IoT Based Smart Energy Meter with Multiple Features

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***Abstract*:- Energy meters which is already installed a tour houses are not replaced, but a small modification on the already installed meters can change the existing meters into smart meters. To develop an IOT (Internet Of Things) based energy meter reading displayed for units consumed and cost thereupon over the internet in text format to reduce manpower.**

Keywords: Power Theft, Smart Energy Management, Easy communication betweenelectricity board and Consumers.

I. INTRODUCTION

Energy meter or watt-hour meter is an electrical instrument that measures the amount of electrical energy used by the consumers. Utilities is one of the electrical departments, which install these instruments at every place like homes, industries, organizations, commercial buildings to charge for theelectricity consumption by loads such as lights, fans, refrigerators and other home appliances. The both ends i.e., Electricity board and consumers are facing problems like corruption and power theft, unannounced power failure respectively. The remedy for all these problems is to keep track of the consumers load on timely basis, which will held to assure accurate billing, track maximum demand, to prevent power theft and reduce corruption. These areall the features to be taken into account for designing an efficient energy meter. These system has the following drawbacks:

- The human intervention easily leads power theft and consumption.
- Physical wiring is needed and installation is complex.

Fig.1: Energy Meter

- Signal interferences and security problems occur.
- Require field intervention of humanoperators.
- Complex setup of infrastructure.

Fig. 2: Transmission Line

II. PROPOSED METHOD

We are undertaking this project to ensure safe consumption and management of power. In India, bill is issued only once in a month or two months. So the consumers will be in the dark during this period of time about their energy usage. In this era of complete digitalization, no one will take their pain to go and check their electricity meter reading and compare it with the previous reading so as to get an idea about their consumption. Some people are still accessing the electricity without any legal agreement with thesupplier.

The Internet Of Things (IOT) might have the capacity to consolidate transparently and flawlessly an expansive number of various and heterogeneous frameworks, while giving open access to chose subsets of information for the improvement of a plenty of computerized administrations.

So, we have designed "an IoT based Smart Energy Meter with Multiple features" for easily receiving the information on how many units of power consumed and how much money does it cost through internet in a text format. It also helps Electricity Board (EB) to know whether there is any power theft happening in their authorized area. For this innovative work we had taken a digital energy meter whose blinking LED signal is interfaced to a microcontroller of PIC 16series family through a optical interface. The blinking LED flashes 3200 times for 1 unit. The optical sensor gives an interrupt each time the meter LED flashes to the programmed micro controller. The microcontroller takes this reading and displays the it on an LCD duly interfaced to the microcontroller. The reading of the energy meter is also sent to a IoT modem being fed from themicrocontroller via level shifter IC and RS232 link.The Node MCU used in the modem being internet enabled transmits the data directly to a dedicated web page for display anywhere in the world in multi level text format. Unpaid customer power will be tripped/Reconnected from EB office.

The power supply consists of a step down transformer 230/12V, which steps down the voltageto 12V AC. This is converted to DC using a Bridgerectifier and it is then regulated to +5V using a voltage regulator 7805 which is required for the operation of the microcontroller and other components.

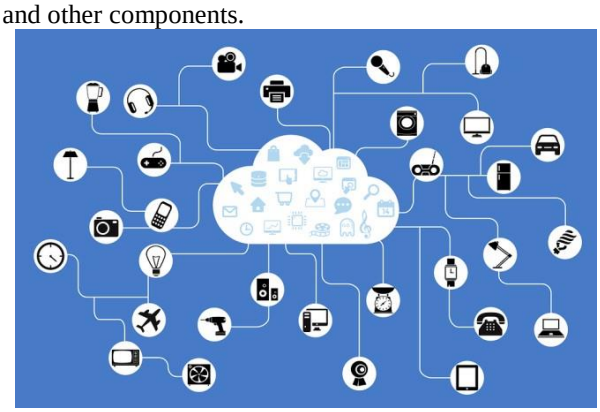

Fig. 3: IoT System

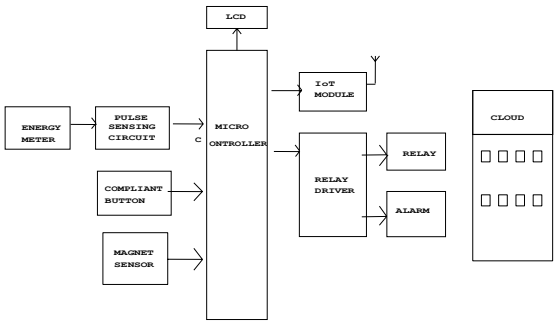

Fig. 4: Block Diagram

The disadvantages of the existing method will be overcome with the help of the 'SMART ENERGY METER'.

- Reading directly send to EB office thusavoiding of corruption.
- No manpower needed to observe reading ofevery house.
- Customer can register their power failure problems through IoT.
- Scheduled power shutdown timings can be intimated through IoT.
- Tampering of energy meter can be identifiedfrom EB office through IoT .
- Previous details can be accessed through the cloud storage.
- It leads to further new innovative ideas in future.

III. HARDWARE SPECIFICATION

These are the detailed explanations on the components used in our project.

