

Manitoba Hydro and The Buggy Whip Syndrome

Introduction:

In my previous submission to this Board in March 2014, I attempted to make the case that Hydro ought not to proceed with Keeyask, and certainly not with Conawapa. Instead, they ought to pursue far more aggressive DSM, and utilize wind and geothermal power for any needed load changes. They ought not to pursue further American export contracts, because the average revenue from such sales, when combined with the wheeling sales is around 3 cents per kWh, likely only a quarter or less of the costs of new hydro generation.

The substance of that argument, (which of course was not followed), was that, in times of significant risk from new disruptive technologies, traditional, slow, costly megaprojects represent a “bet the house” approach, rather than using scalable, low risk interim measures until the longer-term cost picture is clearer.

While this may be an unusual request, I would ask that the Board accept my request to table that 2014 submission as well as considering this newer one I am making today.

What has and has not changed since 2014?

One thing has not changed. Hydro’s capital cost estimates are still as wrong as ever. Keeyask’s costs are still mounting, and your recent study suggests more than a doubling from the original estimates. It is small comfort to Manitobans that this is also the case in BC (Site “C”) and Newfoundland (Muskrat Falls). It will be interesting to hear the Board’s revised estimates of Keeyask’s likely costs per kWh, but it would be surprising if they were less than 12 cents, and that’s before transmission, which will add another 2-3 cents or more. (MISO Estimates 2014) Keeyask will generate power at a cost that is as much as four times Hydro’s average revenue from export sales.

A major change is that Canada seems embarked on a clear commitment to the Paris accord, and with it, carbon taxes that will make the cost all carbon fuels more expensive. Rather than disputing the mechanism and level of this tax, which will impact Manitobans relatively less than most other provinces, we should embrace the chance to grow our green economy, including Hydro consumption here in Manitoba, making us leaders in the coming reduced carbon world.

More dramatically, what has not changed are the steep “S” curves that typify the adoption rate of disruptive technologies. These adoption rates are accompanied by sharply decreasing unit costs of such technologies. I urge members of the Board and staff to view the following presentation by **Tony Seba**, a world expert in disruptive technologies, their source, their characteristics and effects. (<https://www.youtube.com/watch?v=2b3ttqYDwF0&app=desktop>)

While on-shore wind power cost declines are now slowing, new wind power in the interior North America can be generated at between 2 and 4 cents per kilowatt hour. Alberta recently

awarded 600MW of 20 year wind contracts at an average of 3.7 cents per kWh. (www.awea.org/falling-wind-energy-costs) Hydro has the capacity to firm and shape wind in its huge storage system, unless it has given away that capacity to North Dakota, which some suspect it has. (see my previous submission on this issue) Off-shore wind continues to decline in unit costs to under 2 cents in Europe.

Much more dramatic is the fall in the cost and rise in the efficiency of solar energy. Within the past 12 months, large (500MW+) solar projects have fallen in cost from 2.99 cents per kWh for a project in Dubai to in to 1.77 cents for a Mexican project, a stunning 41% decline in one year. ([Centro Nacional de Control de Energía \(Cenace\)](http://Centro Nacional de Control de Energía (Cenace))). The Mexican project totals 682 MW, a little bigger than Keeyask. Solar experts suggest that prices will reach 1 cent within a year or two.

Finally, the third disruptive technology is storage. All over the world, groups are racing to find storage strategies ranging from injecting compressed air into old salt mines (Windsor Ontario), solid state batteries (Panasonic and many others) or pumping water up into upstream dams at night using inexpensive power (Niagara Falls). But the dramatic changes in costs are coming from new battery technology. Backup battery storage units as large 100MW are already in use in Australia and the United States. (<http://reneweconomy.com.au/stunning-new-lows-in-solar-and-battery-storage-costs-13929/>)

Why do these realities matter to Manitoba Hydro?

Manitobans are in the fortunate position of receiving almost 100% of our power from green, renewable sources. So why should we care about disruptive technologies in the rest of the world?

Here's why.

