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6 The Window of Opportunity

6.0 Chapter Overview

This chapter describes the blending of the needs and perspectives of Manitoba Hydro's major export customers, the region with respect to wind integration, and Manitoba Hydro's own requirements. The combination of these needs and perspectives provide a window of opportunity for Manitoba Hydro to optimize the development of large new hydro resources, to serve Manitoba load, through the development of a new transmission interconnection.

The development of a new interconnection and the securing of long-term sales of surplus capacity and energy are vital strategies to manage both the surplus energy that arises as a result of large-scale hydro development and the inevitable variations in energy production resulting from changes in water flow conditions. The Preferred Development Plan along with other development plans that include a new interconnection and new long-term sales take advantage of this window of opportunity.

6.1 The Window of Opportunity – The Blending of the Perspectives

The information contained in this section is based on Manitoba Hydro's understanding of the interests and perspectives of its U.S. counterparties. The views contained herein are those of Manitoba Hydro, except where referenced to a specific source.

6.1.1 U.S. Customers Interested in New Manitoba Hydro Resources

Three U.S. customers—Northern States Power (NSP), Minnesota Power (MP) and Wisconsin Public Service Corporation (WPS)—have expressed an interest in negotiating long-term agreements with Manitoba Hydro for the purchase of power from the proposed Keeyask and Conawapa Generating Stations (G.S.).

Manitoba Hydro's understanding of the interest of these three U.S. customers in Manitoba Hydro's hydraulic resources stems from the perspectives of each as outlined in Section 6.2 below. Each customer has identified a need for new resources beginning in the 2016-2018 time frame, driven by a combination of gradual load growth and the expected retirement of older, smaller coal units. Some parties have an expectation that additional environmental costs on coal units will be incurred in the future. In addition, consideration of a diversified generation portfolio may encourage parties to avoid becoming heavily dependent upon natural gas generation. Renewable hydropower offers Manitoba Hydro export customers an opportunity to diversify their supply portfolio, to reduce their exposure to gas price volatility, and to reduce their exposure to potential environmental costs including future carbon pricing.

Purchasing power from Manitoba Hydro's future proposed hydraulic generating facilities provides U.S. customers an opportunity to reduce risk exposure and to help address their concerns with respect to pending regulation and legislation on emissions associated with fossil-fuel generating facilities, price stability and portfolio diversification.

6.1.2 Optimizing New Hydro Resources with a New Interconnection

Given the long lead time for the construction of hydro resources, the time is imminent when a decision is required on whether to commit to new hydro resources to serve Manitoba domestic requirements in the 2022-2023 time period. As noted below in Section 6.4, from Manitoba Hydro's perspective, the economics of the potential development of additional hydro resources in Manitoba can be optimized with an accompanying development of a new transmission interconnection, preferably into the Midcontinent Independent System Operator, Inc.(MISO) market.

The development of a new interconnection and ensuring long-term sales of surplus capacity and energy constitute vital strategies to manage the surplus energy that arises as a result of large-scale hydro development, as well to manage the inevitable variations in energy exports resulting from changes in water flow conditions:

- The proposed new export sales provide Manitoba Hydro with financially attractive fixed prices for the contracted capacity and energy volumes. Fixed prices reduce Manitoba Hydro's exposure to uncertain future market prices for power surplus beyond immediate needs. Thus the sales can provide predictable and stable revenue that will reduce the costs to be borne by domestic customers.
- The addition of large export sales to MP and WPS (still under negotiation) as part of the Preferred Development Plan helps expand Manitoba Hydro's long-term export portfolio and diversify its credit exposure. Historically, the Wisconsin market has experienced prices slightly higher than Minnesota due to transmission limitations. Expanded transmission access into Wisconsin broadens Manitoba Hydro's market access.
- As explained in ***Chapter 5 – The Manitoba Hydro System, Interconnections and Export Markets***, Section 5.2.3, several types of reliability benefits are also provided by interconnections. The larger interconnection associated with a number of the development plans can provide increased reliability benefits, particularly from the importation of energy during extreme supply-loss events, as well as economic benefits from increased access to imports during droughts.
- Five of the development plans include a 500 kilovolt (kV) transmission interconnection with the capability to export and import up to 750 megawatts (MW) of power. Such a 500 kV interconnection will have sufficient capacity to accommodate surplus energy from both Keeyask and Conawapa generation. A smaller 230 kV transmission line will deliver 250 MW of power to MP pursuant to the 250 MW MP power sales agreement, but its smaller capacity will limit delivery of surplus energy to market. Insufficient export capability on Manitoba Hydro interconnections would constrain the output from Conawapa G.S., potentially resulting in lost opportunity sales when there is insufficient energy storage available.

- A new 500 kV interconnection would facilitate the advancement of the Conawapa G.S. and would allow Conawapa to serve export customers prior to being required for Manitoba domestic load. A new interconnection is a prerequisite for expanding Manitoba Hydro's opportunities in the future to export surplus power and it is the purchase of surplus firm power by export customers that will provide the incentive to build a new interconnection.

6.1.3 U.S. Interest and Motivation to Develop New Transmission Interconnection

Development plans which include the development of a new transmission interconnection are contingent on there being significant interest from U.S. parties to construct the facility. In 2011, the Minnesota Public Utilities Commission (MPUC) approved the 250 MW MP long-term power purchase agreement with Manitoba Hydro which would allow MP to reduce its reliance on coal generation and replace that source with renewable hydropower. This agreement requires that a new transmission interconnection to Manitoba be constructed and is still subject to other regulatory approvals in the U.S. and Canada.

MP has committed to champion the new transmission interconnection through its service territory which is a critical component of a new build. Furthermore, to expedite the development of critical regional transmission, an initiative of the U.S. Secretary of Energy, the U.S. Rapid Transmission Response Team, has been granted federal support and has identified Manitoba to Minnesota transmission as a priority project in U.S. federal regulatory processes.

Thus Manitoba Hydro, working with its export customers, currently has the valuable opportunity to optimize the development of the interconnection to meet its customer, regional and Manitoba needs and this is reflected in Manitoba Hydro's Preferred Development Plan and a number of alternative plans which include either a 230 kV or 500 kV transmission interconnection.

6.1.4 Timing is Important

The current interest in the U.S. to build a new transmission interconnection with Manitoba Hydro forms a window of opportunity that may not exist in the future. Two of the major factors currently driving current transmission construction activity are transient:

- State Renewable Portfolio Standards (RPS) requirements
- transmission rate-of-return incentives to resolve reliability and congestion issues.

