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Power Supply System for DC Solar Equipment by Batteries

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Abstract

In this paper, we present the structure, the sizing and the experimentation of a power system which makes it possible to supply, by solar batteries, DC equipment with photovoltaic renewable energies (Cookers, distillers, refrigerators, drying, etc.) .

The proposed system is based on the use of a Boost-type DC/DC converter with several branches, controlled by a Microcontroller, which generates PWM signals with a frequency of 20 kHz and a variable duty cycle α. The electrical energy, produced by the photovoltaic panels (600 W), is stored in the solar batteries (24V, 520 Ah) then transferred to the application through the proposed DC/DC converter.

Experimentation of the proposed system to power a 500-600 W solar cooker (heating plate), heated by thermal resistances, shows DC/DC converter efficiencies of 84%, heating temperature of the thermal resistance and cooking which reach 640°C and 230°C after 20 seconds and 40 min, energy consumed by the cooker of 647.36 Wh (i.e. 5 % of the total energy of the battery).

The comparison of all the results obtained with those simulated and the economic analysis of the use of renewable energies stored in the batteries, show the proper functioning and validity of the power system proposed in this work

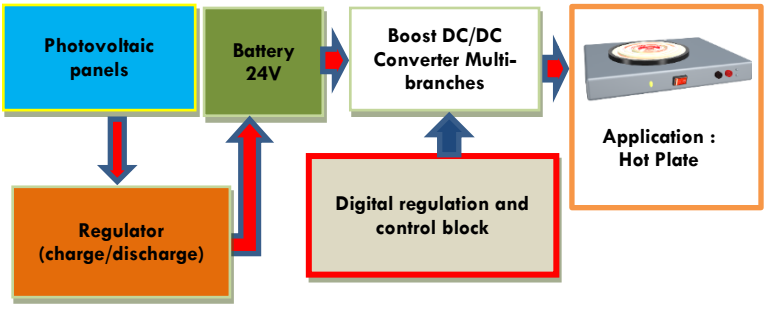

Figure 1 : Synoptic diagram of the power system proposed to supply DC equipment by solar batteries, charged by photovoltaic panels.

Recent Publications

1. OSEI, Emmanuel Yeboah et AMO-AIDOO, Araba, International Conference on Applied Science and Technology Conference Proceedings. (2018) 182-188.
2. ATMANE, Ilias, EL MOUSSAOUI, Noureddine, KASSMI, Khalil, *et al. International Journal of Circuit Theory and Applications*, 49 (2021) 3908-3921.
3. JOSHI, Smita B. et JANI, A. R, Solar Energy, 122 (2015),148-155.
4. BATCHELOR, Simon, TALUKDER, Md, RAHMAN, Arifur, *et al. Energies*, 11 (2018), 2933.
5. ADEWOLE, B. Z., POPOOLA, O. T., et ASERE, A. A. *International Journal of Energy Engineering*, 5 (2015), 95-101.

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