Hydro's already slim export earnings of 3 cents per kWh are in direct competition with these disruptive technologies across the USA. When our more lucrative fixed price contracts expire, the competition will be for power at under 3 cents. Energy demand in the USA is flat to declining as DSM measures shave demand significantly. What is worse for Hydro is that it now acknowledges that demand in Manitoba is also flat to declining. With the proposed sharp rate increases, it will soon get worse. That is because larger Manitoba companies are likely already doing the numbers to see if solar and storage is cheaper than Hydro as Hydro's prices escalate sharply with the rate shock of Keeyask and Bipole 3. Northern Manitoba is soon to have a major surplus of AC power as the smelter at Thompson closes.

These are not "if" statements. A look at the sites noted above, and any number of other such sites, make it clear that this disruption is now, it's fast, and it is entirely economically driven. It is not driven by environmental concerns, though some of us might wish it were. Coal is not coming back, no matter what Trump may say. Already many more workers are involved in solar and wind energy than mining coal, and these are obviously much better jobs to have.

<https://www.forbes.com/sites/niallmccarthy/2017/01/25/u-s-solar-energy-employs-more-people-than-oil-coal-and-gas-combined-infographic/#3f672f9f2800>

As power generation shifts dramatically, there are major implications for our grid that is designed almost exclusively to use direct current to transport large amounts of power over long distances with minimal line loss. Historically, this was also a disruptive technology, for which the engineers of Hydro and AECL have received due credit in years gone by. But the times have changed. When Hydro was making power for 2-3 cents per kWh and selling it for significantly more into markets needing baseload power, the idea of pre-construction of dams being paid for in large part by exports was great. That reality was ending by 2000, was further diminished by new DSM strategies and was buried by the 2008 recession.

This new reality also raises the important issue of whether we should now also contemplate Hydro's plans for renewing the small dams on the Winnipeg river, at enormous costs per kWh. Perhaps it is time for the previously unthinkable, of slowly returning the great Winnipeg river to a state of nature in Manitoba, while avoiding costs of renewing these old dams at a cost per kWh above even those of Keeyask.

Conclusion:

Hydro, and to some extent these hearings, are proceeding in a polite, linear fashion, on the unspoken, and frankly unexamined assumption that while the world of power generation is changing, it is doing so slowly and predictably.

It is neither slow, nor wholly predictable, because disruptive change is neither linear, nor slow, nor entirely predictable.

Here's what Government and Manitoba Hydro focussed on the future might do instead.

- 1. Stop pursuing firm export contracts for our relatively small firm energy surplus, with all the huge and uncertain costs of new dams and lengthy transmission lines.*
- 2. Start measures to increase electrical energy consumption in Manitoba through Geo-thermal heating, electric heating, electric vehicles and electric transit. Stop installing natural gas in new suburbs and use GT. Let's showcase our electric bus manufacturers and industrial scale GT expertise aggressively. It is better to sell power at 7.2 cents per kWh to Manitobans than for 3-4 cents to Americans, especially if we can make our homes, vehicles and transit more efficient and carbon free. Where costs of this transition are an issue, use the carbon tax revenues to mitigate this shift in the initial period.*
- 3. Start working with major corporations and property owners to utilize solar and GT/Heat pumps to increase their operations' efficiency and energy costs and make them more successful Manitoba companies and leaders.*
- 4. Get serious about a possible merger with Sask Power, our next-door neighbour. Residential Power costs there already exceed 13 cents kWh, and dirty brown coal is a major fuel source. http://www.saskpower.com/wp-content/uploads/Service_Rates_Residential_2017.pdf Carbon taxes \$50 per tonne will drive these costs even higher. These two power systems are*

actually very complimentary, and such a merger could lower Saskatchewan's future power costs, reduce the rate shock to Manitobans, and help the environment by converting Saskatchewan's coal plants to natural gas, using them as peakers and for back up. A full merger might eventually make a case for Conawapa.

It is time to call for a careful, informed re-think of the fundamental and technical assumptions that drive our decisions about Hydro's future.

Getting to a 25/75 equity level is the least of our worries. The only real reason for such a pre-occupation is to create one of the conditions to privatize Hydro. What Hydro needs is a new corporate culture that takes seriously the new disruptive technologies, understands that the entire energy world is changing very fast, and that Hydro is already behind the curve. We have spent billions based on a 40 year- old export strategy rooted in 1970 power prices and technology, and continued to pursue that strategy while the world has changed enormously.

Buggy whip manufacturers did that in 1900. We are on the same track. I hope that the Public Utilities Board will examine my evidence and take it into account in their upcoming orders.

Respectfully submitted,

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