Either RPS or transmission rate-of-return incentives may have less influence in the future.

Circumstances Related to Renewables May Change

The regional transmission planning process under MISO, the MISO Transmission Expansion Plan (MTEP), has identified needs for new transmission based on public policy requirements established by state and/or federal laws or regulations. The primary goal of the MTEP is to develop a comprehensive plan that meets not only the technical reliability and economic needs of the region but also incorporates public policy requirements established by state or federal laws or regulations.

Within MISO, stakeholders are currently subject to a number of energy and environmental policies and incentives including RPS, production tax credits, and regulations for greenhouse gas emissions and air pollutants, as discussed in ***Chapter 3 – Trends and Factors Influencing North American Electricity Supply***.

Over the next several years, Manitoba Hydro anticipates that there will be generation and transmission investment driven by RPS requirements. Manitoba Hydro currently has an opportunity to build new transmission as part of a regional plan that includes infrastructure to meet RPS requirements or assist with regional wind integration. It is unclear how long this opportunity may last. Once sufficient transmission is built to meet current RPS needs, it may become more difficult to justify or find support for additional transmission.

Transmission Incentives May Fade

Decades of under-investment in transmission has mobilized many players—from individual companies and regional transmission operators to U.S. federal agencies—to be more proactive in planning and facilitating new transmission construction. The U.S. *Energy Policy Act* of 2005 and subsequent U.S. Federal Energy Regulatory Commission (FERC) Order No. 679 established incentive-based rate treatments for investment in electric transmission infrastructure for the purpose of benefiting consumers by ensuring reliability and reducing the cost of delivered power by reducing transmission congestion. Since issuing Order 679 in 2006, FERC estimates that it has evaluated more than 85 applications representing over $60 billion USD in potential transmission investment[1].

The incentive-based rate treatments for U.S. investment in electric transmission infrastructure can include an incentive return-on-equity based on a project's risks and challenges. Such transmission incentives were expected to have a positive impact on U.S. consumer electricity rates and service; considering that the economic benefits of improved reliability, reduced congestion and access to a more diverse supply of generation far outweighed the cost of incentives. Thereafter, FERC provided additional guidance and clarity on transmission incentives through a November 2012 policy statement.[2] Manitoba Hydro remains concerned that reduced transmission incentives for investor-owned utilities in the U.S. could make utilities less likely to attempt to develop new transmission.

Early commitment and regulatory approval of a new Manitoba to Minnesota transmission interconnection would help reduce the risk that in the future the project would not be eligible for U.S. transmission development incentives.

[1] FERC Policy Statement "Promoting Transmission Investment Through Pricing Reform" issued November 15, 2012 in Docket No. RM11-26-000

[2] FERC Policy Statement "Promoting Transmission Investment Through Pricing Reform" issued November 15, 2012 in Docket No. RM11-26-000

6.2 Manitoba Hydro's Major Export Customers' Perspective

Manitoba Hydro's long-term export customers are facing a number of challenges as they review their resource planning decisions. Key issues that Manitoba Hydro's customers in Minnesota and Wisconsin are facing over the next decade are described here.

6.2.1 Expectation of Gradual Load Growth

As noted in ***Chapter 3 – Trends and Factors Influencing North American Electricity Supply***, Section 3.2, MISO has estimated a compound annual load-growth rate of 0.95% over the next 10 years in its 2012 Transmission Expansion Plan. A gradual regional load growth expectation is generally consistent with the expectations of Manitoba Hydro's major export customers.

Minnesota Power

On March 1, 2013, MP filed its 2013 Resource Plan with the MPUC. In its filing, MP outlined its load growth expectations:

> "In the longer term, energy sales are expected to generally track previous forecasts, growing at an annual growth rate of 0.6% in the forecast period (2012-2026). Minnesota Power expects to continue to be a winter-peaking utility, and anticipates that seasonal peaks will grow at 0.6% per year in the forecast horizon. Historical (2004-2011) average annual rates of growth in energy sales and peak demand averaged 0.9% and 0.5% respectively."[3]

Northern States Power

Northern States Power—a Minnesota corporation, which is one of Xcel Energy's four regulated operating companies—filed its 2010 Resource Plan with the MPUC on August 2, 2010; on

[3] Minnesota Power's 2012 Annual Electric Utility Report, page 41, filed as Appendix A of Minnesota Power's 2013 Resource Plan.

December 1, 2011 NSP filed a Resource Plan Update[4]. The 2011 update outlined NSP's load growth expectations:

> "We now expect 0.7% annual demand growth and 0.5% annual energy growth over the Resource Plan horizon, down from 1.1% and 0.9%, respectively, included in our initial filing. The magnitude of the reduced forecast is such that it prompts us to reconsider some components of our Five Year Action Plan. Thus, this update presents our new sales forecast and provides the Commission with recommendations on some revisions to our plans going forward."[5]

State of Wisconsin

Individual electrical utilities in the state of Wisconsin do not file individual resource plans. Instead, individual utilities file specified information with their regulator, the Public Service Commission of Wisconsin, which is compiled into an annual Strategic Energy Assessment (SEA). The SEA is required by Wisconsin law to assess whether sufficient electric capacity and energy will be available to the public at a reasonable price. Regarding load growth in the state, the 2012 SEA for Wisconsin found that:

> "After an increase of almost 2.5 percent from 2010 to 2011, which appears to largely be the result of a hotter-than-normal summer in 2011, utilities estimate increases in non-coincident peaks to be between approximately 0.5 and 1.3 percent. Non-coincident peak refers to the sum of two or more peak loads on a system that do not occur in the same time interval. Peak demand is much more responsive to weather than total energy use is, and it is not clear at this time that the recession will have the same percentage impact on peak demand that it has on total energy sales. In the last SEA, docket 5-ES-105, Wisconsin utilities

[4] NSP has not yet filed a 2013 Resource Plan as of August 2013.

[5] Xcel Energy, RESOURCE PLAN UPDATE DOCKET NO. E002/RP-10-825, dated December 1, 2011, page 6.

> forecasted approximately 1% growth per year through 2016. The current SEA shows similar forecasts for peak demand growth."[6]

6.2.2 Expected Retirements of Older, Smaller Coal Units

As noted in ***Chapter 5 – The Manitoba Hydro System, Interconnections and Export Markets***, a number of the older coal units in the MISO market footprint tend to be smaller, less efficient, have fewer existing emissions controls and are at risk of having to be retired. The expected coal closures of Manitoba Hydro's major export customers are outlined below.

