

Abstract Submitted
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Efficiency and flow structure of vertical-axis turbines with an upstream deflecting plate¹ DAEGYOUNG KIM, MORTEZA GHARIB, California Institute of Technology — The power generation and flow structure of straight-bladed vertical-axis turbines with an upstream deflector are investigated experimentally in tunnel facilities. When an upstream deflecting plate is normal to flow direction, a region of low velocity is formed in its near-wake. However, the flow speed outside the near-wake region becomes higher than the free-stream speed. Since blades outside the wake encounter higher flow velocity, they can rotate with higher torque and rotating speed compared to the case without an upstream deflector, which results in power output increase. Here, we study the effect of deflector position and width on the efficiency of vertical turbines. We also discuss the flow structure generated by the deflector system.

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