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Europe's Green Supergrid

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Issue

A common argument used to refute the viability of renewable energy is: what happens when the sun doesn't shine or the wind doesn't blow? The European Union (EU) has decided that the best answer is to have the ability to switch instantly to alternate sources of clean power. The switch will be made possible by a Supergrid that will link the sources of renewable energy available in the northern region of Europe with the national grids in the respective member states. Advocates say that a European Green Supergrid is essential to the EU's goal of sourcing 20% of its electricity from renewables by 2020. The Supergrid will be the first green European electricity grid, and will operate as the backbone of the future European electricity supply. Long term plans include connecting the Supergrid to solarvoltaic panels and concentrating solar power installations in the Middle East and North Africa. The Supergrid will take at least a decade to build.

The European Green Supergrid initiative is particularly topical for our region, as the [Western Electricity Coordinating Council](#) (WECC) will receive \$53.9 million in US stimulus funding to develop a smarter energy grid across the Western Interconnect that links BC and the western US. This new infrastructure will open new markets for the sale of BC's renewable energy and for trading between members of the [Western Climate Initiative](#) (WCI).

Background

Plans for Europe's Green Supergrid moved forward in January 2010 as nine European governments, including the UK, Germany, France, Belgium, the Netherlands, Luxembourg,

Sweden, and Ireland signed the “North Seas Countries’ Offshore Grid Initiative”. The North Sea region in particular has been identified as having an abundance of renewable energy sources, with wind farms in Scotland, solar panels in Germany, tidal power in Belgium, and hydro-electric dams in Norway.

Currently, Europe has weak connections among a patchwork of relatively small-scale national power grids that have a difficult time absorbing the intermittent power generated by wind farms and other renewable sources. Europe’s grids are built around large fossil-fuel plants near large urban areas and nuclear power stations, whereas wind and other renewable energy sources are often generated in more remote areas. To address the scale issue the existing grid needs to become a Supergrid: a “smart grid” with significant renewable energy integration. Dr. Gregor Czisch, an energy-systems modeling expert at the University of Kassel in Germany, believes that the Supergrid can allow for 100% of Europe’s electricity supply to come from non-fossil, non-nuclear sources as early as 2030. The wholesale cost would be an estimated 4.6 eurocents per kilowatt-hour, close to the current European average.

It is anticipated that most of the funding for the estimated €40B grid will come from private sources, with the EU Commission providing €165M to initiate the project. The Supergrid will be connected using thousands of kilometres of highly durable overhead and undersea power lines that link national grids to ensure that when one source falls short, another immediately takes up the slack, guaranteeing continuity. Load will be managed by transferring electricity to where it is needed at any given time or, in the event of oversupply, by pumping water uphill for storage in one of Norway’s hydro dams. The network will be based on Direct Current (DC) transmission that will facilitate capacity loading and shaping. When complete, the European Supergrid will create a 30GW battery for clean energy, with the hydroelectric capacity of Norway playing a key storage role.

Expected benefits of the Supergrid include reinforcement of the burgeoning on- and offshore wind industry, decreased carbon emissions, improved stability of supply, reduced dependence on imported fossil fuels, the creation of thousands of “green jobs”, and increased competition through efficient energy trading, resulting in reduced electricity prices.

Options

Europe is not the only region with plans for a Green Supergrid. Australia, China, Japan, South Korea and the US all have similar visions for the future. BC has rich renewable energy resources and therefore, is a Supergrid a viable option for the province and its partners in the WCI?

Key issues include:

- Vulnerability of many kilometers of onshore and offshore transmission cables required to deliver energy into the grid from remote sources;
- Bilateral complications: a Green Supergrid in BC would provide a more consistent supply if integrated with transmission from neighboring provinces or other members of the WCI,

but working agreements between members of the WCI are less well established than those EU member states;

- BC's renewable energy profile, which could be considered analogous to Norway in terms of its electricity storage capacity;
- Availability of technology - critics of the European scheme claim that appropriate transformer stations for managing DC current have not yet been developed;
- Costs – how would these be allocated so that partner nations who benefit most pay accordingly?

Recommendations

The Green Supergrid will help the EU achieve its renewable energy targets. Japan, South Korea and China are investing heavily in infrastructure and information technology to make electricity networks more efficient and capable of integrating renewable power, creating lucrative opportunities for niche technology and equipment providers. Given the mix of renewable energy sources available to BC, the WCI partners, and other North American jurisdictions, as well as the compelling need to reduce carbon emissions associated with electricity generation, the concept of establishing a western North American Supergrid warrants serious consideration.

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