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Change in the Weather? Wind farms might affect local climates**Sid Perkins**

Large groups of power-generating windmills could have a small but detectable influence on a region's climate, new analyses suggest.

Windmills once were quaint several-story-high mechanisms that pumped water or ground grain. They've since evolved into sky-scraping behemoths that can each generate electrical power for more than 100 homes.

Some modern turbines are 72 meters tall and have rotor blades that are about 25 m long, says S. Baidya Roy of Duke University in Durham, N.C. Future windmills may reach higher than 100 m, and their rotor blades may measure 50 m long, he notes.

All such turbines disrupt natural airflow to extract energy from wind. To investigate potential effects of a wind farm that includes thousands of windmills, Roy and his colleagues used a detailed climate model based on wind speeds, temperatures, and ground-level evaporation in north-central Oklahoma during a 2-week period in July 1995. In their scenario, the researchers considered a 100-by-100 array of windmills spaced 1 kilometer apart.

The simulation suggests that during the day, while sun-induced convection handily mixes the lower layers of the atmosphere, such a wind farm wouldn't have important climatic effects.

In predawn hours, however, when the atmosphere typically is less turbulent, a large windmill array could influence the local climate. For example, at 3 a.m., the average wind speed at ground level was 3.5 meters per second (m/s) in the absence of windmills. Adding the wind farm would increase the average wind speed to 5 m/s. Also, the 10,000 windmills would increase the temperature across the area by about 2°C for several hours.

Averaged over an entire day, the wind speed at ground level would go up about 0.6 m/s and the temperature would jump 0.7°C.

Turbulence caused by the rotating blades would shunt some of the high-speed winds typically found 100 m off the ground down to Earth's surface, says Roy. Those surface winds would boost evaporation of soil moisture by as much as 0.3 millimeter per day.

The researchers describe their simulation in the Oct. 16 *Journal of Geophysical Research (Atmospheres)*.

The findings may stimulate scientists to validate the analysis with real-world tests, says Neil Kelley, a meteorologist at the National Renewable Energy Laboratory in Golden, Colo. In



WEATHER MAKERS. Large-scale wind farms can increase wind speed, temperature, and evaporation at ground level, a new analysis suggests.

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general, says Kelley, the simulation agrees with atmospheric data he gathered at a wind farm in California.