

The Manitoba Minnesota Transmission Project is Not Needed

Submitted to the National Energy Board
For its Hearing on the
Manitoba Hydro – Manitoba-Minnesota Transmission Project
By
Manitoba Wildlands

By

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Filed as evidence in addition to CEC evidence with respect to design, societal and economic impacts cumulative assessment, and with respect to gaps with MMTP EIS.

Recommendation

It is recommended that approval by the National Energy Board for the Manitoba Hydro – Manitoba-Minnesota Transmission Project be delayed at this time. This is to provide opportunity to avoid environmental and societal adverse impacts and divert the surplus electric energy back to Manitoba. In doing so build Manitoba's economy rather than the American economy. Our recommendation is based on Manitobans are being asked to pay increasing hydroelectric rates being imposed in order to subsidize the low and unprofitable electricity export prices received in return.

Introduction

It has been stated that in Manitoba, “hydroelectricity is our oil”. Certainly, in the latter half of the 20th century, electric energy exports to the USA were profitable and Manitoba Hydro’s electricity rates became the lowest in Canada. This has changed dramatically in the 21st Century. The cost of hydroelectric projects escalated as in the Manitoba Hydro Wuskwatim and Keeyask hydroelectric projects, built for export, but these export rates are unprofitable for this transmission for export application. It appears Newfoundland and Labrador with Muskrat Falls, and Site C in BC may very well suffer the same fate. It remains to be seen if Wuskwatim Generation Station will ever show a profit, and the same fate may befall Keeyask when it is finished given the spiraling increases in costs.

There is still an obsession in Manitoba that export of electricity, even when unprofitable, is the way forward. The Preferred Development Plan of Manitoba Hydro, reviewed by the Manitoba Public Utilities Board (PUB) in June 2014¹ recommended no more expenditure on the proposed Conawapa hydroelectric project, still leaving the province in an oversupply of electricity.

So, is increasing export of this excess electricity at an average of 4 cents/kwhr, generated at high marginal prices from Keeyask at 12 cents/kwh or greater, the most profitable way forward for Manitoba Hydro? Is cost of constructing the MMTP line to Minnesota Power going to be more than earnings received from export sales?

In order to sustain Manitoba Hydro’s Preferred Development Plan as it was approved by the Manitoba Public Utilities Board (PUB) in June 2014¹, Manitoba Hydro applied to PUB for their General Rate Application 2017/2018 and 2018/2019 (GRA) for a 7.9% rate increase for six years. The conclusion by Drs. Simpson and Compton from the University of Manitoba who provided witness to the PUB for the GRA hearing is: *“Our preferred estimates indicate that due to the proposed increase in real hydro prices, the Manitoba economy will be 3.4% smaller after seven years than it would have been in the absence of hydro price increases above the inflation rate. Moreover, the hydro price change will result in close to 3900 fewer jobs in the province after seven years than would exist without the price increases².”*

The evidence from Simpson and Compton indicates that Manitoba Hydro’s extraordinarily high GRA request is evidence that the economy of Manitoba will suffer as a consequence of proceeding with the June 2014 PUB approved Preferred Development Plan. It indicates that Manitoba Hydro ratepayers would be subsidizing the proposed electricity exports to the US, with the MMTP being stated as necessary by Manitoba Hydro to proceed forward. The PUB recognized the detrimental effect the 7.9% electricity rate increase will have on the Manitoba economy and limited the

¹ The Public Utilities Board Report on the Needs For and Alternatives To (NFAT), Review of Manitoba Hydro’s Preferred Development Plan, June 2014, P18.

² The Effect of the Proposed Hydro Rate Increase on the Manitoba Economy, Manitoba Hydro 2017/18 & 2018/19 GRA, Consumers Coalition. Submitted by the Public Interest Law Centre, Co-authored by Dr. Wayne Simpson and Dr. Janice Compton, October 31, 2017

2018/2019 rate to 3.6% as of 1st June 2018³. Is the obsession Manitoba Hydro has with exporting electricity at a loss the only way forward? If it was indeed a profitable way forward, they would not need to seek a 7.9% rate increase for six years,

It was during the last decades of the 20th century when electricity exports were profitable, Manitoba's electricity rates became the lowest in Canada. This is no longer the case. Is the MMTP IPL the most profitable way forward for Manitoba ratepayers or is it just contributing to the problem?

Export Capability and the MMTP Transmission Interconnection

2.1 A response by Manitoba Hydro to Manitoba Wildlands, NEB_MWL-IR-004 asking will they confirm maximum power that can be exported today to Minnesota Power and Wisconsin Public Service using the existing transmission interconnections?

Their response was they cannot confirm a value but did quote *“the existing long-term power transfer capability of the Manitoba-US interface, including a 75 MW reliability margin, is 2175 MW for exports. (See Application at NEB Ex. A85626-2, PDF page 29.)”*

They also confirmed on page 28 of this reference that *“the current Manitoba-US interface is sold out. The maximum additional long-term firm power that could be exported today to Minnesota Power or Wisconsin Public Service today is zero.”*

By stating there is the *“remaining 1950 MW of transmission capability is available for export schedules”* presumably this is the stated contracts on their website and various opportunity sales. A question arises out of this: **Is the apparently reserved capability above published contracts on the MH website that is also being used for the export schedules just for opportunity sales and “sold out” and therefore not cast in stone?** Below is the redacted figure page 36 of 615 from the Boston Consulting Group report⁴.

