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Tugboats prepare to tow an experimental floating wind turbine to sea in July 2017, part of Statoil's Hywind project off Scotland.

Roar Lindefjeld/Woldcam/Statoil

# Offshore wind farms have powerful advantage over land-based turbines, study finds

By [Eli Kintisch](#) | Oct. 9, 2017, 3:00 PM

Floating wind turbines at sea could create up to three times as much electricity as turbines on land, increasing the energy potential for a technology that has yet to be proven at scale, a new study suggests.

**The new study** comes at a time of reckoning for terrestrial wind power. Before the current **wind power boom**, researchers estimated that wind turbines on land could provide as much as 7 watts of power per square meter. But recent modeling shows that land turbines probably will provide **only 1 watt per square meter** when installed at scale. The problem is that turbines deplete the strength of winds downstream from them, creating a phenomenon called “wind shadow” that has proven a bigger issue than predicted.

Scientists at the Carnegie Institution for Science in Palo Alto, California, wanted to know whether turbines installed in the open ocean—where air currents are 70% stronger than on land—would also face wind shadow problems. So they conducted virtual experiments using a climate model, and in today's issue of the *Proceedings of the National Academy of Sciences* atmospheric scientist Anna Possner and climatologist Ken Caldeira report that turbines placed in the North Atlantic could produce three times as much power as an existing wind farm in Kansas of similar size.

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Driving this greater potential are wintertime low-pressure systems, which occur more frequently at sea than land. They efficiently mix energy from fast, upper level winds down to the surface of the ocean, speeding surface winds. That means offshore wind turbines in close proximity would still encounter each other's wind shadow, the authors write, but the wind speed would recover because of the replenished energy, allowing for sustained high power.

Charlie Zender, a physicist at the University of California, Irvine, commends the authors for a "masterful" analysis of the atmospheric forces at play. But he says the paper's "relevance to energy policy is low" since the notion of building wind farms at sea, at the density envisioned in the paper, is still decades in the future. (Thus far, only a few companies are building floating wind farms because of high construction and operating costs.)

The authors say their findings should spur companies to try to overcome those obstacles, however, estimating that offshore wind farms in the North Atlantic alone "could potentially provide civilization-scale power."

Posted in: [Climate](#), [Engineering](#), [Technology](#)

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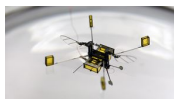


**Eli Kintisch**

Eli is a contributing correspondent for *Science* magazine.

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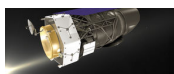


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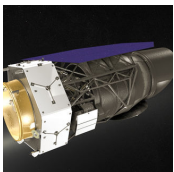
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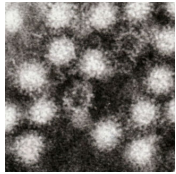
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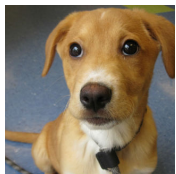
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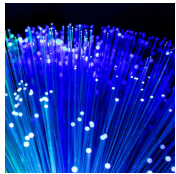
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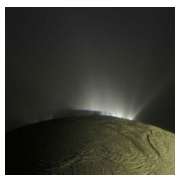
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