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Predicting Energy Harvesting Efficiency in Two Tandem Oscillating Foils[1] BERNARDO LUIZ ROCHA RIBEIRO, University of Wisconsin - Madison, YUNXING SU, Brown University, DAVID BURKHART, University of Wisconsin - Madison, KENNETH BREUER, Brown University, JENNIFER FRANCK, University of Wisconsin - Madison — Oscillating foils in synchronized pitch/heave motions can be used to harvest energy from moving water and offer an alternative to rotary turbines. By understanding the wake structure and its correlation with the pitch/heave kinematics, one can develop predictive models for how foils can coordinate in array configurations. In order to establish a relationship between foil kinematics and wake characteristics, a wide range of kinematics is explored in a 2-foil configuration with inter-foil spacing from 4-9 chord lengths separation. With an in-depth wake analysis, the trailing foil efficiency is normalized by the mean convective velocity and the turbulent kinetic energy in the wake. This normalization accounts for the mean flow in addition to the energy transported by the coherent leading edge vortices (LEVs) shed from the leading foil. Using the mean wake velocity, a model is developed to predict the trailing foil's efficiency demonstrating four different regimes. These regimes are distinguished by the kinematics of the leading foil, which dictates the LEV strength and the trailing foil efficiency profile.

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