

# Global warming reduces available wind energy

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A switch to wind energy will help reduce greenhouse gas emissions -- and reduce the global warming they cause. But there's a catch, says climate researcher Diandong Ren, a research scientist at the University of Texas at Austin in a paper appear in the AIP's *Journal of Renewable and Sustainable Energy*: rising temperatures decrease wind speeds, making for less power bang for the wind turbine buck.

The prevailing winds in the "free" atmosphere about 1,000 meters above the ground are maintained by a temperature gradient that decreases toward the poles. "For example, Wichita, Kansas is cooler, in general, than Austin, Texas," Ren says. "The stronger the temperature contrast, the stronger the wind." But as the climate changes and global temperatures rise, the temperature contrast between the lower latitudes and the poles decreases slightly, because polar regions tend to warm up faster. And as that temperature contrast becomes weaker, so too do the winds.

Wind turbines are powered by winds at lower altitudes -- about 100 meters above the ground -- where, Ren says, "frictional effects from local topography and landscapes further influence wind speed and direction. In my study, I assume that these effects are constant -- like a constant filter -- so wind speed changes in the free atmosphere are representative of that in the frictional layer."

Ren calculates that a 2-4 degree Celsius increase in temperatures in Earth's mid to high-latitudes would result in a 4-12 percent decrease in

wind speeds in certain high northern latitudes. This means, he says, that with "everything else being the same, we need to invest in more [wind turbines](#) to gain the same amount of energy. [Wind energy](#) will still be plentiful and wind energy still profitable, but we need to tap the energy source earlier" -- before there is less to tap.

**More information:** The article, "Effects of global warming on wind energy availability" by Diandong Ren appears in the *Journal of Renewable and Sustainable Energy*. See: [link.aip.org/link/jrsebh/v2/i5/p052301/s1](http://link.aip.org/link/jrsebh/v2/i5/p052301/s1)

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