iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** V **Month of publication:** May 2019

DOI: https://doi.org/10.22214/ijraset.2019.5654

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue V, May 2019- Available at www.ijraset.com

Porto Solar for Rural Applications

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Abstract- As the energy demand of world including india is increasing day by day. The utilities are not able to fulfill this demand and, the conventional energy sources which are used for generation presently are depleting at a rapid rate. Moreover, this source has major limitations like fuel costs, emission of green gases, transportation costs and its limited availability. Hence, we are proposing a solution over this shortcoming by designing a device PORTO SOLAR which can be used for rural as well as urban applications. Basically it is a portable power generator which uses the available photonic energy from sun for utilization in form of electrical energy. Energy sharing will be facilitated in the area where energy requirement is very high. This device is user friendly due to its low weight so it can be carried easily. Hence in our paper we have focused upon providing an electrical solution for all rural as well as urban needs.
Keywords- Power Sharing, Portability, Power bank, Multi Applications, User friendly, Enviroment Compatible.

I. INTRODUCTION

Solar Energy is widely available everywhere freely without any interruptions (with exceptions of clouds and rainy seasons).Renewable Energy plays an important role in today's power sector, which covers mostly 14% of overall installed capacity. Renewable energy sources consist of solar energy, wind energy, biomass energy, tidal energy, oceanic energy, Solar energy is most versatile of them all. As the Fig shows Total installed capacity of India, in which Coal generates 61% where Hydro & RES generates 14%, Gas generates 8% disel and nuclear generates 1% and 2% respectively. Due to use of solar energy the dependency on conventional sources get reduces and so we get free energy from sun which can reduces our running cost. Due to apparent limitations of fossil fuels, solar energy is becoming more popular as a renewable energy source that could change the future.

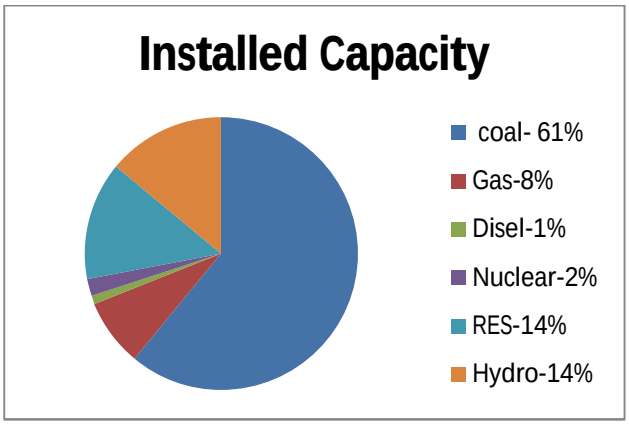

Fig.1 Present Installed capacity of india

We are going to develop a portable device using solar panel which can be use when there is absence of energy. This device name as PORTO SOLAR , that means it contains suitcase over which solar plate is mounted on its surface. Inside the suitcase the total circuitry like charge controller, battery, output ports that are inserted. Porto solar can be used for applications like mobile charging, for residential lighting, fan etc. the main objective of designing this device is to provide electricity free at rural areas where the electricity is not deprived. This device is also user friendly due to its low weight and while transportation that bag can used as power bank for charging of mobile phones. Also it is environment compatible device, overall this device has more advantages with multi applications.

II. LITERATURE SURVEY

A. *A Survey Conducted for PORTO SOLAR*

1) *Name of Author*- David Carvajal, Amos Nortilien, Peter Obeng Department of Electrical Engineering and Computer Science, University of Central Florida, Orlando, Florida.
   a) *Title- portable Solar Power Supply:* In this paper detail study about the Portable Solar Power Supply which is designed to optimize capturing solar energy, storing it into a battery, and providing both standard household alternating current

(AC) and most common direct current (DC) power. This device was designed to have it's weight and size minimized.The device can be used to provide power to devices while camping outdoors.

2) *Name of Author:* Burak akin. Yildiz Technical University" electrical engineering department Istanbul, Turkey.
   a) *Title- Solar Power Charger with Universal USB Output:* This paper describes the importance of Cells phones and other portable electronic video and music players in human lives and proposes a portable device charge system by solar energy with DC-DC boost converter .
3) Matthew Dallard 1, Anthony Forest 2, Amir Shabani 3 Intelligent Building Automation Systems (IBAS) Research Group George Brown College, Toronto, Canada
   a) *Title-Design of a Portable Smart Connected Solar-Powered Charger for Consumer Electronics:* The portable solar-powered USB device charger described in this paper successfully emulates a grid-tied solar power system. The system is capable of charging the battery by using either the grid or a solar input, and can accommodate an array of solar PV panels. They are addressing the main design challenges including proper battery charging and discharging, determiningthe best method of measuring DC current and choosing the most suitable lithium battery chemistry with giving suitable portable smart solution for solar powered charger.

