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How a TransCanada Electric Superhighway will Profitably Achieve Renewable Energy Objectives

By

Dennis Woodford, P.Eng.,

President, Electranix Corporation (on behalf of concerned Professional Engineers across Canada)

I. Introduction

A TransCanada electric transmission system is presented as an essential way forward to reduce thermal electric generation and increase renewable energy integration. To meet this national objective, the TransCanada electric grid must be economic. It is not possible today to economically justify the cost of the grid just on differential electricity prices. As each interconnected province retires thermal generators and as its load grows, reserve margins (total capacity greater than peak load) can be reduced while maintaining the same degree of reliability. The TransCanada grid would thus delay the need for new replacement generation. Some of the saving can be allocated to help pay for it.

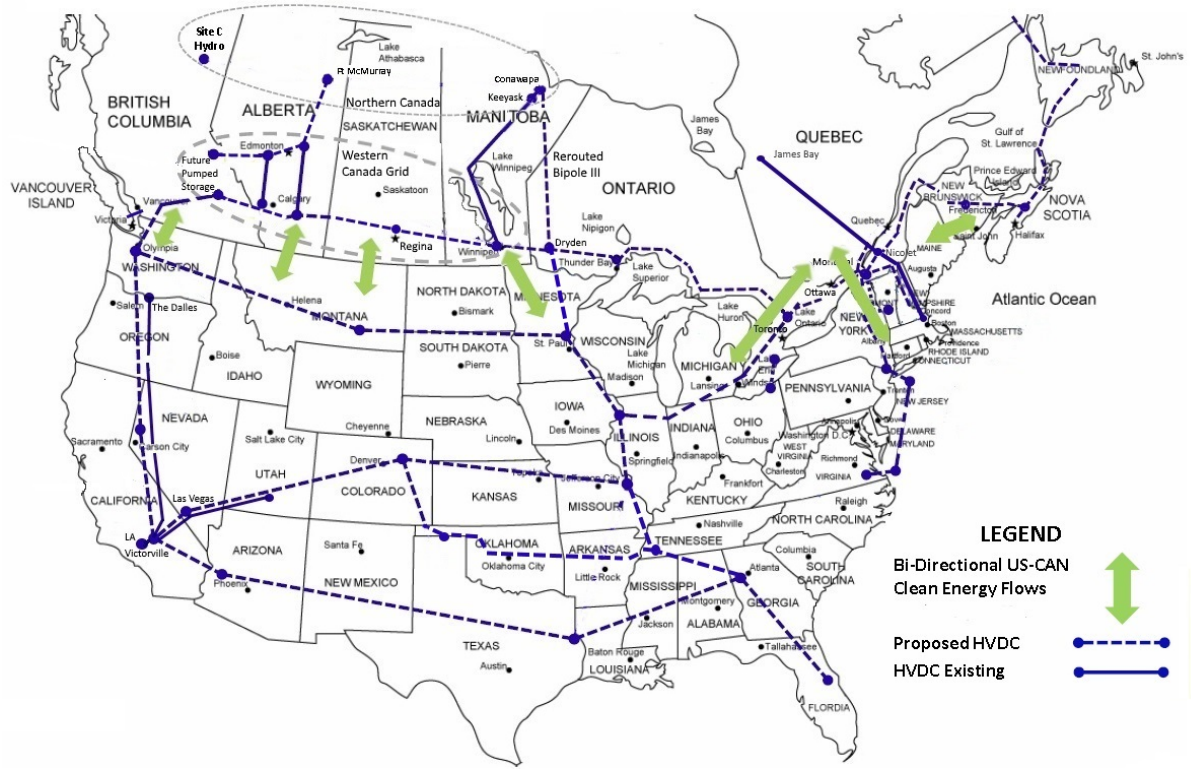

Figure 1: One concept of a combined Canada and USA overlaying grid

Greater benefits can be achieved for the TransCanada grid if it is integrated with a potential overlaying electric grid in the USA. This benefit was shown by a recently completed Pan-Canadian Wind Integration Study (PCWIS), co-funded by Natural Resources Canada (NRCan) and the Canadian Wind Energy Association (CanWEA).

