Abstract Submitted
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Thermal stratification effects on a 4x3 wind turbine array boundary layer[1] ELIZABETH CAMP, Portland State University, Department of Mechanical and Materials Engineering, MURAT TUTKUN, Norwegian Defense Research Establishment, RAUL BAYOAN CAL, Portland State University, Department of Mechanical and Materials Engineering — Efforts have intensified to investigate the effects of thermal stratification on wind turbine performance from a fluid mechanics the perspective. Recently, it has been shown that power production is highly dependent on the temperature variation of the atmospheric turbulent boundary layer. Hence, flow within a 4x3 turbine array is studied under neutral, unstable and stable thermal stratification regimes. The flow upstream of the model wind turbine array was modified using an active grid, strakes, roughness elements, and thermally controlled floor panels. In this wind tunnel experiment, the mean velocities, Reynolds stresses, and trends in C_p curves were measured along the centerline of the array using Particle Image Velocimetry in conjunction with torque sensors. The measurements consequently yield the flow development as well as the differences produced by the thermal effects within the array.

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