

# Electricity Theft Detection System

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**ABSTRACT:** In the most of the developing countries, the effort of collecting electricity utility meter reading and detecting illegal usage of electricity is a very difficult and time consuming task which requires a lot of human resources. Energy meter reading and monitoring system using Internet of Things (IoT) present an efficient and cost-effective way to transfer the information of energy consumed by the consumer wirelessly as well as it provides facilities to detect the illegal usage of the electricity. Aim of this study is to measure electricity consumption in the household and generate its bill automatically using IoT and tele metric communication techniques. Also this study aims to detect and control the energy theft.system and to connect the system to a WiFi network and subsequently to the Internet and Server. In such case, system will send an alert to the server as well as it has the facility to disconnect and re-connect the electricity supply automatically. The proposed system is capable of continuously monitor and being notified about the number of units consumed to the energy provider and consumer. The energy consumptions are calculated automatically and the bill is updated on the internet by using a network of Internet of Things and send the bill to the customer through mail. This automation can reduce the needs of the manual labours.

**KEYWORDS:** Energy meter ,Raspberry pie,optoisolater,voltage sensor

## I. INTRODUCTION

The loss of energy in electricity transmission and distribution is an important problem faced by power companies all over the world. the electricity theft occurs mostly through physical attacks like line tapping, meter breaking, or meter reading tampering . These electricity fraud behaviours may bring about the revenue loss of power companies. Electricity theft behaviours can also affect the power system safety. For instance, the heavy load of electrical systems caused by electricity theft may lead to fires, which threaten the public safety. Therefore, accurate electricity theft detection is crucial for power grid safety and stableness. The main overview of the project is to develop a wireless energy meter. The Raspberry pi takes the reading from the energy meter and that reading send to the cloud. The reading of the energy meter is also sent to the user panel and admin panel. Nowadays electricity cost is 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. In this proposed system, a consumer will get energy consumption data on a real-time basis on their cell phone.

The technology of e-metering (Electronic Metering) has gone through rapid technological advancements and there is increased demand for a reliable and efficient Automatic Reading (AMR) system. The proposed system replaces traditional meter reading methods and enables remote access of existing energy meter by the energy provider. Also they can monitor the meter readings regularly without the person visiting each house. A raspberry pi based wireless communication module is integrated with electronic energy meter of each entity to have remote access over the usage of electricity. The power or utility company can read all of the meters in a closed proximity based on daily/monthly usage chart, high and low consumption alerts, increased leak detection efficiency, or more frequently as appropriate. It is not necessary to send a service person to visit every customer location once a month. The power or utility company will no longer need to estimate usage when meters are not physically accessible to their service people. They can get real-time usage data from any of the meters in the system instantly. Meters are always accessible. With this technique two way communications can be made possible; the power company can manage their peak loads better and offer incentives for customers to shift their power usage off-peak times

## II. LITERATURE SURVEY

Meter Reading and Billing are among the most time consuming functions performed by municipalities and energy distribution companies. These functions have a major influence on the utilities cost, efficiency, productivity, structure and cash flow as well. Solutions based on recording readings manually, then entering it into a central billing system are time consuming, prone to errors and delays in delivering bills to customers with negative effect on cash flow. There are many methods involved in the meter reading process; this includes traditional manual methods up to fully automatic meter reading systems:

### 2.1 GSM BASED AUTOMATIC ENERGY METER READING SYSTEM WITH INSTANT BILLING

[1] In this paper the PIC microcontroller is used to count the o/p pulses from meter, it uses the GSM modem to send billing details to customer via SMS, but this takes more time and it is a bulky system also it is more complex.

### 2.2 GSM BASED REMOTE ENERGY METER MONITORING USING RASPBERRY-PI BOARD

[2] In this paper, the PIC microcontroller is replaced by the Raspberry pi controller. It is same as the previous system, In this paper they simply change the PIC microcontroller with the Raspberry pi controller.

### 2.3 TRADITIONAL SYSTEM

Traditional meter reading is done by the human operator, this requires a more number of labor operator and long working hour to achieve the complete area data reading and billing. Due to the increase in the development of residential building and commercial building the meter reading task increases which require more number of human operators. It should be clear that such methods are very time consuming and does not satisfy the business requirements for the power company, in addition to the large number of errors incorporated in the reading process. This type of systems cannot provide transparency.