Minnesota Power

The 2013 Resource Plan filing with the MPUC outlined MP's expectations regarding coal unit retirements:

> "Minnesota Power's small coal unit plan aligns well with the Company's vision of achieving an energy mix of one-third renewable resources, one-third natural gas/other and one-third coal in the long-term. Minnesota Power has determined that 185 MW of coal generation from its small coal-fired facilities is not cost effective to retrofit with environmental controls. Instead, Minnesota Power plans to cease coal energy conversion at the 75 MW Taconite Harbor Energy Center 3 and refuel the 110 MW Laskin Energy Center with natural gas in 2015."[7]

Northern States Power

NSP 2011 Resource Plan Update filing with the MPUC outlined NSP's coal retirement expectations. NSP is proposing to retire two coal-burning units (Units 3 and 4, total capacity of 253 MW) at the Black Dog G.S. Units 1 and 2 at this plant were previously converted to natural gas combined-cycle operation in 2002.

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[6] PUBLIC SERVICE COMMISSION OF WISCONSIN DRAFT STRATEGIC ENERGY ASSESSMENT ENERGY 2018, dated JUNE 2012, DOCKET 5-ES-106, page 9.
[7] Minnesota Power 2013 Resource Plan, dated March 1, 2013, page 9.

> "Constructed in 1955 and 1960, respectively, Black Dog Units 3 and 4 are both coal fired units. We evaluated the costs of retrofitting these units to comply with the Utility MACT rule and other pending Environmental Protection Agency (EPA) regulations such as Cross-State Air Pollution Rule (CSAPR). Based on our analysis, including an assessment of the compliance costs and the units' age, we concluded it would not be in our customers' best interests to continue operating these units using coal."[8]

State of Wisconsin

The 2012 SEA for Wisconsin included a survey of expected coal unit retirements in Wisconsin. In total, 90 MW of coal generation at the Blount Street G.S. in Madison, Wisconsin are expected to close as indicated in Table 6.1

Table 6.1. EXPECTED WISCONSIN COAL UNIT RETIREMENTS[9]

Table A-3: Retired Utility-Owned or Leased Generation Capacity: 2012-2018

Year	Type of Load Served	Capacity (MW)*	Name	Owner/ Leaser	Fuel	Location (County: Locality)
2013	Peaking	28.5	Blount Street 5	MG&E	Gas, Coal	Madison
2013	Peaking	22.4	Blount Street 4	MG&E	Gas, Coal	Madison
2013	Peaking	39.2	Blount Street 3	MG&E	Gas, Coal	Madison

*Capacity listed is the summer net-accredited capacity

6.2.3 Expectation of Additional Costs due to Environmental Requirements

As indicated in ***Chapter 3 – Trends and Factors Influencing North American Electricity Supply***, Section 3.3, environmental considerations, requirements and policies are another major factor influencing customer resource choices and the market price for electricity. A primary concern facing U.S. customers with existing and future fossil-fueled generating facilities is the uncertainty in the financial costs that will be required to:

[8] Xcel Energy, RESOURCE PLAN UPDATE DOCKET NO. E002/RP-10-825, dated December 1, 2011, page 42.
[9] PUBLIC SERVICE COMMISSION OF WISCONSIN DRAFT STRATEGIC ENERGY ASSESSMENT ENERGY 2018, dated JUNE 2012, DOCKET 5-ES-106, Appendix A, page 2.

- install emission-reduction technologies in order to comply with pending and future state/federal regulations and legislation
- deal with potential carbon pricing.

In addition to potential federal carbon legislation, the regulations that are identified below from the U.S. Environmental Protection Agency (EPA) are creating short-term capital requirements and risk concerns for U.S. customers. In order to hedge the cost and risk associated with future legislation and current emission regulations, U.S. customers are looking to purchase power from Manitoba Hydro's renewable and virtually non-emitting hydraulic generating resources.

Emission regulations pending from the U.S. EPA are expected to have significant cost implications for fossil-fuel generating facilities. In particular, the implications for coal-generating facilities will be more severe than those for natural gas-fired generating facilities, which have negligible mercury, sulfur dioxide and nitrogen-oxide emissions and significantly lower carbon-dioxide emissions. These regulations are as follows:

- Carbon Pollution Standard for New Power Plants – will restrict emissions from new thermal fuel-powered generating facilities to 1,000 pounds of carbon dioxide (CO_2) per megawatt-hour (MWh), roughly half of the typical CO_2 output of a coal-fired generating facility. In order to comply with this regulation, new coal-fired generating facilities will have to invest in expensive carbon capture and storage facilities, making new coal-generating facilities uncompetitive compared to natural gas and/or renewable generating alternatives.
- Mercury & Air Toxics Standards (MATS)–expected to reduce the mercury emissions from coal-fired generating facilities by up to 90% through the installation of environmental control equipment. The cost of investing in environmental control equipment is uneconomic for small coal-generating facilities that are nearing the end of their useful

lives; and the regulation will therefore encourage investment in new generating facilities.

- CSAPR–expected to reduce sulfur dioxide emissions by 73% and nitrogen oxide emissions by 54% from 2005 levels. The regulation is currently stayed by the U.S. Court of Appeals. A replacement regulation may be reissued in 2015. Similar to MATS, it is expected that this regulation will require investment in environmental control equipment that is uneconomic for small coal-generating facilities, and will instead encourage investment in new generating facilities.

Minnesota Power

From 2005-2012, MP invested $350 million USD to reduce emissions, with most of that spent at the 365 MW Boswell Unit 3. Minnesota's Mercury Emissions Reduction Act was a key driver of the Boswell Unit 3 work. MP expects to spend a further $350-400 million USD over the next several years to reduce mercury and other emissions on Boswell Unit 4, which is 80% owned by MP. MP acknowledges that the EPA's issuance of the MATS Rule for mercury reduction in December of 2011 was a key factor in the timing of the upcoming Boswell Unit 4 retrofit[10].

MP is heavily dependent upon coal-fired generation, and has identified coal emissions reductions as one of its two key planning issues:

> "Minnesota Power faces two key long-term planning questions in this fifteen-year planning period. First, what environmental compliance strategies will be utilized to keep its coal-fired generation in compliance with the recently finalized MATS regulations, and second, how will it position and augment its power supply to meet the load growth potential that is emerging in its service territory."[11]

[10] Minnesota Power June 6, 2013 Press Release *"Plan to significantly reduce mercury emissions at Minnesota Power's largest generating station moves forward"*

[11] Minnesota Power 2013 Resource Plan, dated March 1, 2013, page 33.

