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Measurements of mechanical torque acting on a model wind turbine[1] HYUNG-SUK KANG, Johns Hopkins University, RAUL B. CAL, Portland State University, JOSE LEBRON-BOSQUES, LUCIANO CASTILLO, Rensselaer Polytechnic Institute, CHARLES MENEVEAU, Mechanical Engineering and Center for Environmental and Applied Fluid Mechanics, Johns Hopkins University
— A high precision torque converter is developed and calibrated to measure torques on model wind-turbine generators (small DC motor). By multiplying the measured torque and rotor angular velocity, a direct measurement of the extracted power from the wind turbine can be obtained. This direct method is more advantageous compared to the electrical power measured from the model generator, since it avoids contamination by internal friction, and electric and magnetic losses. The torque converter is mounted on a model wind turbine in a 3 by 3 array (3 rows by 3 columns) of wind turbines in the Corrsin wind tunnel. The power coefficients are obtained as a function of the tip speed ratio. Significant difference between the electrical and mechanical powers is observed, which emphasizes on the importance in using the direct mechanical power measurement. Also, the extracted power by the model turbine is found to be comparable with the power estimated from the kinetic energy flux measured using SPIV.

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