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AUTO METER READING AND BILLING OF DOMESTIC ENERGY METER

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Abstract: **Paper introduces a system that provides a platform for a consumer to monitor the meter reading via "Thing Speak" and controls the energy consumption, it will also support keeping the track of energy meter reading. This system helps us to reduce turmoils and energy-related dissent. The system is implemented using an Atmega328P microcontroller and ESP8266 Wi-Fi module. This system do not require the restoration of the energy meter but we associate this system with the installed energy meter that benefits the consumer, the base for designing and implementing a system is IoT (Internet of Things). The instantaneous data will be fetched from the meter. In this paper, the idea of a smart energy meter using IoT and Arduino has been introduced. In this design we are using Arduino because it is suitable in other words it consumes less power, it is the fastest, and has two UARTS. In this paper, energy meters that are already installed at our houses are not replaced, but a little alteration on the already installed energy meters can swap the existing meters into smart energy meters. The use of the GSM module provides a feature of notification through SMS. One can easily access the meter working through the web page that we designed. Current reading with cost can be seen on the web page. Automated ON & OFF of energy meter is obtainable. Threshold value setting and mailing of statements is the other function that we are carrying out**

Keywords: Energy Meter, Electric Panel, UARTS, IOT, GSM, Wi-Fi, the webpage.

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I INTRODUCTION

To measure the amount of energy consumed by the domestic, commercial and industrial user, an energy meter is being use. As the population of energy consumers is gradually increasing the smart energy meter helps to ease the energy management system. The paper depicts the solution for reducing human involvement in energy management for domestic and industrial consumers. All the data monitoring is done via a web-based portal provided with a dedicated internet connection. The system has to be made in such a way that the power consumption is analyzed properly. Currently, the system we use required human involvement which leads to time consumption also, it has always been a necessity that a particular individual or person from the energy department should visit the consumer house and note down the readings and therefore errors can get received. So to overcome the stress, a smart energy meter is introduced. In this work, the figures of energy meters through a webpage. The distribution companies are unable to keep track of the changing system uses an Atmega328p microcontroller because it is energy efficient hence it consumes less power. The system will combine with the energy meter which is already installed in place of residence. The consumer can easily access the maximum demand of consumers due to this consumer is facing problems like receiving due bills for the bills that have already been handled. So to overcome these problems the remedy is to keep track of the consumer's load on a timely basis, which will help to assure accurate billing, track maximum demand and detect threshold value. By considering the present scenario it is important to build an efficient energy meter. The present project "IoT Based Smart Energy Meter Billing and Monitoring System" addresses the problem faced by both the consumers and the distribution companies. This system makes it easier for the electricity department to read the meter readings monthly without labor work. This can be done by the use of an Atmega328p unit that regularly

monitoring and notes the energy meter reading in its memory.

II LITERATURE SURVEY

The basic idea is to get an appropriate reading from the energy meter through the SMS service by a GSM module is implemented by Rahman [1]. The system presents the update module in which SMS service is replaced by the Wi-Fi module so that it includes even more features with the help of the internet also system provides more flexibility to the consumers to revote his/her conventional post-paid meter to work as a prepaid one presented by Rahul Rajesh B, Mohan Kumar S, Nayab Z Sharief [2]. The system presented by Karthikeyan S, Bhuvaneswari P.T.V is cost-effective as it requires a simple upgrade on the existing meters than complete replacement because it is lightweight and compact due to SoC for control and communication, the basic idea is too strengthened and also to enhance the performance of an Energy Meter. Modern-day smart grid technology relies heavily on communication networks for two-way communication between load, generation, transmission, and control center so considering this an advanced metering infrastructures (AMI) is used in this system, proposed by Saikat Saha, Swagata Mondal

III PROBLEM ANALYSIS

The power board has used to the manual procedure and they oblige it although there are numerous worries combined with it. In light of the human blunders in the wake of getting staff charge, it is the issue of the client to get yet adjusted from the vitality supply board. All things considered, the client needs to visit the workplace, remain in line, and get it rectified. The matter is a result of human request. To maintain a strategic distance from human mistakes in the building procedure, in this new age a programmed perusing meter perusing framework came into existence and explained in the following

SYSTEM INCLUDES

3.1 ENERGY METER: The energy meter or watt-hour meter is an electrical instrument that measures the amount of electrical energy used by the consumers. services are one of the electrical departments, which fix these gadget at every location like homes, industries, etc, economic buildings to charge for the electricity utilization by loads such as bulbs, ceiling fans, grinders, and other home appliances. The energy meter measures the rapid voltage and currents, calculates their product, and gives instantaneous power. This power is integrated over a time interval, which gives the energy utilized over that period.

