

Empirical Analysis of the Effect of Cloud Movement in a Basic Off-Grid Photovoltaic System: Case Study Using Transient Response of DC-DC Converters

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Abstract : Mismatch in electrical energy (power) 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 necessity for a well-structured photovoltaic (PV) system is of importance for an efficient and cost-effective monitoring system. The major renewable energy potential on earth is provided from solar radiation and solar photovoltaics (PV) are considered a promising technological solution to support the global transformation to a low-carbon economy and reduction on the dependence on fossil fuels. Solar arrays which consist of various PV module should be operated at the maximum power point in order to reduce the overall cost of the system. So power regulation and conditioning circuits should be incorporated in the set-up of a PV system. Power regulation circuits used in PV systems include maximum power point trackers, DC-DC converters and solar chargers. Inappropriate choice of power conditioning device in a basic off-grid PV system can attribute to power loss, hence the need for a right choice of power conditioning device to be coupled with the system of the essence. This paper presents the design and implementation of a power conditioning devices in order to improve the overall yield from the availability of solar energy and the system's total efficiency. The power conditioning devices taken into consideration in the project includes the Buck and Boost DC-DC converters as well as solar chargers with MPPT. A logging interface circuit (LIC) is designed and employed into the system. The LIC is designed on a printed circuit board. It basically has DC current signalling sensors, specifically the LTS 6-NP. The LIC is consequently required to program the voltages in the system (these include the PV voltage and the power conditioning device voltage). The voltage is structured in such a way that it can be accommodated by the data logger. Preliminary results which include availability of power as well as power loss in the system and efficiency will be presented and this would be used to draw the final conclusion.

Keywords : tilt and orientation angles, solar chargers, PV panels, storage devices, direct solar radiation

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