# "Design and Implement Mechanism for Efficient Energy Meter using IoT"

## Ketaki Nikam[1], Nisha Pagar[2], Sonali Jamdhade[3], Pratibha Shirsath[4]

*[1,2,3,4]B.E.(Computer) & Late G. N. Sapkal College of Engineering, Anjaneri, Nashik*

---***---

**Abstract -** *In today world IOT has taken all over the world as every person is working towards automation of everything. Home automation is one of the main part of IOT system. Now a days in the existing system the real time monitoring system for residential energy system is proposed. In the existing system some kind of manual work is done for the calculation of monthly bill of electricity consumption of users. So we can instead use IOT to overcome this manual work and making the whole system automated. The system will be cost effective as it only need to be installed in the existing system. It will be light weight and easy to install. The system will help in collecting the exact reading of the energy meter and proper bill generation will be done accordingly. The presented work can also be extended to large scale from which load distributed in the area can be estimated so that the system canbe strengthened to enhance performance*

***Key Words*: Arduino, Power Consumption, Billing, Smart Electricity meter**

## 1. INTRODUCTION

As we know in India electricity is one of the main topic we discuss in our day to day life, we all have digital meter in our house, which are used to calculate the electricity used by us in period of one month, we observer that one person is used to take picture of our electrical meter as a proof of our reading, it been since that its a vast investment of our government, Our main objective is to reduce the human efforts, and build a centralized system.

## 1.1 Literature Survey

### (a) Digital electric energy meter individually measuring electric energy of fundamental wave and harmonic wave based on LabVIEW DSP module. [1]

Published year : 2008

Author : Guoqing Zhang

In this paper, the difference between traditional electrical energy metering system and digital electrical energy metering system is presented, the thought and the design method of virtual instrument(VI) technology is introduced, a new development scheme of digital electric energy meter based on Lab VIEW DSP(Digital Signal Processor) module is presented. It takes a floating-point DSP as the core and completes real-time acquisition of currents and voltages with less hardware such as photo electricity sensors and the A/D converter. While the quasi-synchronous sampling digital filtering adding windows FFT (Fast Fourier Transform) operation, electric parameter calculation and so on, are implemented by software in DSP. The program developed in LabVIEW using LabVIEW DSP module can be downloaded to the DSP hard equipment, with no additional DSP compiler, to be operated easily. It makes full use of LabVIEW DSP module in interaction, usability, integrated resource and data processing ability, thus making the development easier and faster. The developed digital electric energy meter has the performance of multi-functions, small cubage, high-performance and easy expansion, etc.

### (b) Electronic meter reader & data base management system [2]

Published year : 2016

Author : Sarwar Wasi

The objective of this paper is to develop a system which can transmit the meter reading of local area electric meter to the nearest electric meter billing and controlling station. For this we interfaced analog electric meter with the digital circuitry to provide real-time billing & reading to the customers by using Liquid Crystal Display (LCD). There are basically two ends, one is user end and the other is server end. The meter can either be prepaid or postpaid, which is completely monitored and controlled by the server end of a specific area. Each user will be provided by a pin code to access the meter either for recharge the meter bill or to check the balance in case of prepaid meter. The key elements of this research are micro controller, global system for mobile communication (GSM) module, and analog meter with IR module. The whole system is revolving a round the GSM module and the micro controller, where GSM module is used for the wireless data transmission and controller controls the whole operation of the system.

### (c) Design and implementation of Bluetooth energy meter [3]

Published year: 2017

Author: B. S. Koay

Presently electronics energy measurement is continuously replacing existing technology of electro-mechanical meters especially in China and India. By the year 2004, digital meter has start replacing electromechanical meters in Singapore. A wireless digital energy meter would definitely offer greater convenience to the meter reading task. Bluetooth technology is chosen as a possible wireless solution to this issue. In this

paper, we present the design and implementation issues of a Bluetooth-enabled energy meter. The energy reader can collect the energy consumption reading from the energy meter wirelessly based on Bluetooth. Two methods, which can retrieve the meter reading with little human intervention, are proposed and implemented in the targeted applications. They are AMR (automatic meter reading) and the APM (automatic polling mechanism). Few commercial applications are suggested to apply for the Bluetooth-enabled energy meter. We have successfully implemented the Bluetooth-enabled energy meter for these suggested commercial applications to demonstrate the advantage of reading the electricity consumption wirelessly via Bluetooth technology.

