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Simulation of Maximum Power Point Tracking in a Photovoltaic System: A Circumstance Using Pulse Width Modulation Analysis

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Abstract : Optimized gain in respect to output power of stand-alone photovoltaic (PV) systems is one of the major focus of PV in recent times. This is evident to its low carbon emission and efficiency. Power failure or outage from commercial providers in general does not promote development to the public and private sector, these basically limit the development of industries. The need for a well-structured PV system is of importance for an efficient and cost-effective monitoring system. The purpose of this paper is to validate the maximum power point of an off-grid PV system taking into consideration the most effective tilt and orientation angles for PV's in the southern hemisphere. This paper is based on analyzing the system using a solar charger with MPPT from a pulse width modulation (PWM) perspective. The power conditioning device chosen is a solar charger with MPPT. The practical setup consists of a PV panel that is set to an orientation angle of 0o north, with a corresponding tilt angle of 36 o, 26o and 16o. The load employed in this set-up are three Lead Acid Batteries (LAB). The percentage fully charged, charging and not charging conditions are observed for all three batteries. The results obtained in this research is used to draw the conclusion that would provide a benchmark for researchers and scientist worldwide. This is done so as to have an idea of the best tilt and orientation angles for maximum power point in a basic off-grid PV system. A quantitative analysis would be employed in this research. Quantitative research tends to focus on measurement and proof. Inferential statistics are frequently used to generalize what is found about the study sample to the population as a whole. This would involve: selecting and defining the research question, deciding on a study type, deciding on the data collection tools, selecting the sample and its size, analyzing, interpreting and validating findings Preliminary results which include regression analysis (normal probability plot and residual plot using polynomial 6) showed the maximum power point in the system. The best tilt angle for maximum power point tracking proves that the 36o tilt angle provided the best average on time which in turns put the system into a pulse width modulation stage.

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