



MONITORING & CONTROLLING OF POWER GENERATED BY SOLAR CELLS, USING GSM MODULE.

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ABSTRACT :- . IT is a proposed system designed to eliminate human involvement in the electricity system.gsm is term which gets plays vital role in the this project. It nothing but the path which can be helps to communicate with the sender and receiver. IOT (Internet of things) is the network of physical things with electronics software, sensors, and connectivity to enable objects to collect and exchange data. In recent scenario, energy saving holds prime significance because of inequality between demand and power generation.IOT based automatic meter reading is the technology of automatic collecting data energy meter and transferring data to the server for billing process and if there is any tempering then also detectable. The internet connected to meter collect the data and display data on the LCD by which we can read and understand the things that are going on the system. The data is received by the internet and whenever a key is pressed microcontroller send SMS through the internet to the transmitter to get the reading of the meter. It is difficult to manual reading and calculating bill of individually. This will help for the proper and accurate reading of billing process. By taking all these features that can be done by IOT based smart energy meter easily

Key Words:- Gsm, Iot, Lcd, Microcontoller, Solar cell, Smart Energy Meter, Wi-Fi Module.

I. INTRODUCTION:-

In the present billing system the distribution companies or domestic solar generated power are unable to track their power generation which varies with demand of consumers or also wrt to time. The consumer is facing problems like receiving due bills for bills that have already been paid as well as poor reliability of electricity supply and quality even if bills are paid regularly. The remedy for all these problems is to keep track of the consumers load on timely basis, which will held to assure accurate billing, track maximum demand and to detect threshold value. These are all the features to be taken into account for designing an efficient energy billing system.

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The present project “Gsm Based Smart Energy Meter” addresses the problems faced by both the consumers and the distribution companies. The paper mainly deals with smart energy meter, which utilizes the features of embedded systems i.e. combination of hardware and software in order to implement desired functionality. The paper discusses comparison of Arduino and other controllers, and the application of GSM and Wi-Fi modems to introduce ‘Smart’ concept. With the use of GSM modem the consumer as well as service provider will get the used energy reading with the respective amount, Consumers will even get notification in the form text through GSM when they are about to reach their threshold value, that they have set. Also with the help of Wi-Fi modem the consumer can monitor his consumed reading and can set the threshold value through webpage.

This system enables the electricity department to read the meter readings monthly without a person visiting each house and also power generating centres which is based on the solar plates. This can be achieved by the use of Arduino unit that continuously monitor and records the energy meter reading in its permanent (non-volatile) memory location. This system continuously records the reading and the live meter reading can be displayed on webpage to the consumer on request. This system also can be used to disconnect the power supply of the house when needed.

II. Problem Statement :-

1) POWER THEFT IN THE POWER GENERATION OR WASTAGE OF POWER :

Nowadays in the Urban area and Rural area theft of electricity from the grids is increasing day by day . This leads to the Commercial losses in the distribution system. This type of theft increases during the festival season people are directly using the energy from the grids or solar generated plants (local) for the use . So by using additional circuit in the solar power generation we can wirelessly sense the theft. This can be accurately sensed by the SCADA and IoT.

2) MONITORING OF POWER :

Due to awareness of wastage of power people get installed solar panels . but due costing of power monitoring some users cannot monitor the power which is used by them. Some times this will results In power thefting at the generation side. This network we can operate wirelessly on the centralizes supervisor computer of remotely on the mobile phone which will give the accurate power monitoring & power thefting fault in the solar power generation network. This we can be done with help of the IoT and SCADA.

III. RELATED WORK :-

1) Internet of Things (IoT)

The Internet of Things (IoT) envisions a near future and is a recent communication paradigm, in which the objects of everyday life are equipped with microcontrollers, transceivers for communication, and suitable protocol stacks that will make them able to communicate with one another and with the users, becoming an



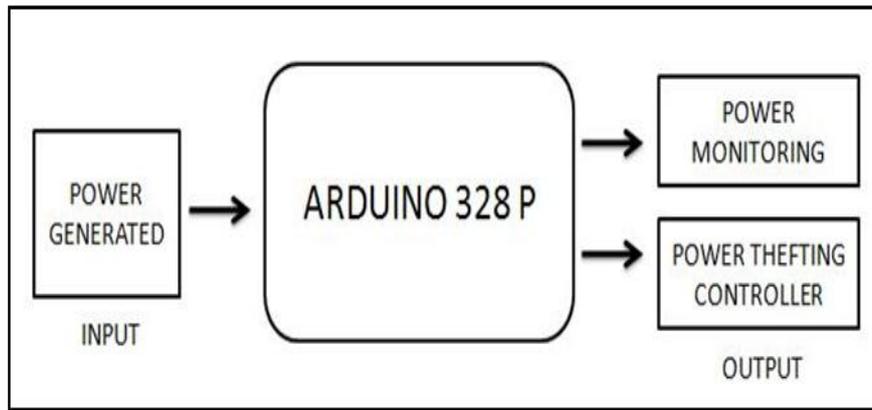
integral part of the Internet. This system aims at making the Internet even more immersive and pervasive. Also by enabling easy access and interaction the internet of things will foster the development of a number of applications that make use of the potentially enormous amount and variety of data generated by such objects to provide new services to citizens, companies, and public administrations by using variety of devices such as, for instance, home appliances, surveillance cameras, monitoring sensors, actuators, displays, vehicles, and so on.