MP is focused on reducing its exposure to coal emissions issues, including carbon emissions, by reducing its high reliance on coal-fired generation. MP indicates that its 2013 Resource Plan does the following:

> "Cost effectively serves increasing customer load requirements while reducing carbon intensity per unit of energy delivered through an optimum mix of effective customer conservation programs, reduced reliance on coal, generating facility efficiency improvements, added development and acquisition of innovative renewable energy sources from wind, water and wood and the addition of natural gas in the long-term. Minnesota Power will reduce carbon emissions by about 30 percent on its system in 2015 while serving about 20 percent more load, exceeding the 2015 state goal for carbon reduction by 15 percent."[12]

Currently MP has significant exposure to carbon pricing. In its 2013 Resource Plan, MP optimized its expansion plans with a base scenario assuming low levels of carbon pricing ($2.50/tonne (USD) in 2013 to $3.50/tonne (USD) in 2027) and a carbon-regulation scenario assuming moderate levels of carbon pricing ($21.50 /tonne (USD) starting in 2017). MP indicates:

> "The expansion plan for the Preferred Plan also highlights the extreme difference in power supply costs that a carbon regulation penalty future could bring to customers. Over $1 billion dollars in cost is added to customers' power supply costs with essentially the same recommended power supply generation additions."[13]

[12] Minnesota Power 2013 Resource Plan, dated March 1, 2013, page 5.
[13] Minnesota Power 2013 Resource Plan, dated March 1, 2013, page 58.

Northern States Power

NSP also has significant exposure to environmental compliance costs for its coal-fired generation and potential cost exposure to carbon pricing. NSP is also working to reduce its emissions including carbon emissions:

> "Because of the diversity of our system, as well as our proactive approach to environmental risk mitigation, we are able to present a Resource Plan that will manage and reduce our carbon emissions. Our plan results in a reduction in system CO_2 emissions of over 20% from 2005 levels by 2015 and nearly 25% by 2020."[14]

NSP has also already spent $1 billion USDon reducing mercury emissions at its three Twin Cities coal-powered generating plants under the Minnesota Metro Emissions Reduction Project[15]. Additional emissions work to comply with various EPA regulations is required, the extent of which is not fully certain.

NSP also has a very significant exposure to carbon pricing. Work done by NSP for the 2010 Resource Plan indicated that their high carbon pricing scenario ($34/tonne carbon (USD)) could result in additional costs to the ratepayer of $5.6 billion USD (present value of the revenue requirements for the period from 2011-2049) in comparison with the base case with $9/tonne carbon (USD).[16]

State of Wisconsin

The SEA notes that Wisconsin generators continue to face the task of updating their current coal facilities to comply with federal emissions requirements, and provides a listing of $2 billion USD in major emissions control projects which are expected to be required for Wisconsin

[14] Xcel Energy 2010 Resource Plan, dated August 2, 2010, page 1-23.
[15] Xcel Energy press release "Xcel Energy completes Twin Cities Metro Emissions Reduction Project" dated October 7, 2009
[16] Xcel Energy 2010 Resource Plan, dated August 2, 2010, Table 4.2, page 4-10.

utilities' power plants. The SEA report also makes reference to MISO studies of EPA emission requirements impacts which have indicated compliance region-wide in the MISO market footprint may be as high as $33 billion USD[17]. The SEA report does not discuss carbon emissions reduction.

6.2.4 Desire for Portfolio Diversification

A diversified resource portfolio can assist Manitoba Hydro's major export customers in mitigating the impact of major changes in the cost of a particular type of resource. As these customers already have large portions of fossil-fueled resources in their supply portfolio, long-term purchases of renewable energy from Manitoba Hydro will assist them with such diversification.

Minnesota Power

MP has a long-term strategy to reduce its reliance on coal-fired generation, and diversify its portfolio by adding renewable resources.

> "Minnesota Power system is declining, from about 95 percent [coal generation] in 2006 to approximately 80 percent today. The Company anticipates reaching a coal, non-coal balance of 50/50 by 2025 and a long-term state of approximately one-third renewable resources, one third natural gas/other and one-third coal."[18]

> "Minnesota Power will focus its long-term plan on a strategy to further reduce carbon emissions in its portfolio and diversify its generation mix towards a balance of approximately one-third renewable resources, one-third natural gas/other, and one-third efficient coal-fired generation. This long-term strategy

[17] PUBLIC SERVICE COMMISSION OF WISCONSIN DRAFT STRATEGIC ENERGY ASSESSMENT ENERGY 2018, dated JUNE 2012, DOCKET 5-ES-106, Appendix A, page 4 and Table 5 on page 14.
[18] Minnesota Power 2013 Resource Plan, dated March 1, 2013, page 2.

will position Minnesota Power to be able to successfully adapt to a range of economic and environmental futures while maintaining service to its customers at a competitive cost."[19]

Northern States Power

NSP also recognizes that renewable energy, including supply from Manitoba Hydro, is part of their balanced supply portfolio:

> "Our five state system is geographically located such that we have access to some of the best wind resources in the world and access to cost-effective, reliable Canadian hydro resources directly to our north. Our renewable energy portfolio provides multiple benefits to our customers, as an intrinsic part of our commitment to maintaining a diverse, robust, reliable, clean, and affordable energy supply portfolio.
>
> We have been aggressive in taking advantage of recent low prices for renewable energy resources, in particular competitively-priced wind and hydro generation. In August 2010, the Commission approved our most recent set of long-term capacity and energy purchases from Manitoba Hydro, effectively extending our long-standing purchases of significant hydro-electric power into 2025. This ensures that our customers will continue to take advantage of reasonably-priced and substantially carbon free generation throughout this planning period."[20]

State of Wisconsin

The Wisconsin SEA report confines its review to the adequacy and reliability of the state's electricity supply and does not discuss supply portfolio diversification issues.

[19] Minnesota Power 2013 Resource Plan, page 79.
[20] Xcel Energy, RESOURCE PLAN UPDATE DOCKET NO. E002/RP-10-825, dated December 1, 2011, page 47.

