Solar Power Monitoring System Using IOT

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Abstract- Solar Power Plants need to be monitored for optimum power output.While this helps to retrieve power output from power plants while monitoring for faulty solar panels and their connections.To administered the solar power generation can significantly boost and increase their performance, monitoring and maintenance of the solar power plant using the Internet Of Things technology.Almost every installation comes with a solar power monitoring device, because it is important to stay informed about what the system is producing and how well it is performing.Weather you are using the energy to power your own building or selling the extra energy for a fixed price to a utility company you need to know when something goes wrong so you can address the problem quickly and continue to derive the maximum benefit from your investment. In this paper we will discuss low cost IOT based embedded in Solar power Monitoring System particulary in remote areas.in this system we will also enable GPRS system which will also detect location and give desired results. while the access of internet it will be used anywhere in the world. This will help us in the real time information and further help in maintainance ,fault detections and all the data and records of the system.

Keywords- Power Measurement, Wireless Transmission, Internet Of Things, Thing speak, ATmega 328, LCD , GSMA, PV, Solar Panel.

I. INTRODUCTION

The Internet of things (IoT) is playing a vital and crucial role in day to day hectic life of humans beings by enabling and giving the access to the connectivity of many and most of the physical devices through internet to exchange the data for reliable control while monitoring and controlling the devices from a remote location, where are the devices becomes intelligent. The Internet of things can connect a wide range and varieties of things such a animals, humans, smart transport, smart grids, virtual power grids, smart cities, vehicles, heart monitoring systems, environmental sensing, shopping systems, automated homes, energy management, assistance for elderly and disable individuals, cochlear implants, tracking and verifying of things, equipment manufacturing, agriculture, emergency monitoring systems, electronics tool collection systems, vehicle control etc. According to the survey there is a increase of 41 % i.e 12.8 billion internet connected devices from 2018-2019. The connected or physical device through internet may increase to 50 billion by 2024 and which makes the business market around 9.8 trillion dollars by 2024 . By using the IoT we can enable the machine to machine communication M2M or device to device communication without human intervention.

The benefits of IOT are:
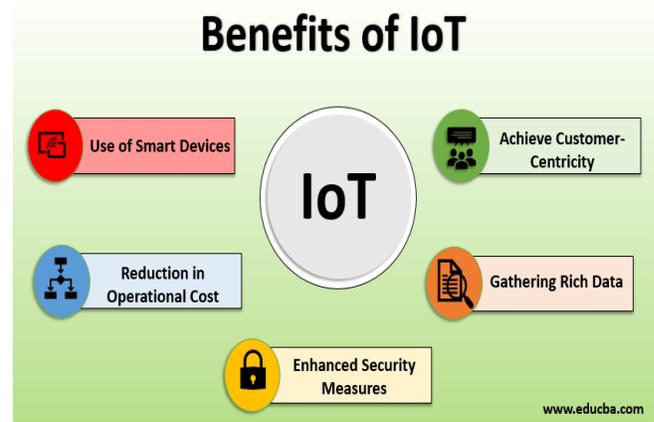
In the modern life electricity became the important and essential part of life. For any work now, a day we   require electricity   like lighting, heating, refrigeration,   cooling transportation systems.   what not all the home appliance works   on   electricity. In day to day life the consumption of electricity is increased but   not decreased more electricity.

To compete with the requirement of the public more and is to be generated and give to the end users. As the range of population increases the consumption also increases in the daily activity

HARDWARE SPECIFICATIONS:-

- Rectifier
- Arduino
- Regulator
- Solar Panel
- GPRS
- Current Sensor
- Voltage Sensor
- LCD Display

SOFTWARE SPECIFICATIONS:-

- Arduino Compiler
- Programming Language

II. LITERATURE REVIEW

[1] Enlargement and development of an online supervision, monitoring and control system for allocated Renewable Energy Sources (RES) based on Android platform. This model utilizes the Bluetooth bond interface of their latest Android Tablet of Mobile phone, as a communication from one link to the other link for data exchange with digital hardware of power Conditioning Unit is used in the internet of things.

