

Development of Vertical Axis Wind Turbines and Solar Power Generation Hybrid System

Yogesh R. Shinde¹, Akshay P. Gahile², Sakshi V. Mali³, Samruddhi R. Zade⁴, Shubhangi K. Thorat⁵

Assistant Professor, Department of Engineering Sciences¹

Students, Department of E&TC^{2,3,4,5}

PVGCOE & SSDIOM, Nashik, Maharashtra, India

Abstract: Solar-wind power generation is an emerging approach in countries like the United States, the United Kingdom, and others, where efforts are being made to harness both solar and wind energy simultaneously. This hybrid system is recognized as a clean, sustainable, and independent energy solution. Despite its potential, many nations have yet to adopt it widely. Solar-wind hybrid systems are predicted to play a vital role in meeting future power demands, thanks to their ability to generate several megawatts of electricity with zero emissions. This study focuses on designing and developing a hybrid solar-wind energy system to enhance energy efficiency by integrating solar panels with wind turbines. The goal is to provide a robust alternative to traditional energy sources such as oil, gas, and coal, which are not only polluting but also increasingly scarce. The system includes an improved Vertical Axis Wind Turbine (VAWT) design. Two types of VAWT structures both vertical windmill-shaped are analyzed for performance and efficiency. Additionally, two solar panels are incorporated to supplement power generation, particularly during sunny days when wind speeds may be low. This hybrid design aims to ensure a more reliable and continuous power supply by leveraging the complementary nature of wind and solar energy.

Keywords: Arduino, Horizontal axis wind turbine (HAWT), Photovoltaic (PV), Pulse width modulation (PWM), Vertical axis wind turbine (VAWT).

