

# AUTOMATIC ENERGY METER MONITORING SYSTEM USING IOT

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## ABSTRACT

*The conventional energy meter reading system has many problems, such as difficulty in construction, poor real time, need more man power etc. To solve this problem this project uses the wireless technology for automatic energy using meter reading. A proposed method provides the communication between Electricity board section and the consumer's section using Internet of Things (IOT) for transmitting the consumer's electricity consumption and bill information that has been calculated. From the Electricity Board section the information regarding the bill amount is communicated to the consumer through internet. The current consumption and billing information is continuously transmitted by using IOT and monitored by the Electricity Board section. Whenever the consumer does not pay the bill or there is delay in paying the amount the Electricity Board section can disconnect the power supply to the respective customer.*

**Keywords—** Electricity Board(EB), Automatic meter reading, Raspberry pi, Wifi-module.

## 1.INTRODUCTION

The driving force behind the development of the country is Electricity. There is a rapid increase in the commercial, residential, and industrial consumers of electricity in the world, so it has become vitally important for the electrical board to devise better, environmentally safe techniques of gauging utilities so that the correct bills can be produced and invoiced.

In the Internet of Things (IOT) model, mostly all things are present in the internet in any one of the form. In recent trends all technologies are using IOT for improved performance and thus producing faster results. Using this IOT in energy meter reading system we are going reduce the man power to take meter reading and note down it manually. Once the reading is taken from energy meter using raspberry pi which is connected with wifi or an Ethernet cable and the measured reading is transmitted to the Electric board (EB) station. The consumer will also get the information about electricity consumption through the mobile app. Now the user can pay the bill amount through online from anywhere in the world.

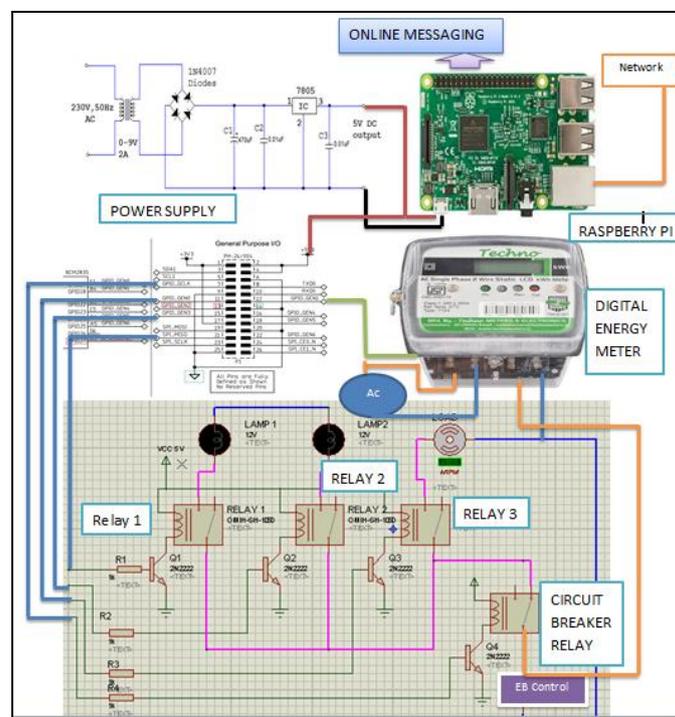
This type of auto billing is one of the best way to overcome the conventional billing, since conventional billing contains wastage of time and resource as well. In this method there is no need of manual meter reading and bill slips.

## II.MATERIALS

Digital energy meter, Raspberry, Step down transformer, Relay, Opto coupler, load, rectifier.

## III.SYSTEM ARCHITECHTURE

In this system reading from the digital energy meter is taken through the led connected to the energy meter. The LED in this energy meter goes glows when a unit of current is consumed thus a high pulse is produced in led for each unit of current consumed. A step down transformer(0-9v) is used to give power supply to the elements used inside the circuit as they cannot be given an input of direct AC 230V. Raspberry pi is used to measure the how many unit of current is consumed and send it to the EB station and also to the consumer. The main part used to interface the raspberry pi and the energy meter is the optocoupler.



### A. Energy meter

An energy meter or electricity meter is a device that is used to calculate the amount of electricity consumed by house, industry, or an electrically powered device. There are two type of energy meter analog and digital energy meter. Analog meters are old day meters and it is not mostly used now days, digital meters are used now commonly used in all areas and platforms. The most common unit of measurement on the meter is kilowatt hour, which is equal to the amount of energy used by a load of one kilowatt over a period of one hour, or 360k joules.

*B. Step-down transformer (0-9v)*

The transformer that decreases the voltage from primary to secondary (less secondary windings than primary) is known as step-down transformer. The step down transformer lowers the input AC 230v to 0-9v so that it can be fed to the relay circuits and switches.

*C. Opto-coupler*

The opto-coupler is also an opto-isolator that transfers electric signals between two isolated circuits by using light, thus preventing high voltages from affecting the system receiving signal.

The Led in the energy meter glows for each of unit of the electricity consumed and this high pulse is fed to the Raspberry pi to note down the readings through the optocoupler.

