>	5568	5637	5706	5776	5845	5914	5984	6053	6123	6192	6261	6331	6400	6469	6539	6608	6677	6747
<b>2009 Base Load Forecast</b>																		
Non-Committed Construction Power																		
<b>Exports</b>	825	825	825	825	825	825	825	825	825	825	825	825	825	825	825	825	825	825
Total	6393	6462	6531	6601	6670	6740	6810	6880	6950	7020	7090	7160	7230	7300	7370	7440	7510	7580
<b>Total Demand</b>	6400	6462	6531	6601	6670	6740	6810	6880	6950	7020	7090	7160	7230	7300	7370	7440	7510	7580
Reserve	840	840	840	840	840	840	840	840	840	840	840	840	840	840	840	840	840	840
<b>TOTAL PEAK DEMAND</b>	7033	7110	7189	7268	7347	7426	7505	7584	7663	7742	7821	7900	7979	8058	8137	8216	8295	8374
<b>SURPLUS (W/R#5)</b>	791	715	631	547	463	379	295	211	127	43	-41	-125	-209	-293	-377	-461	-545	-629
<b>EXPORTABLE SURPLUS</b>	791	715	631	547	463	379	295	211	127	43	-41	-125	-209	-293	-377	-461	-545	-629

Numbers are rounded to the nearest whole number

## Tables 2a - 2b – Alternative Development Plan Supply - Demand Tables

Table 2a - Alternative Development Plan  
System Firm Energy Demand and Dependable Resources (GW.h)  
2009 Base Load Forecast

Fiscal Year	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	
<b>Power Resources</b>																			
<b>Manitoba Hydro Plants</b>																			
Existing	21110	21090	21080	21060	21040	21030	20920	20900	20880	20870	20850	20840	20830	20820	20820	20810	20560	20560	
Wuskwatim																		1250	1250
Conawapa (net addition)																		4550	4550
Keeyask (net addition)																			
Bipole III HVDC LINE									243	243	243	243	243	228	228	228	228	228	228
<b>Manitoba Thermal Plants</b>																			
Brandon Unit 5 (Drought Operation)	811	811	811	811	811	811	811	811	811	811	811	811	811	811	811	811	811	811	811
Selkirk	953	953	953	953	953	953	953	953	953	953	953	953	953	953	953	953	953	953	953
Brandon Units 6-7 SCCT	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354	2354
<b>New Thermal</b>																			
CCGT																			
SCGT																			
<b>Wind Power: 400 MW</b>	320	818	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254
<b>Demand Side Management</b>	244	440	606	719	819	842	798	825	890	949	993	1037	1082	1115	1151	1158	1133	1100	1100
<b>Major Rerunning (incremental to existing)</b>																			
Kelsey Rerunning								60	150	150	150	150	150	150	150	150	150	150	150
Pointe du Bois Redeveloped																			
<b>Imports</b>	2796	2796	2796	2796	2705	2705	2410	2414	2414	2414	2414	2414	2414	2414	2414	2414	2414	2414	2414
<b>Total</b>	28588	29262	30404	31197	31186	31199	30750	30821	31198	31247	30461	30494	32680	35088	35124	35122	34145	33974	33974
<b>TOTAL POWER RESOURCES</b>																			
<b>Demand</b>																			
<b>2009 Base Load Forecast</b>	24239	24759	25323	25763	26177	26783	27137	27495	27808	28088	28462	28818	29185	29555	29927	30300	30681	31063	31063
Non-Committed Construction Power			10	20	40	45	55	60	60	55	80	100	90	30	5				
<b>Exports</b>																			
Total	3626	3404	3385	3259	3156	3156	1560	1352	1352	1352	1352	1352	1642	1642	1642	1642	145	145	145
<b>Total Demand</b>	27865	28163	28718	29042	29373	29984	28752	28807	29220	29495	29884	30270	30917	31227	31574	31942	30828	31208	31208
<b>(SURPLUS (+) / DEF)</b>	723	1099	1686	2155	1813	1216	1998	1914	1978	1752	577	224	1763	3860	3550	3179	3320	3320	2768
<b>EXPORTABLE SURPLUS</b>	288	288	875	1344	1002	405	1187	1103	1167	941	577	224	1763	3860	3550	3179	3320	3320	2768

Numbers are rounded to the nearest whole number



Table 2a - Alternative Development Plan  
**System Firm Energy Demand and Dependable Resources (GW.h)**  
 2009 Base Load Forecast

