

Development of Low-Cost Automatic Off-Grid Inverter System for Power Outages

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Some of the countries around the world including Sri Lanka are facing crucial problems on supplying electricity due to the economic crisis generated by Covid-19 pandemic. It has caused frequent power outages which dramatically affects daily life. This research work highlights an off-grid inverter system which can be used in such situations where it converts 12V DC battery voltage into 230V, 50Hz AC. The output can be used to power up the home appliances without performing many modifications to existing electrical installations. The 12V DC supply is fed into a boost converter and subsequently connected to a center-tapped step-up transformer with two complementarily operated MOSFETs which converts DC supply into AC. MOSFETs are switched using switching signals generated from the Atmega328P microcontroller. Square wave-based inverter model was realized in this research project. To separate the signal side from the power side, opto-isolators were used. Input of those was connected to the microcontroller. A software implemented deadtime was introduced to prevent any shoot-throughs. Two separate auxiliary power supplies were used on the output sides of the opto-isolators to drive the MOSFETs. Upon testing, it was found that this system can maintain a 230V output even when the battery voltage drops to 9V thanks to the boost converter. Moreover, this system is capable of detecting power outages itself and automatically switches on the backup power and switches off the backup power when mains power is available because of the feedback sensors attached to the system.

Keywords: Backup Power, DC-AC Conversion, Off-Grid Inverter System, Power Outages