

Abstract Submitted
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An Experimental Investigation on the Interference of the Multiple Wind Turbines with Different Layout Patterns in Atmospheric Boundary Layer Winds¹ HUI HU, WEI TIAN, AHMET OZBAY, Iowa State University — We report an experimental study to investigate the wake interferences of multiple wind turbines in atmospheric boundary layer (ABL) winds. The experimental study is conducted by taking advantages of the large-scale Aerodynamic/Atmospheric Boundary Layer (AABL) Wind Tunnel available at Iowa State University to quantify the performances of an array of wind turbine models with aligned and staggered arrangement patterns. In addition to measuring dynamic wind loads (both forces and moments) and the power outputs of the wind turbine models, advanced flow diagnostic techniques such as digital Particle Image Velocimetry (PIV) is used to conduct detailed flow field measurements to quantify the flow characteristics of the surface winds and wake interferences among the multiple wind turbines with different layout patterns. The detailed flow field measurements are correlated with the dynamic wind loads and power output measurements to elucidate underlying physics for the optimal design of the wind turbine array layout with the ultimate goal of higher total power yield and better durability of the wind turbines operating in more realistic environments.

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