

From: [Ed Dylke](#)
To: [Commission Secretary BCUC:EX](#)
Subject: Site "C" Proposal
Date: Wednesday, September 20, 2017 7:29:48 AM

Hello Mr./Ms. Commission.secretary,

Introduction:

The reason for my email today is because I am very interested in the future supply of electricity within our province. I believe that the Site "C" dam is a necessary short to medium solution to lack of firm green power which will become a major concern over the next decade. Non-firm energy sources such as wind and solar are not available all days of the year thus cannot be considered. In the longer term, supplies of green electricity beyond Site "C" will be necessary as the BC population increases, electric vehicles become the norm and electricity replaces natural gas for residential and commercial building and water heating.

My Background:

I was:

- the impetus, technical developer and project sponsor of an approximately 60 MW, 390 GWh per annum completely green CoGeneration project which currently is operating within the Province.
- the impetus and technical developer to install a 20 MW CoGeneration system, also a green project. This also is currently operating.
- a member of an industrial group that discussed the consequences and rules regarding equivalent carbon dioxide emissions with the provincial government. Also a representative of a similar group that discussed proposed legislation for equivalent carbon dioxide emissions with the federal ministry of the environment (legislation never made it beyond discussion).
- the individual that justified several energy projects resulting in significant reductions in energy and in equivalent carbon dioxide emissions for the company I worked for.

My Comments:

- I have reviewed the current position of BC Hydro in terms of providing electricity to our province. I do not see any issue with BC Hydro providing the total annual requirements of green electricity to the residents of our province in the short term with or without the Site "C" dam. These can be provided by wind, solar, existing hydro (both BC Hydro and independents from dams), run of river hydro, bio-fuel generated electricity, etc. without the installation of the site C dam.
- The issue I do have is the ability to satisfy short term demand on a firm basis. Wind, solar and run of river are all dependent on conditions being favourable at the time an extreme demand for electricity exists. Since these are not guaranteed they must be excluded from a firm supply. Currently the only real firm supply of green electricity is from dams (whether BC Hydro or independents) and bio-fuel generated electricity (a small component of the overall supply). Wind, solar and run of river should not be discounted; however, since they will help to keep the reservoirs behind the dams full.
- Currently, the province is essentially in balance between supply and demand with the recent demand peak of 10,126 MW and supply availability of about 11,900 MW. This difference in supply currently is very good and provides a significant buffer even in the event some

generators are down; however, it is insufficient for the future providing the “Clean Energy Act” is adhered to. The future issues I see are:

- o Population Growth in BC

The lowest 10 year population growth over the past four decades has been 11.1% (the highest was 27%). Being very conservative, and assuming the BC population growth will increase by 11% over the next ten years will likely result in an increase in commercial and residential demand. Based on factoring out large industrial demand (perhaps a poor assumption however probably conservative) would indicate an actual increase in peak demand of about 8.4% by 2025 compared to 2015. Thus a peak of about 10,800 MW can be expected by 2025.

- o Electric Cars

There has been a huge impetus towards the production of electric cars around the world although we have seen little of this in Canada. For example, The Netherlands will eliminate all gas and diesel vehicle sales after 2025, similarly, India by 2030, Norway by 2025 (currently about 40% are hybrid, electric, or hydrogen), France and Britain by 2040. Car manufacturers are taking note with Volvo announcing that 100% of all production will be hybrid or fully electric by 2019. Volkswagen has announced that 2 – 3 million of its vehicles will be pure electric vehicles by 2025. Based on the percentage increases in electric vehicles already on an annual basis, I expect that electric vehicles will supplant gas and diesel vehicles much sooner than projected. Already forecasters are rapidly changing their predictions about the rate of increase in percentage in electric vehicles sold. Obviously, initial vehicle price, the price and reliability of the battery and range will be major considerations in a consumer’s decision making but already all of these are improving.

One additional factor which may encourage a rapid switch away from gasoline is maturation of autonomous vehicle technology especially when combined with smart highways. Both electric and autonomous vehicle developments are happening simultaneously thus become a natural fit even though each is independent of the other. Autonomous vehicles and the smart highway will allow shorter driving times and greater traffic densities than are possible currently. Thus drivers will push to have these technologies implemented coincidental with electric vehicles.

Based on the above, and a guesstimate that 10% of the BC automobile market will be electric vehicles by 2030 provides the following demand for electricity (I am assuming that a gasoline engine is about 30% efficient and an electric vehicle {including charging} is about 80% efficient. I used 2016 gasoline sales in BC for my calculations. I assumed no change in diesel sales. In addition, I assumed that an electric vehicle will be charging 50% of the time). Based on these assumptions, I have calculated an increase in electrical demand of about 400 MW by 2030. By 2040, I believe we will see an electrical demand increase of 3000 to 4000 MW above the current values. This increase by itself far exceeds the expected 1100 MW of firm power to be produced from the Site C dam.

Further increases in demand will occur when diesel is replaced with electricity; however, I expect this switch will take longer than for gasoline powered vehicles.

Elimination of Natural Gas in Homes and Commercial Businesses

The replacement of natural gas forced air furnaces with heat pumps and the replacement of natural gas water heaters with electrical resistance heaters will have a very significant increase in demand for electricity within the Province. I have not calculated the effect because I was unable to find the breakdown of natural gas usage in the way that I wanted it; however, am convinced that the effect by 2030 will probably be at least the same level as that shown above for electric cars.

One modest reduction in electrical usage will occur due to the replacement of resistance coils on cooktops with induction coils. This will marginally improve cooking electrical efficiency but this gain will probably only offset the elimination of natural gas cooktops.

- The above convinces me that the site C dam is necessary for the Province of BC again, not because of annual energy requirements, but because of relatively short term demand considerations. My arguments show a more and more dire situation in the decades after 2030. Thus, why not do it now? We can argue that the demand situation can be managed:
 - o through the purchase of electricity from Washington State or Alberta; however, I would suspect that they will be in very similar situations to BC in the future. Perhaps they will have energy but it will be fossil fuel generated. In my opinion, this is a non-starter.
 - o through the installation of a nuclear power facility. This facility would increase the stable base production of electricity thus providing a significant increase in firm supply. Unfortunately, I don't believe in the short term that this will be compatible with the wishes of the BC populace thus a non-starter at this time.
 - o through the installation of many batteries (probably Lithium ion) in the province. I suspect but do not know that the capital and maintenance costs of such a system would be higher than the Site C dam. Again, for these reasons, a non-starter.
 - o through the development of geo-thermal power. The development of this technology is still early so it is doubtful that a major project would be considered for at least 25 years.
 - o through time of day metering. Although this may provide some relief for very short term high demand situations, it will not alleviate the overall concern of higher electricity demands due to population growth, electric vehicles and housing.

In the above I have shown that the site C dam or some other form of firm electricity is required to satisfy higher electricity demand within the province within the next decade due to population increases, the adoption of electric vehicles, and the replacement of current fossil fueled home and water heating with electricity. Although I concentrated on demand which will see the first shortfall, average electrical energy also will be in short supply in the future unless major baseload energy supplies such as geothermal or nuclear are developed or a better lower cost battery is developed which allows more solar or wind power to be further exploited.

Although in the 2020 to 2030 period we will require the site “C” dam, in the period beyond this we must develop other sources of electricity if we are to satisfy the demand of a modern society in the period beyond 2040 and pressured even before that.

Sincerely,
Ed Dylke, PEng

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