

“IOT BASED DIGITAL CHARGE CONTROLLER”

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Abstract: Solar Inverters are highly in demand for the alternative source of electricity. The home Inverter and off grid inverter are mostly use everywhere. These inverters are not able to monitor online as well as having only one battery bank to provide the backup supply. We propose the system which can be used with these inverters to put the normal inverter online as well as two battery banks to increase the life of battery and to reduce the maintenance cost.

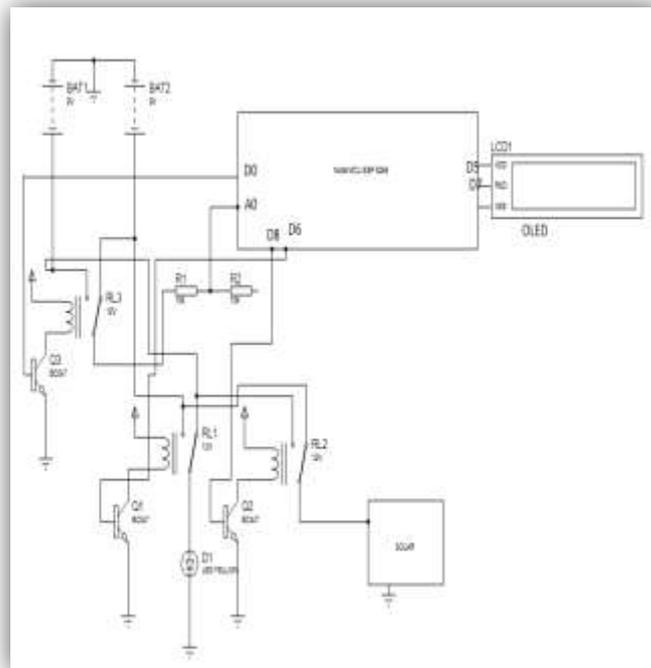
Sometimes, electricity can be cut-off due to natural disasters often happened. So, this type of energy such as wind energy, hydraulic energy and solar energy, they are needed as the source of electricity. The advantages of choosing solar energy by using a solar panel are that the lifetime of solar panel is long lasting than any other source of energy. The solar charging system is very important and necessary to use for people live in rural areas. Now a days, we use the sun as a natural source of energy. Solar resource is unlimited the government is trying to implement the use of solar panels as energy source in rural and suburban areas for lighting the street lights power.

Keyword: NodeMCU, OLED, Relay.

Introduction: Solar home lighting system are photovoltaic systems which offers cost effective solution to supply energy to remote off- grid areas. Solar energy sustains life on Earth for all plants, animals and people because it provides an exciting solution for all the societies to meet their needs for clean, abundant sources of energy in the future. The main source of solar energy is the nuclear reaction at the core of the Sun, where the energy comes from the conversion of hydrogen into helium.



Solar energy is transmitted to the Earth in the form of electromagnetic waves, which can also be represented by photons. The Earth, therefore, is essentially a huge solar energy collector receiving large quantities of solar energy which can be seen in various forms such as plant photosynthesis, and evaporation of the oceans resulting as rain which forms rivers and provides hydropower energy.



Internet of things is a future technology in the industry products. It mainly deals with cloud computation, Machine learning, Business Analytics. IOT can be dealt both from embedded point of view as well as application perspective. IOT from the application point of view deals with deploying Customized Web application on the cloud for Data logging and diagnostics. From the embedded point of view a microcontroller is the heart of the project, From the Microcontroller the data can be sent through wired mechanism or wireless technique. In this project the Wi-Fi module is connected to the Micro controller through UART. Any electrical device can send some key parameters to the Microcontroller which processes it and sends the telemetry messages to the Wi-Fi module which in turn sends the same to the cloud. The main advantage of this is a performance of the device can be monitored at any place using the parameters which we sent to the cloud.



Literature Review:

I. A Charge Controller Design For Solar Power System, INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 5, ISSUE 06, JUNE 2016.

Development of IOT Solution for Solar Based Charge Controller, International Journal of Innovative Research in Computer and Communication Engineering (An ISO 3297: 2007 Certified Organization) Website: www.ijrcce.com Vol. 5, Issue 6, June 2017.

II. Sarat Kumar Sahoo, G. Tulasi Ram Das, Vedam Subrahmanyam, "Contribution of FPGAs to Industrial Drives - A Review", *International Conference on information and Communication Technology in Electrical Sciences*, pp. 343-348, 2007.