## 2. BLOCK DIAGRAM:

In the existing system, electricity meter reading for electricity usage and billing is done by human workers from home to home and building to buildings. This requires huge number of workers and long working time to achieve complete area data collection and billing. Human workers billing are prone to reading error as sometime the houses electric meter is placed where it isn't easily accessible. Labour billing job is some- time also restricted and slowed down by bad environmental condition. Paper billing has the tendency of losing in the post box. The increased development of residential housing and industrial buildings in the developing country such as for example, India require more human workers and longer working hours to complete the usage reading task. These increases the energy provider operation costs for meter reading.
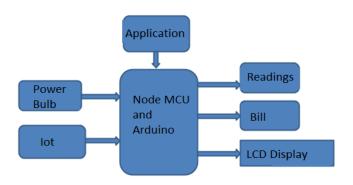


**Fig -1**: Block Diagram

The energy meter records the amount of energy consumed by the load. In the older days electro mechanical type of energy meter are available and now a day's digital energy meter are available. The energy meter mainly works on the current increment in amount of current flow through circuit causes the disc to rotate, means that the rotational speed of disc is directly proportional to the amount of current flowing through circuit. Old type rotation effect of disc type meter causes the gear mechanism to work accordingly and in similar way power consumption by the load is recorded by the micro controller the blinking rate of LED integrated within the meter. Present type of energy meter also had a

blinking led for the counting the pulses are sent to the microcontroller and these readings are stored into external memory of the microcontroller. External memory is an EEPROM. This memory is able to store previous energy consumed as well in case one needs to check present Energy consumed status. LCD is connected with microcontroller, microcontroller sends a messae to LCD display unit so that we can view the status of wifi Modem. Wifi communicate over wireless system.

## 3. SENSOR DISCRIPTION

### 3.1 Node MCU



Node MCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Es press if Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language

### 3.2 Arduino

The Arduino Uno is a microcontroller board based on the ATmega328. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs), a 16 MHz resonator, a USB connection, a power**jack**, an in-circuit system programming (ICSP) header, and a reset button.



### 3.3 LCD Display

**LCD** (**Liquid Crystal Display**) **screen** is an electronic **display** module and find a wide range of applications. A 16x2 **LCD display** is very basic module and is very commonly used in various devices and circuits. These
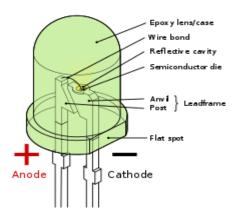
modules are preferred over seven segments and other multi segment LEDs.



### 3.4 LED

A light-emitting diode (**LED**) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. ... Modern **LEDs** are available across the visible, ultraviolet, and infrared wavelengths, with high light output.



### 4. CONCLUSION

This paper is intended to present an overview of prepaid energy meter which can control the usage of electricity on consumer said to avoid wastage of power. Prepaid energy meter is a concept to minimise the electricity theft with a cost efficient manner. The users are not bound to pay excesses amount of money, users have to pay according to their requirement. Prepaid energy meter is more reliable and user friendly. This prepaid remote energy meter proves to be a boon in the power sector. It control the usage of electricity on consumer said to avoid wastage of power. It helps to the country revenue by stopping current theft and punishing the dishonest customers. However their design has to meet certain prepaid standards and regulations. The only concern is the security and privacy of data as they are prone to cyber attack. However the use of GSM in this particular system provides numerous advantages over methods that have been previously used. Data transmission is charged at standards SMS rates, thus the charges are not based on the duration of data transmission. The cost efficient of readings. Developed system also gives information about daily, monthly and yearly power usage. 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.

### REFERENCES

[1]. Sh-Wei Lee, Cheng-Shong Wu, Meng-Shi Chiou, KouTan Wu A re- search paper on , Design of an Automatic Meter Reading System National Chung Cheng University

[2]. M. Popa A research paper on ,Data Collecting from Smart Meters in an Advanced Metering Infrastructure, Politehnica University,Timisoara,Romania

[3]. Adnan Rashdi, Rafia Malik, Sanam Rashid, Anam Ajmal, Sulaiman Sadiq, A research paper on, Remote Energy Monitoring, Profiling and Control Through GSM Network, 1 National University of Sciences and Technology, Islamabad, Pakistan

[4]. Ali Abdollahi, Marjan Dehghani, and Negar Zamanzadeh, A research paper on, SMS based Reconfigurable Automatic Meter Reading System

[5]. A research paper on, Electronic Energy Meter with Instant Billing

[6]. Jawed Ahmed, M. Afshar Alam, Abdul Mobin, Shahla Tarannum4, A research paper on ,A Soft Computing Approach for Obesity Assessment Computer Science, Jamia Hamdard, New Delhi