³PUB Order No. 59/18, Final Order with respect to Manitoba Hydro's 2017/18 and 2018/19 General Rate Application, Orders No. 3 & 4, released 1 May 2018

⁴ Boston Consulting Group report to Manitoba Hydro, dated July 6, 2016, which was submitted by Manitoba Hydro to the Public Utilities Board for the “Manitoba Hydro 2017/18 & 2018/19 General Rate Application, PUB MFR 72 – Attachment”:

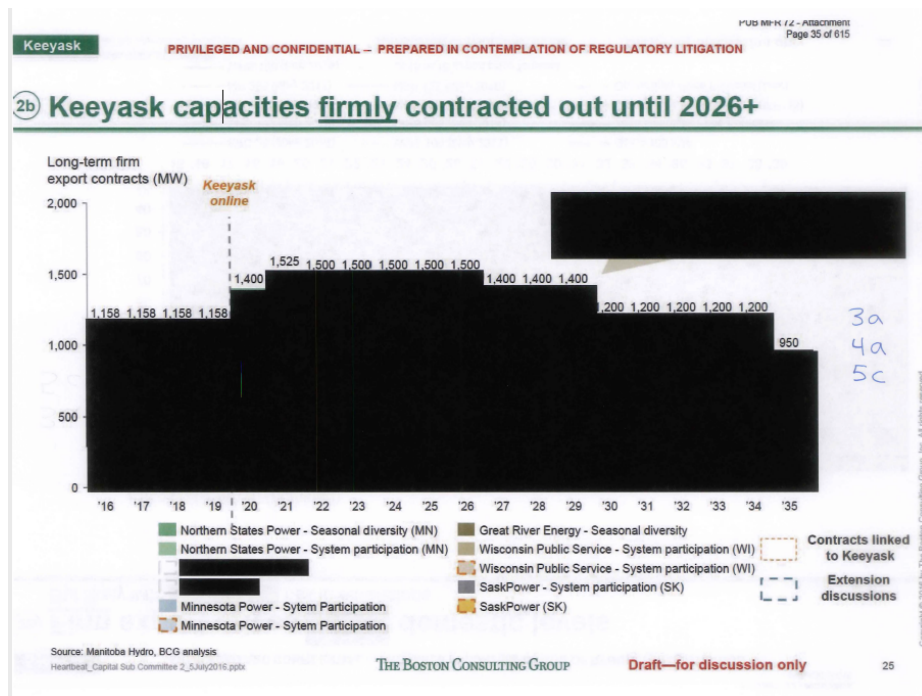


Figure 1: The long-term firm export contracts through to 2035 provided in 2016

What this figure is showing is that highest firm export contract even after MMTP comes on line is 1,525 MW when Keeyask comes online and that includes export to SaskPower and this is below the 1,950 MW capacity to the US that today is supposed to be “sold out”. So, the conclusion is that the MMTP with its additional 883 MW capacity line is not required for firm export contracts thereby contradicting the statement that the 1,950 MW existing export capacity to the US is “sold out”.

We can only conclude based on Figure 2, the existing US export capacity today of 1,950 MW is adequate to accommodate the maximum firm contract after Keeyask comes on-line of only 1,525 MW.

As further evidence, on pages 125 and 126 of the PUB Order No. 59/18³ released 1st May 2018, it states:

“Manitoba Hydro assumes no new firm long term contracts will be negotiated for the substantial surplus dependable energy and capacity in the 20-year forecast. Manitoba Hydro further assumes existing long-term firm contracts will expire without negotiating extensions.”

The following table was included showing the current list of Manitoba Hydro’s contracted export sales. Note, sales expiring 2020 are shown faded. In addition, the 250 MW sale to Minnesota Power from 2020 to 2035 not originally shown was added in by Manitoba Wildlands:

Table 1: Current list of Manitoba Hydro's contracted export sales with the proposed 250 MW power sale to Minnesota Power from 2020 added in by Manitoba Wildlands

Power Sale Contract	Contract Start	Contract End
Minnesota Power 50 MW System Participation	May 2015	May 2020
Minnesota Power 250 MW System Participation	Jun 2020	May 2020
Minnesota Power 50 MW ZRC System Participation	Jun 2017	May 2020
Great River Energy 200 MW Seasonal Diversity	Nov 2014	Apr 2030
Northern States Power 125 MW System Power	May 2021	Apr 2025
Northern States Power 375/325 MW System Power	May 2015	Apr 2025
Northern States Power 350 MW Seasonal Diversity	May 2015	Apr 2025
Northern States Power 75 MW Seasonal Diversity	Jun 2016	May 2020
Wisconsin Public Service 100 MW Sale	Jun 2021	May 2027
Wisconsin Public Service 108 MW System Participation	Jun 2016	May 2021
SaskPower 100 MW System Participation	Jun 2020	May 2040
SaskPower 25 MW System Participation	Nov 2015	May 2022
American Electric Power 79 MW ZRC	Jun 2016	May 2018
American Electric Power 50 MW ZRC	Jun 2018	May 2020
Basin Electric 50 MW ZRC System Participation	Jun 2018	May 2020
Basin Electric 50 MW ZRC System Participation	Jun 2020	May 2021
NextEra 30 MW ZRC Sale	Jun 2015	May 2018
NextEra 100 MW ZRC Sale	Jun 2016	May 2018
Minnesota Power 250 MW Sale (Added in by MWL)	2020	2035

Summing up the total contracts in June 2021, they come to:
 $200+125+375+350+100+100+25+250 = 1533$ MW (which is close to the 1525 MW quoted above).

