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IOT BASED SOLAR POWER MONITORING SYSTEM

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Abstract – **As the world now is turning towards renewable energy sources and countries like Iceland have obtained 100% renewable energy status and India has also started to lean towards renewable energy, moreover rooftop solar panels are becoming a trend nowadays, but in order to know how efficiently the solar photovoltaic system is working and for performance evaluation there should be some monitoring system. Therefore, here we propose a system using a microcontroller and internet of things technology using sensors to monitor the parameters of the solar photovoltaic system remotely from anywhere using smart phones and computers using web server. Some solar photovoltaic systems are located in inaccessible locations and it is difficult to monitor it and the solar panels are not utilized to its full efficiency all day ,in order to achieve the solar panel must absorb maximum sunlight every instant , in order to achieve it here we propose a sun tracking technology to control the solar panel and rotate it so it absorbs maximum sunlight every instant .The system is based on a new cost effective technology using a microcontroller and internet of things technology monitors and controls the solar photovoltaic system remotely from anywhere around the world.**

Index Terms – Ardino Uno,Solar Panel, Regulated Power Supply, WIFI Module, Voltage Sensor,LCD Display, Aurdino Software.

I. INTRODUCTION

The internet of things is a futuristic technology by which an object could be sensed, monitored and controlled remotely using the cloud server network. By using this technology machines can communicate with themselves and be controlled without requiring humans. In the past decade of years there is increase in demand for reliable and abundant electrical energy derived from renewable energy sources renewable energy plays important role in energy crisis of country. The government started to decrease the usage of conventional energy sources and encouraging people to use renewable energy sources like hydro and solar. One such example of renewable energy is solar power. Solar energy is a very large, inexhaustible source of energy. Each hour the earth receives 430 quintillion joules of solar energy which is more than enough to power the whole world for a year. But the problem here is it is tough to utilize this much of energy efficiently. The solar panels nowadays are installed everywhere but they are not monitored so we do not know how much they generate and moreover the solar panels operate at its maximum efficiency for an hour or 2 hours but these can be overcome by monitoring and controlling the solar panel using IoT. An IOT Based Solar Power Monitoring system monitors the Solar panel parameters like voltage current and power generated over a Web server using internet and the solar panel detects sunlight using LDR so that it

can get positioned where it receives maximum sunlight, due to this solar panel can operate at its maximum efficiency all day. The system will show the voltage, current and power generated by solar panel on the LCD and as well as on a webpage so that it can be monitored very easily. The solar panel current is sensed using a current sensor, then the power and voltage are calculated using the analog signal generated from the sensor. Using a dc motor and LDR the sunlight is tracked and IOT Based Solar Power Monitoring System DYPIET, Ambi [Dept. of Electrical of Engg.] Page 4 atmega 328p (ardiuno) is used as the microcontroller. In this Iot project the solar panel can be monitored from anywhere using computer or smart phone.

II.LITURATURE SURVEY

Development of an online monitoring and control system for distributed Renewable Energy Sources (RES) based on Android platform. This method utilizes the Bluetooth interface of Android Tablet of Mobile phone, as a communication link for data exchange with digital hardware of power Conditioning Unit.

Introduction to an instant monitoring infrastructure of renewable energy generation system that is constituted with a wind turbine on current and voltage measurements of each renewable source. The related values are measured with the developed sensing circuits and processed by 18F4450 microcontroller of Microchip. The processed parameters are then transmitted to personal computer (PC) over universal series bus (USB) to be saved in database and to observe the system instantly. The Coded visual interface of monitoring software can manage the saved data to analyze daily, weekly and monthly values of each measurement separately.

Goto, Yoshihiro, explained about an integrated system that manages and remotely monitors telecommunication power plants has been developed and has started operations. The system is used to operate and maintain more than 200,000 telecommunication power plants which includes devices such as rectifiers, inverters, UPS's and air-conditioning plants installed in about 8000 buildings.

Feature of the system are to integrate the management and remote monitoring functions into single system and improved user interfaces which uses information and communication technology

The development of monitoring online and the control of system is based on android platform by Bluetooth interface of mobile phone. As a communication link, it creates data exchange with the hardware of power conditioning unit, with the help sensing circuits the value of Current and the voltage measurement of the renewable source is processed by the micro controller of the microchip. Then the parameter is Sent to the personal computer over USB and the system is observed instantly. The system is monitored daily, weekly and monthly.