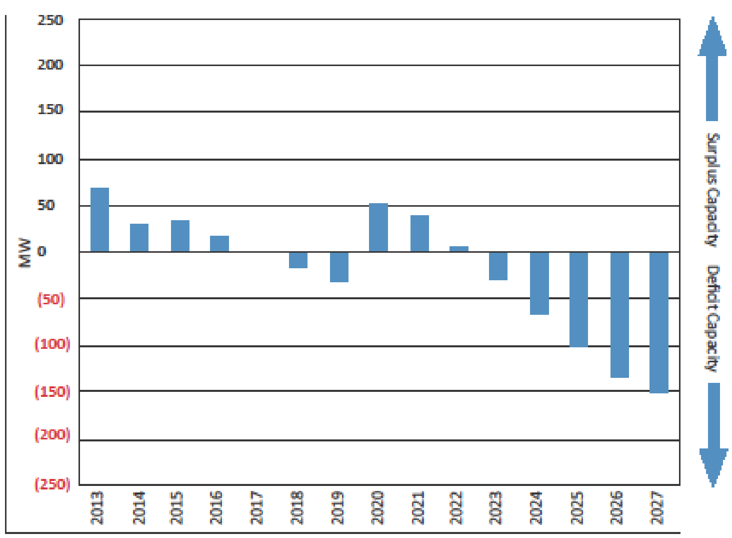
6.2.5 Expectations for Future Resource Requirements

Manitoba Hydro's major export customers are anticipating the need for additional resources to meet load growth or replace retiring generation units in the 2016 to 2018 time frame as outlined below.

Minnesota Power

MP's system load forecast reflects a projected summer peak demand of 1,918 MW by 2015 and 2,070 MW by 2026. MP's base case indicates that MP is projecting a summer season capacity deficit beginning in 2018 as shown in Figure 6.1. The capacity deficit becomes a surplus in the 2020-2022 period as a result of its 250 MW power purchase from Manitoba Hydro, and then MP is projecting increasing capacity deficits in 2023 and beyond. MP anticipates adding 200-250 MW of natural gas combined-cycle generation sometime after 2020 to deal with projected capacity deficits. [21]

Figure 6.1. MINNESOTA POWER'S PROJECTED SUMMER SEASON CAPACITY POSITION

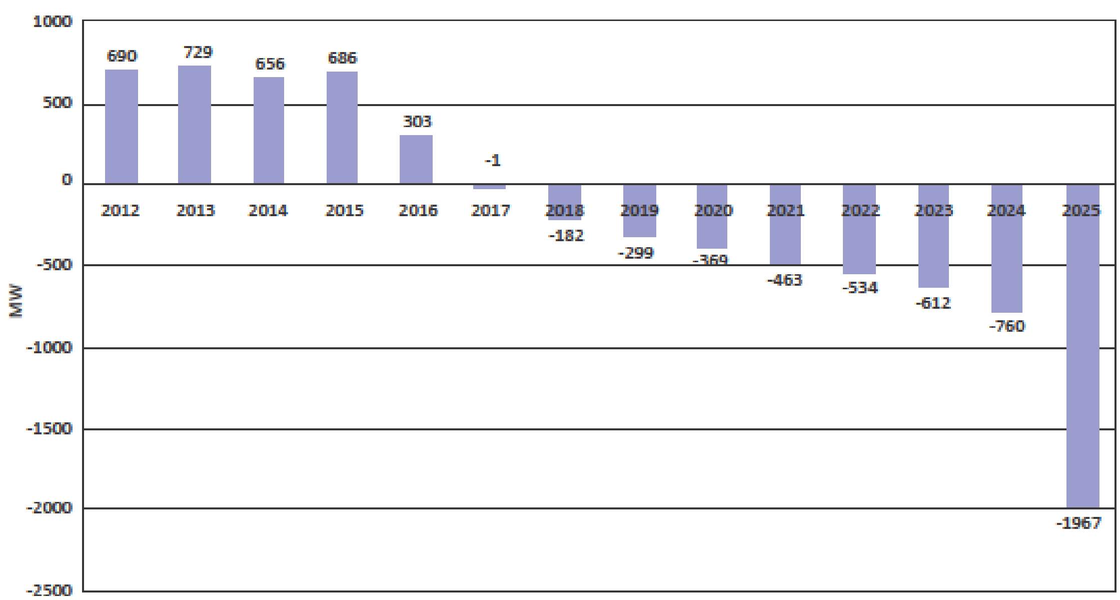


[21] Minnesota Power 2013 Resource Plan, dated March 1, 2013, page 25 and 26.

Northern States Power

In 2011, NSP's net summer peak demand was forecast to be 8,450 MW in 2012, increasing to approximately 9,000 MW by 2019. NSP expected to have a surplus of generation capacity through 2016, and the need for additional resources beginning in the 2017/2018 time frame, as shown in Figure 6.2[22]. NSP's resources for the 2015-2025 time period include three long-term contracts with Manitoba Hydro approved by the MPUC on May 26, 2011 as follows: 375/325 MW System Power Agreement May 1, 2015 - April 30, 2025 (NSP 375), 125 MW System Power Agreement May 1, 2021 - April 30, 2025 (NSP 125), and the 350 MW Diversity Agreement May 1, 2015 - April 30, 2025 (NSP 350 SD).

Figure 6.2. NORTHERN STATES POWER NEW RESOURCE (MW) NEEDS BY YEAR



On March 5, 2013 the MPUC approved NSP's resource 2010 plan, as amended in the December 2011 update. In approving the resource plan, the MPUC found:

[22] Xcel Energy, RESOURCE PLAN UPDATE DOCKET NO. E002/RP-10-825, dated December 1, 2011, pages 19-21 including Revised Figure 3.11 .

> "… that the record demonstrates a need for an additional 150 MW by 2017, increasing up to 500 MW by 2019;" and "Specifically, Xcel Energy [NSP] proposes placing a 215 MW combustion turbine in service in 2017 at its Black Dog plant in Burnsville, substantially replacing the plant's coal-fired generating capacity, which is scheduled to be retired in 2015."[23]

On April 15, 2013 Xcel Energy/NSP announced a proposal to add up to three peaking units in Minnesota and North Dakota, totaling 150 MW of new power resources, in 2017 and up to another 350 MW by 2019, to meet customers' needs during times of high electricity demand.[24]

State of Wisconsin

As shown in Table 6.2, Wisconsin's 2012 SEA indicated that there was sufficient generation capacity within, or contracted by, Wisconsin utilities to meet projected peak demand through 2018. Subsequently, on October 22, 2012 Dominion Resources announced plans to close and decommission its 556 MW Kewaunee Nuclear Power Station in Wisconsin after the company was unable to find a buyer for the facility[25]. The Kewaunee plant closed on May 7, 2013, reducing available supply in Wisconsin. Also included in Table 6.2are updated demand and supply projections without the Kewaunee plant, which indicate additional resources could be required in Wisconsin as early as 2016[26].