*D. Relay*

- A relay is an electrically controllable switch that is used in industrial controls, automobile appliances
- The relay isolates two separate sections of a system with two different voltage sources i.e., a small amount of voltage or current on one side can manage a large amount of voltage or current on the other side, but there is no chance for the voltage to mix up.

*E. Raspberry Pi*

- Raspberry pi is a single board computer that has two types in its model A and model B. Model A has 256 Mb RAM, one USB port and no network connection. Model B has 512 Mb RAM, 2 USB ports and an Ethernet port.
- Python is chosen as the main programming language, as it is generally accepted to be both easy to learn and a fully fledged, programming language suitable for real world applications.
- The raspberry pi measures the reading from the energy meter and it also controls the total circuit and it uploads the measured reading content on to the web and the user app.
- The raspberry pi is given the Ethernet connection or a wifi connection which helps it to send the data to the web and the application.



Figure: Raspberry pi board

- An circuit breaker part is also integrated to the circuit to raspberry pi which helps to cutoff the power supply to the user if the bill is not paid. Thus Raspberry pi helps to monitor the total circuit.

#### IV.METHODLOGY

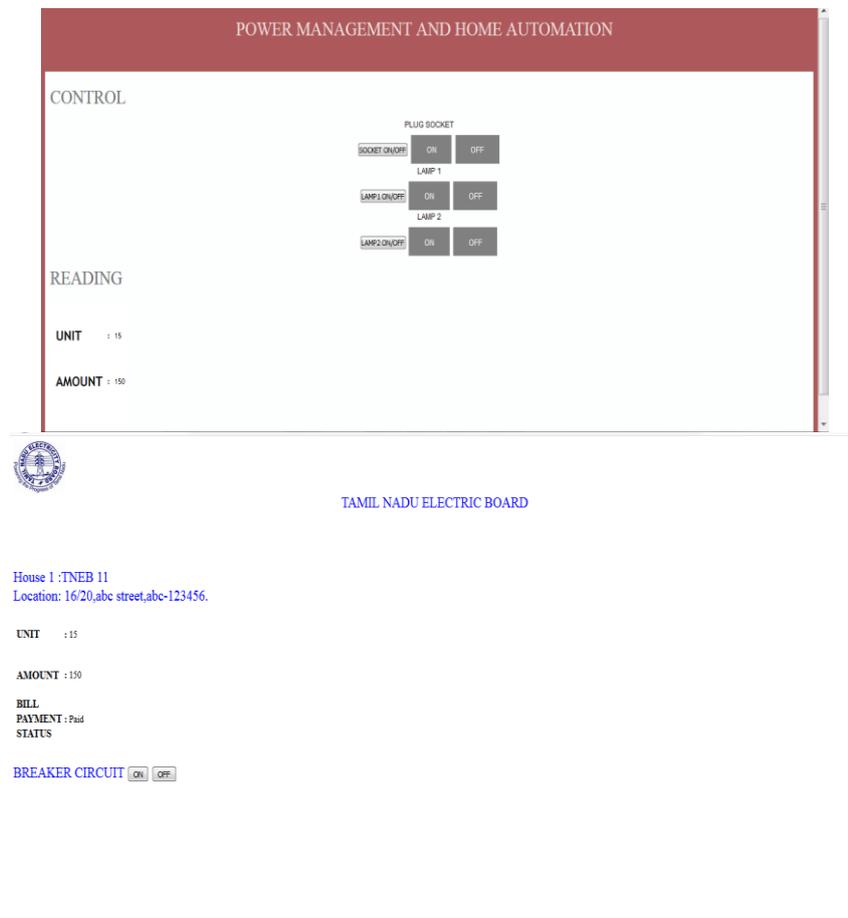
The energy meter in the houses and in the industries are used to calculate the amount of Electricity used in the house and in industries. The raspberry pi measures the reading from the energy meter through the led output. Led and raspberry pi are connected through the optocoupler to prevent the flow of any back current from the energy meter.

A step down transformer is provided to reduce 230v ac input to 9v this input from transformer is given to the rectifier to convert the ac input to direct current (dc), this dc is fed to the relay and circuit breaker. The circuit breaker and relays are controlled by the raspberry pi.

As the current is consumed by the loads the energy meter measures the reading and the raspberry pi also measures the reading in terms of units. The raspberry pi is interfaced with the wifi module, and as the readings are being measured the raspberry pi uploads the reading in to the web to the consumer and Eb station portal websites. Through which officers can monitor the readings of each house and industries.

The consumer also can see the reading and the bill amount through web. The alert message is sent to the each consumer at the end of the month to pay the bill, if the bill is not paid till the due date the EB officer can cut off the current to the particular house by switching on the circuit breaker, which cut off the power supply. Thus we can monitor and control the power supply to all house and industries. The experiment result and output are shown in the below diagram.





## HARDWARE IMPLEMENTATION&RESULTS

### V. CONCLUSION

The proposed automatic energy meter reading system, enables to view the measured reading through internet and it is most economical implementation and reduces the man power to measure reading. It provides ease in taking readings, accuracy, and reduction in possible corruption related to meter reading. The wireless transmission makes it easy for the consumer and EB officer to monitor the current consumption from anywhere. And the EB officer can also control the power supply to the house through the breaker circuit.

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