The objective of this paper is to send telemetry data from the solar based charge controller to Microsoft Azure IOT Hub using bare metal STM32 microcontroller and ESP8266 Wi-Fi module. An attempt has been made to reduce the overall memory consumption while connecting to the cloud.

III. Akarsh Sinha, M. Pavithra, K.R. Sutharshan, Sarat Kumar Sahoo, "Arduino Based Pulse Width Modulated Output Voltage Control of a de-de Boost Converter Using Proportional Integral and Derivative Control Strategy", *Australian Journal of Basic and Applied Sciences*, vol. 7, no. 11, pp. 104-108, Sept 2013.

A Charge Controller Design For Solar Power System ,INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 5, ISSUE 06, JUNE 2016 ISSN 2277-8616.

IV. P.U Enric, M. D Michael, "Recommended Practices for Charge Controllers. Renewable Energy and Hybrid System Group CANMET Energy Diversification Research Laboratory. M. K. Alam F. H. Khan and A. S. Imtiaz "An efficient power electronics solution for lateral multi -junction solar cell systems", *Proc. IEEE IECON*, pp. 4373-4378, 1998.

This paper presents the solar charge controller circuit for controlling the overcharging and discharging from solar panel. This circuit regulates the charging of the battery in a solar system by monitoring battery voltage and switching the solar or other power source off when the battery reaches a preset voltage. This circuit is low voltages disconnect circuit. A charge controller circuit can increase battery life by preventing over-charging which can cause loss of electrolyte. The flow chart is also provided.

V. Nwanya A.C. (May 2015) "Solar PV Installation and Maintenance" Lecture Material NAPSAS Training Programme Introduction to Power Electronics by Danial W. Hart. TECHNICAL REPORT ON STEP BY STEP INSTALLATION OF SOLAR ENERGY AND ITS MAINTENANCE, *International Journal of Scientific Engineering and Applied Science (IJSEAS)* – Volume-2, Issue-9, September 2016 ISSN: 2395-3470

VI. This technical paper describes solar energy and Its Maintenance. Solar Energy is refers to as the energy from the sun; the conversion of the sunlight into electricity gives you Solar power. It allows any user with necessary receiving components to receive the sun for its utilization by using photovoltaic (PV). Photovoltaic convert light into an electric current and this current can be converted into alternating current (AC) using an inverter and also stored using a well arranged batteries for use in homes for illumination and for appliances at home. This technical paper will discuss in details the necessary steps to be taken for proper installation and maintenance of solar energy.

VII. Solar Home Lighting System with AC and DC Loads, *IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE)* e-ISSN: 2278-1676, p-ISSN: 2320-3331, Volume 12, Issue 3 Ver. II (May. – June. 2017)

VIII. Sarat Kumar Sahoo, "Modeling and Simulation of DTC Scheme for Three Phase Induction Motor using VHDL / FPGA", *International Journal of Mathematical Modelling Simulation and Applications*, vol. 4, no. 1, pp. 96-115, 2011 At the same time PV technology is the strongest growing electricity generation technology, which also provides a solution to the global warming. Almost every portion of the tropical India is favorable for adopting this technology.

IX. Batteries and Charge Control in stand-Alone Photovoltaic system Fundamentals and Application-Prepared by:James P. Dunlop, P.E.Florida Solar Energy Center1679 Clearlake RoadCocoa, FL 32922-5703.

Type of converter and load depends on the application to which it is intended. The study presents the analysis of solar powered home lighting system practically and verifies the design of the system for reliable and optimal performance.