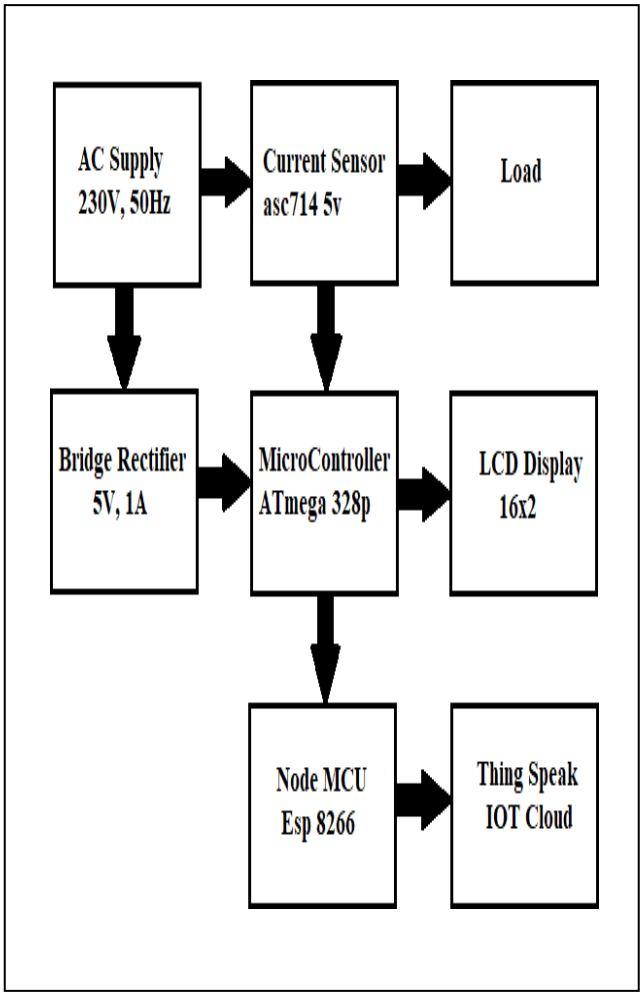

Fig 1 Block Diagram

3.2 SIGNAL CONDITIONER (P817): it is the simple internal working of optocoupler P817 which we are using as a signal conditioning block. As we can see on a working meter that one LED continuously blinks, it is nothing but indicates the count of power. The LED whenever blinks it produces only 0.7v which is not suitable for the Arduino board to capture, so to remove this error we are using this block. When the LED blinks the diode will conduct, the transistor will get active and it will give 5v at the output which we are externally giving to a transistor. Whenever LED will blink the 5v supply will be provided to the Arduino board and it will count them. We are using a signal conditioning block to increase voltage.

3.3 ARDUINO UNO (ATMEGA 328):

Arduino is the soul of our setup. The entire functioning of the system depends on this board. Arduino reacts to the 5v supply given by the optocoupler and keeps on counting the

supply and then calculates the power consumed and also the cost. This data, it continuously stores on the webpage, so that users can visit any time and check their consumption. It **eve**n revert accordingly as per compute to the situations like message mailing during threshold value

3.4 MAX 232:

We are using MAX 232 for serial contact with the equipments which are GSM modem and Wi-Fi modem MAX232 is connect to provide TTL to the equipments as per the condition GSM requires TTL so it is linked to Arduino over MAX232. Some Wi-Fi module doesn't require TTL because it's already built-in it and some may require based on its working.

3.5 Wi-Fi MODULE (ESP8266):

Wi-Fi stands for Wireless Fidelity. We are using Wi-Fi which is the heart of an IoT. Through Wi-Fi the consumer can set changes in the threshold value, he can ON and OFF the energy meter. From time to time the readings of units and cost are displayed on the webpage. The consumer can access the Arduino board and meter with help of Wi-Fi.

3.6 IOT Representation:

Fig. 2; IOT Structure

16*2 LCD - LCD (Liquid crystal display) screen is an electronic display module and finds a wide range of applications. 16*2 display means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in a 5*7-pixel matrix. The 11, 12, 13, and 14 pins of the display are used as data pins for Arduino interfacing. It is used to display the wattage

3.7 WEBPAGE (HTML):

We designed a webpage for operating Arduino and Energy Meter with the help of HTML. HTML stands for Hypertext Markup Language. It is a standard markup language for creating web pages and web applications with Cascading Style Sheets (CSS) and JAVA scripts it forms a triad of cornerstone technologies for the World Wide Web. The web browser receives HTML documents from a Webserver or local storage and renders them into multimedia web pages. HTML describes the structure of a web page semantically and originally included cues for the appearance of the document. HTML elements are the building blocks of HTML pages.

