DESIGN AND ANALYSIS OF THE EFFICIENCY OF THE VERTICALLY AXIAL WIND TURBINE

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Abstract

There are significant efforts around the globe to develop effective systems for energy production from renewable sources such as wind energy. The replacement of so-called dirty technologies used for the production of energy from fossil fuels with modern clean technologies led to the development and testing of aerodynamic constituents of wind farms that can provide environmentally friendly and safe energy.
The objective of this paper is to present the analysis of the efficiency of vertical axis wind turbines that can be installed on the building roofs in big cities. Primary design of the turbine construction was based on idea to minimize the number of moving parts which could cause potential defects during the lifecycle. The rotor was design as a composite structure that should be resistant to stresses caused by complex weather conditions during the seasons.
Based on the results of two-dimensional numerical simulation of the vertical axis wind turbine motion, it can be concluded that there will be enough buoyancy forces on the rotor blades to create a torque around the axis of rotation and transform kinetic energy of the rotational movement into electrical energy.
Furthermore, comprehensive 3D simulation gives an even better picture of the streamlines and a clear path to the design and testing of the prototype. Due to the constant induction of the buoyant force (i.e. the moment), the continuous load on the construction will produce quieter motion of the blades, which is of great importance for people who would live in buildings under this type of wind turbine.

Keywords

Wind energy, vertically axial wind turbines, composite structure, 3D simulation