Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Experimental investigation of the wake characteristics of flow-powered and motorized laboratory-scale wind turbines[1] DANIEL ARAYA, JOHN DABIRI, California Institute of Technology — We present experimental data that compares the wake characteristics of a laboratory-scale vertical-axis turbine while it is either powered by the flow or by a DC motor. This distinction is relevant for laboratory experiments in which scale turbine models are used that require the use of a motor to spin the turbine blades. Particle image velocimetry is used to measure the velocity field in a two-dimensional plane normal to the axis of rotation. This velocity field is then used to compare time-averaged streamwise velocity, turbulence kinetic energy, and power of the two configurations. The results give insight into the kinematic effect of adding energy to the flow by way of the motor, and they suggest limits on the extrapolation of laboratory results to full-scale performance.

[1]This work was supported by an NSF Graduate Research Fellowship to D.B.A and funding to J.O.D. from ONR N000141211047.

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Date submitted: 30 Jul 2013 Electronic form version 1.4