### 2.4 PIC BASED ENERGY METER

To improve the efficiency of the billing system this method was invented. This is an electronic energy meter designed to replace conventional electromechanical meters in which PIC based is more accurate than conventional energy meters. In this system the energy consumed by the user is measured, and according to that the charges were applied. The main aim of this system was to safeguard the electrical system from over voltage, under voltage and over load conditions. Over voltage and under voltage conditions are detected by using a step down transformer and full wave rectifier. Over current condition was detected by using a current transformer which is connected in series with the load. But this system is not so much effective in prepaid billing process as this did not reduce the laborious tasks and this is only useful in protective purpose

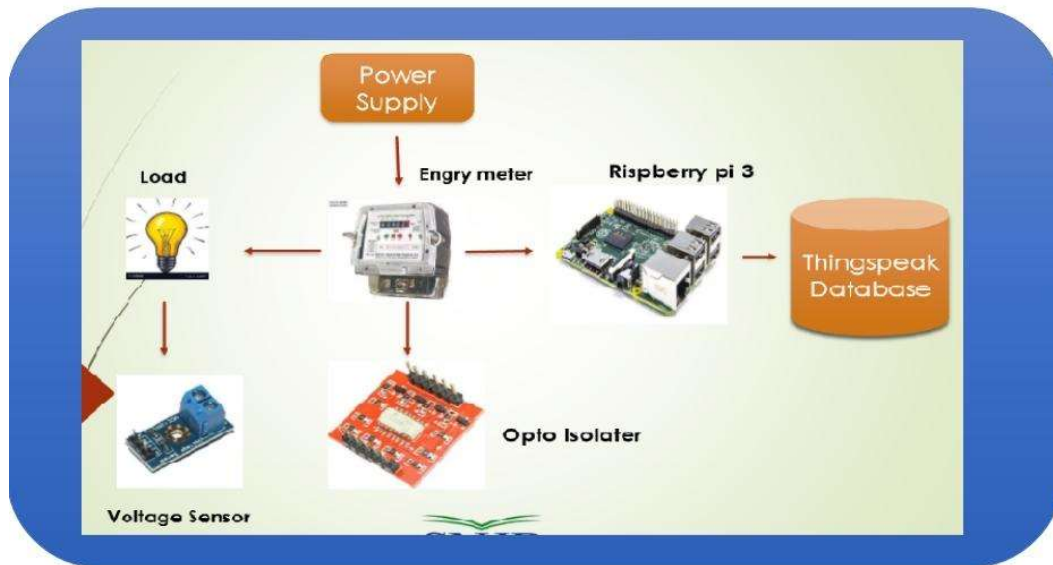
### 2.5 SMART CARD BASED ENERGY METER

In the last decade, smart cards evolved from basic memory cards to complex systems on chips with expanding processing power. This has opened the avenue to many applications such as financial transactions, e-commerce, physical access control, health, and transportation services. The smart card, an intelligent token, is a credit card sized plastic card embedded with an integrated circuit chip. It provides not only memory capacity, but computational capability as well. A smart card usually consists of a ROM or flash memory, EEPROM and a CPU. Access to data stored on the card is under the control of the smart card operating system. The card operating system not only makes the smart card secure for access control, but can also store a private key for a public key infrastructure system. That is it only stores the amount of energy consumed for a certain period.

