

Abstract Submitted
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LES investigation of turbine spacing effects in wind farms¹ XIAOLEI YANG, FOTIS SOTIROPOULOS, St. Anthony Falls Laboratory, Department of Civil Engineering, 2 Third Avenue SE, Minneapolis, MN 55414, USA — We study turbine spacing and layout effects in large wind farms using large-eddy simulation (LES) with the actuator disk model to represent individual turbines. The actuator disk model is implemented in our second-order accurate immersed boundary finite-difference solver using the discrete delta functions to interpolate the velocities on the disk and distribute the body forces to the surrounding fluid points. For aligned wind farms, the effects of the streamwise and spanwise spacings on the extracted power and turbulence intensities in the vicinity of the turbines are systematically studied. A model for the effective roughness length is also developed based on the present numerical results. As part of our future work, the effect of turbine spacing in staggered wind farms will be investigated.

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