

IoT Based Smart Energy Meter

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Abstract— This project is described to measure energy consumption in the house and generate its bill automatically using telemetric communication. This can help in reducing energy consumption in house as the owner is continuously being notified about the number of units that are consumed. Its objective is to generate bill automatically by checking the electricity unit's consumption in a house and in a way to reduce the manual labour. The calculation are performed automatically the bill is updated on the internet by using a network of internet of things. The bill amount can be checked by the owner anywhere globally. Design an implementation of project is mainly based on Arduino controller using IOT concept. In electricity transmission to human involvement is not required. Consumer pays the electricity bill for the consumed power. If in case consumer fails to pay the bill on time electricity transmission can automatically turn off.

Keywords: IoT, Energy Meter, Arduino, Relay

I. INTRODUCTION

In the present billing system the distribution companies are unable to keep the track of the changing maximum demand of consumer. The consumer is facing problems like receiving due to bills for bills that have already been paid as well as poor reliability of electricity supply and quality even of bills are paid regularly the remedy for all this problem is to keep the track of consumer load on timely bases, which will help to assure accurate billing, track maximum demand to detect threshold value. These are all the features to be taken into account for design and efficient energy for billing system. The present project "IOT based smart energy meter" addresses the problem faced by both the consumers and the distribution companies. The project mainly deals with smart energy meter, which utilizes the features of embedded system that is combination hardware and software in order to implement design functionality.

The project discusses comparison of Arduino and other controllers and the application of GSM and WIFI modems to introduce smart concept. With the use of GSM modems to consumers as well as service provider will get the used energy reading with the respective amount, consumers will even get notification in the form of text through GSM when they are about to reach their threshold value, they have set also with the help of WIFI modem the consumer can monitor his consumed readings 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 this can be achieved by the use of Arduino unit that continuously monitors 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 energy meter reading in its permanent (non-volatile) memory location.

II. LITERATURE REVIEW

- 1) Maha Aboelmegeed, Yasmeen Abdelghani, Mohamed A., Abd El Ghany "Wireless IoT based Metering system for Efficient Smart Cities" [1]. In this paper the design and implementation of a full integrated smart energy efficient metering system. The design provides a low power consumption smart metering system. The proposed design is implemented at two ends, one on the consumer end for IoT operation and other on the service provider end for managing customers data through an implemented Website and customized database. Android application is also designed to have a more easily operated system at the customer end.
- 2) Snehal Chaudhari, Purvang Rathod Ashfaque Shaikh, "Smart Energy meter using Arduino and GSM" 2017 [2]. An electricity meter, electric meter or energy meter is a device that measures the amount of electric energy consumed by a residence, a business, or an electrically powered device. Electric utilities use electric meters installed at customers for billing purposes. They are typically calibrated in billing units. The most common one being the kilowatt hour (kwh). They are usually read once each billing period. The most common unit of measurement on the electricity meter is the kilowatt hour. Which is equal to the amount of energy used by a load of one kilowatt over a period of one hour, or 3,600,000 joule instead. Electricity meters operate by continuously measuring the instantaneous voltage (volt) and current (amperes) to give energy used (in joules, kilowatt-hour). Energy meters are classified as per principle and operation. Like Electromechanical meters, Electronic meters, automatic energy meter, digital meters.
- 3) Birendrakumar Sahani, Tejashree Ravi, Akibjaved Tamboli, "IoT based smart energy meter" [3]. In this paper we can see a person standing in front of our house from electricity board, whose duty is to read the energy meter and hand over the bills to the owner of that house every month. This is nothing but meter reading. According to the reading we have to pay the bills. The main drawback of the system is that the person has to go area by area and he has to read the meter of every house and hand over the bills many times errors like extra bill amount or notification from electric board even though the bills are paid are common errors. To overcome this drawback we have come up with an idea which will eliminate the third party between the consumer and service provider even the errors will be overcome.
- 4) Md. Masudur Rahman, Noor-E-Jannat, Ohidul Islam, "Arduino and GSM Based smart Energy Meter for advance Metering and Billing System" The proposed energy meter system can incorporate with embedded controller and GSM modem to transmit the data like consumed energy in kwh, generated bill, security

services over GSM mobile network such as data can be then fed and integrated into existing energy management system located at power companies or organizations to provide the services among the customers without manpower. Our implemented project is able to provide all required services remotely for metering and billing with high fidelity.

