IoT BASED SMART ENERGY METER

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ABSTRACT
IoT based energy meter is mainly based on Arduino. Design and implementation of project based on IoT concept. Arduino board performs monitoring and controlling actions. If electricity consumption goes beyond the limit then power supply connection will disconnected from service provider or automatically gets cut off. This proposed system eliminates human involvement in electricity measurement. Due to increase in electricity demand, there is increase in electricity theft. Hence the proposed system used for theft detection also.

The energy meter is connected to Arduino controller. Arduino reads the main energy meter & sub energy meter reading. The difference between main energy meter & sub energy meter is referred to check theft status. If difference occur between main & sum meter reding then theft detected message is displayed on LCD display as well as on mobile app for service provider.customer and service provider can access data from anywhere on globe using customer id.

KEYWORDS: IoT, Arduino Uno, Energy meter, LCD display, Current Sensor, ESP8266

INTRODUCTION

In today's world, electricity has become an indispensible part of our life. It is a major driving factor for advances in technology. As population goes on increasing there is increase in demand of power supply. By proper monitoring and avoiding energy wastage, energy efficiency can be reduced to certain extent.

In this era of digitization, if consumers can check their energy usage using their mobile phone or laptop instead of checking energy meters it will be the great leap in the area of energy management.as most

people are today 24*7 online, it will be advantious if they can monitor their energy consumption online from anywhere on globe.

in present system, a man from electricity board goes area by area and takes reading from meters installed at homes and takes readings from meter and gives bills to customer which is to be paid. In this paper we are describing a advanced method of electricity meter reading using IoT concept. By the use of wireless communication technology there are various in automating functions for reducing labour. Wireless communication media has made exchange of information fast, secure and accurate. In proposed

system, power reading is uploaded to cloud using ESP 8266.

A smart meter is an electronic device that communicates the information to service provider and customer. Also, records energy consumption, monitoring and billing to service provider. Our proposed system uses energy meter with Arduino microcontroller to monitor and control energy consumption. The meter is used to monitor consumed units and transmit the units using Arduino and Wi-Fi module over internet. This allows user to check energy consumption along with cost charged online using web application. Thus, energy monitoring system allows user to monitor electricity meter readings and check billing online with ease. The main brain for this system is Arduino Uno board for controlling and monitoring. Arduino runs a code to control a relay board according to input and serves a web page which respective output to relay board can be controlled. This system allows supplier to remove connection from distant server if user fails to pay electricity bill or in case of theft detection.

LITERATURE SURVEY

Some recently published works on smart meters reviewed as:

Milanpreet Kaur et.al [1] proposed smart energy meters in which user able to monitor meter readings anytime from anywhere, two way communication of energy consumption using Arduino. Information is sent to web server through Ethernet. This proposed design eliminates human errors. The consumer can receive information using IP address on their devices. This paper presents Ethernet for communication to web server.

Sayantan Chakraborty et.al [2] gives information about current Indian power sector, technology and devices used in Smart Grid, Smart grid challenges, current smart grid status in India. Objectives for initiatives of Smart Grid pilot projects are (1) increase in power availability (2) reduction in blackouts.(3) load management during peak hours.(4) optimal utilization for sustainable growth.

Abhinab Das et.al [3] proposed Arduino based prepaid electricity meter. In this system calculates energy consumption based on energy pulses coming from energy meter.As system sends messages timely to the user in case of low balance. This reduces human efforts to go door to door billing. The system is temperproof design, also there is automatic power off if theft is detected. In this LDR sensors are used to detect the pulse output from energy meter. LDR sensors detects flow of current from load side of meter and generates proportional current. This sensor is used to detect the electricity theft.

Sayali Gore et.al [4] give information about electricity management through Android application. Proposed system providing prepaid and postpaid billing system to customer. Meter readings are transmitted to server and generate the bill automatically. Customer and service provider can see updated meter reading and billing information. Generated bill will be sent to customer via SMS alert.

S. Imran et.al[5] proposed a system to develop IoT based electricity meter reading using internet. In this digital meter is connected to microcontroller through LDR, LED blinks. Meter reading is sent to microcontroller and then through Ethernet module data is transmitted directly to web page.

