Abstract Submitted
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**Effects of downstream and cross-stream spacings in an array of aligned wind turbines** DANIEL HOUCK, MATT MELIUS, RAUL CAL, Portland State University — This study seeks to address the effects of downstream and cross-stream spacings in a finite array of aligned wind turbines. A series of wind tunnel experiments were performed in which a 3x4 array of scale wind turbines were arranged in four patterns of different downstream (DS) and cross-stream (CS) spacings. The four cases, using the rotor diameter as unity, were: 6DSx3CS, 6DSx1.5CS, 3DSx3CS, and 3DSx1.5CS. All cases were subjected to the same inflow conditions, which replicated an atmospheric boundary layer. Particle image velocimetry was used to measure the flow field at the entrances and exits of the first and third rows of the array and velocity field data was collected. Results indicate effects of the downstream and cross-stream spacings separately, but also effects that appear to correlate to turbine density and not a specific arrangement. The cases often pair up with similar trends, but do so differently in the first and third rows and even, at times, in the entrances and exits and at different heights. The effects of cross-stream spacing are more pronounced in the first row than the third, and vice versa for downstream spacing.

Daniel Houck
Portland State University

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