- 5) Rohit Bhilare, Shital Mali “IoT based smart home with real time E-Metering” [5] Power consumption and efficiency with a users comfort level is most important issue stage while performing various operations. Controller is suitable for power consumption in system and efficiency experiment with size factor. E-controller is represented by combining embedded technology with IoT. Real time information data monitoring of energy consumption is main objective of system. The paper introduces smart home system based on IoT with the help of web application.

III. PROPOSED SYSTEM

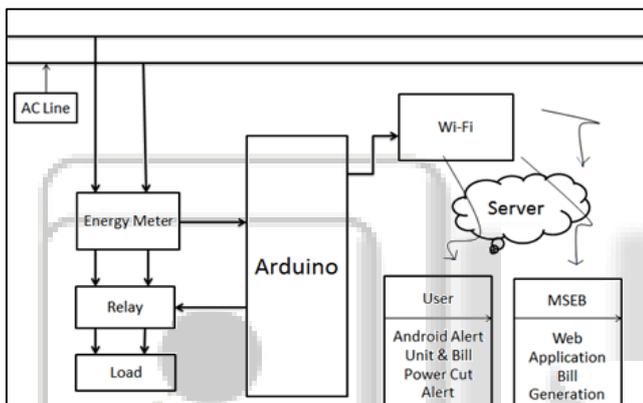


Fig. 1: Smart Energy meter.

This project describes the design and implementation of IOT based smart energy meter system for node MCU using IOT Technology. In the project we have to used the CT, PT sensors, which is used to measure the voltage and current. The consumed energy is measured in units and gives to the Arduino. In Arduino family we are using the node MCU, because of inbuilt in WIFI. Arduino is used to transfer the units on the webpage. It consist of different hardware components mainly,

- 1) Arduino (node MCU)
- 2) Energy meter(CT/PT sensor)
- 3) Relay
- 4) GSM Module

A. Arduino Uno(Node MCU):

The Arduino Uno is a microcontroller board based on the ATmega328. Arduino is an open-source, prototyping platform and its simplicity makes it ideal for hobbyists to use as well as professionals. The ArduinoUno has 14digital input/output pins (of which6 can be used as PWM outputs), 6 analog inputs, a16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

Arduino is an open source platform used for building electronic project. Arduino consist of both a physical programmable circuit board piece of software that runs on your computer used to write and upload compute code to the physical board.

B. Energy Meter:

The conventional mechanical energy meter is based on the phenomenon of “Magnetic Induction” It has a rotating aluminum wheel called freewheel and many toothed wheels. Based on the flow of current, the Freewheel rotates which makes rotation of other wheels. This will be converted into corresponding measurement in the display section.

A energy meter is a device that measures the amount of electric energy consumed by a residence, a business, or an electrically powered devices. Electrical utility use electric meters install at customers premises for billing purposes.

C. Relay

Relay is an electromagnetic switch that is used to turn on and turn off a circuit by a low power signal, or where several circuits must be controlled by one signal. We know that most of the high end industrial application devices have relays for their effective working. Relay are simple switch are operated both electricity and mechanically.

Relay consist of an electromagnet and also a set of contacts. The switching mechanism is carried out with the help of electromagnet. There are also other operating principles for its working. But they differ according to their applications. Most of the devices have the application of relays.

D. GSM

GSM module is used to establish communication between a computer and a GSM system. Global system for mobile communication (GSM) is an architecture used for mobile communication in most of the countries. GSM MODEM is a class of wireless MODEM devices that are designed that are designed for communication of a computer with the GSM network.

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IV. CONCLUSION

The project is mainly concentrated on IoT network. When we discussed certain points to be notify. We are doing automatic reading and disconnection of meters using Wi-Fi module.

Finally concluding our project that have read the meter bills which also be uploaded on the we website using IoT concept.

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