Shaik Salman Siddiq et.al [6] proposed a system in which customer can do management of power by taking energy usage information time to time. This system uses Arduino microcontroller, ESP8266 Wi-Fi module. Energy readings are displayed on LCD. Also readings are updated on web server using Wi-Fi module. If tampering detected buzzer will go off making loud noise. In this project all information is available on webpage that is Thingspeak.com.Thingspeak.com is one webpage which takes help of MathWorks MATLAB analytics to present information in description and visualization manner.

Giri Prasad et.al [7] describes about digital meter reading using IoT.in proposed system energy meters measures amount of power consumed. The power reading from digital meter is read using optocoupler and this data is transmitted digitally to Arduino.the power reading is sent to cloud using ESP8266 wifi module.

Ajeeba A.A. et.al [8] proposed IoT based energy meter reading, theft detection in won LCD as well as web server which they used PIC16F877A microcontroller. The energy meter is interfaced to PIC microcontroller. The readings of main energy meter and sub energy meter are compared to identify theft status. If there is mismatch of two values then theft is detected and message is displayed on LCD as well as web server.

S.S. Nagendrakumar et.al[9] introduces IoT based control and monitoring of smart grid and power theft detection by locating area.Rasberry PI is used for controlling and transferring data between consumer and service provider through cloud. In this Zigbee module is used to transfer data to the hub.

S.V.Anushree et.al [10] proposed IoT based energy meter reading. this paper describes ATMEGA328P Microcontroller and implementation of energy meter using IoT,theft detection.GSM modem is used to send the meter readings to customer and electricity supplier.
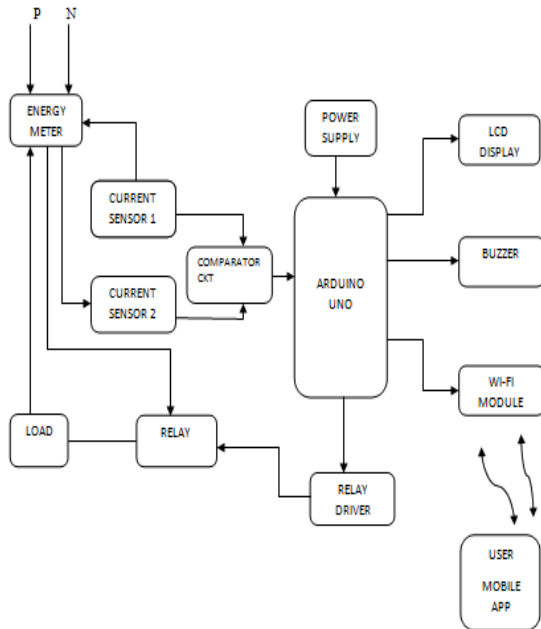
PROPOSED SYSTEM

Fig:Block diagram of IoT based Energy meter

The block diagram of IoT based energy meter and theft detection is as shown in Fig. The major components used in this system are Arduino, CT sensor, Energy meter, load, Relay, Buzzer, LCD display, load, Wi-Fi module. CT sensor 1 works as a main meter and CT sensor 2 works as a sub meter. Both these sensors are connected to Arduino controller using interfacing circuit. Interfacing circuit consist of voltage divider circuit and burden resistor for signal conditioning. Arduino collects the live meter readings from CT sensors. The readings are displayed on LCD connected to Arduino. During normal operation, readings of CT sensor 1 is equal to reading of CT sensor 2. if readings of both sensors are equal then no theft will be displayed on LCD and if there is difference between sensors reading then theft detected will displayed on LCD. If theft occur, then relay will operate for disconnecting the power supply.

Wi-fi module connected to Arduino through which data is accessed globally. The app shows reading of both sensors and theft detection. Thus, readings are displayed to service provider and consumer side.
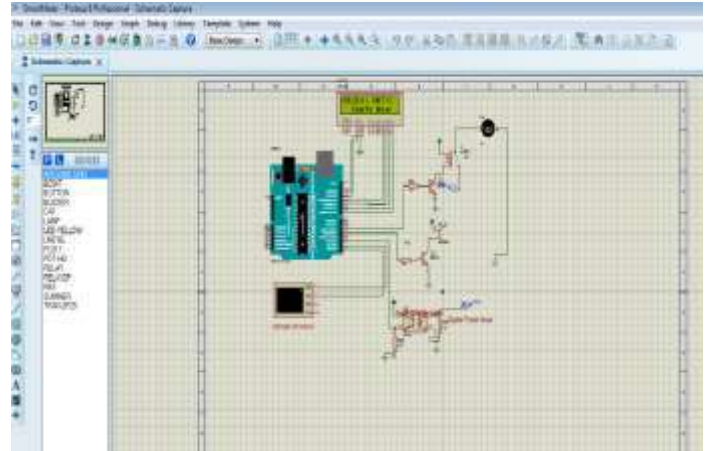
SYSTEM IMPLEMENTATION

