

THEFT DETECTION BY SMART PREPAID ENERGY METER USING IOT

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ABSTRACT

This paper discusses about the IOT based smart prepaid energy meter as a part of measure to make electricity accessible to every consumer, to overcome the problem of overbilling, meter tempering, fault finding and to ensure a cost effective operation, we have introduced the Prepaid Electricity System. The user receives message on their mobile phones about the units they purchased via IoT technology. We live in a world where almost everything runs on electricity. 67% of their sources used to produce electricity are non-renewable sources of energy. Power is the soul of world which is related to the electricity and "electricity" is the word which now rules the world. So, proper utilization of these resources is of immense importance to us. Though many technological innovations are taking place in this world, existing electricity consumption billing process seems in India to be very old fashioned and does not meet the latest technology available.

The advantage of this system is that a user can understand the power consumed by the electrical appliances after every 10 days and can take further steps to control them and thus help in energy conservation. From the electricity board section, the information regarding the bill amount, payment and the pre-planned power shut down details are communicated to the consumer. If the customer does not pay the bill in time, the user is informed through a message. If still the customer does not pay the bill, then as per designated consideration, one alert message will be sent then automatically power connection is disconnected from the remote server. In the already existing smart energy meter, it shows the energy consumed by the appliances from the date of installation of the energy meter and its corresponding rupees. In this proposed energy meter, the meter gives the energy consumed on daily basis, its corresponding rupees, fault finding on meter on daily basis, billing details and payment using IOT. Additionally, it has the main objective of giving the preintimation of power schedule and an alert system for producing an alarm when the energy consumption exceeds beyond the certain limit. It also has the facility of terminating the power supply when the residents are out of station to minimize the wastage of energy. This system not only reduces the power cut issues and the labor cost for noticing the residential energy consumption in regular intervals but also increases the energy conservation with the help of alarm systems and the energy meter.

Keywords: - Arduino, GSM, IoT, energy consumption, , shut down, alert message, payment details, , alarm systems

1. INTRODUCTION-1

The electrical energy has become an essential necessity to human life. Its production and proper utilization is the backbone of the survival, socio-economic development and progress of a nation. Therefore, its distribution and management has top priority in government policies globally [1].

In India, distribution losses are substantial from pilferage of distribution lines and connected equipment like energy meters, distribution boxes and various connectors [2].

In [3], utility distribution system, electricity metering plays an important role, as it measures the electricity consumption of users and generates bill, which is a source of revenue. Electricity theft is one of the biggest problems damaging the power sector of India; it includes any activity done, in order for the consumers of electricity to use electric power without the proper consent of the utility so as not to pay for the energy. Presently [4] electronics energy measurement is continuously replacing existing technology of electro-mechanical meters worldwide. A wireless digital energy meter will definitely offer greater convenience to the meter reading task.

Traditionally, the electricity meters are installed on consumer's premises and the consumption information is collected by meter-readers on their fortnightly or monthly visits to the premises [5].

Distribution companies are facing many losses mainly due to following reasons ,Power theft by tampering of electricity meter, □Non functional Meters ,□Error while taking meter reading ,□Unpaid bills.□□Delay in electricity bill generation[6]

To overcome the problem of overbilling, meter tempering and to ensure a cost effective operation, we have introduced the Prepaid Electricity System. .The user receives message on their mobile phones about the units they purchased via GSM technology. The warning message was sent to user mobile through GSM technology before the disconnection of electricity [2]. The [7] primary objective of this study is to develop a cost effective Internet-of-Things (IoT) based electricity theft detection and prevention .

Internet of Things (IoT), defined as the networked interconnection of everyday objects[8] .Internet of things (IoT) has helped many organizational systems to improve efficiency, increase the speed of process, minimize error and prevent theft by coding and tracking the objects and also detect the fault at consumer level. Power consumption can be reduced to a great extent if we can monitor our daily power usage and switch off appliances which are unnecessary consuming electricity [9].