[23] Minnesota Public Utilities Commission DOCKET NO. E-002/RP-10-825, Order dated March 5, 2013.
[24] Xcel Energy News Release dated April 15, 2013, available at http://www.xcelenergy.com/About_Us/Energy_News/News_Releases/Xcel_Energy_proposes_adding_natural_gas_units_to_meet_customers'_future_electricity_needs
[25] Dominion Resources New Release "Dominion To Close, Decommission Kewaunee Power Station", dated October 22, 2012.
[26] PUBLIC SERVICE COMMISSION OF WISCONSIN DRAFT STRATEGIC ENERGY ASSESSMENT ENERGY 2018, dated JUNE 2012, DOCKET 5-ES-106, Table 1, updated for 556 MW Kewaunee closure.

Table 6.2. STATE OF WISCONSIN PROJECTED SURPLUS CAPACITY 2014-2018

	2014	2015	2016	2017	2018
Adjusted Electric Demand (MW)	13,684	13,875	13,994	14,193	14,315
Electric Power Supply with Kewaunee (MW)	15,937	16,216	16,006	16,131	16,538
Calculated Data with Kewaunee					
➢ Required Planning Reserves at 11.9%(MW)	15,312	15,526	15,659	15,882	16,018
➢ Surplus Capacity (MW)	625	690	347	249	520
Electric Power Supply without Kewaunee (MW)	15,381	15,660	15,450	15,575	15,982
Calculated Data with Kewaunee					
➢ Required Planning Reserves at 11.9%(MW)	15,312	15,526	15,659	15,882	16,018
➢ Surplus Capacity without Kewaunee (MW)	69	134	-209	-307	-36

6.3 Regional Perspective

One of MISO's key objectives is to ensure the reliability of the transmission system over the planning horizon, while facilitating U.S. public policy objectives, such as meeting RPS. Because complying with states RPS often involves increased wind generation and wind integration challenges, the flexibility of hydro resources can add value to the MISO market by assisting with wind integration.

6.3.1 Hydro- Wind Synergies in North America

Wind is the fastest-growing renewable energy resource in North America, while hydropower represents by far the largest source of renewable energy. The relationship between wind and hydropower is increasingly important as levels of wind generation penetration increase; and as power system planners across North America factor in low-carbon policies, aging generation fleets, continuing demand growth and the challenges inherent in siting and building any new generation or transmission facilities.

Of interest to regional power-system operators, planners and policy makers is the role that hydropower can play as more wind generation is added to power systems. An industry-wide report identified six issues associated with the integration of large amounts of variable renewable energy resources[27]. Of these, three issues are relevant to a discussion of wind and hydropower synergies:

- additional flexible resources including energy storage
- significant transmission additions
- greater access to large generation pools including use of energy limited resources.

[27] NERC Special Report (2009): "Accommodating High Levels of Variable Generation"

Table 6.3 illustrates some of the challenges of wind generation and the role of hydropower in meeting those challenges.

Table 6.3. WIND INTEGRATION CHALLENGES AND HYDRO SYNERGY[28]

	Recommendations to Integrate High Levels of Variable Generation	Wind Challenge	Hydro Synergy
1	Additional flexible resources including energy storage	Wind generation production (daily and annual cycles) often does not match load demand, input (wind) energy cannot be stored.	Pumped storage and reservoir hydropower provide large, economical storage options. Hydropower is very predictable in the very short-term.
2	Significant transmission additions and reinforcements	The best wind power sites are typically remote from load and can suffer from restricted outlet transmission.	Hydropower sites are often remote and require the development of transmission which facilitates wind integration. Because wind and hydro generation are complementary, they can use transmission more effectively than individually.
3	Greater access to larger pools of available generation and demand, address minimum generation issues, make good use of energy-limited resources	The variations in the output of wind generation can be somewhat absorbed over a large load area but most variations require an equivalent but opposite change in other generation.	Hydropower can usually start and ramp up output quickly. In some systems, hydropower is the best option for regulation up and a major source of regulation down as well as spinning reserve. Appropriate energy and operating reserve pricing is necessary to ensure appropriate investment in new generation technologies for hydropower to be available to provide services important for the integration of other sources of renewable energy.

6.3.2 Hydro - Wind Synergy in MISO

MISO is currently studying the contribution of the Manitoba Hydro system to operation of the MISO market footprint, including how Manitoba Hydro is able to assist with the challenges of

[28] Adapted from the Executive Summary of NERC Special Report (2009): "Accommodating High Levels of Variable Generation"

integrating increasing wind power development in MISO. MISO's Manitoba Hydro Wind Synergy Study began in May 2011 and is scheduled to be completed in the fall of 2013.

The study evaluates the benefits to the MISO market of Manitoba Hydro's hydraulic resources, in particular, the value of increasing hydro storage and transmission to deliver increased energy in conjunction with MISO wind. Findings to date include:

- The variable and non-peak nature of wind creates integration challenges within MISO.
- The addition of Manitoba Hydro generation and transmission demonstrates positive synergy with Minnesota/North Dakota MISO wind—particularly when reviewing the relationship between Manitoba Hydro interchange activity, MISO wind generation and MISO load. Wind and load within MISO have shown almost no correlation; there was a strong inverse correlation between Manitoba Hydro-MISO export activity and MISO wind generation; Manitoba Hydro-MISO export activity is strongly correlated to MISO load.
- The MISO region would benefit from production cost savings from displaced thermal generation ranging from $134-$159[29] million USD per year in 2027. An alternate measure of benefit called "cost to load"—savings to the load as a result of reductions in locational marginal electricity prices—was determined to range from $327-$360 million USD per year.
- Two routing alternatives were evaluated for the proposed Manitoba-U.S. interconnection and the two options showed similar benefits.

The Manitoba Hydro Wind Synergy Study has demonstrated that there are significant benefits to MISO power consumers from Manitoba Hydro's current exports and increased benefits from additional exports and from additional operational flexibility between Manitoba Hydro's hydraulic resources and the MISO market. The findings of such benefits to MISO power

[29] Median water supply case.

consumers will be of interest to U.S. energy regulators when reviewing power purchase or transmission line agreements.

6.4 Manitoba Hydro Perspective

This section briefly summarizes the discussions found elsewhere in this submission regarding Manitoba Hydro's perspective on the need for additional resources, and options for meeting those additional resource needs.

As discussed in ***Chapter 4 – The Need for New 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 forecasted Manitoba energy demand and export commitments.

There are a number of resource technologies which are potentially suitable for utility-scale generation. These technologies have different technical, environmental, socio-economic and economic characteristics reviewed in ***Chapter 7 – Screening of Manitoba Resource Options***. The range of supply options available to Manitoba Hydro is broader than many other regions and includes developable hydro sites within Manitoba.