3.8 SWITCHING DEVICE:

In our system, we are using SSR as a switching device even though we can use RELAY because SSR is highly advantageous. We are using a switching device to switch the energy meter. For the ON and OFF purpose of the meter, we are using a switching block. SSR stands for SOLID STATE RELAY. Why SSR instead of RELAY? Both are used as AC switching devices, but if• switching speed is high then SSR is suitable, if switching speed is slower then RELAY is used. Relay life decreases as the number of usage time• increases, but in SSR there is no change. For driving RELAY, the current or power required is• more comparatively to SSR. For switching SSR requires 15amp, whereas RELAY• needs (30amp,50amp,90amp) as per requirement.

IV WORKING

In this project, we are using ATmega328P as a controller and Esp8266 for Sending data to the cloud. In the 230V 50Hz Ac line Supply, the phase is connected to the Current sensor ACS712 to sense the fluctuations and current in ampere. Through the sensor, the phase line is connected to the load.

We used one more external 230VAC supply to power up our project, this supply is connected to a 6-0-6 Transformer to reduce 230VAC/50Hz supply into 6VAC/50Hz. Supply 6VAC Connected to the bridge rectifier circuit to convert AC supply into Regulated DC supply and its provide 5V,1A Output. This 5VDC, 1A supply is sufficient for controlling our whole circuit. When Load is connected to the AC supply, Sensor ACS712 provides output in analog form. ACS712 output is connected to the ATmega328p and convert output analog values is Voltage, Current, Watt & Unit forms. These converted values are displaying on a 16x2 LCD. After a complete one month, the electricity bill is generated automatically reading the units of energy. This electricity bill

is displaying on the ThingSpeak Cloud platform using of Esp8266 IOT controller device.

Calculation unit:

Normally, the basic unit of electricity is Kilowatt hour (KWh). 1kWh = 1000 watt for 1 hour. For example, Ten 100watt bulbs used for 1 hour gives 1kWh.

V CONCLUSION

The main cause for the design of IoT-based E-meter is to reduce the power consumption in the house. It avoids human intervention reduces the cost, saves human power. It works both automatically and manually. This meter sends billing directly to mobile before the due date without causing human intervention. This computerization diminishes the work costs as well as makes the framework more effective and exact. The system is mainly intended for smart cities with public Wi-Fi hotspots. The project is based on the internet of things concept. This is aimed at replacing the old energy meters with an advanced implementation. It can be used for automatic power reading by which one can optimize their power usage thereby reducing the power wastage. The readings from the meter are uploaded to Thingspeak.com where a channel with the energy usage for a particular energy meter can be viewed by both the service end and the customer. Conclusion In the era of smart city advancement, this project is concentrated on the connectivity & networking factor of the IoT. In this project, an energy consumption calculation based on the counting of calibration pulses is designed and implemented using PIC16F*&A MCU in the embedded system domain. In the proposed work, IoT and PLC-based meter reading system is designed to continuously monitor the meter reading and service provider can disconnect the power source whenever the customer does not pay the monthly bill and also it eliminates human involvement, delivers effective meter reading, prevent the billing mistake. The Project has achieved the following

5.1 objectives:

1. Ease of accessing information for consumers from energy meters through IoT. 2. Theft detection at consumer end in real-time. 3. LCDs energy consumption units and temperature. 4. Disconnection of service from the remote server. Future enhancement In the present system, IoT energy meter consumption is accessed using Wi-Fi and it will help consumers to avoid unwanted use of electricity. The performance of the system can be enhanced by connecting all household electrical appliances to IoT. So, in the future following objectives can be achieved to save power and avoid thefts: 1. We can make an IoT system where a user can monitor energy consumption and pay the bill Online. 2. We can make a system where a user can receive SMS when he/she crosses the threshold of the electricity usage slab.

VI FUTURE SCOPE

The project is focused on the government's plan to turn the major cities of the country into smart cities. The project provides the entire energy readings at one's fingertips. The project can be further extended to detect energy meter tampering. A smart app can be designed to provide various alerts based on the readings from the device. A unified can be provided to the customers for both viewing the energy usage and a platform to pay the bill online following the digital India initiative. In one case the service provider can evaluate the bills which are not paid and can disconnect the energy connection remotely

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