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DESIGN AND ANALYSIS OF POWER ELECTRONICS BASED ENERGY MANAGEMENT SYSTEM

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ABSTRACT
The economical growth of any nation is depends upon the energy spending of the country. The electrical energy sector plays a decisive role in the development of the country like India. The losses in the electrical systems will reduce the effective utilization of the power and hence it is necessary to have an automated system for energy management as per the demand. The demand of the electricity is continuously changing and hence management of the electricity is a challenging task to achieve. The continuous improvement in the system by means of management and the control is important. Authors have developed the energy management system with the help of power electronics devices and control is achieved with supporting controller.

KEYWORDS: Power devices, controlled energy, management system, design and development, etc.

INTRODUCTION

Energy without a control can never be utilized effectively as it cannot be utilized efficiently with the convenience of end user. The electrical energy sector is very important all over the world as it is one of the basic needs and most of the processes in the industrial as well as domestic and commercial applications are electricity dependent. Power electronics devices were found very popular in control of electricity since their development. Controlling the power improves the performance of systems appropriately. The sustainable system development must be the aim of the designer of the system. With spacious variety of the ratings the power devices are used globally to manage the energy.

The eminence of generated energy can be achieved with the accurate organization of the power with controlled approach. Monitored electricity is always easy to control. The developed softwares and online monitored control has been implemented now days. The lightning system monitoring and control itself saves the electricity remarkably. The figure below is showing energy management of the various devices.

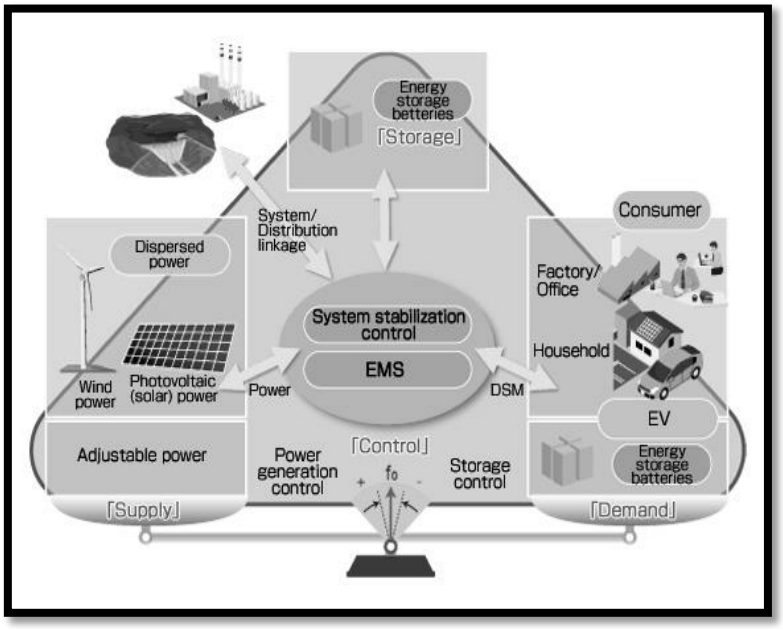

Figure 1: Energy Management system

The digitalized control of the energy fulfills the demand very effectively. Better efficiency results in less need of generation and hence conservation of the fuels. The secured energy on the other hand is also an important factor from user point of view. Indian energy sector is working on different possible energy management options for saving of electricity. Saving the fossil fuels by means of efficient utilization of the generated energy is one of the aspects of energy management. Authors have developed the management system with control and storage of electricity.

IMPLEMENTED SYSTEM OVERVIEW:

The system is developed with the help of power devices, batteries, digital control and monitoring system. Control of the grid is achieved with the help of the inverter switch and batteries.

