Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Development of a Wind Turbine Array Boundary Layer Under Thermally Stratified Conditions ELIZABETH CAMP, ZACHARY WILSON, DOMINIC DELUCIA, RAÚL BAYOÁN CAL, Portland State University — Efforts have intensified in studying wind energy from a fluid mechanics and turbulence standpoint. Here, a wind turbine boundary layer is studied experimentally under stratified conditions. In this wind tunnel experiment, the mean velocities and turbulent quantities within a 3 by 3 scale-model wind turbine array are investigated. Cases for unstable and neutral boundary layer flows are described. These flows are modified upstream of the turbine array in order to emulate the atmospheric turbulent boundary layer using an active grid, strakes, thermally controlled floor panels, and roughness elements. All reported measured quantities are obtained through dual simultaneous stereo Particle Image Velocimetry systems which are made along the entire streamwise length of the array in order to chart the development of the flow.

Zachary Wilson
Portland State University

Date submitted: 02 Aug 2011 Electronic form version 1.4