

Real-time implementation and monitoring of Standalone PV and Wind Energy using Microcontroller

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Abstract

This project proposes a real-time integration of standalone Photovoltaic (PV) and Wind turbine permanent magnet synchronous generator power system to be online monitoring system. Maximum power point tracking (MPPT) and backup battery charge controllers are essential in this framework. Buck converter-based microcontroller for PV and wind MPPT charge controller is strategically designed for fast battery charge. In the control scheme, buck converter is synchronized with MPPT extracted from PV 100 W and wind turbine 400 W. Perturb and observer algorithm has been implemented in microcontroller to maintain the duty cycle of PV and wind turbine functioning around their respective MPPTs. The MPPT of wind turbine is achieved when the 3-phase voltage output of wind turbine is rectified. Therefore, sensor of wind speed measurement is circumvented. Control scheme capable of controlling overcharge, deep-discharge, and load control/abnormal condition during the day has been successfully incorporated. The energy data from PV and wind turbine, battery capacity and load conditions are recorded and displayed through online spreadsheet.

Keywords

PV, Wind, MPPT, and battery charge controller, buck converter

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