Electricity Metering and Billing System over IoT

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Abstract— Electricity is that the heart of today's world. And currently the planet goes to be digital thus electricity is extremely abundant necessary side. Generation and provide of electricity are that the primary task of electricity board, however it's conjointly necessary to live the ability employed by the patron that's taking readings and generate the bills. In the current state of affairs taking a reading and generating bills is manual work. It's terribly time intensive. Power stealing is that the one with all the most important issues in Bharat. Generally, user didn't pay the bills on time that the electricity board employee cut the power supply manually. During this case, corruption done by the user or that employee that results in the loss of electricity board. In some areas, cameras conjointly accustomed to take a reading, however it's a really sophisticated system and not so easy. To avoid these issues, we have proposed a wireless system for smart electricity meter and billing system using IOT (Internet of things). We have also used the relays to cut down the power supply of unpaid user which might be controlled wirelessly using IoT.

Keywords: Arduino, IoT (Internet of Things), Wi-Fi Module, Bluetooth Module

I. INTRODUCTION

The world is dynamic towards automatic wireless technologies, which prefer not only reducing human efforts, however helps in creating systems automatic and economical. A system is alleged to be intelligent once, it will decide what to do with none instruction and may work automatically. An electrical or Energy meter measures the overall voltage in units employed by the appliances that consume voltage from the main power supply. Electromechanical and Electronic meter are 2 kinds of meter are available within the market to live the unit consumption. Electromechanical meters are normally utilized in village areas, wherever the uses of contemporary technology aren't as high because it is in cities. Electromechanical meters became out of date these days. Electronic meters replace electromechanical meters. This meter consists of LCD/LED to show the reading. The standardization crystal rectifier is employed on the meter that shows the units consumed. Work force is needed to scan the meter and publish the reading. The reading on the meter is increasing that is employed to get the electricity bill. An IOT based Smart Electricity Meter and Billing System will do equivalent task while not human efforts. IOT based SEM system is controlled using Arduino Mega that may be a microcontroller board. The aim behind selecting this board is its potency and memory. It's a lot of economical in terms of memory and GPIO. The information obtained is then sent to the cloud through the web. Information obtained are often simply sent wirelessly over long distance with none noise disturbance using the web. As information is directly sent to the cloud there's no occurrence of range and distance issue

and is extremely correct and economical due to no human interference. The other wireless technologies like Zigbee, Bluetooth etc. have restricted range therefore can't be used over terribly long distances effectively. This project envisages the utilization of web and also the idea of IOT by that the base station, likewise as users, stay updated with the present consumed units, changing the current issues long-faced by the electricity board and also the user.

II. LITERATURE SURVEY

1) Smart Electricity Billing System. (Krishnarao.Kundeti, Saikumar Pallagani).

In this project, the idea of a smart electricity billing system using an ARM-7 microcontroller has been developed. Due to this concept, it provides a well-planned cost management of electricity billing. The existing energy billing systems are discrete, inaccurate, expensive and time-consuming. They are also time and labor consuming." This system measures the power consumption through the IR sensor unit. After getting the power consumption the ARM processor will detect the unit pulse and the unit will be converted as per our currency based on government tariff values and displayed on the LCD screen for a specific user. Smart electricity billing system also reduces the error made by humans while taking readings to a large extent and there is no need to take the reading in it. According to the power consumption, the amount will be displayed on the LCD screen. A relay system has been used which shut down or disconnect the energy meter and load through supply mains when the consumer doesn't pay his bill within the given time. Buzzer and LED's are used for indicating the payment of the bill by the user.

2) Camera Click Energy Meter Reading System. (Manisha V Shinde, Pradip W Kulkarni).

Nowadays, electricity power consumers have increased in every sector like rural, urban, residential, commercial and in an industrial area. Thus, it is very important to take care of the proper use of energy to generate accurate bills, invoices and try to reduce the frauds. Electromagnetic watt meter reading is done manually and it requires a huge number of manpower. It is difficult to access the meters at rural area, indoor meters and meters with obstacles. To overcome this here we are going to introduce automatic meter reading concepts (AMR) which automatically collect the consumption of energy and then the system transfer that collected data to a central database for billing. Because of these expenses are reduced on the meter reader, his periodic trips to each house to read a meter in the case when in the first trip reading is not available. Here transistor-transistor logic (TTL) serial camera is used to take the image and wirelessly send this to server Personal Computer (PC) where it undergoes processing to extract digits and with reference to a previous month database new bill is generated with tariff consideration.

3) Design and implementation of the smart electricity meter. (V. Preethi, M. Tech, Student Department of ECE, G. Harish, Assistant professor Department of ECE).

