Tiny but Mighty: Small Scale Wind Power

Olsen, Greta

Renewable energy offers potentially endless supplies of power. It's becoming vital to harness any of these sources in the most efficient way possible. Wind power is just one source of renewable energy. In windy places all around the world, wind turbines of all sizes convert the mechanical power of the wind into electricity. Because larger turbines create more energy, most industrial turbines take up a lot of space. A smaller turbine offers many benefits when compared to a larger model. Could a line of smaller turbines be as effective in creating electricity as a large one? My hypothesis is: if a group of turbines has the total planform area (area of the front of the blade) equal to that of a single turbine, then the group will produce as much power as a whole as the single turbine will because they have equal areas exposed to the power of the wind. To test this, two wind turbines were built, a 40 cm model and a 20 cm model, which had 1/4th the planform area of the larger model. They were set in front of a fan and the voltage produced was measured. Based on the hypothesis, the 20 cm turbine should have produces about 25% the average power of the 40 cm turbine. The 20 cm turbine actually produced 64% of the average power the 40 cm turbine did. With these results, a group of small turbines may be built to outperform a single large one in the same conditions.

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