III. OBJECTIVES

A. To create a portable power generation system that is easy to carry & to develop a portable system that can charge most portable appliances.
B. The charging capability of this device must be equivalent to the charging ability of any indoor power outlet and any USB power outlet.
C. To provide electricity free of cost for basic electrical needs in rural areas.
D. Harness Solar power in a portable way which will effectively promote power sharing in rural areas and make them self sufficient.
E. Objective is to achieve economic feasibility that will allow to provide electricity at low cost for charging & illumination applications so that even the poor class can afford it.

IV. HARDWARE RESOURCES

Fig.2 Architecture view

The PORTO SOLAR consist of mono crystalline solar panel which is mounted on top surface of suitcase. The outlet connections from solar panel is given to the charge controller which is kept inside the suitcase. We are using lithium Polymer battery pack due to its high efficiency , compact size and less weight .due compact size of batteries , suitcase handling get easy. Also we are using SMPS model i.e Switched mode power supply which takes external Ac supply from House to fed battery in cloudy days.

V. SOFTWARE RESOURCES

We are using PIC16F876A Microcontroller

A. It has 8 channels of analog to digital converter with 10 bit resolution.
B. It supports wide range of 32KHZ to 20MHZ external oscillator frequency.

C. It available in 28/40/44 pin packages.
D. The code is written C language.
E. Software in which the code is written is MicroC. The software is available freely on www.Mikroelectronica.com
F. The C code was compiled in this software into .HEX file and was burned into microcontroller by Bootloader.
G. The software was debugged amd the chip programmed by PICKIT2 development tools.

VI. BLOCK DIAGRAM

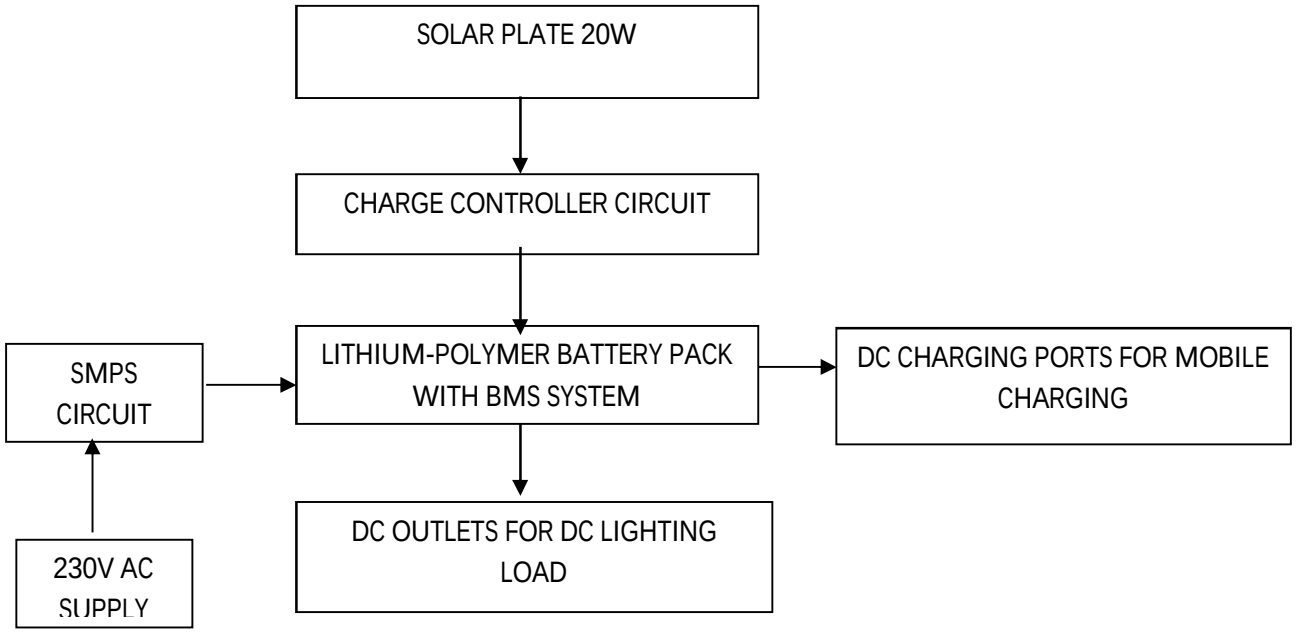

Fig.3- Block diagram

Fig shows the block diagram of porto solar containing Solar plate of 20 watts which receives the sun rays and convert it into electrical energy of 12v dc supply. Then the output of solar panel fed to the charge controller, it is device which control rate of flow of charge from solar panel to battery. In charge controller we are using BMS i.e battery management system which protects battery from overvoltage & under voltage and also provide constant 12v dc for dc USB charging and dc outlets for dc lighting load. Battery pack of lithium-polymer is used due to its low weight, compact size and high efficiency.

