

Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Improving wind turbine array efficiency through active flow control JOHN-MICHAEL VELARDE, GUANNAN WANG, PATRICK SHEA, MARK GLAUSER, Syracuse University, LUCIANO CASTILLO, Texas Tech University — We attempted to demonstrate the capability of instrumenting three wind turbine blades with an air delivery system that provided active flow control in an effort to improve turbine performance in the presence of the wake turbulence that is inherent in a turbine array. Presently, turbines are being designed for set conditions, such as steady incoming wind and a set velocity profile, however conditions can be drastically different in the field – thus causing poor performance from the turbines. The blades were instrumented with pressure transducers which measured the suction surface pressure; the sensor setup was such that three unique blade configurations existed: spanwise sensors, chord-wise sensors, and a reference sensor. The compressed air was delivered through a rotary union connected to the turbine hub with tubing attached to the suction side of the blades. The primary purpose of this test was to demonstrate the ability to deliver air to a rotating frame for active flow control. We collected data under three test conditions using an open-section wind tunnel, courtesy of Texas Tech University: static with no flow control, rotation with no flow control, and rotation with active flow control.

John-Michael Velarde
Syracuse University

Date submitted: 01 Aug 2013

Electronic form version 1.4