MICRO-GRID MONITORING AND CONTROL STRATEGY FOR RENEWABLE ENERGY SOURCES USING IOT

Koushal Kishore N R	**Ramanjaneya G**
Department of Electrical and Electronics Engineering	*Department of Electrical and Electronics engineering*
Dr. Ambedkar Institute of Technology	*Dr. Ambedkar Institute of Technology*
Bengaluru-560056	*Bengaluru-560056*
Praveen Kumar K L	**Prof. Rajesh L V**
Department of Electrical and Electronics Engineering	*Department of Electrical and Electronics Engineering*
Dr. Ambedkar Institute of Technology, Bengaluru -560056	*Dr. Ambedkar Institute of Technology,Bengaluru -560056*
Purushotham N P	
Department of Electrical and Electronics Engineering	
Dr. Ambedkar Institute of Technology Bengaluru-560056	

ABSTRACT:

Micro-grid is a small network of electricity with a local source of supply. Nowadays Micro-grid concept is developing rapidly. In this paper, renewable energy(solar) source has been used to reduce the usage of energy from main grid. The use of renewable energy sources also reduces the dependency on fossil fuels which causes environmental pollution. Since from last decade various methods are developed by the scientists to protect environment. In this regard, renewable energy sources(RES) are being deployed in the power system to meet the energy demand. Here solar energy from the photovoltaic panel is used to run the loads energy saving plays important role in Micro-grid management strategy. In this paper various techniques have been implemented to save the energy.

- ***Control of loads using IoT.***
- ***Smart controlling algorithm using IoT to control schedulable load as per the need.***

The major part of the paper is State of charge (SoC), which is one of the best solution to overcome the problems related to Battery management like over draining of the Battery

KEYWORDS:*Micro-grid, LDR sensor, Grid connected mode & DC fast charging.*

INTRODUCTION

Demand for electricity is increasing rapidly due to increase of population. We need alternative approaches to fulfil the demand.These type of problems can be solved by a concept called Micro-grid. Micro-grids leads to the demand side management through the modification of consumer demands. Increasing energy requirements have become notable concerns and Micro-grid have emerged as a sustainable to overcome. Renewable energy sources such as solar and wind are need to be used to avoid environment pollution. Renewable energy sources doesn't cause any pollution and never-ending. Loads can be controlled through IoT. This type of energy management system can be installed to reduce power consumption. State of Charge(SoC) is also important part of the proposed system. This keeps on monitoring the battery percentage available, the respective loads are switched on.

METHODOLOGY

The block diagram shows representation of our proposed system. We are using solar as renewable energy resource, 12V, 5W solar panel and loads can be run by the energy obtained from solar energy.To step down the a.c. voltage Transformer is used. Therefore the step down transformer output voltage is 12V. The output voltage is rectified through bridge rectifier to get the D.C. voltage. Voltage divider is used to reduce the higher voltage into lower voltage because we are using lower voltage circuits. To get constant output voltage, a voltage regulator (7805) is used.

BLOCK DIAGRAM

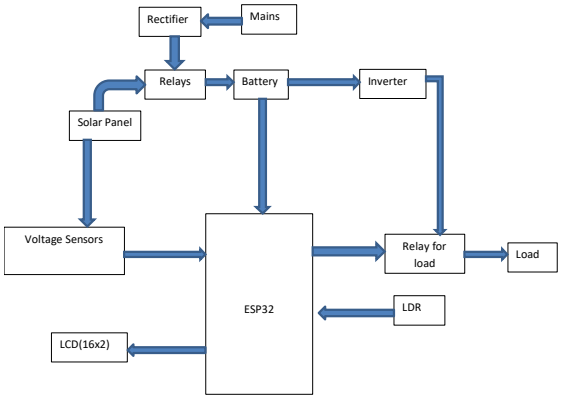

Fig:1Block Diagram

In this proposed work, ESP32 is used as a controlling device, which acts as main part of the System. This system automatically works in grid connected mode if, energy obtained from solar source is not sufficient .This can be achieved by using this ESP32 microcontroller. LCD display is connected to ESP32 so that amount of solar energy generated is displayed in LCD(Liquid Crystal Display).There is another concept in the proposed system called state of charge(SoC) .It keeps monitoring the battery percentage. According to the available battery percentage the respective loads can be switched ON, which leads to the priority wise load management leads to the demand side management. Light Dependent Resistor(LDR) senses whether it is day,the respective load will be switched ON or it is night the respective load will be switched OFF.ESP32 has inbuilt wi-fi module it helps to communicate between the system and IoT application, Therefore loads can be controlled IoT.

