

Abstract Submitted
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An Experimental Investigation on the Wake Characteristics behind Dual-Rotor Wind Turbines¹ ZHENYU WANG, AHMET OZBAY, WEI TIAN, ANUPAM SHARMA, HUI HU, Iowa State University, AEROSPACE ENGINEERING, IOWA STATE UNIVERSITY TEAM — We report an experimental study to investigate the aeromechanics and wake characteristics of dual-rotor wind turbines (DRWTs) with co- and counter-rotating configurations, in comparison to those of a conventional single-rotor wind turbine (SRWT). The experiments were performed in a large-scale Aerodynamic/Atmospheric Boundary Layer (AABL) wind tunnel under neutral stability conditions. In addition to measuring the power output performance of DRWT and SRWT systems, static and dynamic wind loads acting on the SRWT and DRWT systems were also investigated. Furthermore, a high resolution PIV system was used for detailed wake flow field measurements (free-run and phase-locked) so as to quantify the characteristics of the turbulent turbine wake flow and to quantitatively visualize the transient behavior of the unsteady vortex structures in the wakes of DRWTs, in comparison with those behind a conventional SRWT systems. The detailed flow field measurements are correlated with the dynamic wind loads and power output measurements to elucidate underlying physics for higher total power yield and better durability of the wind turbines.

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