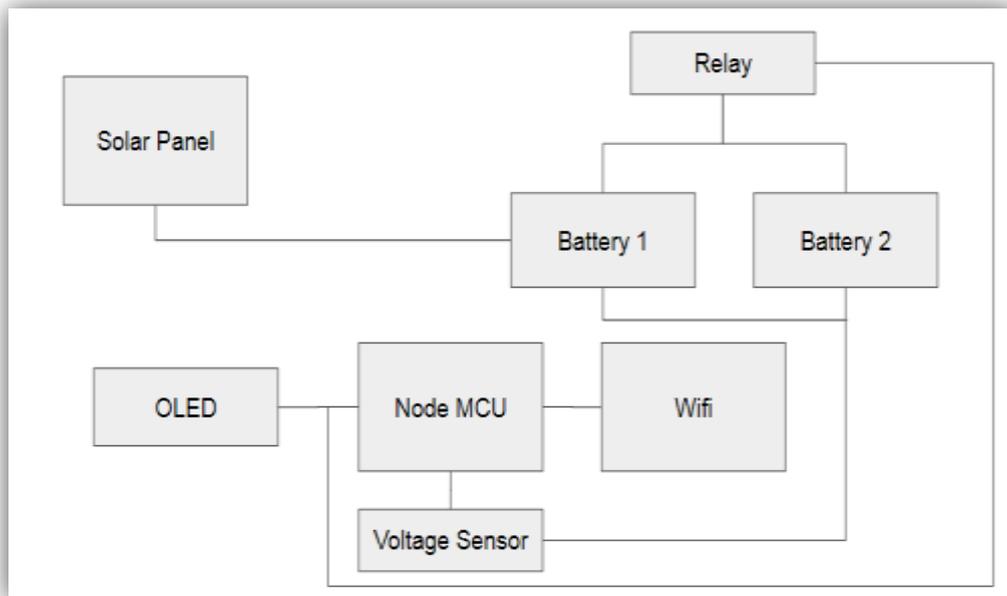
Methodology:

This is digital solar charge controller for offgrid solar power system to monitor the voltage and battery charging mode on WIFI network. Then both batteries operated by relay alternately.

There are two batteries connected and working of both batteries are depend on voltage. if one battery voltage is less than 5 volt then automatically is in charging mode and other battery will be in live mode if require and vice versa. If battery A will discharge then it will connect in charging mode via Relay and then battery B will connect in live mode.

Controller system generally uses a controller connected to battery. A charge controller is used to maintain the proper charging voltage on the batteries.

As the input voltage from the solar array, the charge controller regulates the charge to the batteries preventing any overcharging. A Solar charge controller is placed between the Solar Panel Array and the Battery to control the amount of electric energy produced by solar panels going into the batteries. The advantage of choosing solar energy by using a solar panel are that the lifetime of solar panel is long lasting than any other source energy. Solar energy has become a promising alternative source. Because it has many advantages such as abundance, pollution free and renewability.



The system status of Battery and voltage will be monitor on WIFI network devices like mobile or laptop via IP address assigned to the system. And the is to send telemetry data from the solar based charge controller to Wi-Fi network using NodeMCU microcontroller which is ESP8266 Wi-Fi module.

Solar energy in recent years has attracted more attention to people due to inefficiency and unavailability of power for different use in homes and industries. Sometimes, electricity can be cut-off due to natural disasters aften happened.

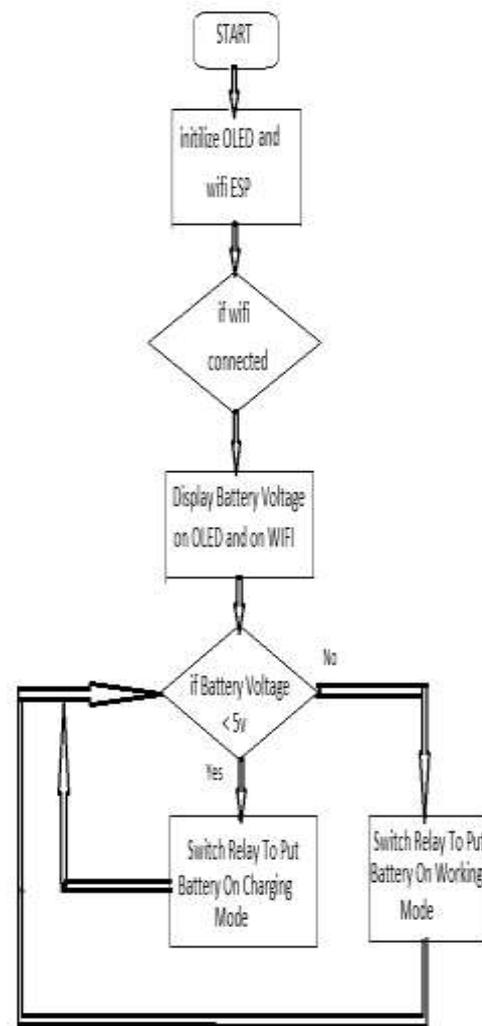
Solar On grid system will cut off if the Grid supply will off and can be monitor online. Solar Offgrid system will continue on even if the grid supply is off as it uses Batteries.



```
void loop() {
  // put your main code here, to run repeatedly:
  digitalWrite(DK,001);
  delay(2000);
  analog_valuel = analogRead(A0);
  temp1 = (analog_valuel * 5.0) / 1024.0;
  input_voltage1 = temp1 / (2/11+2);

  if (digital_valuel < 0.1)
  {
    input_voltage1=0.0;
  }
  Serial.print("V1=");
  Serial.println(input_voltage1);

  digitalWrite(DK,0100);
  delay(2000);
  analog_valuel2 = analogRead(A0);
  temp1 = (analog_valuel2 * 5.0) / 1024.0;
```