So, in reality the 883 MW MMTP rating is based on just the 250 MW contract to Minnesota Power, since the contract to Wisconsin Public Service is already operational on the existing interconnections to Minnesota at 108 MW and will continue from June 2021 to May 2027 at just 100 MW. It is expected the 250 MW contract to Minnesota power was not listed in the PUB Order No. 59/183 as it requires approval by the NEB for the MMTP IPL.

2.2 In Manitoba Hydro's application to the PUB for its 7.9% rate increase, it was stated Manitoba Hydro revised the export price forecast to value all surplus energy at opportunity prices rather than ascribe a higher value for its dependable surplus product⁵.

So, this reinforces the argument made in 2.1 above, that if there is no MMTP and no 250 MW contract to Minnesota Power, there is still capacity on

⁵ PUB Order No. 59/18, Final Order with respect to Manitoba Hydro's 2017/18 and 2018/19 General Rate Application, Orders No. 3 & 4, released 1 May 2018, page 125.

Manitoba/US interconnections for Manitoba Hydro to sell their surplus electricity into the Midcontinent Independent System Operator (MISO) opportunity market with no great loss, while saving the expenditure of \$453 million for the MMTP, and 72% of \$US712 million for the GNTL in Minnesota⁶. This is approximately \$1.1 billion Canadian, not including Manitoba Hydro's responsibility to fund 66.7% of the GNTL operating costs.

Taking into account increased losses without MMTP, extra spillage and possible differences in export revenue if any between a 250 MW 15-year contact with Minnesota Power, and just selling it into the opportunity market, a detailed analysis needs to be undertaken to see how long it would take to justify the \$1.1 billion cost of the MMTP. This is a justification for delaying the approval of MMTP until such an assessment is made.

Therefore, it appears that the MMTP line can be delayed.

2.3 Manitoba Hydro must accept that *“long-term firm Transmission Service Requests submitted by Manitoba Hydro's Marketing Function”* is dependent on NEB approval. The *“prospective export sales under negotiation”*, and *“transmission capacity for non-negotiated MISO energy market sales”* are all subject to NEB approval and therefore cannot be final.

Therefore, Manitoba Hydro export agreements are not cast in stone if they are dependent on the NEB approving the MMTP project.

2.4 The issue for *“transmission capacity for reliability purposes to allow imports to Manitoba in drought conditions or emergencies resulting in the loss of local supply”* is a minimal impact factor as in the Boston Consulting Group figure slide 52 from the Boston Consulting Group⁷ where it indicates hydrological risk mitigation places no cost impact on the tie line providing key *import* capability in extreme drought.

2.5 Reliability has been stated as an important benefit for the MMTP project. This was the deterministic justification for construction of Bipole III. How often can the reliability scare tactic be applied to justify a major transmission project?

The most significant and profitable way to justify an interconnection transmission project based on reliability is when it is used to share generation reserves. This allows each interconnected jurisdiction to reduce their reserves when generation plant is retired or load grows. Saving in new generation not purchased when each jurisdiction is able to operate with reduced reserves will pay for the interconnection. This was the case in the 2000 MW

⁶ PUB Order No. 59/18, Final Order with respect to Manitoba Hydro's 2017/18 and 2018/19 General Rate Application, Orders No. 3 & 4, released 1 May 2018, pages 99 & 100.

⁷ “Boston Consulting Group October 11, 2016, Tie Line Economics Review, Capital Sub Committee, Manitoba Hydro 2017/18 & 2018/19 General Rate Application PUB MFR 72”

interconnection constructed in the 1986 between England and France⁸. This is not the case for the MMTP line since there is excess generation coming on line in Manitoba, not a reduction. However, with a strong interconnection to Saskatchewan, the saving in new generation not purchased when thermal plant retires could be allocated to paying for the cost of the east-west interconnection. The reserve generation margin needed to supply Saskatchewan with adequate supply reliability could be lowered, and the surplus hydroelectricity from Manitoba could be provided if during a peak load time in Saskatchewan, not enough generation was available. It is not likely Saskatchewan peak load will occur at exactly the same time as peak load time in Manitoba. This needs detailed evaluation to ensure Saskatchewan reliability of supply is maintained with profitable use of Manitoba hydroelectricity.

Such a detailed investigation should be made before the MMTP line is approved.

Electricity Export Prices

A response by Manitoba Hydro to Manitoba Wildlands, NEB_MWL-IR-007 asking will Manitoba Hydro seriously review delaying construction of the IPL until such time as the export market to the USA becomes profitable?

Their response was a flat-out “No” as they will proceed as outlined in the PUB’s June 2014 report on the Needs For and Alternatives To (NFAT), Review of Manitoba Hydro’s Preferred Development Plan.