SIMULATION

This is the simulation setup we have done in the matlab software.

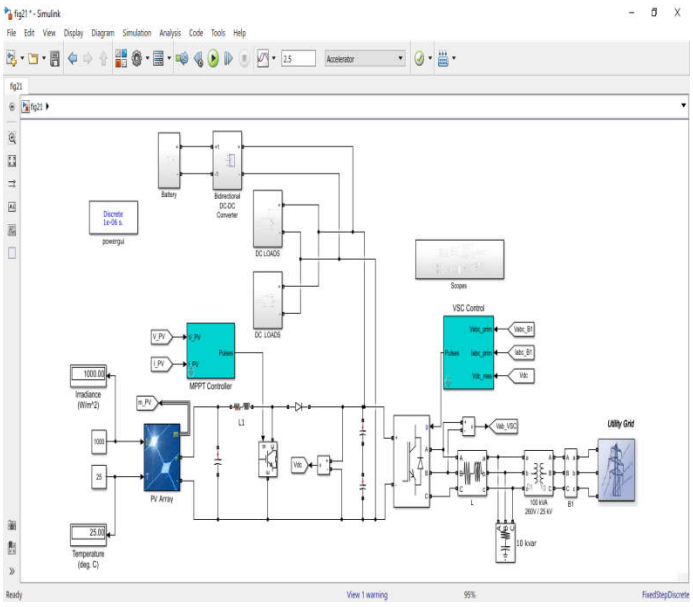

Fig: 2 Schematic diagram

SIMULATUION RESULTS

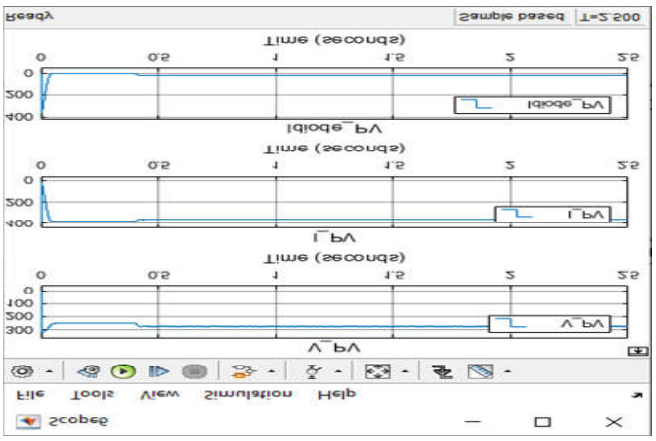

Fig: 3 Solar side voltage, current and diode current

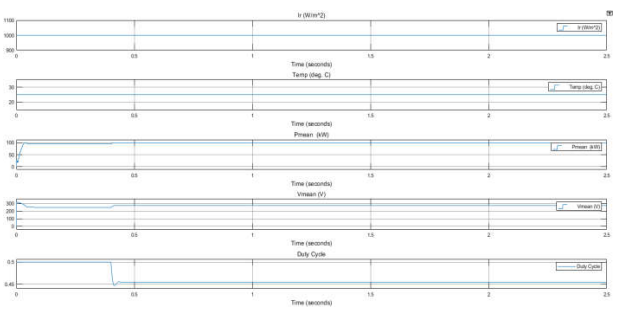

Fig: 4 Solar side

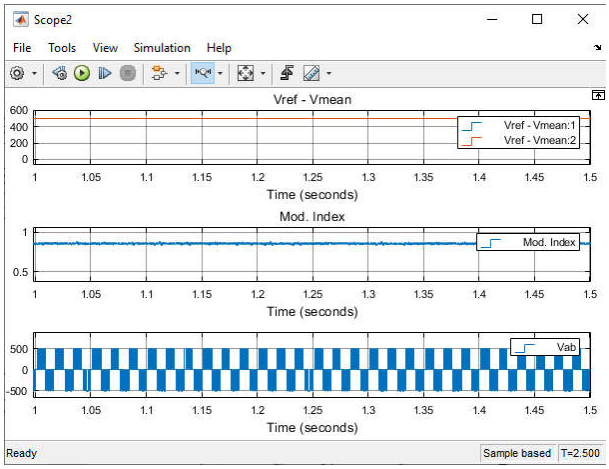

Fig: 5 Inverter side dc voltage, modulation index, Phase voltage

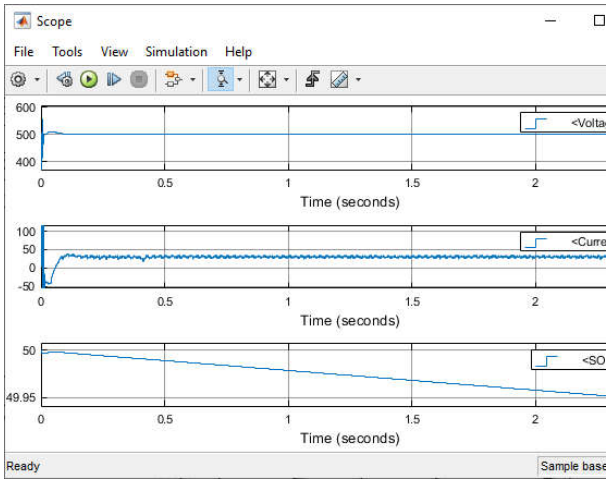

Fig: 6 Battery side voltage, current & SOC

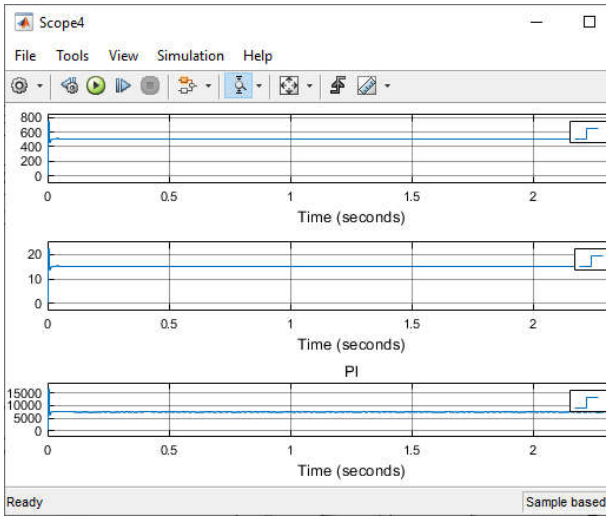

Fig: 7 Load-1 side Voltage, Current & Power

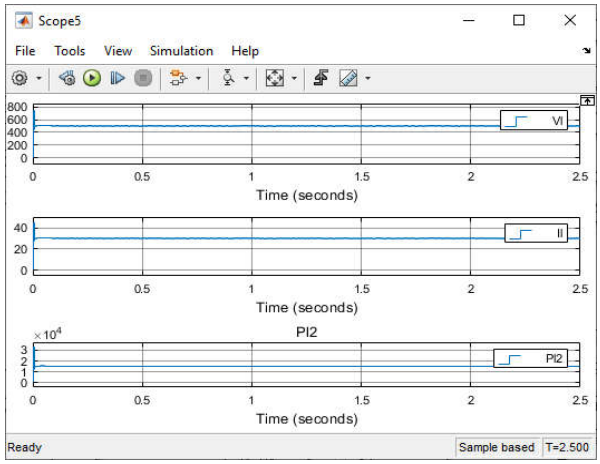

Fig: 8 Load-2 side Voltage, Current & Power

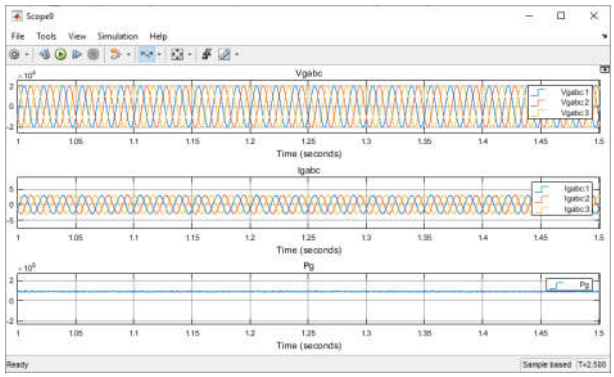

Fig: 9 Grid side voltage, current & active power

CONCLUSION

In this paper Micro-grid monitoring and control strategy for renewable energy sources using IOT is successfully designed. This system is highly energy effective as it uses ESP32 microcontroller which uses less amount of energy.The manual and automatic switching of loads is done through a Blynk application, by using IoT platform. This proposed system manages the demand in an efficient way thus reduces the electricity consumption, electric bill and thereby maintenance cost is less. The state of charge(SoC)of the battery is also executed so that the battery life will be good since according to the charge in the battery of loads is been controlled.

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