CONCLUSION

The main objective of the study is to provide alternate lightning system by using solar energy. The system taken for study consists of a Solar panel of 10W, a 12 V battery, a solar charge controller.

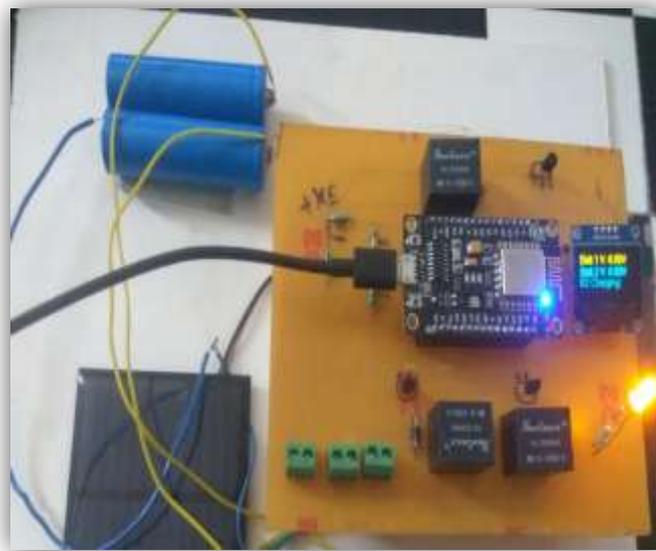
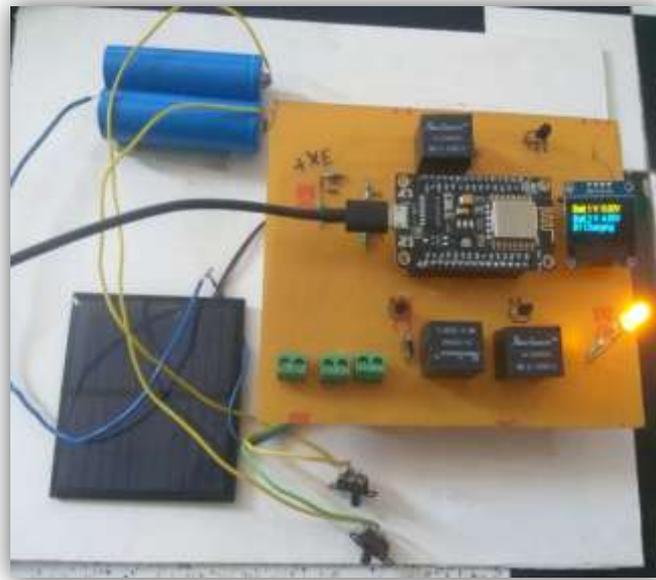
The charge controller maintain the flow of charge to the battery i.e. it provides protection against the overcharging and deep discharging of the battery.

ACKNOWLEDGMENT

We would like to express my sense of gratitude to my guide Prof. Vaibhav Babrekar for this valuable guidance which helped me in the project idea. The blessings, help and guidance given by him time to time will carry me for a long way in the journey on which we about to embark. His willingness to give his time so generously has been very much appreciated. Without his help we would not have been possible for us to implement and present this project.

I would also like to extend my thanks to the technicians of the laboratory of the EXTC department for their help in offering us the resources in running the program.

RESULT:



PARAMETERS:

1.	Maximum voltage of Battery1	12V
2.	Maximum voltage of Battery2	12V
3.	Battery switches to charging if the voltage is	<5V
4.	Battery switches to working if the voltage is	>5V
5.	Maximum voltage of Solar Panel	12V

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