Submission to BCUC

Site C Dam

From: Doug Hargitt
[redacted]

[redacted]

The site C dam has created a lot of political furor and with that a great deal of contradictory information and sometimes misinformation. As a lay person in this matter, but with a background that includes university education in math and physics, and lengthy career as an industrial operations manager, I became interested in sorting this question out for myself.

In terms of the 5 questions, the first 3 are essentially accounting questions for which I simply do not have enough data to comment, other than a note about cost over-runs.

Cost Over-runs:

Much is made in some circles about the potential for cost over-runs.

Generally, I see a lot reference to the Muskrat Falls project. That project has indeed been plagued by actual costs being much higher than estimated. It is, however, really comparing apples and oranges. The Muskrat Falls project is as much the building of a complete grid infrastructure as it is a dam project, and includes two very ambitious undersea transmission links.

The other project that comes up regularly in cost over-run discussion is the Keeyask dam project. That project is similar in scope to site C and so provides a more "apples to apples" comparison. The latest publicized estimate of costs to complete Keeyask is slightly less than site C.

That leads me to conclude that site C can indeed be brought to completion at close to the current estimate. Obviously, as with any project, there are risks to that budget, but they do not appear to be excessive risks.

Portfolio of Alternatives:

In essence, renewable options are rather limited.

The primary ones that are touted are wind and solar. There is a great deal of conflicting information out there regarding wind and solar (and their cousins tidal and wave). Rather than try to sort through the conflicting detail to a conclusion it is more germane to look at real world experience.

Even real world experience in wind and solar is difficult to sort out because of the high levels of taxpayer subsidies applied to wind and solar in particular. In the end, however, it is not that difficult to sort out the variances in retail electricity rates by grid jurisdiction, and consider subsidies as estimated adder.

The challenge I put forth was to find a wind-solar directed grid jurisdiction that has abundant, renewable, reliable, and affordable electricity without subsidies (or including subsidies). I was unable to do so. Every single grid jurisdiction I looked at to meet those criteria (which is what BC, Manitoba, and Quebec boast from their hydroelectric systems) failed.

Fundamentally, what I found was that the generating benefits from lowered cost wind and solar generation were drastically insufficient to offset the ancillary costs (storage, transmission, and distribution) and the destruction of peak capacity flexibility that they induce.

The retail costs for electricity in every single grid jurisdiction that chose to make wind and solar a significant part of their grid have soared. On average, the retail electricity rates using wind and solar have tripled as the system matures. (Part of that rapid rise is the destruction of legacy capacity economics by the destruction of off peak wholesale rates, which is why it takes some time for the problems to show up.)

The accompanying problem with these large rises in electricity rates caused by wind and solar is a growing social problem of energy poverty. There are many programs out there to combat this issue, from countries like Scotland through to our own province of Ontario.

The Ontario experiment with wind (which is better in the Canadian context than solar) has been a very costly exercise. The program to offset energy poverty in Ontario is costing the province $45 billion (and possibly as high as $93 billion). Even with that very large taxpayer rate subsidy, Ontario retail electricity rates are higher than those we have in BC with hydroelectric.

The $45 billion that Ontario is spending due to wind power makes site C look very cheap at $9 billion, and that $45 billion does not include the billions spent on building the wind power system. It also only covers a period out to 2027, where site C can expected to provide reliably relatively low cost electricity through to 2125 (and possibly beyond).

I can only conclude that while wind and solar have an initial appeal, the end costs are far and away higher than is portrayed. The generation cost is not what matters, it is the delivered cost to the customer.

The other significant potential source of electricity generation for BC is geothermal. That can be split into two streams, hydrothermal and enhanced geothermal.

There are insufficient natural hydrothermal vents in BC to make the hydrothermal portion of significance.

Enhanced Geothermal Systems (EGS) does have significant potential for BC. However, EGS brings with it serious risks of induced seismicity that have yet to be resolved, and in essence EGS is still experimental technology. Whether or not the problems with induced seismicity can be resolved is controversial, but it looks unlikely. BC has two regions with high potential for EGS, the extreme northwest and the southeast. The extreme northwest is simply too far from potential markets. In the southeast region, the EGS potential is tangled up in National Parks, Provincial Parks, and indigenous land claims.

Given those difficulties and limitations surrounding geothermal, I can only conclude that geothermal does not offer sufficient potential at this time to be considered. Perhaps, assuming current experiments succeed, EGS will be available for future needs when the capacity of site C is exhausted by demand – but EGS is simply not available now or expected to be available in the near/mid term.