The predominately hydraulic nature of Manitoba Hydro's existing system results in surplus energy by design as discussed in ***Chapter 5 – The Manitoba Hydro System, Interconnections and Export Markets***. A predominately hydro system serving a specific domestic load will have, in years other than the critical-flow period, surplus hydro energy which can be sold to other regions/markets. This surplus is due to the investment in large-scale increments typical of hydro development and means that major new generating stations can supply years of load growth. Since not all of the new additional energy is needed for domestic load immediately, the construction of a new generating station creates additional surplus energy immediately upon completion.

As noted in ***Chapter 5 – The Manitoba Hydro System, Interconnections and Export Markets***, over 50 years ago it was recognized that the economic development of large hydro resources in Manitoba required large markets outside of Manitoba in order to take advantage of the economies of scale.

Over the last 50 years, Manitoba Hydro has interconnected to the adjacent power systems and power markets in Canada and the U.S. as outlined in ***Chapter 5 – The Manitoba Hydro System, Interconnections and Export Markets***, Section 5.4. These adjacent power markets are much larger than Manitoba Hydro's system and are capable of absorbing surplus energy exports in higher water flow years and providing a source of energy in lower water flow years. To the extent that Manitoba Hydro would have large amounts of surplus capacity immediately after building new large hydro resources, such surplus capacity can be sold to customers within adjacent power markets to allow them to defer their investment in new generation.

From Manitoba Hydro's perspective, the economics of the potential development of hydro resources in Manitoba can be optimized with an accompanying development of a new transmission interconnection. As previously shown in ***Chapter 5 – The Manitoba Hydro System, Interconnections and Export Markets***, Table 5.10, each previous development of a major hydro station on the lower Nelson River was accompanied by the associated development of additional transmission interconnection capacity. Therefore, as Manitoba Hydro evaluates the economics of hydro-electric resource options in comparison with other supply alternatives, it would be remiss if it did not explore additional transmission interconnection development in order optimize the hydro options.

Manitoba Hydro is currently directly interconnected with the MISO market in the U.S., the Independent Electricity System Operator market in Ontario and with the province of Saskatchewan. Expansion of the current interconnections is most beneficial to Manitoba Hydro when the expansion is with the largest power market in the closest proximity. The larger size of the interconnected market creates more opportunity, and also means that water flow-based fluctuations of export volume have minimal effect on the market. Close proximity to such a market also helps reduce transmission interconnection costs, environmental impacts of the interconnection, and transmission line losses.

As discussed in ***Chapter 5 – The Manitoba Hydro System, Interconnections and Export Markets*** Section 5.4, the relative importance of the MISO energy market to Manitoba Hydro is not expected to change. The MISO market is:

- the largest market with which Manitoba Hydro is interconnected
- four times larger than the southern Ontario market, and much closer
- over 20 times larger than the Saskatchewan demand, and has a major load centre (Minneapolis) only about 200 km farther away from Winnipeg than the nearest major load centre in Saskatchewan (Regina)
- a full functioning power market with an independent market operator dispatching over 6,000 generators to meet a July 2012 peak load of over 98,000 MW

The MISO market offers Manitoba Hydro the best market opportunities for a new transmission interconnection. A new interconnection is also a prerequisite for expanding Manitoba Hydro's opportunities to export surplus power. New generation will be required for domestic load within a decade and it is the purchase of surplus firm power by export customers that will provide the incentive to build a new interconnection.

6.5 Development Plans with a New Interconnection

6.5.1 New Hydro Generation and Associated Transmission

All of the eight development plans which include a new interconnection have the Keeyask G.S., with an in-service date beginning in 2019/20, with five of the development plans also including the Conawapa G.S., with an in-service date beginning in 2025/26.

As outlined in ***Chapter 2 – Manitoba Hydro's Preferred Development Plan Facilities*** Section 2.1.1, the Keeyask Project consists of three components: the Keeyask Generation Project, comprising a 695 MW hydro-electric generating station; the Keeyask Infrastructure Project; and the Keeyask Transmission Project. The infrastructure and transmission projects provide facilities required to construct and operate the generation project.

As outlined in ***Chapter 2 – Manitoba Hydro's Preferred Development Plan Facilities*** Section 2.2.1, the Conawapa Project consists of two components: the Conawapa Generation Project, comprising a 1,485 MW generating station, and the Conawapa Generation Outlet Transmission Project.

For those development plans in which Keeyask G.S. and Conawapa G.S. are both constructed, it is expected that transmission improvements will be required in the Manitoba Hydro system once the second plant comes into service to be able to transmit all the firm power to southern Manitoba. As the additional north-south transmission would not be required for over ten years, the final determination of the design will be made nearer to the time it is needed.

6.5.2 Export Contracts

Two of the eight development plans with a new transmission interconnection to the U.S. include the six long-term export commitments contingent upon future development of hydro resources in Manitoba, as listed in Table 6.4. The remaining six development plans have five of the six long-term sales listed in Table 6.4, with the WPS up to 300 MW potential contract being excluded.

Table 6.4. LONG-TERM EXPORT COMMITMENTS CONTINGENT UPON NEW HYDRO DEVELOPMENT (REFERENCED TO MANITOBA BORDER)

Customer	Contract Name	Capacity (MW)	Type	Term	Contingent Upon	Status
Minnesota Power	MP 250	250	System Participation	June 1, 2020 to May 31, 2035	Keeyask G.S. and New U.S. Interconnection	Signed
	MP Energy Exchange	0	Energy Exchange	June 1, 2020 to May 31, 2035	Keeyask G.S. and New U.S. Interconnection	Signed
Northern States Power	NSP 125	125	System Participation	May 1, 2021 to April 30, 2025	New Hydro	Signed
Wisconsin Public Service	WPS 100 Product A	100	System Participation	June 1, 2021 to May 31, 2025	Keeyask G.S.	Signed
	WPS 100 Product B	0	Surplus Energy	June 1, 2025 to May 31, 2029	Keeyask G.S.	Signed
	WPS	Up to 300 MW	System Participation and Surplus Energy	June 1, 2014 to May 31, 2040	New Hydro and New U.S. Interconnection	Under Discussion

A summary of the major terms and conditions for these contracts is contained in ***Appendix 6.1 - Summary of Terms and Conditions of Export Contracts.*** Of the export agreements contingent upon new hydro development, it is the potential agreement with WPS for up to 300 MW which is not signed, and for which negotiations are on-going. Manitoba Hydro is not able to offer further comment on these negotiations at this time. In the event that no agreement is reached with WPS, Manitoba Hydro will consider alternative arrangements.

