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Wattershed HTS Cable Transmission Innovations

Additional submitted attachment is included below.

WATTERSHED

We would like EPIC to consider funding innovation in transmission. Wattershed aims to commercialize a "small is beautiful" approach to transmission pioneered and demonstrated by our Chief Scientist at Los Alamos National Lab. Wattershed employs high temperature superconducting (HTS) wire in overhead, underground, and subsea cables. HTS wire holds 100X the power density of copper with zero losses to resistance when kept below its critical temperature with liquid nitrogen. Our small footprint approach can clear local bottlenecks in transmission and distribution where siting poses an issue, lower the cost of bringing offshore wind power to shore, and offer robust long distance, high power transmission with zero losses to resistance.

While we respect the need for storage to smooth out supply and demand, finding a demand on the grid for intermittent via transmission supply remains the optimal use of generation resources. By widening the grid through long distance transmission connections, regional grids could handle up to 80% renewables without stress, as described by this NOAA research:

http://spectrum.ieee.org/energywise/energy/renewables/noaa-model-finds-renewable-energy-could-be-deployed-in-the-us-cost-effectively-without-storage-to-cut-carbon-emissions

Our Chief Science Officer, Dr. Steve Ashworth, ran the HTS Applications group at Los Alamos National Lab for more than a decade. He demonstrated and tested a simple, low-cost overhead version of HTS cable there for a full year in 2011-2012, though it was not a grid-tied demonstration. Our cables can carry very high current at low or medium distribution voltage — meaning AC transmission of 50 MVA to 3 GVA on street-sized power poles at 10 to 60 kV. Our HTS AC and DC cable solutions are simpler and cheaper than any HTS solution to date. We expect to compete with copper on cost in the near term. The cost curve of HTS wire is following Moore's law, dropping 20% with every doubling of global capacity.

Delivering power in small spaces solves the biggest hurdle for most transmission projects: NIMBYism in siting and permitting. We can up-rate the current on existing rights of way with *no permitting required*. We can cross continents with zero losses to resistance, and hope someday to cross oceans. Indeed, Wattershed holds a patent on transmission crossing oceans, connecting continents, using HTS cables (U.S. Patent No. 8,655,496).

The DOE funded research into HTS wire and cable to the tune of $60 million per year for more than a decade. After multiple successful on-grid demonstrations of the technology, the DOE figured it was ready for commercial deployment and stopped the funding. Our approach emerged at LANL only at the end of this era, and remains at a technology readiness level 7-8 needing a final refinement and push to commercialization. It's been difficult to find a funding home at DOE or ARPA-e to date as a result.

Energy R&D and investment dollars have been chasing battery storage as the solution to intermittent solar and wind generation. Long distance, zero loss transmission could enable a much higher penetration of renewables on the grid, and do so at 1/10th the levelized cost of storage per megawatt-hour. We hope to unlock a trillion-dollar transmission opportunity globally and unleash the limitations to intermittent renewables on the grid.