Basing the decision to not review delaying the IPL because of the recommendation in the PUB’s June 2014 NFAT report does not recognize that very significant changes have occurred in the generation and use of electricity since then. This fixed decision emphasizes the inflexibility of Manitoba Hydro systems planning. There is no examination of cost-effectiveness since it is obvious that the IPL and all that goes into it is very unprofitable because of the 7.9% rate increase Manitoba Hydro has requested again in its latest General Rate Application to the PUB and which only 3.6% was approved. If all had been profitable, the requested rate increase would be at or below cost of living increases³. The following are some specific issues of concern:

The Manitoba Hydro Act states under Purposes and Objects of the Act: *“promote economy and efficiency in the development, generation, transmission, distribution, supply and end-use of power”* with a secondary mandate *“to market and supply power to persons outside the province on terms and conditions acceptable to the*

⁸ See white paper submitted for evidence to the NEB by Manitoba Wildlands entitled: “How a TransCanada Electric Superhighway Will Profitably Achieve Renewable Energy Objectives”, page 5

board.” It is obvious because of the very large rate increase request that the economy in the end-use of power in Manitoba is not being met, and Manitoba Hydro is carrying blithely forward steadfastly causing Manitoba Hydro ratepayers to effectively subsidize the exports to the Americans who are purchasing our electricity at very low rates (averaging 4 Canadian cents/kwh since 2010 and not increasing), boosting their economy at the expense of the Manitoban economy.

Manitoba Hydro appears to be confusing the Purpose and Objectives of the Manitoba Hydro Act.

See Figure 2 below:

There is no reason to continue with unprofitable use of our excess electricity if there is a way forward that will divert the energy into the province of Manitoba.

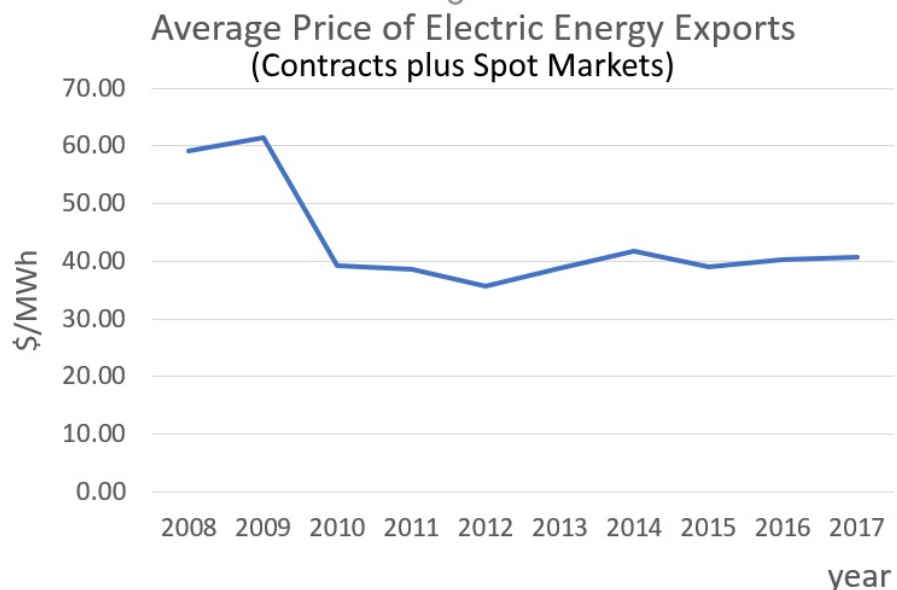


Figure 2: Manitoba Hydro average export market prices in Canadian dollars.
Sources: Manitoba Hydro Annual Reports from fiscal year ending 2008 to 2017

Future spot export prices will not be bounded by marginal gas generation costs at Minnesota hub (US\$ 20-96 /MWh) as the Boston Consulting Group state with slide 57 of Project Heatbeat Board

Review⁹. Instead, energy prices of solar and wind generation with batteries are falling¹⁰. This is shown in Figure 3 below and will apply a greater impact on future spot export prices in the US than marginal gas generation prices, thereby calling into question the Boston Consulting Group's claim that future spot export prices will be bounded by marginal gas generation cost. Wind, solar and batteries will dominate export prices. For example, Minnesota is a summer peaker when the future spot export prices should be highest. With increasing solar installations in Minnesota to offset air conditioning load, the summer energy market for Manitoba Hydro will fall.

In comparing the estimated 2017 costs of energy in Figure 3 of the various electric generation energy sources show crystalline solar at about \$US50/MWh and wind generation at about \$US45/MWh; both below combined cycle gas generation at about \$US60/MWh. What is even more dramatic is the 2018 energy prices¹⁰ where solar generation with battery storage is \$US36/MWh and wind generation with battery storage is \$US21/MWh.

This is a very serious implication for Manitoba Hydro to expect any increase in US energy prices. These are the future prices they will have to compete against, reducing the chances of any gains in export revenue and increasing the likelihood of exports sales being at a loss.

There can be no expectation that the average export price for US electricity sales in the future will rise above the \$40/MWh in Figure 2 for normal water years in Manitoba. In fact, there is a very high probability that the average export prices will fall below \$40/MWh while in juxtaposition, Manitoba Hydro ratepayers will be forking out ever increasing prices for their electricity to subsidize this export boondoggle.

