

Grid realities cancel out some of wind power's carbon savings

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To test how wind energy affects carbon dioxide emissions, Argonne scientists modeled the Illinois electric grid to test how more wind power would affect the system. Image courtesy Sharon Loxton.

(Phys.org) -- Wind energy lowers carbon emissions, but adding turbines to the current grid system does not eliminate emissions proportionally, according to a report by researchers at the Argonne National Laboratory.

To test how [wind](#) energy affects [carbon dioxide](#) (CO₂) emissions, Argonne scientists modeled the Illinois [electric grid](#)—power plants, production and demand -- and tested how more wind power would affect the system. They found that adjusting for wind power adds inefficiencies that cancel out some of the CO₂ reduction.

It's actually the older technology in the background that hampers wind.

Because the wind doesn't blow all the time, operators occasionally have to turn on extra fossil-burning plants to keep up with demand.

"Turning these large plants on and off is inefficient," explained study author Lauren Valentino. "A certain percentage of the energy goes into just heating up the boilers again." Power plants are also less efficient when they're not operating at full capacity.

Like many states, Illinois has pledged to get 25 percent of its energy from clean sources by 2025. But it still has a long way to go; in 2010, the state got 2.2 percent of its energy from wind.

"Illinois gets its strongest winds at night, when demand is low," said co-author Audun Botterud, an Argonne energy systems engineer. "At the same time, we have a high fraction of very large, inflexible power plants in the system." This is a problem because it's inefficient to turn larger plants off and on to accommodate sudden influxes of wind power.

The best solution, he said, would be a way to store unused energy when the wind is blowing. But we don't have a good way to store large amounts of electricity, a problem Argonne battery scientists are tackling elsewhere at the lab. In the meantime, smarter electric grids can help by leveling out demand.

The study, "[Systems-Wide Emissions Implications of Increased Wind Power Penetration](#)", a collaboration between researchers at Argonne and summer interns Valentino (University of Illinois at Urbana-Champaign) and Viviana Valenzuela (Georgia Institute of Technology), was published in *Environmental Science & Technology*. Other Argonne co-authors are Zhi Zhou and Guenter Conzelmann.

In a [related study](#) published in *Wind Energy*, researchers investigated the use of advanced forecasting and operational strategies to accommodate

more [wind energy](#) in the power grid.

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Provided by Argonne National Laboratory

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