In the end, I can only conclude that when subsidies and ancillary costs are considered, that there is no cost comparable renewable alternative at this time, nor on the visible horizon.

Peak and Aggregate Demand:

I recognize that forecasts are both difficult to do, and fraught with uncertainty. That being the case, the most logical route is to consider past performance data and future possibilities to estimate the upside and downside risks to the trends.

The BC grid does not operate in isolation. That makes forecasting even more unreliable. However, we can look at what we know and and what the primary trends are.

The BC population is growing, however the electricity intensity per resident has a downward trend – but one that is leveling off. Pretty much everyone now has EnergyStar appliances, and most have LED bulbs etc. The trend to smaller residences has run much of its course in terms of the average electrical intensity per capita. We can expect then that electricity demands will indeed continue to rise with population growth, which remains considerable.

The industrial side of the equation is more difficult to read, as it will be impacted by many outside influences. We do know, however, that some industries are significantly impacted by high electricity rates (Australia now has a problem with industries leaving because of high electricity rates – caused by the transition to wind and solar). Co-generation facilities have impacted industrial demand, and industries are becoming more efficient in their electricity usage.

That said, there is an upside risk to industrial demand if BC electricity rates stay relatively low. Electricity use heavy industries could be attracted to BC as rates rise elsewhere.

In the end, it is the population growth and shifts away from fossil fuels that will drive increased demand.

Initiatives such as the City of Vancouver push away from the use of natural gas in buildings will actually increase electrical demand. The effects are difficult to predict, however it would be reasonable to assume that this kind of initiative could spread and create a demand uptick as natural gas for heating and cooking is displaced.

Electric vehicles are a growing trend world wide. In the BC context, a reasonable estimate is that EVs could achieve a market penetration of around 30-40% within 15 years. That represents a significant amount of energy requirement transfer from fossil fuels to electricity. Fortunately, a very significant portion of that electricity demand can be time shifted to night time charging hours where other demands are low. (Which rules out solar generation and weakens the impact of wind generation.) That will create overall demand and also create more peak demand.

The impacts of increased carbon taxes are likely to have little effect on choices outside of transportation/EVs. Certainly, higher carbon taxes will be a factor in leaning choices toward Evs, but outside of that area the impact is relatively small.

There is a system risk in terms of peak capacity from rooftop solar as currently structured. The net metering program as currently structured provides a significant ratepayer subsidy to those that install rooftop solar (and unfairly places cost pressures on rates for lower income ratepayers). That system risk is evident in the experience of other jurisdictions. The daily demand curve "duck" becomes a daily demand curve "goose" with a much higher peak demand ramp in the evenings. Negative daytime demand from rooftop solar users suddenly switches to peak demand grid demand in the evenings. In other jurisdictions this effect has tended to hurt overall economics of dispatchable sources, and drive up peak demand rates.

There are similar risks in terms of peak power from all non dispatchable sources. They may, or may not be in a position to supply additional power during peak demand periods. Certainly under the influence of an Arctic high, my area experiences light winds and little sunshine during a period of very high demand.

The effects of climate change are also going to have effects on peak demand in particular. As the climate warms, and it is predicted to do so, more homeowners turn to whole house air conditioning. Anecdotally, almost no one in the previous community I lived in had whole house air conditioning, however whole house air conditioning is becoming much more common.

All of that places additional demand on BC Hydro to provide more peak capacity cushion. That is a difficult position, in that there is no guarantee of the demand, however it is necessary to maintain grid stability and integrity. That is born out by the two peak demand records BC Hydro experienced this year.

In all of the discussion on the demand side the longer term trend is the key. Examining the domestic demand figures from BC Hydro financial statements 2005 and 2016 shows a significant demand growth.

The preponderance of demand risks are to the upside, both for aggregate and peak demand. Quantifying those is always difficult, however it is prudent to assume that the capacity of site C will be required within a relatively short period of time – especially on the peak demand side.

Conclusions:

- **No grid jurisdiction that relies on wind and solar renewable electricity has been able to maintain affordable electricity rates without considerable subsidies.**
- **The potential for cost over-runs of site C appears manageable, and even it if it does run over budget, the net costs would be far lower than the alternatives with subsidies included.**
- **The electricity from site C will be required in the near to mid term, especially its peak demand capability.**

Thank you.