Modern wind farms require significant land resources to separate each wind turbine from the adjacent turbine wakes. This aerodynamic constraint limits the amount of power that can be extracted from a given wind farm footprint. We investigated the use of counter-rotating vertical-axis wind turbines in order to achieve higher power output per unit land area than existing wind farms consisting of propeller-style turbines. Full-scale field tests of vertical-axis wind turbines in various counter-rotating configurations were conducted under natural wind conditions during summer 2010. Whereas wind farms consisting of propeller-style turbines produce 2 to 3 watts of power per square meter of land area, these field tests indicate that power densities an order of magnitude greater can be achieved by arranging vertical-axis wind turbines in layouts that enable them to extract energy from adjacent wakes and from above the wind farm. Moreover, this improved performance does not require higher individual wind turbine efficiency, only closer wind turbine spacing and a sufficient vertical flux of turbulence kinetic energy from the atmospheric surface layer. The results suggest an alternative approach to wind farming that has the potential to concurrently reduce the cost, size, and environmental impacts of wind farms.

Friday, March 4, 2011
JHU Homewood Campus
Hodson 110
12:00 – 12:45 pm

Seminar is FREE. For parking please see link for visitors at www.jhu.edu and select information on Homewood Campus.

One Professional Development Hour (PDH) will be awarded to attendees.