

Abstract Submitted
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The Influence of Rotor Configurations on the Energy Production in an Array of Vertical-Axis Wind Turbines¹ MATTHIAS KINZEL, DANIEL ARAYA, JOHN DABIRI, Caltech — We analyze the flow field within an array of 18 vertical-axis wind turbines (VAWTs) at full-scale and under natural wind conditions. The emphasis is on the energy flux into the turbine array and the energy extraction by the turbines. The wind velocities throughout the turbine array are measured using a portable meteorological tower with seven, vertically-staggered, three-component ultrasonic anemometers. These measurements yield a detailed insight into the turbine wakes and the recovery of the flow. A high planform kinetic energy flux is detected, which enables the flow velocities to return to 95% of the upwind value within six rotor diameters downwind from a turbine row. This is significantly faster than the recovery behind a typical horizontal-axis wind turbine (HAWT). The Presentation will compare the results for different rotor configurations. Conclusions will be drawn about the influence of these configurations on the power production of the individual turbines as well as the turbine array as a whole.

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