III.METHODOLOGY

1.Arduino Uno

Arduino Uno It is a microcontroller board which is built on ATmega328P microchip. The word Uno means 'one'. It consists of 14 digital input/output pins that can be associated with various types of other circuits and Arduino Uno also has 6 analog I/O pins that are supported by Arduino IDE (Integrated Development Environment), with the help of a USB cable. Apart from these Arduino Uno shown in figure 2 also consists of a Power Jack, a 16MHz crystal oscillator and a reset button. It operates at a voltage of 5v. It has all the features required to support the microcontroller.

2.Solar Panels

Solar Panels are also called as PV (Photovoltaic).solar panel are used to convert the light energy from the sun. Solar panels are made up of many independent solar cells which are formed by combining the elements like silicon, phosphorus and boron layers. These panels absorb the photons from sunlight and collaborate with the electrons which are present in the panels and generate electricity which can then be used for various purposes.

3.Regulated Power Supply

It is an embedded circuit consists of a rectifier circuit that converts alternating current (AC) supply into direct current (DC). It supplies a stable voltage to a device which works with definite power supply. The output which is gained from the regulated power supply is always near DC but may be alternating or unidirectional. The other name for regulated DC power supply is linear power supply. This has various blocks like step down a transformer, rectifier, DC filter, and regulator.

4.WI-FI Module

We are using WI-FI Module-ESP8266 in this system. This is a self-contained SoC microchip which consists of a TCP/IP protocol stack that permits access to any microcontroller to a WiFi network. It has enough storage capability and on-board processing that allows it to interact with the other sensors and gadgets. This module requires an external logic level converter as it is not capable of 5V-3V logic shifting.

5. LCD Display

An LCD (Liquid Crystal Display) is an electronic display module which is commonly used in various devices and circuits to display the data. The LCD display used in this system. Generally, an LCD works by blocking the light. We are using a 16x2 LCD display in this system. A 16x2 display consists of 16 characters and 2 lines. LCD is a formation of both solid and liquid. It uses liquid crystals to produce a visible image on the screen.

6.Voltage Sensor

Voltage Sensor is a device which is capable of sensing or identifying the type of electrical or optical signals. This sensor is used to calculate the amount of voltage obtained in an object and also used to monitor it. It is primarily used to detect and measure AC or DC voltage levels. Voltage itself is given as input to this sensor and the output may be switches, analog voltage signal, a current signal etc.

IV.Block Diagram of System

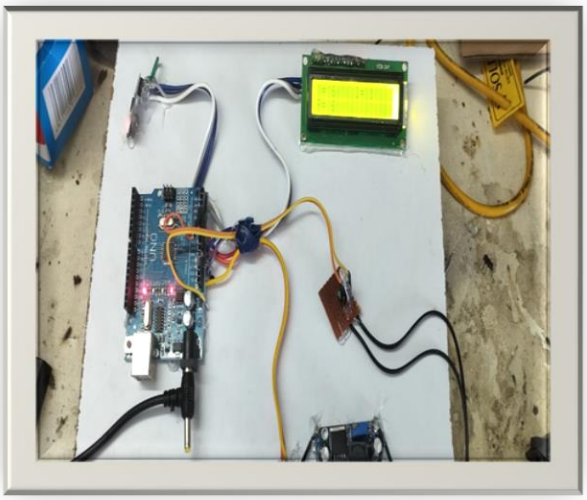
The main intention of this proposed project is to get maximum power output from the solar panels. Additionally, if there is any improper inverter as it is not capable of 5V-3V logic shifting.

Functioning of the solar panels will be shown and also the parameters like voltage and current are monitored by using the sensors and displayed by using the IoT technology. This model is explained by using the solar radiation i.e., sunlight from the sun is trapped by the solar panels and then these solar panels capture sunlight and turn into useful energy forms of energy such as heat and electricity. Then the obtained electrical energy is sensed by the sensors such as voltage sensor sense the voltage generated by the solar panel with the help of voltage divider principle and current is obtained by using mathematical formulation. The designed structure of the proposed monitoring system is shown in figure 1. The experimental arrangement of the introduced system consists of solar panels, Regulator power supply, Wi-Fi module-ESP8266, Voltage sensor, Current sensor, LCD (Liquid Crystal Display) and Arduino Uno microcontroller. Programming codes are developed on Arduino IDE, Embedded C.