⁹ Boston Consulting Group report to Manitoba Hydro, dated July 6, 2016, which was submitted by Manitoba Hydro to the Public Utilities Board for the "Manitoba Hydro 2017/18 & 2018/19 General Rate Application, PUB MFR 72 – Attachment"

¹⁰ Denver Post, Published: January 16, 2018, Updated: February 1, 2018, Xcel Energy receives shockingly low bids for Colorado electricity from renewable sources, <https://www.denverpost.com/2018/01/16/xcel-energy-low-bids-for-colorado-electricity/>

Estimated Cost of Energy in the US

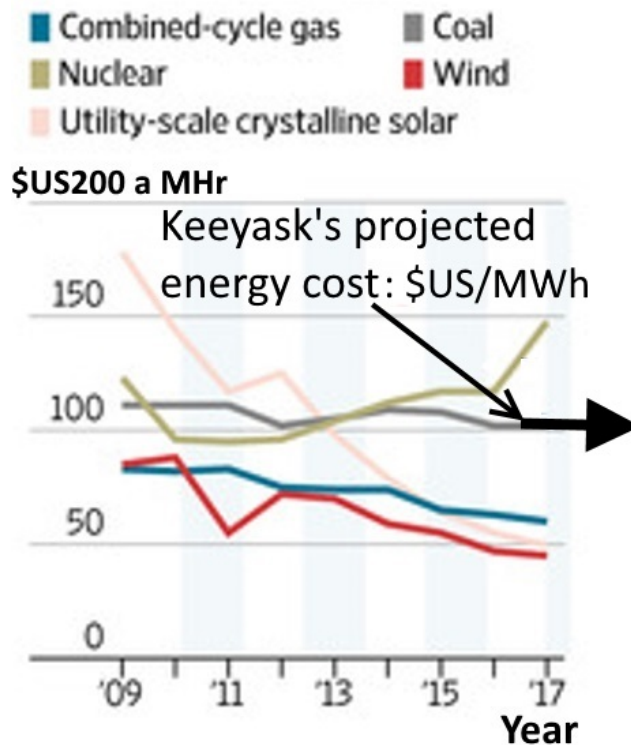


Figure 3: An historical review of estimated costs of generated energy in the US from 2009 to 2017 compare with the projected marginal cost of Keeyask energy as of 2014 added. Source: The Wall Street Journal, Nov 30, 2017

Manitoba Hydro are very challenged when it comes to load forecasting. In the Manitoba Hydro's 2016 load forecast submitted to the PUB for its GRA request for a 7.9% rate increase over 6 years³. Bloomberg New Energy Finance (BNEF) in 2017 released a forecast of how electric vehicles (EV) will grow¹¹. The following comparison of Manitoba Hydro's forecast for EV growth in Manitoba is compared with BNEF's predictions for EV growth in Figure 4 by proportional scaling:

¹¹ <https://about.bnef.com/electric-vehicle-outlook/>

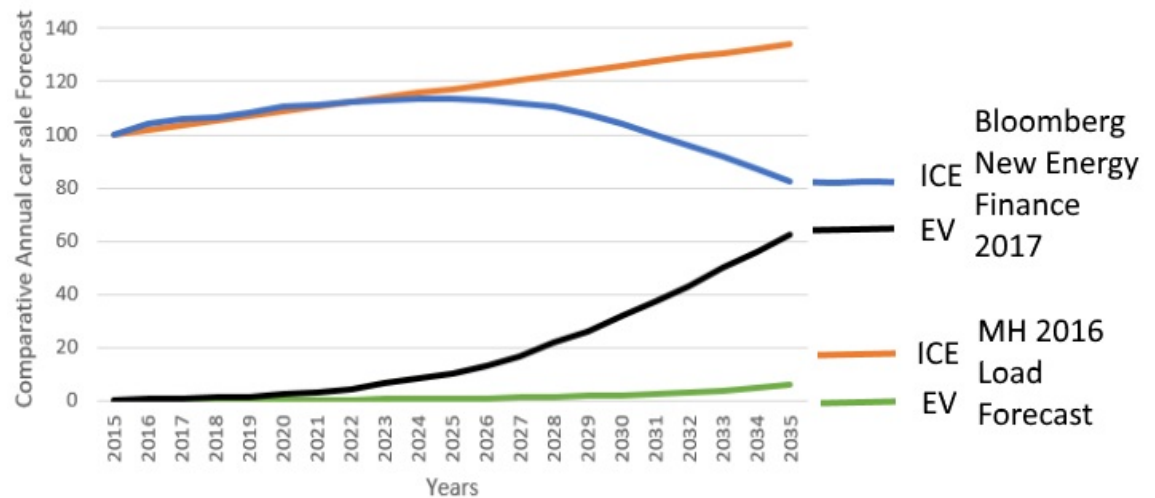


Figure 4: Comparison of predicted annual electric vehicle (EV) and internal combustion engine (ICE) car sales will grow

Figure 4 emphasizes one aspect of the challenges Manitoba Hydro has on load growth predictions. A major factor that needs to be considered is that the future is largely made, not predicted. Load forecasting in these times where electric power generation and use is changing rapidly, is a valueless exercise.

It appears there have been more developments and changes to electric power systems in the past 5 years than in the 100 years preceding. And the risk of MMTP profitability based on forecasts is becoming more obvious as acts of futility.

A present value analysis would reveal the economic benefits possible when energy exported to the US spot market is diverted to electric vehicle charging and the comparison in energy benefits between following the Manitoba Hydro 2016 load forecast for electric car sales and the BNEF's prediction. One important factor to take into account would be the reduction in oil imported to the province and the value in money staying in the province for the reduced purchase of that oil.