Fiscal Year	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41	2041/42	2042/43	2043/44	2044/45
<b>Power Resources</b>																		
<b>Manitoba Existing Plants</b>	20550 1250 4550	20540 1250 4550	20540 1250 4550	20530 1250 4550	20530 1250 4550	20530 1250 4550	20510 1250 4550	20510 1250 4550	20500 1250 4550	20490 1250 4550	20480 1250 4550	20480 1250 4550	20480 1250 4550	20470 1250 4550	20460 1250 4550	20460 1250 4550	20450 1250 4550	20440 1250 4550
Manitoba Existing Wuskwamim Conawapa (net addition) Keeyask (net addition)	228	228	228	228	228	228	228	228	228	228	228	228	228	228	228	228	228	228
<b>Manitoba Thermal Plants</b>	953 2354	953 2354	953 2354	953 2354	953 2354	953 2354	953 2354	953 2354	953 2354	953 2354	953 2354	953 2354	953 2354	953 2354	953 2354	953 2354	953 2354	953 2354
Brandon Unit 5 (Drought Operation) Selkirk Brandon Units 6-7 SCCT																		
<b>New Thermal</b>																		
CCGT SCGT																		
<b>Wind Power: 400 MW</b>	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254	1254
<b>Demand Side Management</b>	1066	1070	1046	1027	1009	990	970	949	925	901	877	855	855	855	855	855	855	855
<b>Major Rerunning (incremental to existing)</b>	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Kelsey Rerunning Pointe du Bois Redeveloped																		
<b>Imports</b>	1575	1575	1575	1575	1575	1575	1575	1575	1575	1575	1575	1575	1575	1575	1575	1575	1575	1575
<b>TOTAL POWER RESOURCES</b>	<b>33930</b>	<b>33924</b>	<b>33900</b>	<b>33872</b>	<b>33853</b>	<b>33824</b>	<b>33752</b>	<b>33611</b>	<b>33478</b>	<b>33343</b>	<b>33219</b>	<b>33097</b>	<b>32987</b>	<b>32877</b>	<b>32767</b>	<b>32657</b>	<b>32547</b>	<b>32437</b>
<b>Demand</b>	31450	31638	32230	32622	33014	33405	33797	34189	34581	34973	35364	35756	36148	36540	36932	37323	37715	38107
<b>2009 Base Load Forecast</b> Non-Committed Construction Power																		
<b>Exports</b>	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145
<b>Total Demand</b>	<b>31595</b>	<b>31983</b>	<b>32375</b>	<b>32767</b>	<b>33159</b>	<b>33550</b>	<b>33942</b>	<b>34334</b>	<b>34726</b>	<b>35118</b>	<b>35509</b>	<b>35901</b>	<b>36293</b>	<b>36685</b>	<b>37077</b>	<b>37468</b>	<b>37860</b>	<b>38252</b>
<b>SURPLUS (W/ BMS)</b>	2336	1941	1525	1105	695	273	3590	3177	2752	2326	1909	1486	1094	692	290	342	383	424
<b>EXPORTABLE SURPLUS</b>	2336	1941	1525	1105	695	273	3590	3177	2752	2326	1909	1486	1094	692	290	342	383	424

numbers are rounded to the nearest whole number

Table 2b - Alternative Development Plan  
**System Firm Capacity (Winter Peak) Demand and Resources (MW)**  
 2009 Base Load Forecast

Fiscal Year	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
<b>Power Resources</b>																		
<b>Manitoba Hydro Plants</b>	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900
Existing																		
Wuskwatim																		
Conawapa (net addition)																		
Keeyask (net addition)																		
Bipole III HVDC LINE																		
<b>Manitoba Thermal Plants</b>	105	105	105	105	105	105	105	105	105	105	132	132	132	132	132	132	132	132
Brandon Unit 5 (Drought Operation)																		
Selkirk																		
Brandon Units 6-7 SCCT																		
<b>New Thermal</b>	298	298	298	298	298	298	298	298	298	298	298	298	298	298	298	298	298	298
CCGT																		
SCGT																		
<b>Wind Power: 400 MW</b> (Wind has no dependable capacity for Winter Peak)	39	88	129	159	181	185	188	193	206	218	228	238	247	256	265	269	261	249
<b>Demand Side Management</b>																		
Major Rerunning (incremental to existing)																		
Keissey Rerunning																		
Poinie du Bois Redeveloped																		
<b>Imports</b>	616	616	616	616	550	550	385	385	385	385	385	385	385	385	385	385	385	385
<b>TOTAL POWER RESOURCES</b>	6090	6150	6414	6487	6443	6447	6285	6333	6435	6447	6352	6362	6891	7379	7647	7651	7259	7247
<b>Demand</b>																		
<b>2009 Base Load Forecast</b>	4363	4437	4530	4601	4664	4765	4820	4876	4924	4973	5038	5103	5168	5233	5299	5365	5432	5500
Non-Committed Construction Power																		
<b>Exports</b>	693	638	638	605	605	605	413	413	413	413	413	413	550	550	550	550	550	5500
<b>Total Demand</b>	5056	5075	5168	5206	5269	5370	5232	5288	5336	5386	5450	5515	5718	5783	5849	5915	5432	5500
<b>Reserve</b>	445	448	454	459	472	483	510	516	520	524	531	538	544	551	558	565	572	580
<b>TOTAL PEAK DEMAND</b>	5501	5522	5822	5665	5741	5853	5742	5804	5856	5910	5981	6053	6282	6384	6407	6480	6053	6130
<b>SURPLUS (w/ B&amp;S)</b>	589	627	792	823	702	594	543	528	579	537	371	309	630	1045	1241	1171	1206	1117
<b>EXPORTABLE SURPLUS</b>	484	522	687	718	597	489	438	423	474	432	371	309	630	1045	1241	1171	1206	1117

