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Effect of Marine Hydrokinetic array configuration on power extraction MICHAEL VOLPE, MARIA LAURA BENINATI, Bucknell University, MICHAEL KRANE, ARNIE FONTAINE, Pennsylvania State University — Experiments are presented to explore how the spatial arrangement of a Marine Hydrokinetic (MHK) turbine array affects the power extracted from an individual turbine. The experiments were performed in the small-scale testing platform in a hydraulic flume facility (9.8 m long, 1.2 m wide and 0.4 m deep) at Bucknell University. The study focuses on a V-shaped sub-array, with the vertex element in the downstream location. The vertex element is a two-bladed horizontal axis turbine, is loaded using a metal-brush motor, and the two upstream elements are circular perforated disks designed to mimic the time-averaged flow disturbance imparted to the flow by a similar turbine. Experiments were performed for a range of stream-wise separation between the perforated plate elements and the turbine element. For each separation distance, drag on the turbine, power extracted by the turbine, as well as the velocity field upstream and downstream of the turbine, were all measured. From these measurements, the flow incident on the turbine and the rate of work done by the flow on the turbine are obtained. Results show that placing a turbine in the accelerated flow region between the wakes of upstream array elements can result in increased energy extraction.

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