

Abstract Submitted  
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**Coordinated Control of Cross-Flow Turbines** BENJAMIN STROM, STEVEN BRUNTON, BRIAN POLAGYE, University of Washington — Cross-flow turbines, also known as vertical-axis turbines, have several advantages over axial-flow turbines for a number of applications including urban wind power, high-density arrays, and marine or fluvial currents. By controlling the angular velocity applied to the turbine as a function of angular blade position, we have demonstrated a 79 percent increase in cross-flow turbine efficiency over constant-velocity control. This strategy uses the downhill simplex method to optimize control parameter profiles during operation of a model turbine in a recirculating water flume. This optimization method is extended to a set of two turbines, where the blade motions and position of the downstream turbine are optimized to beneficially interact with the coherent structures in the wake of the upstream turbine. This control scheme has the potential to enable high-density arrays of cross-flow turbines to operate at cost-effective efficiency. Turbine wake and force measurements are analyzed for insight into the effect of a coordinated control strategy.

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