SUBMISSION TO THE

BRITISH COLUMBIA UTILITIES COMMISSION (BCUC)

INQUIRY INTO BC HYDRO'S SITE C PROJECT

Submitted August 29, 2017

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This submission represents the thoughts of a ratepayer of BC Hydro, a taxpayer to the British Columbia government (which is ultimately responsible for the financial status of BC Hydro) and a resident of British Columbia who has seen the significant long-term benefits that residents and commercial enterprises have received from the commitment to large-scale hydroelectric developments in BC made in the past.

By way of background, I am a retired lawyer who was involved in energy-related matters for over thirty years. I appeared on many occasions before the BCUC as counsel. While some of those appearances related to BC Hydro matters, I have never acted on behalf of BC Hydro (on a few occasions I did act as counsel for British Columbia Transmission Corporation when it was a separate organization) and I have often acted against BC Hydro in BCUC proceedings and in other venues.

This submission primarily relates to question 3(b)(iv) in the OIC establishing this Inquiry, although it peripherally relates to other questions that are before the Commission. In preparing this submission I have not analyzed detailed cost estimates or detailed forecasts of electric demand. Instead, this submission is based on knowledge gained during my years of energy-related legal practice and as an interested observer of energy issues in my retirement.

Major hydro-electric facilities such as the Site C project can provide reliable power to the province for years into the future. Through use of their reservoirs large scale hydro-electric facilities provide operators of electric systems with the storage of potential energy, thereby providing a flexibility to match generation with demand that is unmatched by any other form of power production.

It would be irresponsible, both from ratepayer's perspective and from an environmental perspective, not to develop major hydro-electric projects that can provide power at a cost that is reasonably competitive with other sources of electric power. Such irresponsibility would be magnified in the circumstances of the Site C project, in which a significant portion of the costs have already been spent or committed (in the parlance of economists these are "sunk" costs).

Value of Generation

In answering the questions before it in this Inquiry the Commission must keep in mind that in electric matters British Columbia is not an island. The electric systems in the western part of North America, including British Columbia and Alberta, form an inter-connected grid, coordinated through the Western Electricity Coordinating Council (WECC). Question 3(b)(iv) in the OIC establishing this Inquiry commences with "Given the energy objectives set out in the *Clean Energy Act…*". Energy objective (n) of the *Clean Energy Act* recognizes the inter-connected nature of the electric grid in western North America where it lists as an objective: "to be a net exporter of electricity from clean or renewable resources with the intention of benefiting all British Columbians and reducing greenhouse gas emissions in regions in which British Columbia trades electricity while protecting the interests of persons who receive or may receive service in British Columbia". The interconnected nature of the electric grid in western North America is of consequence to this inquiry: major hydro-electric facilities with reservoirs (such as the Site C project) are the only type of clean or renewable generation that provide storage of energy and the capability of subsequently making it available for export sales (or domestic consumption) when electric power is most valuable. Major hydro-electric facilities are a key component of grid reliability.

Solar, wind and run-of-river generation have no storage capability as part of their facilities. Power from those types of generation will tend to occur at the same time as similar generation in interconnected areas, particularly to the south. The seasons in all of western North America occur at the same time. If it is sunny in BC, it is likely to be sunny in Washington and Oregon, and perhaps throughout the whole of the WECC area. If it is windy in BC, it is likely to be windy in Washington and Oregon. If it is the spring freshet on the rivers in BC, it is almost certainly to the spring freshet in Washington and Oregon. Electric power generated in BC from solar, wind and run-of-river sources will tend to be generated at the same time power from those sources is being generated in other parts of western North America; with the result that power from those sources will tend to have low (or even negative) value due to the large amount of power then available in western North America. In contrast, large scale hydro-electric facilities such as Site C are able to store water in their reservoirs, delaying generation until the value of electric power is high. Unlike solar, wind and run-of-river generation that must occur when the sun, wind or water is available, generation from large scale hydro-electric facilities can shifted from day to day, month to month, or year to year.

In the paragraph above I refer to the possible negative value of power. Negative pricing of electric power has occurred in the WECC area in some years during the spring freshet. Bonneville Power Administration (BPA) operates a series of large hydro-electric facilities on the Columbia River that have limited storage (reservoirs). During the spring freshet in some years the electric power that can be generated at the BPA dams from the volume of water flowing in the Columbia is greater that BPA's system requirements. For environmental (fish) reasons BPA prefers to run the water through its turbines and generate power rather than allowing water to spill over its dams. In such periods BPA will pay others (such as BC Hydro) to take power to serve their loads; resulting in a negative price for electric power moving into the BC Hydro system. When such an event occurs it will likely coincide with a period when run-of-river generation facilities in BC are producing their maximum power, and selling it to BC Hydro at a contractually agreed (and certainly not negative) price.

Cost Comparisons

The Commission will likely hear from submitters representing solar and wind industry interests that the cost of solar and wind generation has decreased, and forecasting that it will decrease further. It is true that the cost of manufacturing a unit of photovoltaic capacity has decreased. The unit cost of turbines for wind production of electricity may also have decreased. But, to use power from solar generation as an example, the cost of the photovoltaic module is only a part (perhaps a very small part) of the cost of electricity to a consumer.

Electric systems (such as BC Hydro's) must be designed and built to meet the projected peak demand of the system. In British Columbia that peak demand will occur during cold weather in winter. Question 3(b)(iv) refers to grid reliability and requires consideration of the cost of ensuring system peak demand is met. That cost can be conveniently divided into four components: production (generation); transmission; storage and/or back-up capacity; and distribution. The source of production (Site C or another type of generation) is unlikely to cause the cost of distribution to vary, and accordingly distribution costs can be ignored when considering the cost of electricity from different types of generation.