2) GSM & WI-FI MODULE :

Supervisory Control and Data Acquisition is the system of software and hardware element that allows organization to control the processes locally and remote locations. It helps in monitoring , controlling , processing the hardware and the elements automatically and manpower is not needed for this process , speed of this type system is fast and accurate. A GSM module or a GPRS module is a chip or circuit that will be used to establish communication between a mobile device or a computing machine and a GSM or GPRS system. The modem (modulator-demodulator) is a critical part here. These modules consist of a GSM module or GPRS modem powered by a power supply circuit and communication interfaces (like RS-232, USB 2.0, and others) for computer. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities.

IV. Proposed Methodology:-

- 1) Power Generated By Solar Cells Is Measured By Ct's & Pt's Which Present In Primary Side Of Project.
- 2) This Measured Values Of Power Will Get Changes In Specific Ratio Because Of Controller Will Accept Only Low Values.
- 3) Controller Is Nothing But The Arduino Atmega 328 It Has 28 I/O Pins.
- 4) When In The Input Will Get Approches At The Controller It Will Activate Output Pins For Secondary Functions (Like Lcd, Relays Etc)
- 5) 16x4 Lcd Display Is Connected At Output Side Which Shows The Generated Power.
- 6) Relays Circuit Is Activate When User Getr Command To The Controller Via Software Which Build For Power Thefting Operation & Power Monitoring.
- 7) Relays Operates The Controller And Controller Will Get Shut Down The Incoming Power Supply Remotely.
- 8) Gsm Module Work As A Communication Purpose Which Gets Sends The Message To User.



Requirements :-

1) Software Requirements:

- Operating System: Windows XP Professional or Above
- Adafruit IO: Android Phone v4.0 or above.
- Winlog Lite 3

2) Hardware Requirements:

a) solar panel :-



Solar panel are mainly used to generate power from the sun rays by absorbing them & convert them into dc electric power via converter. It can placed at primary side of project.

b) Arduino Uno Atmega328p :-



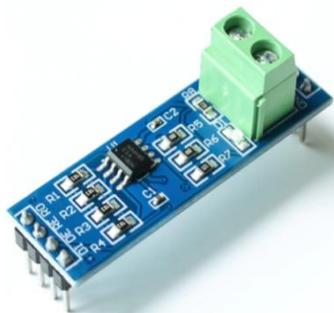
Its used for controlling the present output devices and taking the input from, the primary side.

b) Wi-Fimodule: (ESP-01)



This is used for transmitting the data to input of IoT and by help of this data is uploaded on mobile.

c) SCADA module (RS-485) :-



It can be work as a sender from controller to the consumer iot screen where we can observed the actual power generation & power thefting etc.

d) wi-fi & gsm module :-



It is nothing but the gprs module which is helps to communicate between user & actual system.

V. Working:-

The working is divided into 3 parts

1) Primary side :-

Solar panel which have photovoltaic cells are get absorb the sun rays to generate the power from it. Pv cells generates dc power output. But controller cannot accept the higher input values it should be accept only spetic values tthen for obtaining the specific values we are used ct & pt which get measures the power & step down the power as per controller requirement.

2) Intermediate stage :-

In this the NRF 2401 collects the data wirelessly and then the data is converted into its original form and give further to the Arduino AT328P which again monitors the data and give multiple outputs to the IoT and gsm operation. In this stage the controller performs different operation & it is required separate power input for the further operation. We can be program the arduino as per our working required.

3) Secondary stage :-

In this the data which is been displayed on the SCADA software screen or on the Mobile phone. As the Ardino is programmed it c the readings of the ct,s & pt's will get shows on the consumer screen , their actual display shown at the generation site where this measures values also shown their. If consumer not consuming the power which generated from the solar then user will changes the path of electricity from consumer premises to msebe transmission grid it can helps to reduces the power wastage. This can occurred by sending the signal to relay circuit which present at sec side of controller when the consumer will tap on the option of change the path it should activate the relay output which get controls the further assembly.

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VI. ADVANTAGES:-

1. Accurate detection of the type of fault
2. Remote monitoring is possible.
3. Cost effectiveness
4. Theft detection is possible

VII. APPLICATIONS:-

1. In domestic purposes
2. For Various energy monitoring agencies.
3. Un-accessible power monitoring areas

VIII. CONCLUSION:- By using the smart techniques for power monitoring we can be achieved the effectively power monitoring or also power thefting. We can also used this technology for smart metering at wheres msebe consumers meters can be placed

IX. References :-

- 1) <https://www.sparkfun.com/>
- 2) <https://www.wikipedia.org/>