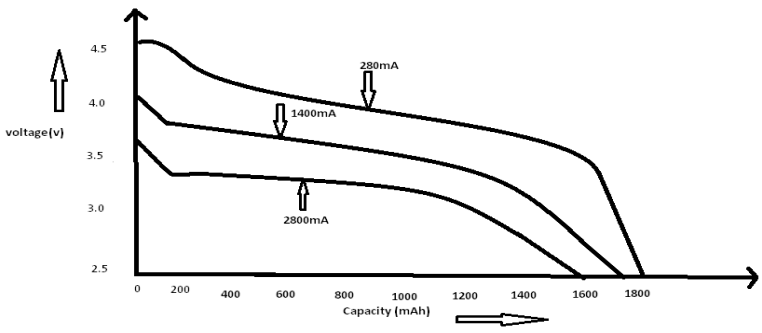

Fig.4 – lithium polymer characteristics

We would like to express our special thanks of gratitude to Principal Prof. Mrs, Dr. K. R. Joshi and Head of Electrical Engineering Department, Prof. Mrs. N.R. Kulkarni who gave us the golden opportunity to do this wonderful project . We would also like to thank our project guide Prof. .Mrs. V.S.Jape who gave us opportunity to do work on PORTOSOLAR for rural application in renewable energy domain. We would also like to thank all the faculty member for helping and guiding us one very step, resulting in successful completion of our paper

VIII. CONCLUSION

By providing proposed solution like PORTOSOLAR, power sharing can be easily done. By use of this device multi application like mobile charging, residential lightning can be achieved. Hence use of PORTOSOLAR lead towards reducing per annum charging cost hence consumer gets more profit.

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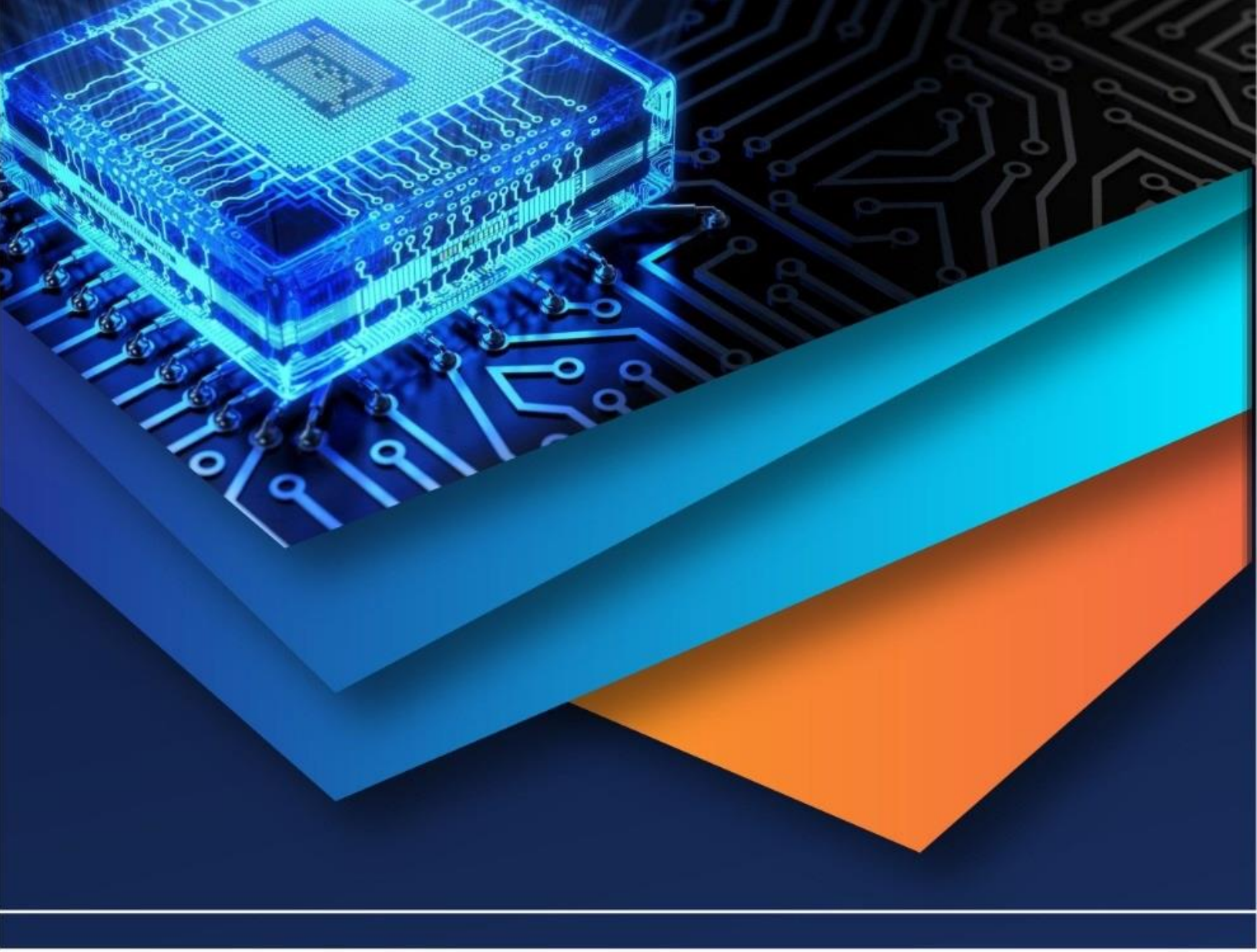

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