Many researchers and scientist while working on the solar power had made many studies in this major problem and proved that 50% of the PV solar panels performance reduces by the dust accumulation on the cleaned panels.and is it necessary to clean the solar panel always so that it works in a good condition.

The figure of Solar Panel shown below:-

Due to accumulation of dust on the panels it is observed that useful energy is reduced. The common methods are used to clean the dust is by spraying water on the panels with cleaning agent. Vibrating the panels regularly with motors as the cell.It is vital that solar panels monitored regularly in one way or another.

[2] In the other paper Goto, Yoshihiro, explained about an integrated system that manages and remotely monitors telecommunication power plants has been developed and has started operations. The model used in their paper is used to utilize and maintain their activity more than 200,000 telecommunication power plants which includes a large 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.

III. PROBLEM STATEMENT

Our goal is to implement the perfect code different in the internet of things models or the algorithm so as to classify, to the best possible degree of accuracy and to give exact or the nearest results, If for some reason the network fails in the solar monitoring system model, then the devices won't be able to transmit data from one link to the other link, which could cause you to miss important data indicating performance issues, or misinterpret other available data.Their should go to the place of the panels arranged and note the readings every time this is the main problem collecting data each and every time. It is a manual checking procedure, always should go to the place of solar panel system arrangement to note down the readings. So, it is not possible to take readings all the time, whenever required should go to the place of system arrangement. And optimum power cannot be obtained due to no proper alignment of solar power.

IV. PROPOSED SYSTEM

In this paper, we've used the main objective or the idea of this project is to get an optimum power output from the solar panels during dust is accumulated on it. Also, if there is any malfunctioning of the solar panels will be displayed on and we can also get the information about weather the solar or battery connected for the loads.The system detects and alerts the user each and every time for the administrator when is fall below the predefined conditions, and display on the GUI. A solar panel is used here in this model which give results that keeps monitoring the sunlight, here the main different parameters like voltage ,current and temperature are displayed on the LCD by using IOT technology using GPRS technology.ATmega 328 is used in this model her to analyze its high functionality with simplicity and familiarity.the main purpose of this is that it provide a gap between Solar Panel and IOT. On the other hand voltage and current sensor which is INA219 which gives the total power consumed by shunt load and gives respective reading in digital form to ATmega 328. The C program loaded with ATmega 328, calculates the current and voltage reading of shunt load use in both current and voltage sensor. LCD is used for displaying the product name & total cost. All the calculated data by using ATmega

328 is processed further by Wi-Fi Module in order to store and analyse the data on IoT for handling the Server or Cloud.

How does the solar monitoring system work as shown below:-
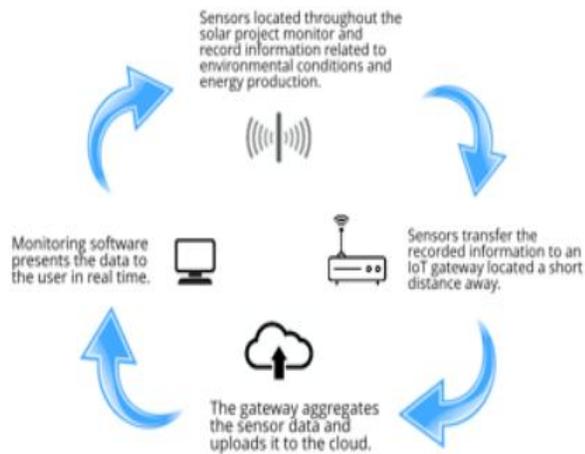
As shown in the figure above the program are loaded in the server or the cloud which monitor the software which is ATmega 328 present in the data to the user in real time basis.then the sensors located throughout the solar project monitor and then the records all the gathered information related to the environmental conditions and energy production. then the sensors transfer the recorded information to an IOT gateway located to a short distance away.using GUI or the GPRS they collect all the data in the system and can be built anywhere in the world and can be functioned regularly and also if any problem occur then it can be deducted and monitored their functions and then the gateways aggregates the sensors data and uploads it to the cloud and this function work regularly like this and then the solar power plants need to be monitored for optimum power output.