3.2 There are new markets being proposed within MISO, and there may be opportunities for Manitoba Hydro to take advantage of them. A 2013 study on Wind Synergy¹² between MISO and Manitoba Hydro outlined benefits for using Manitoba's Hydro resources to lessen the impact of variable wind generation. Benefits to MISO were identified if a new 500 kV interconnection was built into Minnesota such as

¹²<https://cdn.misoenergy.org/Manitoba%20Hydro%20Wind%20Synergy%20Study%20Final%20Report117083.pdf>

MMTP, but this study required Conawapa to be in service after 2027. So, after the PUB requirement to cease developing Conawapa in June 2014, this study requires revising to see what benefits can still be achieved with and without MMTP.

MISO continues to update and enhance their market systems. One area that is of developing interest is an Energy Imbalance Market, functioning effectively in the US western states and now with British Columbia. Energy Imbalance Markets help balance fluctuations in variable generation and load. MISO appears to be considering something similar, and it could be an expansion to the old Wind Synergy market. But an Energy Imbalance Market should also be studied for east-west diversity.

The concept of wind synergy markets is that variable energy is weather dependent as well as time of day dependent, so wide area transmission and east west transmission can be profitable even possibly with new transmission, but not necessarily with new costly generation. A true wide area market and transmission system is being studied for western Canada administered by the Alberta Electric Power System (AESO) with funding from NRCan. It is known as the Regional Electricity Cooperation and Strategic Infrastructure Initiative (RECSI)¹³ and is nearing completion. It is examining east – west transmissions and markets. It does include examining the benefits of new interconnection options between Manitoba and Saskatchewan including impact on operating reserves. This is a consideration in evaluating comparative benefits of an east-west interconnection from Manitoba and is another reason why approval for the MMTP line should be delayed to allow detailed benefit/cost analysis for the new options opening up for economic development of electric energy.

Further options may open up with the three country North American Renewable Integration (RECSI) study¹⁴ being undertaken by the National Renewable Energy Laboratory (NREL) to *“analyze pathways to modernize the North American power system through the efficient planning of transmission, generation, and demand. As wind, solar, hydropower, and natural gas continue to grow, NARIS will illuminate possible power system futures and explore how the United States, Canada, and Mexico can collaborate to enable economic competitiveness and reliability.”* This will take several years to complete.¹⁵

¹³ <https://www.aeso.ca/market/market-updates/regional-electricity-cooperation-and-strategic-infrastructure-initiative-recsi/>

¹⁴ <https://www.nrel.gov/analysis/naris.html>

¹⁵ Note: Manitoba Wilderness’ expert witness from Electranix Corporation is a subcontractor on the RECSI study and a member of the Canadian Stakeholder Committee for the NARIS study

Diverting Export Energy to Manitoba to Build its Economy

4.1 The increased number of EVs as predicted by Bloomberg New Energy Finance scaled to Manitoba has a small effect on the energy load forecast. The 4,400 GWh annual energy from Keeyask could support 1.26 million EVs if each consumed 3,500 kwh/yr. Every gas station could be assisted or mandated to have EV recharge facilities, which in turn will provide local business opportunities to achieve this. Dr. Nazim Cicek of the University of Manitoba has proposed in addition to electric mobility, *“freeing up surplus renewable electricity capacity that could be used to attract electricity-intensive new industries and jobs. Such industries could include advanced manufacturing, urban and northern agriculture (including cannabis cultivation), electrolysis-driven fertilizer production, value-added food and fibre processing, blockchain-based services, software developers and computer server farms.*

This is where increased usage of electricity to displace gasoline, diesel and natural gas also comes into play. As efficiency savings are achieved and new hydro capacity comes online in the next few years, local transition into electric transportation and heating becomes more attractive. Added to this is the aggressively dropping cost of renewable energy, making future expansion of renewable electricity capacity easier, but export sales more challenging.”¹⁶.

For example, every kwh used in Manitoba instead of being exported to MISO at opportunity market prices will build Manitoba’s economy instead of the economy of the US. If an electric car is charged overnight at 8.1 cents/kwh instead of into the opportunity market at 3 cents/kwh, this brings more revenue to Manitoba Hydro, reducing its debt faster, and so taking pressure of increasing electricity rates. In addition, that kwh charge added to a car battery will enable the car to travel about 5 km. A gasoline fueled car with an internal combustion engine of similar size will consume about 0.35 litre to travel the 5 km. At \$1.20/litre, that will cost about 42 cents, compared to 8.1 cents for the electric vehicle. So, the electric vehicle travels 5 times the distance for the same fuel charge. In Manitoba, the gasoline has to be imported and so it is money leaving the province, whereas the money to charge an electric vehicle helps Manitoba Hydro become more profitable. As

¹⁶ <https://www.winnipegfreepress.com/opinion/analysis/the-cure-for-what-ails-manitoba-hydro-481026973.html>

electricity becomes the new energy, this electric vehicle example expands to new uses and new industries as pointed out by Dr. Cicek above.

There is also the application of electric busses in Manitoba to replace over time the diesel busses in use today¹⁷. This would include city transit and school busses. All being charged with energy diverted from the export into the spot market of the Midcontinent Independent System Operator (MISO). Dr. Nazim Cicek also states⁸: *“Winnipeg could put itself on the map by becoming the first large city in North America to have a completely electric transit system, using 100 per cent renewable energy and a local product supplier.”*



Figure 5: Winnipeg Transit electric bus. Source: New Flyer Industries

4.2 One area completely ignored by the Manitoba Hydro 2016 load forecast is the growing use of hydrogen for transport. New Flyer Industries here in Manitoba include hydrogen busses (as well as electric busses) in their Xcelior range of busses. However, the potential growth of hydrogen mobility will be in heavy trucks and trains. Hydrogen is used to generate electricity through fuel cells to charge batteries which drive the traction motors.

