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Renewables Plus Transmission Could Cut Emissions by 80 Percent

Large-scale transmission lines could eliminate the need for advanced energy storage, researchers conclude.

By Richard Martin on January 25, 2016

A new study concludes that we can cut emissions associated with the electricity sector by 80 percent while keeping prices at or below their current levels. The key will be a nationwide, modernized grid.

The work of a team of researchers led by Alexander MacDonald of the National Oceanic and Atmospheric Administration and Christopher Clack of the Cooperative Institute for Research in Environmental Sciences at the University of Colorado and published today in *Nature Climate Change*, the study concludes that we can provide large amounts of carbon-free electricity by viewing the continental U.S. as a single, interconnected energy market. Such a large-scale system would eliminate the problem of intermittency in power generation from wind and solar resources. "If wind or solar power are not available in a small area, they are more likely to be available somewhere in a larger area," write MacDonald and colleagues.

The plan would require big investments in high-voltage direct-current transmission lines. Indeed, the researchers compare the expansion to building the interstate highway system in the 1950s. Currently, there are three separate grids in the United States, and most transmission lines are based on alternating current. That limits both the voltage and the thickness of the wires, thus limiting the amount of power that can be transported.

But MacDonald and Clack say that the benefits of expanded transmission capacity far outweigh the costs. "Even doubling the cost of the transmission

lines wouldn't alter the results, because the benefits of building this infrastructure are so large," says MacDonald.

The study is the first to examine the emission reductions that could be achieved with a wide-area system of existing renewable technologies combined with increased transmission capacity. Still, adding new grid infrastructure is notoriously difficult and is often opposed on the grounds of cost and unsightliness. In early January, U.S. energy secretary Ernest Moniz announced \$220 million in new funding for grid modernization and advanced storage systems, but the program includes nothing on the scale of the high-voltage lines envisioned by the NOAA study. Thus, despite the theoretical potential, political and financial constraints could make such a dramatic expansion of the U.S. transmission grid unattainable.

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