II. How the TransCanada Grid can be Profitable

Benefits are:

1. With wide-area transmission, wind and solar generation are assured an outlet into a larger market. This will contribute to the growth of the clean energy economy by encouraging developers to tap the best resources regardless of siting.

2. The use of hydroelectricity in Quebec, Manitoba and BC and new pumped storage facilities would be utilized as bulk energy storage, providing a balancing capability for the increasing variable renewable energy of solar and wind generators.

3. Several provinces have announced plans to retire thermal generators even as their loads grow. Without replacements, their capacity margins (total capacity above peak load) will become insufficient to maintain the required level of electric reliability. However, these replacements would prove unnecessary if neighboring provinces could contribute in peak periods. A TransCanada Grid would enable the sharing of margins between those provinces with high margins and those in need. In 2015, one province with high margins[1], held a margin of 36% not including wind and solar and could certainly contribute to a regional pool. Some of the savings on avoided replacement generation can be allocated to help pay for the TransCanada Grid.

4. The adverse impacts of sudden regional weather changes on solar and wind energy generation are smoothed out in a power system spanning several regions.

[1] AESO 2015 Annual Market Statistics, March 2016, Figure 15, p.16.

5. Margin sharing is aided by regional diversity, both daily and seasonal, resulting from the staggering over time of regional peak loading periods and from climatic differences.

6. A larger more integrated wide area electric energy market would be established for all interconnected utilities.

III. Socially Acceptable Transmission

While the benefits over costs of the TransCanada grid can be determined, one of the main challenges today with overhead high voltage transmission implementation is achieving social and environmental acceptance. Public opposition to additional power transmission lines is apparently much more related to appearance and lack of real say in location than other factors. European experience has shown low profile aesthetic designs can improve the prospect of lessened visual impact and thereby increase public acceptance[2].

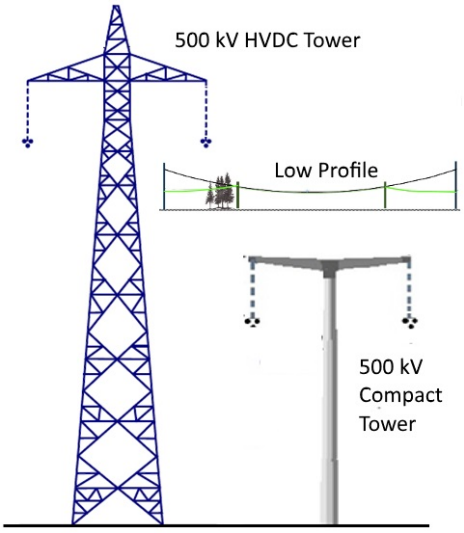

Figure 2: Comparison of transmission towers each capable of up to 4000 MW

Their reduced land requirements also increases the likelihood that the compact line can share transportation corridors and lessen environmental impact with a narrower right-of-way.

IV. The Challenge to the Provinces

Essential concepts presented in this document are intended as a starting point for a process that will require creative effort. To develop the regulatory construct, enabling provincial legislation will be challenging, the most difficult of which will be to enable legislation that is sufficiently timely to avoid near term bilateral arrangements currently being discussed foregoing optimum solutions. Solving these matters exceed the engineering and environmental challenges. Addressing them, can remove barriers to potentially huge electricity cost savings and accelerated reductions in greenhouse gas emissions.

[2] http://www.bystrup.dk/

Based on the results of USA studies for an American grid, it is expected benefits greater than costs can be exceeded by 25% for a TransCanada Superhighway.

Finally, the provinces are requested to each contribute funds for a detailed study cofunded with NRCan. This study is to demonstrate how the TransCanada grid can be staged to significantly reduce Canada's carbon footprint with minimum environmental impact and be profitable. If it can be shown that benefits exceed costs, public and private financing will be attracted to it and a positive impact on electricity rates will benefit all.

The contractor(s) for such a study would be selected through competitive bidding under NRCan. It is not expected the study would cost less than $5 million.

Contact:
Dennis Woodford, P.Eng., President,
Electranix Corporation
Suite 12, 75 Scurfield Blvd.,
Winnipeg, MB R3Y1G4
Phone: +1 204 953 1832
Email: daw@electranix.com
Web: www.electranix.com

Note: This request to the provinces and NRCan was prepared with the expert assistance of senior professional engineers from BC, Manitoba and QC