

Abstract Submitted  
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**An Experimental Investigation on the Interferences among Multiple Turbines in Onshore and Offshore Wind Farms**<sup>1</sup> WEI TIAN, AHMET OZBAY, HUI HU, Iowa State University — We report an experimental study to investigate the wake interferences among multiple wind turbines on onshore and offshore wind farms. The experimental studies are conducted in a large-scale Aerodynamic/Atmospheric Boundary Layer (AABL) Wind Tunnel with an array of scaled three-blade Horizontal Axial Wind Turbine (HAWT) models placed in atmospheric boundary layer winds with different mean and turbulence characteristics to simulate the situations in onshore and offshore wind farms. In addition to measuring dynamic wind loads (both forces and moments) and the power outputs of the scaled turbine models, a Particle Image Velocity (PIV) system is used to conduct detailed flow field measurements to quantify the turbulent wake vortex flows and the wake interferences among the wind turbines sited over onshore and offshore wind farms with non-homogenous surface winds. The detailed flow field measurements are correlated with the dynamic wind loads and power output measurements to elucidate underlying physics in order to gain further insight into the characteristics of the dynamic wind loads and wake interferences among multiple wind turbines for higher total power yield and better durability of the wind turbines.

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Hui Hu  
Iowa State University

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