In heavy trucks the Nikola One and Two are being developed in the US¹⁸. These will require charging stations, and Winnipeg is an obvious choice for hydrogen charging stations with its CentrePort Canada located here in

¹⁷ <http://www.cbc.ca/news/canada/manitoba/opinion-nazim-cicek-winnipeg-electric-buses-1.4595527>

¹⁸ Nikola Motors: <https://nikolamotor.com/one>

Winnipeg. Trucking companies have indicated interest in the hydrogen trucks. Nikola Motors will include hydrogen charging stations which will draw electricity. These heavy trucks will be travelling to Winnipeg and back to the US and east and west. Note: Anheuser-Busch has recently ordered 800 Nikola hydrogen trucks¹⁹.



Figure 6: Prototype Nikola One hydrogen truck with 800 km to 1600 km range with 15-minute refill time. Source: Nikola Motors

The city of Aberdeen in Scotland has hydrogen busses which use Ballard fuel cells from Vancouver. Figure 7 is a hydrogen bus unmanned refilling station. It requires electricity to generate hydrogen.



¹⁹ <https://www.theverge.com/2018/5/3/17314606/anheuser-busch-budweiser-hydrogen-trucks-zero-emission-startup-nikola>

Figure 7: Hydrogen bus refilling station in Aberdeen. Source: Aberdeen Hydrogen Bus Project

4.3 Another use for Manitoba's surplus energy is in rail transportation. The province of Ontario is studying plans to have a hybrid electric train system (hyd rail) for all its rail network by 2025 as it transforms GO from a commuter transit system to a regional rapid-transit system. Hydrogen will be the fuel to generate electricity through fuel cells to the onboard batteries and electric drive system²⁰.

For Manitoba, the rebuilt Churchill rail line would be a way to apply a hyd rail to Churchill to export and import goods to and from Asia and Europe. Such an advanced rail system and port would provide a way to lower transport costs for the ailing northern mining industry and expand northern development. One example is cobalt, an essential metal for lithium ion batteries. Cobalt is found with other metals found in Manitoba such as in nickel ores. There are opportunities to extract cobalt from ores mined in Manitoba and ship them the world where there are growing numbers of lithium ion battery plants.

Since Kawasaki in Japan is studying extracting hydrogen from brown coal in Australia and from hydro and wind in Norway²¹, there is a possibility hydrogen could be generated at Churchill from Manitoba's abundance of electricity for export too.

Manitoba Hydro must extract itself from the fixation of always exporting 'surplus' electricity to the US and collaborate with the provincial and federal governments and business to generate economy growing opportunities in Manitoba with the surplus electricity at present available

The Significance of Transmission and Interconnections

Another concern supporting the delay in approving the MMTP interconnection is Manitoba Hydro's lack of including the values of the land in the right-of-way (ROW) for the 500 kV transmission line. This allowed Manitoba Hydro assume a 100 m width for the ROW. In the US the most common value for 500 kV AC single circuit ROW width is 200 feet (61m)²². When traversing woodlands and farmlands, the 39 m difference is not insignificant. In woodlands, this means less habitat destroyed and fewer trees chopped down. A typical width of right-of-way in North America of 230 kV single circuit transmission lines is 125 feet (38 m)¹⁷.

²⁰ <http://urbantoronto.ca/news/2018/02/ontario-releases-feasibility-study-hyd rail-system-go>

²¹ <https://www.reuters.com/article/us-japan-hydrogen-australia/australias-agl-to-host-coal-to-liquid-hydrogen-export-trial-for-japans-kawasaki-heavy-idUSKBN1HJ0ET>

²² Capital Costs for Transmission and Substations, Updated Recommendations for WECC Transmission Expansion Planning, February 2014, Section 2.5 Right Of Way Costs

A further reduction in ROW width is possible with tubular steel tower structures. Low profile with less visual impact can be achieved using high tension low sag conductors as shown in Figure 8. Transmission lines with reduced visual impact will most likely have a higher economic cost than the conventional lattice tower design of the MMTP.

On the other hand, because of the reduced tower base area requirements of tubular steel tower structures with a low-profile design, there is more opportunity to share existing ROWs including road and rail side, or along farmland road allowances. More time is needed for Manitoba Hydro to redesign the ROW and its route for less environmental impact and improved visual acceptance.



Figure 8: Reducing visual impact of high voltage transmission lines with high tension low sag conductors

The Manitoba Clean Environment Commission in approving MMTP²³ with recommendation 9.5, page 151 stated: “*Manitoba Hydro, in future projects, should also consider the visual impact of a transmission line on traditional land and resource use.*”

More visually pleasing transmission structure designs have achieved greater public acceptance in Denmark and the UK as well as in the US. New high voltage interconnections must be made more acceptable to the public, otherwise they will suffer the same impediments that oil pipelines are facing. This is already happening in Europe and now in North America where society acceptance and social licence to operate are becoming significant in decision making. Consider the recent prevention by the state of New Hampshire of the Northern Pass interconnection between Quebec and New Hampshire.