Electricity is one of the fundamental necessities of human beings, which is commonly used for domestic, industrial and agricultural purposes. Power theft is the biggest problem in recent days which causes a lot of loss to electricity boards. In countries like India, these situations. are more often. If we can prevent these thefts, we can save a lot of power. This is done using Smart Energy Meter (SEM). SEM is an electric device having energy meter chip for measuring the electric energy consumed and a wireless protocol for data communication. This paper presents a smart energy meter for an automatic metering and billing system. In this meter energy utilized and the corresponding amount will be displayed on the LCD continuously and communicated to the controlling base station. The feedback from the user helps in identifying the usages between authorized and unauthorized users which helps in controlling the power theft. Communication between user/household and substation is done using Zigbee. GSM network is used for sending SMS to the local authorities regarding the theft cases. This meter can work as either prepaid or post-paid meter. The proposed system replaces traditional meter reading methods and enables remote access of existing energy meter by the energy provider. Also, they can monitor the meter readings regularly without the person visiting each house.

4) Arduino Mega and IOT based Intelligent Energy Meter (IEM) to Increase Efficiency and Accuracy in Current Billing Methodology. (Osmi Jaiswal, B.E, Student Department of ECE, Dilip Chaubisa, B.E, Student Department of ECE).

One cannot imagine life without electricity, as it is one's prime requirement. Thus, there is a high need not only an efficient generation and transmission of electricity but the way itis being used and measured at the time of billing. As per the current scenario, manpower is required to collect data from meter reading and accordingly, the bill is being generated. As there is an involvement of human, it can be erroneous. Likewise, a human is involved in cutting the power line if the bill is due or unpaid by the consumer which could be hazardous and risky. Not only this, a quite good amount is paid for such task every month which is a waste of money. Thus, the present methodology needs to be converted into an intelligent and efficient mechanism which would benefit both the ends i.e. the base station and the consumer. In this paper, a wireless method is proposed which puts emphasis on Intelligent Energy meter (IEM) reading and bill generation using Arduino Mega and Ethernet Shield. The monthly generated bill will be sent to the consumer through SMS using GSM900 and power of unpaid consumers would be disconnected using a relay which would be controlled wirelessly using the concept of the Internet of things (IoT).

5) Smart Energy Meter Billing using GSM with Warning System. (P. Loganthurai, A.Vanmathi, M.Veeralakshmi, M.Shalini, V.Vivitha).

The main idea of the project is to modernize our billing system using GSM. The GSM is a technique works on the principle of TDMA – time division multiple access and operates at the frequency off 900MHZ. The details of power displaced in the energy meter are transferred to the mobile using GSM and it also shows the units consumed by the load. If the number of units consumed by the total load exceeds certain limit means it will give a warning based on tariff and also, we are doing to turn ON and turn OFF the load by setting a password to each load using GSM technique. Thus, with the help of this project, we can reduce the electricity bills.

III. PROPOSED SYSTEM

In electricity metering and billing system over IOT project, we are using energy meter, relay, load, Arduino, current sensor, voltage sensor. IOT based smart electronic meter system is controlled by Arduino.
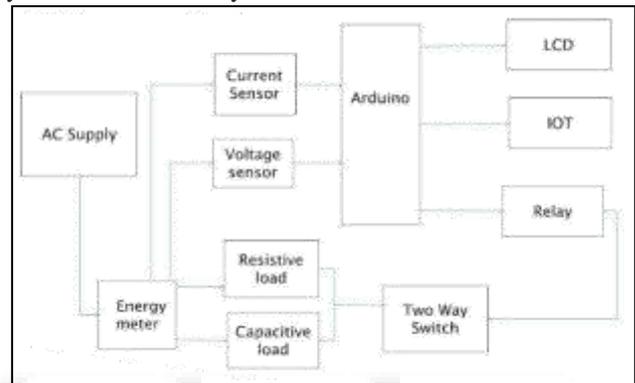

Fig. 1: System Architecture

In this system, we are using one current sensor connected to Arduino board which used as analog input. The Arduino analog input pins are connected to different digital pins of LCD (16x2) display. LCD display will show voltage. Electronic energy meter consists of LCD/LED display which the units consumed. The IOT based smart electronic meter is controlled through Arduino, which is a microcontroller. The units consumed data is sent to cloud by internet. Then monthly generated bill will be sent on consumer mobile phone through GSM. Power of unpaid consumers will be cut automatically by the sensor. Due to the IOT based electronic meter there is no need to go to consumers address to note down the reading. Hence extra labour cost is reduced. The users can be aware of their electricity consumption.

IV. ADVANTAGES & APPLICATIONS

A. Advantages

−   To reduce wastage of energy.
−   Prevent electricity shortage during dry seasons.
−   Real time bill monitoring
−   Time reduced receiving bill.

B. Applications

−   Residential and commercial building.
−   MUNCIPAL CORPORATION
−   PUBLIC POWER SOURCES
−   MSEB
−   Govt. Energy plant

V. CONCLUSION

The existing system has a number of the issues like manual work, Human errors, inaccurate meter reading, corruption, Power is stealing. In the proposed system the electricity connection to every user are given solely to the registered user and also the smart billing is done via IoT (Internet of Things).

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