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Computational Study of Savonius Wind Turbines with Stators
AARON ALEXANDER, ARVIND SANTHANAKRISHNAN, Oklahoma State University — The dynamics of a stator assembly that directs incoming wind into an internal cylindrical trapped flow that exits vertically has been previously studied using particle image velocimetry and computational fluid dynamics (CFD). The present study uses the commercial CFD package Star-CCM+ (CD-adapco) to investigate how a Savonius rotor is affected by the introduction of cylindrical flow trapped by a stator enclosure. The results are then compared with the flow field around an identical Savonius rotor without a stator assembly. The flow characteristics are investigated at Reynolds numbers on the order of one million to examine local flow effects around the rotor as well as downstream wake vorticity. Additionally, the minimum free stream wind velocity needed for rotor start-up and rotor output power will be compared with and without the use of a stator.

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