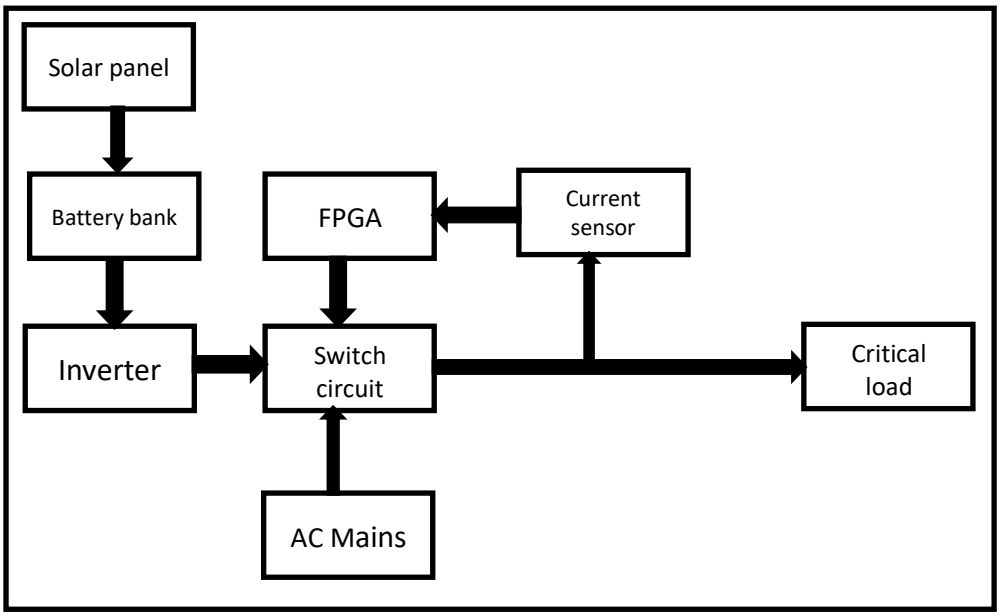

Figure 2: Implemented System Overview

RESULTS:

EFFICIENCY AND POWER:

Efficiency is given by

$\eta = P_{out} / P_{in}$ (1)

The output across the circuit is 45v AC. This voltage is V_{ac}

V_{ac}= V this is full load AC voltage. (2)

Now on the basis of ac voltage maximum voltage is calculated.

$Vm = \pi V_{ac}/2$ (3)

Vm = V (4)

P_{out}= W &P_{in} = W

READINGS OF THE SYSTEM:

- Input voltage of the system = 220v
- Output power of the system = 60w/ 40w
- Output of Battery = 12v dc
- Output of FPGA board = 5v
- Output of inverter circuit =220v ac
- Input of inverter circuit = 12v dc
- The 12 volt battery is charged in 3-4 hours in normal condition