3.1 Energy Meter

The energy meter is an electrical measuring device, which is used to record Electrical Energy Consumed over a specified period of time in terms ofunits, is the base to raise the bill power supplier. Because of massive rural and urban electrification programme of Government, there is a good demandfor this product.

The basic principle of induction energy meter is electromagnetic induction. A thin disc of aluminium (copper) is pivoted between the two Shunt and Series magnets and cuts the fluxes of both the magnets.

Hence two eddy currents are induced in the disc . Thedriving torque on the disc is produced as a result of interaction f the two inducing fluxes.

Fig. 5: Digital Energy Meters

3.2 IoT Module

An Iot module is a small electronic device embedded in objects, machines, and things connected to wireless networks and sends and receives data. However, all complete IoT systems are the same inthat they represent the integration of four distinct components: sensors/devices, connectivity, data processing, and a user interface.

The IoT allows objects to be sensed or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reducedhuman intervention.

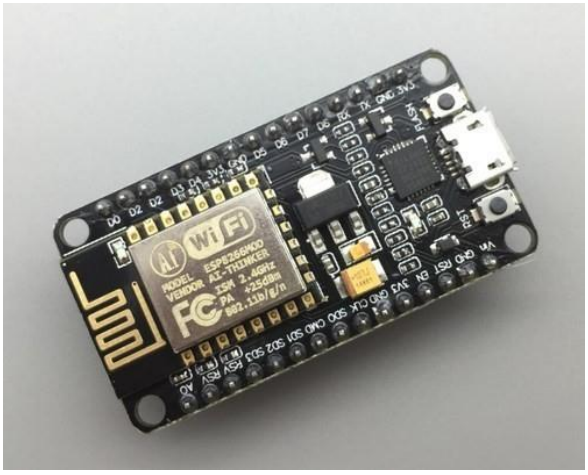

Fig. 6: IoT Module

In short, the **Internet of Things** refers to the rapidly growing network of connected objects that are able to collect and exchange data in real time using embedded sensors. Thermostats, cars, lights, refrigerators, and more appliances can all beconnected to the **IoT** ,

3.3 Magnetic Sensor

Magnetic sensor is a sensor which is used to notice disturbances as well as changes within a magnetic field such as strength, direction, and flux. There are different types of detection sensors which can work on some of the characteristics like light, pressure, temperature. These sensors are separated into two groups:

- The first one is used to calculate the total magnetic field.
- The second one is used to calculate vector components of the field.

Fig. 7: Magnetic Sensor

3.4 MCT2E IC

MCT2E is a phototransistor Optocoupler, as the name “phototransistor” suggests it has a transistor which is controlled based on light (photon).So this IC basically has an IR (infrared) LED and a photo- transistor inside it.

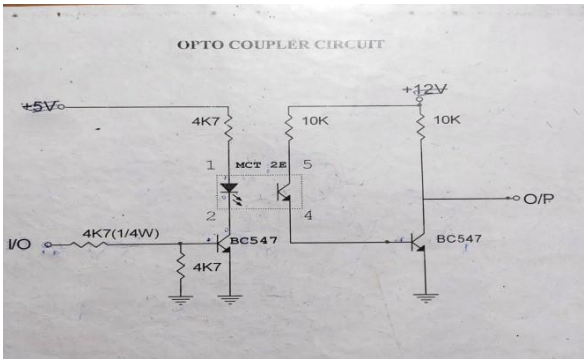

Fig. 8: MCT2E IC Circuit Diagram

The optocoupler is used to transmit analog or digital information between circuits while maintaining electrical isolation at potentials up to 5,000 volts.

3.5 Relay Driver

A relay driver circuit is a circuit which candrive, or operate, a relay so that it can function appropriately in a circuit. They driven relay can thenoperate as a switch in the circuit which can open or close, according to the needs of the circuit and its operation.

Fig. 9: Relay Driver

3.6 Relay

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple

contact forms, such as make contacts, break contacts, or combination thereof.

Fig. 10: Relay

It converts small electrical stimuli into larger currents by using electromagnetism. These conversions occur when electrical inputs activate electromagnets to either form or break existing circuits.

3.7 Cloud

Cloud computing is the on-demand availability of computer system resources, especially data storage and computing power, without direct active management by the user. Large clouds often have functions distributed over multiple location, each location being a data center.

Fig. 11: Cloud

It is the delivery of computing services-including servers, storage, networking, software, analytics, and intelligence-over the internet ("the cloud") to offer the faster innovation, flexible resources, and economies of scale. It is the best mode of storage. Components of Cloud Computers are 1) Client Infrastructure, 2) Application, 3) Service, 4) Runtime Cloud, 5) Storage, 6) Infrastructure, 7) Management, 8) Security, and 9) Internet. Cloud computing makes a complete Cloud computing system simpler.

IV. CONCLUSION

Energy meter which can control the usage of electricity on consumer said to avoid wastage of power. Prepaid energy meter is a concept to minimize the electricity theft with a cost efficient manner. Details regarding daily power consumption will help consumer to manage their power usage. This developed system is reliable and secure as only authorized person can access the system. In the absence of payment from the consumer, power can be easily tripped by Electricity Board (EB) without using much efforts. Consumers also can raise their complaints easily. This will be leading step towards innovation.

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