numbers are rounded to the nearest whole number

Table 2b - Alternative Development Plan  
**System Firm Capacity (Winter Peak) Demand and Resources (MW)**  
 2009 Base Load Forecast

Fiscal Year	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36	2036/37	2037/38	2038/39	2039/40	2040/41	2041/42	2042/43	2043/44	2044/45
<b>Power Resources</b>																		
<b>Manitoba Hydro Plants</b>																		
Existing	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900	4900
Wuskwam	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
Conawapa (net addition)	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300
Keeyask (net addition)																		
Bipole III HVDC LINE	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
<b>Manitoba Thermal Plants</b>																		
Brandon Unit 5 (Drought Operation)	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132	132
Selkirk	298	298	298	298	298	298	298	298	298	298	298	298	298	298	298	298	298	298
Brandon Units 6-7 SCCT																		
<b>New Thermal</b>																		
CCGT																		
SCGT																		
<b>Wind Power: 400 MW</b> (Wind has no dependable capacity for Winter Peak)																		
<b>Demand Side Management</b>																		
Major Rerunning (incremental to existing)	235	236	230	226	224	221	217	212	208	203	198	194	194	194	194	194	194	194
Keisley Rerunning	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77	77
Poinie du Bois Redeveloped	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Imports																		
Total	7233	7234	7228	7224	7222	7219	7641	7636	7631	7626	7622	7618	7618	7618	7618	7618	7724	7777
<b>TOTAL POWER RESOURCES</b>	7233	7234	7228	7224	7222	7219	7641	7636	7631	7626	7622	7618	7618	7618	7618	7618	7724	7777
<b>Demand</b>																		
2009 Base Load Forecast	5568	5637	5706	5776	5845	5914	5984	6053	6123	6192	6261	6331	6400	6469	6539	6608	6677	6747
Non-Committed Construction Power																		
Exports																		
Total																		
<b>Total Demand</b>	5568	5637	5706	5776	5845	5914	5984	6053	6123	6192	6261	6331	6400	6469	6539	6608	6677	6747
Reserve	640	648	657	666	675	683	692	701	710	719	728	736	745	753	761	770	778	786
<b>TOTAL PEAK DEMAND</b>	6208	6285	6364	6442	6520	6598	6676	6754	6832	6911	6989	7067	7145	7222	7300	7378	7455	7533
<b>SURPLUS (w/ B#5)</b>	1024	948	864	783	702	621	365	882	799	716	633	551	473	396	318	293	269	244
<b>EXPORTABLE SURPLUS</b>	1024	948	864	783	702	621	365	882	799	716	633	551	473	396	318	293	269	244

Numbers are rounded to the nearest whole number.

**Table 3**  
**Existing System Capacity and Energy Availability**  
**Reflected in Supply - Demand Tables**

<b>Source of Energy</b>	<b>Winter Peak Capacity (MW)</b>	<b>Dependable Energy (GW.h)</b>	<b>Average Energy (GW.h)</b>
Hydro Total	4900	21110	29250
Thermal Total	535	4118	205
Wind Total	0	320	375
<b>System Total</b>	<b>5435</b>	<b>25548</b>	<b>29830</b>

**Table 4**  
**Potential New Resources**

<b>Project</b>	<b>Winter Peak Capacity (MW)</b>	<b>Dependable Energy (GW.h)</b>	<b>Average Energy (GW.h)</b>	<b>Earliest ISD</b>
<b>New additions in Recommended Plan:</b>				
Wuskwatim	200	1250	1520	2011/12
Keeyask	695	2900	4430	2018/19
Conawapa	1485	4550	7000	2021/22
Pointe du Bois rebuilt	120	620	805	2016/17
Kelsey Rerunning	77	0	350	2012/13
<b>Churchill River Diversion Stations:</b>				
Notigi	100	625	750	>2030
First Rapids	225	1400	1600	>2030
Manasan	200	1250	1400	>2030
<b>Lower Nelson River Stations:</b>				
Birthday	460	1900	2600	>2030
Gillam Island	820	3500	5040	>2030
<b>Upper Nelson River Stations:</b>				
White Mud	300	1450	2000	>2030
Red Rock	250	1700	2250	>2030
<b>Upper Churchill River Stations:</b>				
Bonald	120	400	650	>2030
Granville Falls	125	410	670	>2030