V. METHODOLOGY

The most conspicuous part of al solar power system is the solar panels. Thin-film semiconductor or crystalline silicon is used make the P V solar cell for many of the residential applications. These photovoltaic (PV) devices contain semiconductors that generate electricity directly from sunlight.The electrical devices are powered, or it is send to the grid when electrons are made free by solar energy in these materials. One of the most important aspects of getting your solar panels to produce electrical energy at optimum efficiency is keeping them in full and direct sunlight. DC voltage current is generated when the Photovoltaic solar panels are exposed directly to the sunlight. Solar panels generate the DC were the home appliance works on the AC

power, so the output of the panels is given as input to the invertor. All the appliance works through the invertor. The invertor consists of a battery. The battery gets charges when the appliance is not in used and gets discharged when requires the supply. Solar monitoring systems will track the amount of electricity your solar panels have generated and contributed to the power grid.Things Speak Cloud setup is an open source cloud platform application think speak is used.Which retrieves and stores the data from the sensor or the things connected to the systems through internet that uses hypertext transfer protocol (HTTP) from the local network to the cloud. The below figure shown here is that how they are connected in the solar monitoring system to upload the data to the server
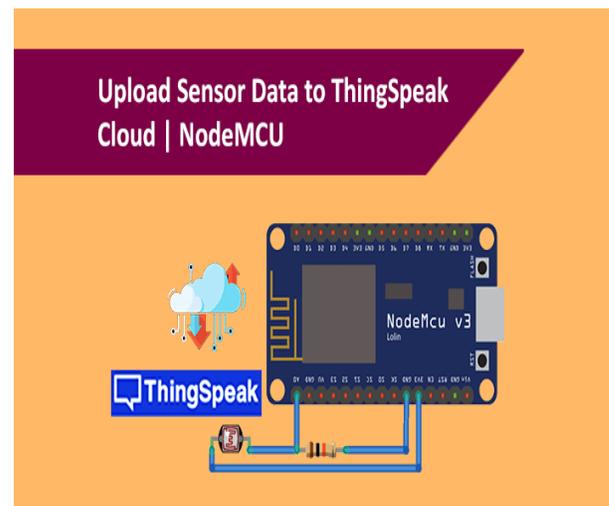
VI. CONCLUSIONS

In this project IoT based system is designed to get an optimum power output from the solar panels during dust is accumulated on it. And, a monitoring system is designed for there is any malfunctioning of the solar panels will be displayed on and we can also get information about whether the solar or battery connected for the loads.only information we can see it in cloud but in future we can control whole system through IoT which Distant is a way. so as this system keeps continues track of solar power plant ,then the the daily requirements of weekly and monthly analysis becomes easy and efficient also with the help of this analysis.

VII. FUTURE ENHANCEMENTS

While we couldn't reach out goal of 100% accuracy in Solar monitoring System, we did end up designing a system that can, with sufficient time and data, we were very close to that goal. As with any such project, there is some room for improvement here. The formation and the results obtained in this project will allows for multiple code to be integrated or

desegregated together as modules and their results can be combined to increase the accuracy of the final result.This project can be further improved and will be further excellence with the addition of more programming code into it which can also improve the time efficiency. There's a lot more to solar than solar power monitoring devices. The monitored values obtained are helpful in predicting the future values of the parameters considered.Once that condition is satisfied or fulfilled , then the modules are easy to add as done in the code. This provides a great degree of compatible and versatility to the project.The web application and also android application can be developed for interaction with the end user .The user can also predict values of future events.

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