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Performance analysis of vertical axis wind turbine: Introduction of new blade profile with deflector-rudder unit

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The present study deals with designing of wind turbine blades and deflector-Rudder unit for the efficiency improvement of a straight-blade vertical axis wind turbine (S-VAWT). A wind turbine blade has been designed considering the effect of lift and drag forces acting on the blades which were obtained by the CFD simulation results. According to previous studies, it was found that the performance of the S-VAWT can be improved by means of the deflectors. Shapes and positions of the deflectors were selected to maximize the torque effect to the turbine on the relevant region. Performance of new blade profiles with deflectors is compared with that of NACA profiles. Comparison results show, new blade profile with deflector-Rudder unit has better power extraction ability than existing designs due to effective projection of the wind toward the blades by deflectors. Power coefficient of the present design can be increased up to 0.30 when the tip-speed ratio is around 1.25

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