

Abstract Submitted
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A numerical study of a vertical axis turbine with chordwise-flexible blades operating at low tip speed ratios PIERRE-OLIVIER DESCOTEAUX, MATHIEU OLIVIER, Universit Laval — This talk will present high-fidelity numerical simulations allowing the performance evaluation of a Vertical-Axis Turbine (VAT) equipped with chordwise-flexible blades. The simulations are carried out with a partitioned Fluid-Structure Interaction (FSI) code in which an in-house structural finite-element solver is linked to a finite-volume flow solver based on the OpenFOAM library. The idea behind this study is to take advantage of the strongly changing flow conditions acting on the blades when the VAT operates at low tip speed ratios. In such cases, the unsteadiness of flow forces can be used to alter the shape of the blade. This analysis will show under which conditions it is possible to increase the efficiency of a VAT by allowing passive foil deformations at a high Reynolds number. The FSI effects related to the flexibility and inertia of the blade will be investigated and the mechanisms that allow efficiency improvements, such as stall mitigation, will be described and compared against rigid-blade VAT operating in the same regime.

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