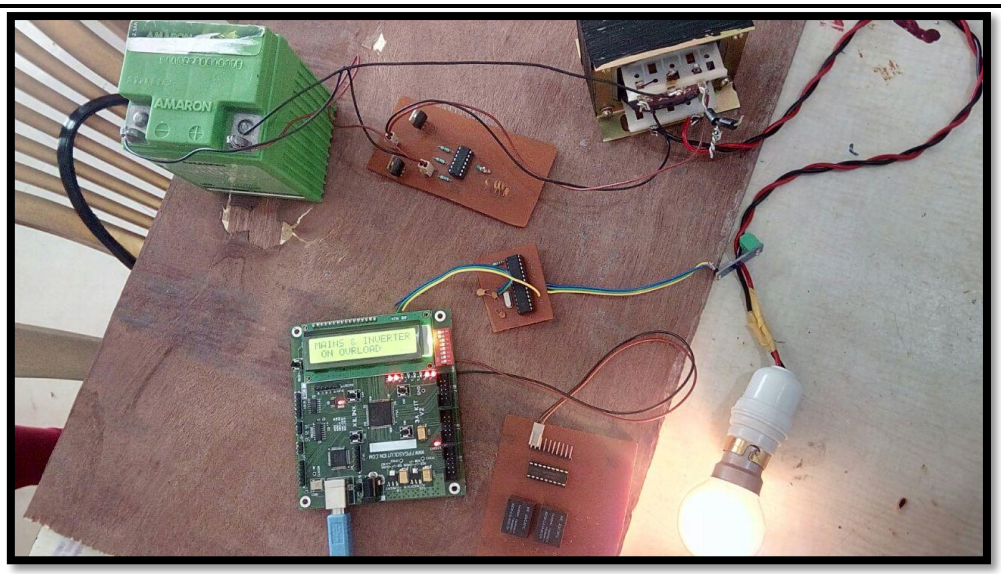

Figure 3: Experimental setup condition1

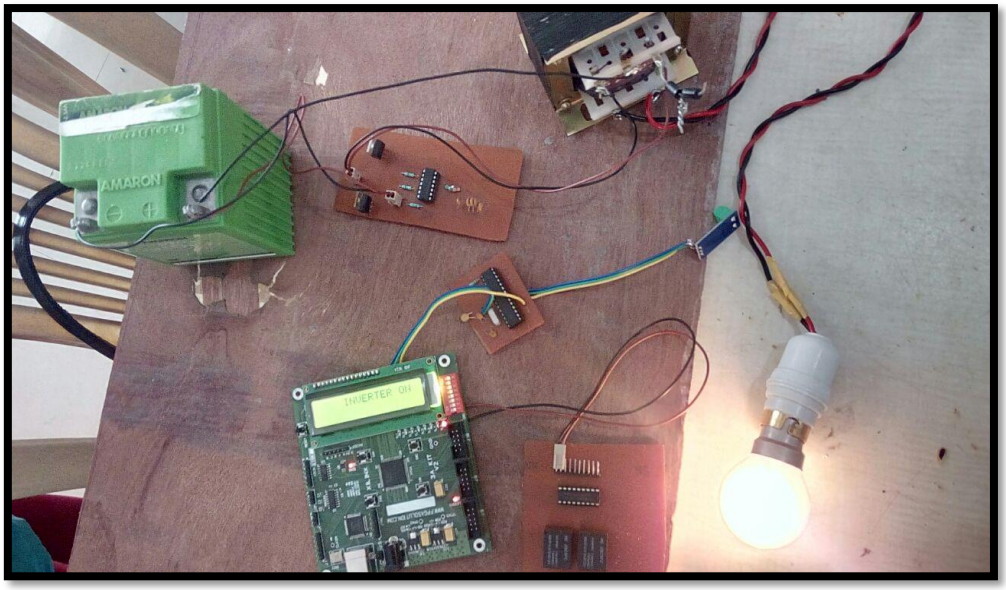

Figure 4: Experimental setup condition2

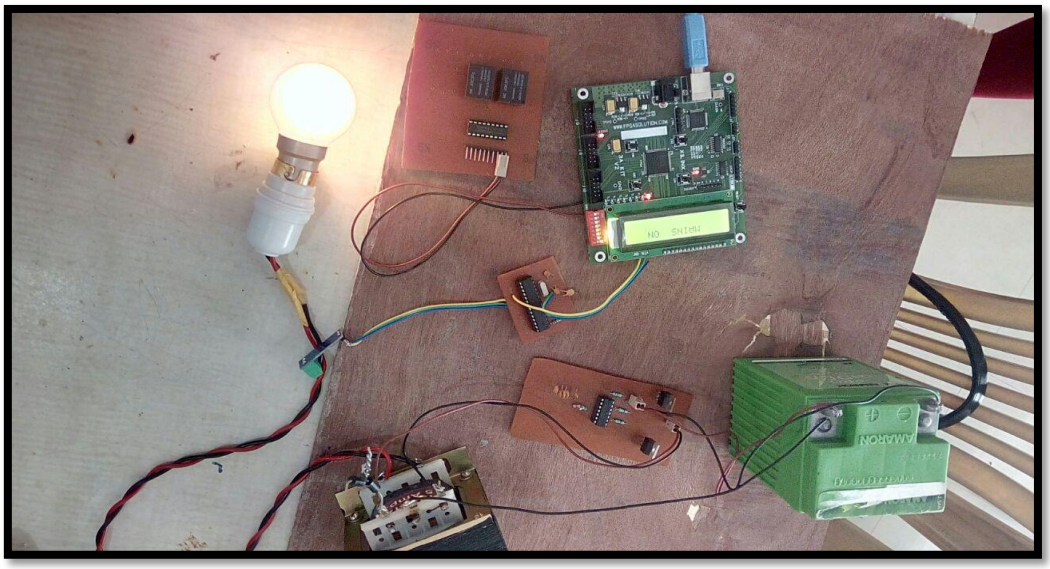

Figure 5: Experimental setup condition3

CONCLUSION

Authors have demonstrated the energy management system with the help of the power electronics circuit. A controlled inverter circuit with batteries has achieved the better flexibility. The control circuit was found useful for the control of the power and utilizing it effectively. The controlled approach is effective as fur as the utilization of the power is concerned.

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