

# IoT BASED ENERGY METER BILLING SYSTEM

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**Abstract:-** Electricity plays a vital role in day to day life. With the rise in the standard of living of the people the electricity consumption has also increased. Almost every device in homes and industries run with the help of electrical energy. Thus this energy should be utilized effectively so that it can be saved for future generations. The main objective of this project is to create awareness about energy consumption and efficient use of home appliances for energy savings. Proposed system gives the information regarding the no. of units consumed, bill amount and also provides notifications when energy consumption exceeds beyond the specified limit using IoT. This idea is being implemented to reduce the human dependency to collect the monthly reading and minimize the human errors regarding billing process. The advantage of this system is that a user can understand the power consumed by the electrical appliances in real time and can take further steps to control them and thus helps in energy conservation.

**Keywords:** - Internet of Things (IoT), energy conservation.

## I INTRODUCTION

Electricity is an important invention without which life on earth is impossible. So obviously there is a need for measuring the consumed electricity. It is accomplished by the energy meter, but a person from the electricity board has to visit each house for taking the readings about energy consumption which is used for further operation. The billing process of electricity consumption which we are using at present is very long process and requires a lot of manpower and consumes time. Nowadays electricity cost is also high and therefore, it becomes a necessity for the consumer to know how much electricity is being used by them in order to control

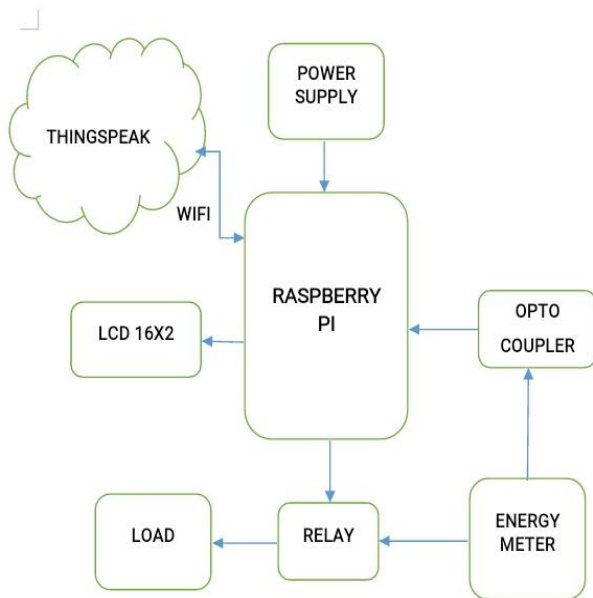
the electricity bill that should come within their budget. To tackle all these issues, we have intended to construct fully automated billing system i.e. "IoT Based Energy Meter Billing System".

The proposed energy meter measures the amount of electricity consumed and uploads it to the cloud, from which the concerned person can be given alerts. So it automates the process of measuring the energy consumption at homes using IoT and thereby enabling remote access and digitalization. The main objective of the project is to develop an IoT based system which replaces traditional meter reading methods and enables remote access of existing energy meter by the energy provider and monitoring of energy meters at lower cost is made possible. Daily consumption reports are generated which can be monitored through the web portal. The current system of electrical energy billing is erroneous and also time consuming. Errors get introduced at every stage of energy billing like errors with electro-mechanical meters, human errors while noting down the meter readings and errors while processing the paid bills and the due bills. This paper reduces the deployment of manpower for taking meter readings and distribution of bills. It has many advantages from both suppliers as well as consumer's point.

## II SYSTEM DESIGN

The AC power supply is given to the load through an energy meter. The energy meter measures the amount of electric energy consumed by an electrically powered device. Output of an energy meter that is calibration led output which is

not in a digital form. Hence this output is given to the optocoupler which converts output of led which is in millivolts into digital pulses which can be accepted by raspberry pi for further operation. Raspberry pi is the central unit of this project. Raspberry pi programming is done in such a way that it generates bill for a certain time. Here, we are considering 2 min=1 month.



