DETERMINATION OF AIRFOIL SELECTION AND DESIGN PARAMETERS EFFECTS ON THE PERFORMANCE OF VERTICAL AXIS WIND TURBINES

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Integrating wind turbines in urban areas especially over buildings is a new way of producing electricity which is supported in recent years.
The use of vertical axis wind turbines at buildings seems favorable owing to the fact that they do not suffer from frequent wind direction changes, architects like the design and the idea to integrate such design with the building, and they have better response in turbulent wind flow which is common in urban areas.

This paper presents a computational study into the aerodynamics and performance of small scale vertical axis wind turbines and describes the effect of some design parameters including number of blades, airfoil type, turbine solidity and blade pitch angle on the performance of them. To perform the transient simulations, k- turbulence model is chosen and Multiple Reference Frame (MRF) model capability of a commercial CFD solver is used to express the dimensionless form of power output of the wind turbine as a function of the wind freestream velocity and the rotor's rotational speed. The results show that simulated turbines experience a maximum power coefficient of 0.37 in tip speed ratio of about 3.5.

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