Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Wind Resource Evaluation at the Caltech Field Laboratory for Optimized Wind Energy[1] QUINN MULLIGAN, MATTHIAS KINZEL, JOHN DABIRI, Caltech — Wind resources are evaluated at the Caltech Field Laboratory in order to understand how an array of vertical-axis wind turbines extracts energy from the flow. A tower with sonic anemometers placed every meter over the turbine's rotor height is deployed in upwind and downwind positions relative to the array of turbines to obtain the three dimensional wind velocity vectors. Upwind of the array, far enough to be considered free stream, the measured velocity profile represents the turbulent boundary layer flow at the site. Downwind, the measured wind velocities are reduced significantly and display a smaller variance over the rotor height. The topmost sensor, located above the top of the rotor height, reports flow velocities close to the free stream quantities. Sweeps and ejections are both present in the downwind velocity profile. The talk will present the data from these field measurements, discuss the similarities and differences to canopy flows and draw conclusions about the interaction between the wind turbine array and the flow.

[1]The financial support of the Moore Foundation is gratefully acknowledged.

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Date submitted: 05 Aug 2011 Electronic form version 1.4