3D CFD simulation and parametric study of a flat plate deflector for vertical axis wind turbine

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Highlights

- Numerical simulations were performed on a straight-bladed VAWT with a flat plate deflector.
- Parametric analysis of the flat plate deflector.
- VAWT performance enhancement by the flat plate deflector as power augmentation device.

Abstract

Three-dimensional numerical simulations have been performed to analyze the aerodynamic characteristics of a straight-bladed NACA0021 vertical axis wind turbine (VAWT). The unsteady flow CFD simulation was validated with the wind tunnel experiment data available in the literature. Sliding mesh method with the SST $k-\omega$ turbulence model was employed to simulate the rotational motion of the VAWT using ANSYS Fluent. The study showed a good agreement between the simulation and the wind tunnel testing. Further simulations were carried out to study the effects of a flat plate deflector being placed at the upwind of the VAWT by varying a