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Performance Enhancement of Wind Turbine System: Numerical Investigation

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Abstract – In this work, a numerical model of a domestic wind turbine with a horizontal axis of varying power between 0.4 kW and 50 KW, were proposed to exhibit the wind turbine performances.
The numerical analysis was performed using the computational fluid dynamic (CFD) tool to solve 3D Navier-Stokes equations. The efficiency of power wind turbine is estimated for different cases of Reynolds number and experimental data (rotor diameter; height of mast; wind speed; speed of rotation; energy produced). The results showed that the effect of the uniform flow of air around on the turbine pressure and the velocity. Streamlines, vectors and the power of the wind turbine were analysed in details.

Keywords – Wind Turbine, Power Performance, Electrical Efficiency, CFD.

Graphical abstract