**Figure 1 : Block diagram of the system**

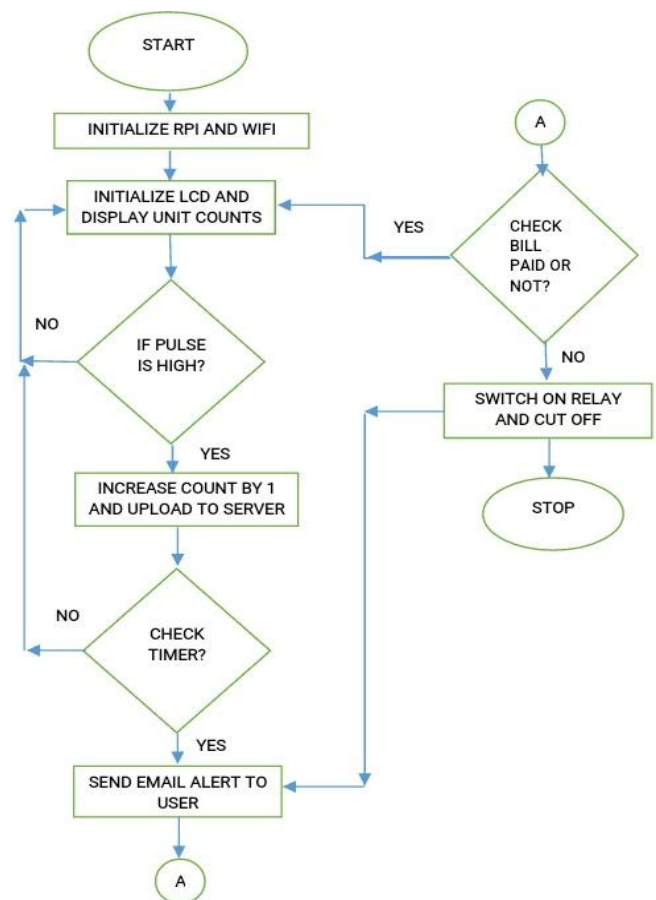
According to the number of units consumed, costing for respective units consumed is calculated along with due date of bill payment. This bill is sent to the THINGSPEAK cloud which updates data to the server and also sends mail to the user. Also we are using LCD (Liquid Crystal Display) to display the same information. After due date of bill payment if bill is not paid then user is informed through gmail portal and also the supply connection of that particular user could be disconnected by using simple relay through Adafruit dashboard.

### III WORKING

A general purpose energy meter is used to measure the the number of electricity units. An optocoupler is used to convert the output signal getting from energy meter in digital form which is used for further operation. Optocoupler gives a high pulse for every unit of consumed electricity. This pulse is further given as input to the raspberry pi. Raspberry pi is connected to the internet through WiFi. Once the internet connection is set then system login to the raspberry pi to start developing

IoT platform. Python programming language is used.

Raspberry pi sends information regarding energy consumed in terms of no.of units along with its cost, billing details, etc. through the internet connected to the server (which is under control of energy provider) for monitoring energy used by individual user. Also system displays same information on LCD device. Cloud storage and web hosting is used for storing real-time energy data and allows other programs to access and monitor the data. Here, we are using ThingSpeak website to monitor the data. In this website, we have created 2 fields, one of which shows the units consumed and other one shows the status of relay which is used to connect or disconnect the load. An Email alert is send to the user for every specified time. If the bill is not paid, relay can be switch ON to disconnect the supply connection for the user. This can be done using a GUI button from Adafruit site or dashboard which would update status on second field of Thingspeak website.



**Figure 2 : Flowchart of the system.**

#### IV FUTURE SCOPE

In future, we can create a mobile application in which we can provide information about power consumption of each device, notifications, etc. Here, current and voltage measurement can be done. So that over current and over voltage protection can be implemented.

#### V CONCLUSION

The present work is focused on the development of smart energy meter to avoid the electricity theft, to reduce the human efforts and time. This system updates the information about units consumed in every 1 to 2 seconds on the internet using public cloud THINGSPEAK. Proposed system is an IoT system where a user can monitor energy consumption in real time. Also a system where a user can receive alerts, when 50 percent, 90 percent of the specified threshold value is reached. If the customer does not pay the bill in time, the user is informed through a gmail. If still the consumer does not pay the bill, one alert notification will be sent, then automatically power supply connection is disconnected by the energy provider through Adafruit dashboard.

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