

Towards a pan-Canadian high-voltage transmission system?

If Canada is to meet its greenhouse gas (GHG) emission targets, then the next few decades are going to witness a wholesale transition away from fossil fuel consumption towards renewable sources of energy, and regardless of whether that renewable energy is stored in batteries, as hydrogen or by other means, we will need to vastly expand our electricity generation and transmission capacity.

On October 11, 2017, James Carr, Canada's Minister of Natural Resources declared the Government's interest in the addition of energy links between the provinces, projects which are well suited to the Government of Canada's infrastructure program. A first step, perhaps, in advancing an idea that has been presented many times in the past¹: the creation of a pan-Canadian high-voltage power grid. Like similar nation building projects of the past, it is a bold and imaginative step that would unite the country from East to West and North to South.

Some characteristics of the proposed pan-Canadian network

Although over 60% of Canada's electricity needs are already met by hydroelectricity, the hydroelectric potential still available in Canada is sufficient to add another 175,000 MW to the approximately 75,000 MW of in-service hydroelectric facilities. This potential is available primarily in Labrador/Quebec (extra 50,000 MW available) and British Columbia/Yukon/NWT (also 50,000 MW available), and is often found in remote locations, hence the need for new transmission and the interconnection of provincial systems.

While we need to respect native land claims and the environment, we also need to understand that we cannot maintain our standard of living without some impact on the land, the oceans and the air. The goal is therefore to first reduce our needs by employing the best technologies to conserve energy, and then to utilize the most benign methods to meet our energy needs. It is estimated that the Mackenzie River alone could generate 14,000 MW 80% of the time, if properly developed using the available topography to minimize flooding, etc., and judged against the impact of other technologies. In Quebec, a potential addition of 20 to 24 000 MW of hydroelectricity could be generated at a currently economic cost, which will become even more cost advantageous when Canada wide carbon costs of \$50/tonne are included in 2022. In addition, our vast geography lends itself well to the development of additional wind and solar generation in locations when and where they make economic and environmental sense.

Built incrementally over a period of about two decades, the project would cost some 60 billion dollars and create a very high voltage (VHV, e.g. 735 kV) inter-provincial power grid approximately 14 000

¹ Project proposed by CD Howe Institute, The Fraser Institute, the Canadian Academy of Engineers and the Canadian Society of Senior Engineers and others.

kilometers long², connecting new hydro, solar and wind generating facilities to the load centres where that power will be needed.

Such a network, because of its extent across different time zones from the Atlantic to the Pacific, would blend both peak consumption and intermittent generation times, allowing the full exploitation of solar and wind energy. In addition, the reservoirs of large hydroelectric facilities in multiple locations could meet demand by holding back or releasing water from the dams.

With Quebec in the east and B.C./Yukon/NWT in the west, each holding the bulk of the existing and undeveloped hydro resources, when coordinated together over a national network, the entire country would benefit from an unbeatable set of clean, renewable and sustainable energy sources.

Environment

According to Environment Canada³, in 2015 Canada emitted 722 Mt CO₂e⁴ of GHG's, 78.7 Mt of which were the result of electricity generation from the remaining coal, natural gas and diesel generating facilities. In addition, with robust renewable resources on line, ground transportation (173 Mt), building heating (85.6Mt) and industrial processing (74.6Mt) can be, at least partially, converted away from fossil fuels to utilizing renewable sources, further reducing emissions. As Canadian and global demand for fossil fuels declines, so too will the 189.5Mt of emissions associated with the Canadian Oil & Gas sector.

Benefits to provinces

Energy generation and extraction is the responsibility of the provincial rather than the federal government, and each province has therefore sought to optimize its own electricity system based on its unique resources and requirements, largely to the exclusion of other opportunities. Rather than thinking and acting as one country, provincial rivalries and attitudes have limited each province's outlook, resulting in optimized subsets of an un-optimized whole.

Several provinces need to replace aging and dirty generating facilities. Others, such as Ontario, have sought to further develop their own resources, but at a cost that exceeds that of other alternatives, resulting in a loss of competitiveness⁵. Meanwhile, Quebec has been trying to sell low-cost surplus hydro power to the United States. In British Columbia, the construction of the 1100 MW Site "C" on the

² Similar to that currently existing in Quebec.

³<https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/greenhouse-gas-emissions/canadian-economic-sector.html>

⁴ 722 Million tonnes CO₂ equivalent

⁵ On October 17, the Fraser Institute published a study that highlighted the fact that high electricity rates on Ontario's industrial activity had resulted in the loss of some 75,000 job

Peace River could be abandoned very soon, after investing some \$ 4 billion, because the potential for energy demand seems to be insufficient. However, in the immediate vicinity of site C, in Alberta, there is a 6,000 MW pool of coal fired power plants that require replacement.

In Newfoundland, in 2011, the William's government dropped headlong into the construction of the Muskrat Falls project, the smallest of the two projects studied, but also the least profitable. The \$ 8 billion cost estimate has now been revised to more than \$ 13 billion, a huge debt for a small province with a population of only 530,000 people, and a market unable to support such a project. What may not make economic sense for a province in isolation, may make sense in the context of a Canada wide system and market that such a national grid would create.

Our country faces a huge challenge, one which requires us to work together in order to turn that challenge into an opportunity. It's time we put aside our provincial differences and sought a common solution. We have built national projects before and it is time that we did so again. In the 1880's it made sense to unite our country by building a rail line, today it makes sense to again unite our country by building a VHV transmission line.

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