Production: The costs of major hydro-electric facilities such as the Site C project are massive, but it must be kept in mind that the facilities will be available for years and years into the future. With regard to the Site C project, the Site C costs relevant in a comparison to the cost of reliable electricity from other types of production are limited to the costs beyond those already spent or committed (i.e. the sunk costs of the Site C project should be excluded). The costs of suspending or terminating the Site C project must also be taken into account in a comparison of costs, as those termination or suspension costs will only be incurred if generation is to be from a source of production other than Site C; when comparing costs Site C termination or suspension costs should either be added to the costs of other sources of production or subtracted from the costs of the Site C project.

Water rental fees for power production paid by BC Hydro and others under the *Water Sustainability Fees, Rentals and Charges Tariff Regulation* should be excluded from the comparison of costs between Site C and other sources of production. While these fees are a cost that must be paid by BC Hydro and others using water for the production of power, the fees are paid to the province, thereby benefiting BC residents and commercial enterprises; the beneficiaries are generally the same persons and firms that pay BC Hydro rates. Water is not "used up" during the production of electricity; water rental fees are not a true cost, they are simply a means of shifting the burden of provincial taxation from taxpayers to ratepayers. Since the taxpayers and the ratepayers in British Columbia are largely the same persons and firms, water rental fees should be excluded from comparisons of the costs of producing reliable power from different sources of generation.

With regard to power from solar and wind production, while the cost of manufacturing a unit of photovoltaic capacity has been decreasing and the unit cost of wind turbines has decreased, that does not necessarily mean that the cost of producing power via solar or wind is decreasing. Production of power via solar or wind involves more than the cost of manufacturing photovoltaic modules or the cost of wind turbines. Costs of production include transportation from point of manufacture; site acquisition costs. Installation costs, operating costs, and maintenance and replacement costs.

Transmission: The costs of the Site C project include the costs of new transmission lines to connect the generation to the existing transmission grid. Sites for other forms of generation (be it solar, wind, run-of-river hydro or geothermal) may be located at a distance (often considerable) from existing transmission lines. The cost of new transmission and transformation facilities to service generation from such sites must be included when comparing the cost of meeting system peak demand.

Storage and/or back-up capacity: This component of the cost of ensuring peak demand is met is often ignored by advocates of power from solar, wind and run-of-river sources. Power from large scale hydro-electric facilities with reservoirs is reliable, and is available 24 hours a day, 365 days per year. In contrast, other sources of power production (such as solar, wind and run-of-river dams) are only available at certain times of the day, or at certain times of the year; and are often not available at the time of peak demand on the inter-connected electric system in western North America (a very cold, windless, night in winter). In comparing the cost of meeting system peak demand via the Site C project to the cost of meeting system peak demand from other sources of production the cost of mass storage, or the cost of back-up facilities must be included for all sources of production that are not available 24 hours a day, 365 days a year. With regard to mass storage, no form or mass storage has been invented other than the storage of water (potential energy) in reservoirs behind dams. Either dams have to be built to provide mass storage for periodic forms of generation such as solar, wind and run-of-river hydro, or spare generation capacity (usually natural gas-fired thermal generation units) must be installed to be used when power from solar. Wind or run-of-river production is not available. The cost of that spare capacity must be taken into account as part of the cost of the producing power from sources that are not available 24 hours a day, 365 days a year.

BC Hydro experienced system peak demand most recently in January 2017 and before that in November 2006; see: https://www.bchydro.com/news/press_centre/news_releases/2017/cold-snap-drives-electricity-demand.html Examining the power available from wind sources during those peak demand periods illustrates the need for alternate sources of generation to ensure peak demand is met; wind power cannot be relied on when most needed. In 2006 there was no wind generation on the BC Hydro system, but there was generation from wind sources connected to the BPA system. Some years ago BPA had data available which indicated that at the time of 2006 BC Hydro peak demand (which coincided with peak demand on the BPA system) there was zero power production available from wind sources (which makes sense since the very cold weather was part of a high pressure weather system with little or no wind). The 2006 data no longer appears to be available on the BPA website, but that website does have data for January 2017. The 2017 data indicates that there were some hours in January 2017 when the power available from wind generation in the BPA control area was zero, and many hours when the power from wind generation was very low – see the Excel spreadsheet available for 2017 in item 5 at https://transmission.bpa.gov/Business/Operations/Wind/default.aspx

Conclusion

Large scale hydro-electric facilities such as Site C provide reliable power year round. Their reservoirs allow energy (water) to be stored, which provides the system operator (BC Hydro in the case of Site C) with flexibility to meet the demand of the system as it varies from time to time, and provides the capacity to meet system peak demand when it occurs. This combination of storage and flexibility is not available from any other source of generation. The Site C project will not only provide those benefits to BC Hydro, but will also assist in providing reliability to the overall interconnected electric grid in western North America.

I have been a resident of British Columbia throughout my life. I, and all the other residents of British Columbia, have benefited from the financial commitments made many years ago when major hydro-electric facilities were constructed on the Peace River and the Columbia River system. While completion of the Site C project will entail a large expenditure, that expenditure will provide benefits to British Columbia far beyond my lifetime.

When I Look what has happened to Ontario electricity prices due to that province embracing wind and solar projects that produce power when it is not needed, and do not produce power when needed, I conclude that we in British Columbia are blessed by the availability of large scale hydro-electric sites. The Site C project has been commenced and significant costs have already been incurred and committed; the Site C project should not be terminated or suspended; such a decision would cause British Columbians to lose or delay receipt of the benefits it will provide.

Respectfully,

Cal Johnson

August 29, 2017