The idea is being proposed to reduce the human interference to collect the monthly reading and to minimize the technical problems regarding the billing process. From the electricity board section, the information regarding the bill amount, payment and the pre-planned power shut down details are communicated to the consumer. If the customer does not pay the bill in time, the user is informed through a message using IoT [10].

2. EXISTING SYSTEM-2

In [9], existing system either an electronic energy meter or an electro-mechanical meter is fixed in the premise for measuring the usage. The meters currently in use are only capable of recording KWH units. The KWH units used then still have to be recorded by meter readers monthly, on foot. The recorded data need to be processed by a meter reading company. For processing the meter reading, company needs to firstly link each recorded power usage data to an account holder and then determine the amount owned by means of the specific tariff in use many systems built on various platforms have been proposed by different research groups all over the world for Automatic Meter Reading. Tele watt meters were implemented to transmit data on monthly basis to a remote central office through a dedicated telephone line and a pair of modems.

A microprocessor or DSP- based meter is used in this to measure the electricity consumption of multiple users in a residential area. A master PC at the control center was used to send commands to a remote meter, which in turn transmitted data back, using the Power Line Communication technique. These techniques were mainly implemented in areas that had a fixed telephone network. Bluetooth energy meters were designed and implemented in some areas where several meters in close proximity, communicated wirelessly with a Master PC. In this measurement technique that encompasses the GSM network as a mean of transmitting energy data is more relevant. The GSM network offers most coverage in most developed and developing countries [9].

3. PROPOSED SYSTEM -3

The existing model is a time consuming process and it needs a lot of labor. The proposed system eliminates the need of labor and it is a cost efficient and a time saving process [10].

The proposed system gives the information about the energy consumption on daily basis, billing and payment through IoT, pre-intimation of shut down details, alert systems when the energy consumption exceeds beyond the critical limit and the disconnection of power through a message when the residential are out of station to prevent the wastage of energy[10].

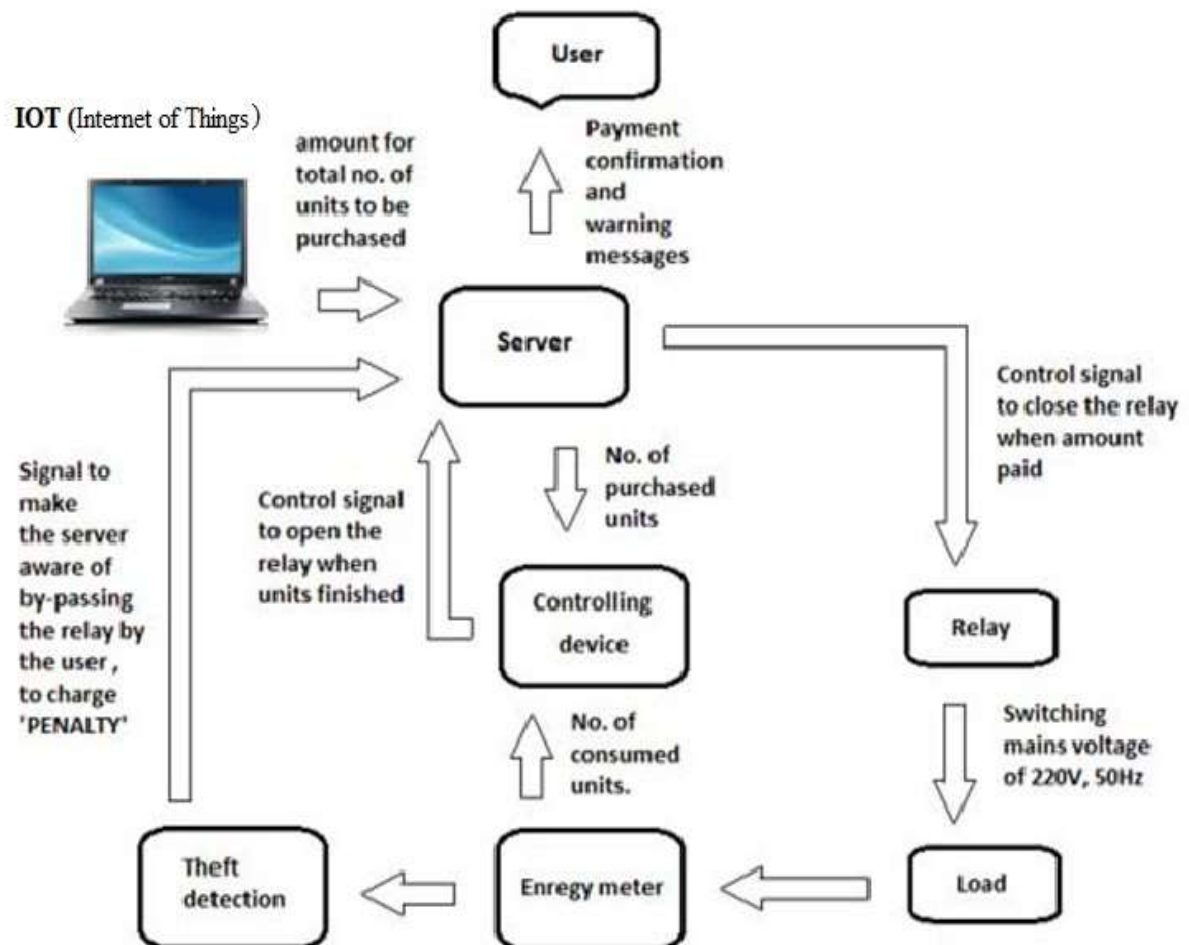
3.1 DESCRIPTION OF PROPOSED SYSTEM Sub Title-1