V.Results

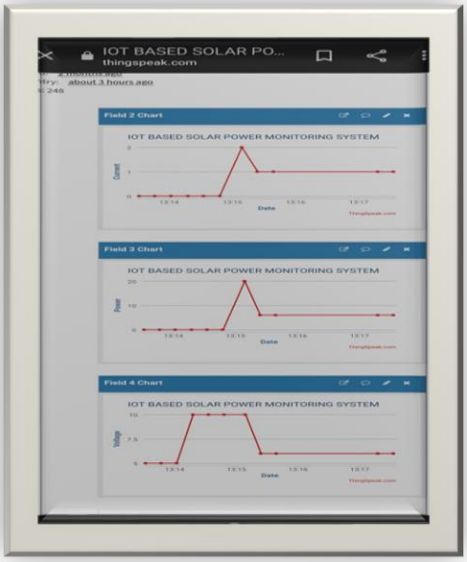
By using the LCD the solar panel, the voltage current and the power is displayed in real time.

The solar panel parameters are also displayed and stored in an



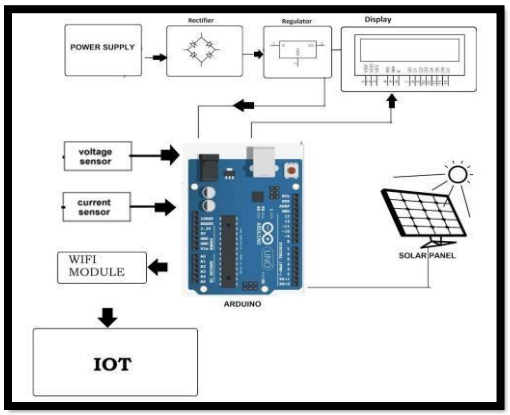
application or web page using the think speak IoT platform. So that the solar panel can be monitored remotely.

The result in the webpage is displayed in the form of a table containing the parameters with their unit with date and time.



VI.CONCLUSION

In this project we implement a system which we can grasp the maximum power from the sun by continuous tracking and can use this energy for future purposes which is cost effective and easy maintainable and by using this analysis it is possible to detect any fault occurring in the system as there would be



VII.REFERENCE

[1] Jiju K. et. al., 2014. "Development of Android based online monitoring and control system for Renewable Energy Sources." Computer, Communications, and Control Technology (I4CT), International Conference on. IEEE, 2014

[2] Kabalci, Ersan, Gorgun A. and Kabalci Y., 2013. "Design and implementation of a renewable energy monitoring system." Power Engineering, Energy and Electrical Drives (POWERENG), Fourth International Conference on. IEEE, 2013.

. [3] Yoshihiro G. et. al., 2007. "Integrated management and remote monitoring system for telecommunications power plants with fully DC-powered center equipment." INTELEC 07-29th International Telecommunications Energy Conference. IEEE, 2007.

[4] Shailesh Sarswat, Indresh Yadav and Sanjay Kumar Maurya 2019 Real Time Monitoring of Solar PV Parameter Using IoT 9 p 267

[5] R.L.R. Lokesh Babu, D Rambabu, A. Rajesh Naidu, R. D. Prasad and P. Gopi Krishna 2018 IoT Enabled Solar Power Monitoring System Int. J. Eng. & Tech. 7 p 526

[6] R. Vignesh and A. Samydurai 2017 Automatic Monitoring and Lifetime Detection of Solar Panels Using Internet of ThingsInt. J. Inn. Res. in Comp. and Comm. Eng. 5 p 7014

[7] Subhasri. G and Jeyalakshmi. C 2018 A Study of IoT based Solar Panel Tracking System Adv. In Comp. Sci. Tech. 11 p. 537

[8] Ankit Kekre and Suresh K. Gawre 2017 Solar Photovoltaic Remote Monitoring System Using IoT Int. Conf. on Recent Innovations in Signal processing and Embedded Systems (RISE) (Bhopal, India) p 27

[9] M. C. Hottel and B. B. Woertz 1942 Performance of flat plate solar heat collectors Trans. ASME, 64 p 91