6.5.3 New Transmission Interconnection

The Preferred Development Plan and four other development plans include a major new transmission interconnection to permit substantially increased energy transactions with customers in the MISO energy market. As introduced in ***Chapter 2- Manitoba Hydro's Preferred Development Plan Facilities***, the new transmission interconnection is an international transmission line, with two distinct components – the Manitoba-Minnesota Transmission Project (MMTP) in Manitoba and the Great Northern Transmission Line (GNTL) in Minnesota. The interconnection would have an incremental transfer capability of 750 MW for both exports from and imports into Manitoba.

As described in ***Chapter 2- Manitoba Hydro's Preferred Development Plan Facilities***, the proposed interconnection consists of a new single-circuit 500 kV AC transmission line originating from Dorsey Station, northwest of Winnipeg, running south of Winnipeg and heading in a south-east direction across the international border towards Duluth, Minnesota. The new transmission line would terminate in a new 500 kV substation adjacent to the existing Blackberry substation in Minnesota, located approximately 100 km northwest of Duluth, Minnesota. The approximate total length of the 500 kV transmission line between Dorsey and Blackberry substations is 587 km, with about one-third constructed in Manitoba.

6.5.3.1 Manitoba-Minnesota Transmission Project

The MMTP will include the 500 kV transmission line between Dorsey and the U.S. border; a 300-MVAr shunt reactor, 75 MVAr shunt capacitor and termination facilities at the Dorsey substation; a 1,200 MVA 230/500 kV transformer and 150 MVAr shunt capacitor at the Riel substation and a 300 MVA 230 kV phase shifting transformer at the Glenboro substation. These facilities would be built, owned and operated by Manitoba Hydro. The total cost in Manitoba is estimated to be $350 million including interest and escalation.

Actual transmission line routing in Manitoba will be the subject of subsequent environmental assessment and route selection processes which began in June 2013. No preliminary routes or corridors have been identified for the MMTP.

6.5.3.2 Great Northern Transmission Line

Generally, utilities in the U.S. making transmission investments for the purpose of benefiting consumers by ensuring reliability and reducing the cost of delivered power may be eligible for incentive-based rate treatments for their investments. The GNTL[30], the U.S. component of the interconnection, is being proposed by MP in order to receive delivery of the 250 MW of power they have agreed to purchase from Manitoba Hydro under the MP 250 MW power agreement during the period 2020 to 2035 shown in Table 6.4. The estimated cost of the Minnesota section is in the order of $700 million (U.S. 2020 base dollars).

Under the Preferred Development Plan, a 300 MW sale to WPS is assumed, of which 200 MW will require new transmission service. For evaluation purposes, it is assumed that the cost of this new transmission service will be reflected in the sale arrangement with WPS. It is also assumed that Manitoba Hydro will be responsible for 40% of the capital and ongoing operating costs associated with the U.S. portion of the 750 MW interconnection facilities, with the remainder of the transmission costs to be borne by MP and WPS.

6.5.3.3 Agreements Related to the New Transmission Interconnection

There are several agreements being developed in relation to the construction of the new transmission interconnection as described below.

[30] More information on the Great Northern Transmission Line is available at http://greatnortherntransmissionline.com/

Interconnection Memorandum of Understanding – signed January 25, 2013

The Interconnection Memorandum of Understanding was entered into for the purpose of outlining a framework for further discussions between Manitoba Hydro and MP regarding:

- the general line route and arrangement for a 500 kV interconnection
- an agreement to work towards both an Interconnection Term Sheet and an Interconnection Development Cost-Sharing Agreement for development expenses.

Interconnection Development Cost Sharing Agreement – signed March 31, 2013

In order to realize the target in-service date of the new interconnection, MP has incurred development expenses in advance of having executed a MISO Facilities Construction Agreement. Manitoba Hydro has committed to funding two-thirds of planning and engineering expenses after an Interconnection Term Sheet has been executed, and 50% of planning and engineering expenses incurred until the date an Interconnection Term Sheet is executed. Allocation of these costs will be determined by a Facilities Construction Agreement, once signed, and are expected to total approximately $2.5 million.

MISO Facilities Construction Agreement – pending

The project participants made application to MISO for transmission service and received a study report detailing the need for a new 500 kV line to be built in order to create the required incremental transmission system capacity. This agreement is for the users of the new transmission system capacity to fund the cost of the line being built by MP, and operated by MISO. Parties to this agreement are expected to include MISO, MP, and Manitoba Hydro (through a wholly-owned Canadian subsidiary company). The agreement is broken into phases in which certain conditions precedent apply to certification and pre-construction, and others to the construction phase, which begins after certification concludes.

Manitoba Hydro Facilities Construction Agreement – pending

This agreement is similar to the MISO Facilities Construction Agreement, except that Manitoba Hydro is the only party to it as Manitoba Hydro is both the customer to transmission service, the owner of the transmission facilities, and the operator of the transmission system in Manitoba.

Transmission Service and/or Generator Interconnection agreements – pending

These agreements will be executed by those customers reserving transmission service or applying for generator interconnection, as applicable using capacity provided by the interconnection under both the Manitoba Hydro and MISO tariffs. The agreements will be contingent on the facilities identified being successfully brought into service prior to the start dates of the service.

Letter of Intent – pending

Manitoba Hydro and MP are in discussions with a view to concluding and signing a letter of intent which will provide for additional details for the term sheet in the event that other potential project participants that were part of the MISO study report do not commit to proceeding with the project.

Interconnection Term Sheet - pending

The Interconnection Term Sheet will provide a framework for agreements required to proceed through the construction phase of the interconnection project. The term sheet identifies a definitive Interconnection Project Development Agreement and several other smaller but related agreements.

Interconnection Project Development Agreement – future

The Interconnection Project Development Agreement will be the definitive agreement detailing the project participants' relationship and division of responsibilities and obligations through the construction phase of the project and once the project is in service.

6.5.3.4 MMTP Project Schedule

The in-service date of the new 500 kV interconnection is planned to coincide with the start of the MP 250 MW export sale beginning June 1, 2020. Construction activities are expected to last approximately three years. Some of the anticipated milestones include:

- Sign Manitoba and MISO Facility Construction Agreements and Transmission Service Agreements–August 2013
- MP receives Certificate of Need approval – June 2014
- MP receives route permit and Presidential permit – October 2015
- Manitoba Hydro receives an *Environment Act* (Manitoba)licence – June 2016
- Manitoba Hydro receives National Energy Board permit – December 2016.

Construction is permitted to start once all applicable permits and licences have been acquired.