Modelling of Power Curve Equation for Small-Scale Vertical Axis Hydrokinetic Turbine

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Abstract In this paper, the power curve equation model using a vertical axis turbine for small-scale hydrokinetic energy harnessing real-time simulation is proposed. The modelling technique is based on an analytical approximation method on the C_P-*TSR* curve characteristic of the H-Darrieus turbine. In this work, the C_P-*TSR* curve characteristic is generated and derived through a simulation process using QBlade and MATLAB software. The Root Mean Square Error (RMSE) method is implemented to obtain the most accurate polynomial approximation equation to represent the H-Darrieus turbine. The 6th polynomial equation has been chosen as a turbine power equation model due to the least RMSE value. The results indicated that the proposed power equation model enhanced the energy conversion with 86.92% efficiency compared to the other model.

Keywords Hydrokinetic · H-Darrieus · Power curve equation

1 Introduction

The depletion of fossil fuels, high CO_2 emission, global warming, and environmental pollution are among the main factors of all initiatives by governments to move forward for a sustainable environment [1]. Renewable Energy (RE) has the potential to play a significant role as a clean and sustainable energy resource for electricity generation in the future. The RE is a reliable, key-climate solution and offers climate-safe energy by reduction of CO_2 emission and environmental friendly [2].

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