A report explained the main reason for the project not being approved:

“Opponents led by scores of small town officials, property owners and environmentalists said they worried that the transmission line towers — some as high as 155 feet — would destroy scenic views, reduce property values and hurt tourism in a part of the state that includes the White Mountain National Forest. They also

²³ Report on Public Hearing, Manitoba Minnesota Transmission Project, Sept 17, 2017, by the Manitoba Clean Environment Commission.

http://www.cecmnitoba.ca/resource/hearings/43/00850.MB_Clean_Enviro_Report%20web.pdf

argued the project offers few benefits to New Hampshire, since much of the power is slated to go to customers in Massachusetts.”²⁴

In this day and age, the adverse impact of transmission lines on scenery and habitat is a factor. There is a need to provide a cost value to scenic disruption, loss of species, loss of habitat, loss of carbon sequestration. Such a cost value would vary with the type of scenery and from proximity to other man-made structures to wilderness. Other variables also define public acceptance. It is recognized that there has been a decline in aesthetic quality of rural and wilderness landscapes.

As the electric power system evolves with low cost variable generation and storage, there will be a need for interconnections between regional grids such as the Manitoba to US, Manitoba to Saskatchewan (and perhaps further west) and Manitoba to Ontario. However, the requirement for new inter-regional interconnections must be profitable and provide economic benefit to ratepayers even if ratepayers become producers as well as consumers of electricity. There must be recognition of electricity developing into the dominant energy used.

Low profile, visually pleasing transmission line designs are often dismissed as being more costly than conventional lattice tower structures. However, it is claimed design can result in visually pleasing transmission structures that are easier on the environment, faster to install, last over 80 years with less maintenance. 50Hertz Transmission GmbH in Germany is looking at new 400 kV lines designed to the dimensions of 220 kV lines to increase public acceptance with added benefit of reduced width of right-of-way (38 m in North America¹⁷).

Undergrounding, although visually preferred is economically penalized against overhead transmission thereby making the case for putting forward visually pleasing structures.

Conclusions

6.1 Manitoba Hydro has not addressed other alternatives for the excess generation in the province. Their requirement to adhere to the Manitoba Hydro Act to “*promote economy and efficiency in the development, generation, transmission, distribution, supply and end-use of power*” as assumed by Manitoba Hydro that this can only be achieved by exporting their surplus electricity into an ever-softening US market. This has been an abject failure as evidenced by ratepayers paying for the economic losses of the approved Manitoba Hydro Preferred Development Plan with requests for dramatic increases in their electricity rates. Passing the blame to the PUB for approving the Preferred Development Plan is not acceptable. It is not the PUB’s responsibility to plan Manitoba’s electric power system. It also not acceptable to justify proceeding

²⁴ Casey, M., “Regulators reject hydropower project over tourism concerns”, The Associated Press, February 1st, 2018 : <https://www.winnipegfreepress.com/world/regulators-reject-hydropower-project-over-tourism-concerns-472228413.html>

with the MMTP interconnection because the PUB approved it, particularly in the nearly four intervening years, Manitoba Hydro's marginal generation costs will be increasing with Keeyask while in the US marginal generation costs have reduced with their low cost solar and wind generators with energy storage.

6.2 Manitoba Hydro in its Environmental Impact Statement for the MMTP line as presented to the Manitoba Clean Environment Commission (CEC) did not provide alternative means to reduce environmental impact. Instead only one transmission alternative was presented and that is what all who were consulted or intervened had to accept. The Canadian Environmental Assessment Act, 2012 under "Factors to be Considered", Section 19 (1) states: "(g) *alternative means of carrying out the designated project that are technically and economically feasible and the environmental effects of any such alternative means*;" . This was clearly not done by Manitoba Hydro and when an alternative transmission configuration to the lattice tower structures with 100 m right-of-way width was presented to the CEC by Manitoba Wilderness proposing tubular steel towers with a narrower right-of way as alternative with less environmental impact, it was rejected by Manitoba Hydro.

6.2 There are opportunities for Manitoba Hydro to assist in developing local markets for their surplus electric energy if they apply the same vigor that they have applied in their attempts to obtain export markets. In doing so they should collaborate with businesses, local, provincial and federal governments. There are great changes occurring in the generation and use of electricity, and insightful advantage needs to be taken of the opportunities that are forthcoming. The total cost of the MMTP line is stated above at \$1.1 billion. A portion of the money that can be saved from this by not constructing the MMTP line can be applied to co-fund initiatives with governments and business to build up the Manitoba economy.

6.3 Use of electricity for mobility to displace imported oil must also be a consideration in planning the economic development of Manitoba.

6.4 The transition to building provincial markets for electricity from developing only export markets will not happen overnight. The *existing interconnections* will remain a valuable support to Manitoba Hydro bringing in revenue from contracts and the spot market. New markets will develop in MISO over time but may not require more interconnection capacity between Manitoba and the US while surplus electric energy would be diverted into Manitoba to build up its reducing economy. Approval for the MMTP line should be delayed until comprehensive studies of possible new market options within Canada show benefit/cost analyses that are profitable and will ease the demand on Manitoba electricity ratepayers.

1. 6.5 To minimize environmental, agricultural and societal adverse impacts of any future MMTP line or any high voltage interconnection that Manitoba Hydro participates in, they need to consider more acceptable transmission line designs to

head off future blocking as is happening today with pipelines and in some cases, transmission lines that are visually unacceptable.



The best way to
predict the future

is to make it happen

Peter Drucker