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Cross-Flow Turbine Array Interactions[1] ISABEL SCHERL, BENJAMIN STROM, STEVEN L. BRUNTON, BRIAN L. POLAGYE, University of Washington — Cross-flow turbines, also known as vertical-axis turbines, use blades that rotate about an axis perpendicular to the incoming flow to convert the kinetic energy in moving fluid to mechanical energy. Arrays of cross-flow turbines with optimized geometries and control strategies have been shown to out-perform geometrically-identical turbines in isolation. In this work, the performance of a two-turbine array in a recirculating water channel was experimentally optimized across sixty-four unique array configurations. For each configuration, turbine performance was optimized using tip-speed ratio control where rotation rate for each turbine is optimized individually and using coordinated control where we operated the turbines at equal rotation rates and optimized the rotation rate and phase difference between the two rotors. By contrasting configuration and control cases, we explore the hydrodynamic interactions and hypothesize how operating conditions affect array performance.

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