The system we are implemented is simple and effective. Here a microcontroller will calculate power, power factor and energy from line voltage and line current. Then it displays the information in a LCD display that connected with microcontroller. Functional block diagram of proposed IoT based energy meter is shown in Figure 1[4]. There are so many different merits of smart energy meter such as[5]:

- User new smart energy meters send precise reading on a regular interval in sequence about customer's energy usage to utility (Electricity provider). So the bills will be proper and labor cost is reduced for taking a reading in consumer residents [5].

- If the consumer did not pay the energy bill within time, the utility can remotely disconnect the service (line) of a particular consumer and after payment, the service continues to the consumer. So we can avoid sending an employee to cut off energy from the network and again to reconnect their connection.
- We have connected lever switch for tampering attempt detect. When anyone tries to open the meter cover the button will release and send information to the service provider.
- When the power quality is not maintained from the distribution supply, then the customer equipment can be protected by disconnecting and reconnecting to the supply [5] .

4. BLOCK DIAGRAM



5. WORKING

The overall process of the paper is shown in the above given figure. Internet of things IOT based electricity billing system. The consumer purchases the electricity according to his requirements and credit. He can consume electricity until his credit exhausted. Microcontroller is used for controlling all operations. There is a separate microcontroller for each purpose. User can receive or send Short Service Message (SMS) via GSM technique. XOR gate is used for theft detection and at the end relay operation is for cutting off the electric supply when credit becomes zero. The hardware and the software interface are connected to each other to monitor the power consumption of the user and further, this will be monitored by IOT and will be provided to the user log on to the webpage in computer and App installed in the mobile. The smart meter will display the voltage, current and power on LCD display [3].

6. OBJECTIVES

Its objective is to overcome electricity consumption problem beyond consumer's budget, to overcome electricity theft problem, to avoid bill dues, and to avoid mistakes while taking the meter readings [3].

7. ADVANTAGES

- This system shows the energy consumed on daily basis, hence it helps to reduce the consumption by Comparing the daily usages.
- It reduces the human interference to collect the monthly reading and it also saves the time and money.
- The pre-announced shut down details helps to take necessary preventive measures and also helps to charge the essential equipments.
- The alarm system helps to create awareness to the public regarding their energy consumption and the corresponding charges.
- It prevents the wastage of energy by disconnecting the power through a message when the residents are out of station.
- The LCD display, situated in the distribution board helps the residents in the apartments to be aware of the messages in the LCD display since they are far away from the energy meter.

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