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Reliability Study of a Fully-Passive Oscillating-Foil Turbine Concept[1] WALTFRED LEE, DYLAN IVERSON , University of Victoria, GUY DUMAS, Laval University, PETER OSHKAI, University of Victoria — A self-sustained fully-passive flapping-foil hydrokinetic turbine prototype subjected to water flow at the Reynolds number of 21000 in a water channel. The prototype was exposed to three distinct types of flow disturbances: symmetric vortices shed from an oscillating foil placed upstream of the test foil, boundary layer tripping by distributed roughness on the surface of the foil, and freestream turbulence introduced via a fractal grid turbulence generator. The potential of power extraction of the foil undergoing elastically constrained oscillations in heave and pitch under these nonideal, unsteady flow conditions was quantified by implementing an eddy current brake. When placed in the wake of an upstream oscillating foil, the fully-passive turbine was sensitive to the frequency of the shed vortices in the incoming flow. Stable operation of the turbine could only be obtained under a limited range of kinematics of the upstream oscillating-foil. An overall increase in power extraction was observed when the turbine was subjected to the high freestream turbulence and when the surface roughness was applied.

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