Low dimensional model of energy reconstruction for inline and offset wind turbine arrays NICHOLAS HAMILTON, Portland State University, MURAT TUTKUN, Norwegian Defence Research Establishment (FFI), RAUL BAYOAN CAL, Portland State University — Wind tunnel data was obtained via stereo-Particle Image Velocimetry for wind turbine models in rectangular and row-offset array configurations. Inflow and wakes were compared statistically and through proper orthogonal decomposition (POD). Spacing within the array configurations lead to varied wake recovery conditions visible in statistics and POD analyses. The number of snapshot POD modes required to reconstruct specified energy levels for the wakes demonstrates a strong dependence on the array configuration. Quantities including flux of kinetic energy and production rebuild with fewer POD modes than vorticity and dissipation as they rely on large-scale structures for shape andintensity. Energy content and organization in small-scale structures contribute to the delay of recovery of the flow to upstream inflow conditions.

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Date submitted: 01 Aug 2012

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