## III. PROPOSED SYSTEM

The purpose of our project is remote monitoring and control of the Domestic Energy meter. This system enables the Electricity Department to read the meter readings regularly without the person visiting each house. It sends meter reading to the consumer Service provider through cloud. A RASPBERRY-Pi unit continuously monitors and records the Energy Meter readings in its permanent (non-volatile) memory location. Raspberry Pi board is used as the Central Unit of this Project. Energy measuring circuit is connected to Raspberry Pi Board. In this system give a unique Id number for every energy meter. This system continuously monitors the energy consumption and sends monthly to the service provider and the user. The meter reading is stored in database of Raspberry Pi board. Customer will be updated with weekly consumption of energy and also amount of the bill. This proposed system going to use the Raspberry pi 3 model B controller to count the pulse from meter as seen in paper[2] they also used the Raspberry pi controller and to

send the billing details they used the GSM modem, here this system not restricted to use the GSM modem to send billing details, this system send the billing details to cloud which design through the IP address of the Raspberry pi 3 model B. at the cloud there are two panel, one is user panel which is used to send the billing details to user and second is the admin panel which is authorized distribution company, the admin panel is having the authority to manage the meter system and only admin panel can access the meter.



**Fig: 3.1 Architectural Diagram of Implementation Model**

Energy Meter Monitoring Using RASPBERRY-PI Board is used to continuously monitor the meter reading and give weekly information about the number of units consumed along with its cost to the consumer and electricity department. Major components used in this project are RASPBERRY-PI board, GSM model, LCD display, energy meter circuit, and load. RASPBERRY-PI is a credit card size minicomputer developed in UK. It acts as a fast processor system. RASPBERRY PIE is a central unit of this project. RASPBERRY PI board is connected to monitor, GSM, LCD, and energy meter through various ports. In this project consumption of energy through variable load stored in an internal memory location of RASPBERRY-PI board. ADE 7757 IC counts the number of units consumed which get displayed on a LCD display along with its cost. The same information is provided to the electricity department through GSM Modem. This system enables the electricity service provider to read meter reading regularly without the person visiting each house so that manual meter reading will get reduced. Customers will get weekly update regarding power consumption through SMS. Power theft can be detected as this system gives information about the no. of units consumed along with its cost

### 3.1 WORKING

Raspberry pi Based Remote Energy Meter Monitoring system uses RASPBERRY PI set up which is a central unit of this project; it is a credit card size minicomputer which acts as a fast processor system. This system enables the electricity service provider to read meter reading regularly without the person visiting each house so that manual meter reading will get reduced. Customers will get weekly update regarding power consumption through SMS. Power theft can be detected as this system gives information about the no. of units consumed along with its cost. This system facilitates to make effective usage of electricity thereby it will help to minimize the power crisis in our country This system automatically reads the energy meter data and sends it to the customer and service provider on reception of a specific message from service provider. The system can also provide the facility to disconnect the supply of a customer in case of any payment related issue and also if the amount falls below certain amount, then it will be indicated by the microcontroller through buzzer and also send message service to the customer by using Raspberry pi modem.

### 3.2 MODULES USED

1. Interface Energy meter with Raspberry pi
2. Send Sample mail to the user

### 3.3 ALGORITHM / TECHNIQUE

Module 1:

- Steps1.Boot Raspbian OS in SD card.
- 2.Put SD card in Rpi
- 3.Turn on Rpi.
- 4.Interface Energy meter.
- 5.Connect load to the meter.
- 6.Run Code to calculate the units.
- 7.Display units.

Module 2:

- Steps1.Turn on Rpi.
- 2.Connect the internet to raspberry pi.
- 3.Write a firmware code to send mail.
- 4.Give the sender gmail id and password to the firmware code.
- 5.Also give it the receiver gmail id to the firmware code.
- 6.Write a message which we want to send.
- 7.Run the code.

## IV. CONCLUSION

IoT based smart energy meter reading and monitoring system was proposed in this paper. The system provides many significant advantages, such as wireless data transmission, low workload, remote monitoring and controlling, anti-theft mechanism and less expenses. The system would provide a simple way to collect the meter reading and detect an electrical power theft without any human involvement. The use of embedded microcontroller and Wi-Fi module increases the stability of wireless data transmission. By using this system the customer can anytime check their consumed unit and bill in the Internet in which paper is not required for billing which saves paper and printing cost. The bill can be paid using online customer support system. In future, the project can be integrated to form smart cities using Internet of Things based sensors as done globally. When compare with the existing GSM based and other traditional energy metering and monitoring system, the propose system is more efficient and cost effective. It allows the consumer to check the energy consumption and bill any time they login to the system whereas other existing system send the bill monthly or on request to the customer

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