Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Leading Edge Vortex Formation of an Oscillating Foil in Energy Harvest Modes JAMES LIBURDY, FIRAS SIALA, Oregon State University, ALEXANDER TOTPAL, Oregonstate University — The vortex formation number, represents a non-dimensional time scale to achieve its maximum circulation, defined as Γ/cU_{SL},where Γ is circulation, $c$is foil chord length, and U_{SL} is the feeding shear-layer velocity. It has been observed that the formation number may be universal, with an optimum value of 4. In this study, phase-locked particle image velocimetry measurements are used to investigate the effect of foil flexibility on the vortex formation number of the leading edge vortex (LEV) of an oscillatory foil in the energy harvesting mode. The goal is to provide insights as to how surface flexibility can enhance energy harvesting efficiencies. Experiments are conducted using three airfoil configurations: fully rigid, flexible trailing edge and flexibility leading edge. The objective is to identify the ability of surface flexibility to enhance the LEV circulation and its associated shear-layer. Results are presented in terms of the vortex formation number for a range of operating reduced frequencies, $k = 0.05$ – 0.2, which reportedly yield the most efficient energy harvesting conditions.

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Date submitted: 07 Oct 2016 Electronic form version 1.4