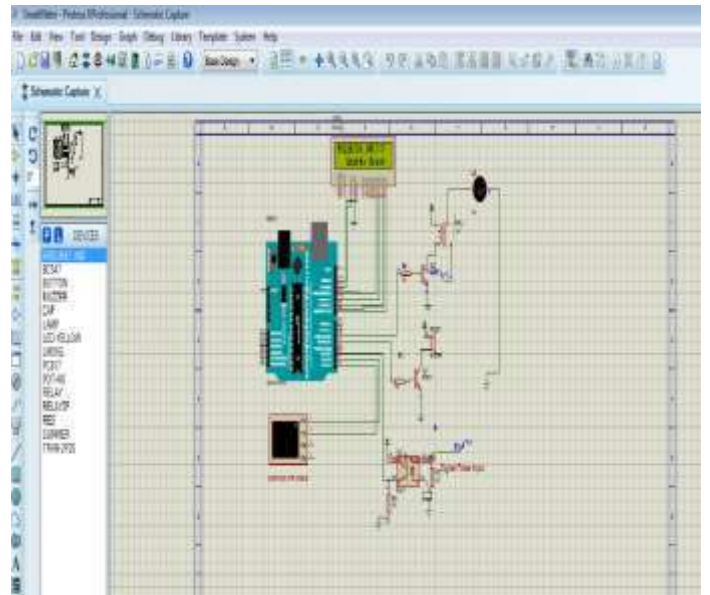**Fig: Energy meter reading displayed on LCD**

Fig: Above set point power automatically get cut off

Fig: Hardware setup for IOT based Energy meter

ADVANTAGES

1. Wi-Fi based user-friendly interfacing.
2. Low power consumption.
3. Controls high and low voltage devices.
4. Long life.
5. Wi-Fi wireless transmission.
6. Fast response.
7. Efficient and low cost design.

RESULT AND DISCUSSION

As sown in system implementation, normally energy meter reading displayed on LCD but when it crosses the set point then Arduino will process and cut off the power supply. Also, if difference occur between readings of CT1 &CT2 then theft is detected, and the message will displayed on LCD also same message is sent to service provider to take action against theft

CONCLUSION

- Energy monitoring using IOT is an innovative application of internet of things to control energy remotely over the cloud from anywhere.

- Energy load consumption is accessed through wi-fi & it will help to consumer to avoid unwanted use of energy.

- The system updates information in every second

REFERENCES

1. Darshan Iyer N, Dr.KA Radhakrishna Rao M. Tech. student, Dept. of ECE, PES College of Engineering, Mandya, Karnataka, India"IOT based Energy Meter Reading and Theft Detection and Disconnection using PLC modem and Power optimization", Vol.4, Issue 7, July 2015.

2. " Abhiraj Prashant Hiwale, Deepak Sudam Gaikwad, Akshay Ashok Dongare, Prathamesh Chandrakant Mhatre, DILKAP College, Neral, Maharashtra, India " IOT Based Smart Energy Monitoring", Vol. 5, Issue 3, March 2018.

3. Giri Prasad, Dept. of ECE, ," IoT Based Energy Meter", Issue March 2017.

4. Pooja D Talwar1, Prof. S B Kulkarni2 1PG Student, Department of VLSI Design and Embedded Systems, K.L.E. Dr.M.S.Sheshgiri college of engineering and technology, Belagavi, Karnataka,India, "IOT BASED ENERGY METER READING", International Journal of Recent Trends in Engineering & Research (IJRTER), Issue2016

5. Ajeeba A A1, Anna Thomas2, Risa Rasheed3,123 EEE Dept., Mar Athanasius College of Engineering, Kothamangalam, India,"IoT Based Energy Meter Reading, Theft Detection and Disconnection", International Research Journal of Engineering and Technology (IRJET), Volume: 04 Issue: 04 | Apr - 2017

6. Karthikeyan S1, Bhuvaneswari P.T.V2Department of Electronics EngineeringMadras Institute of Technology, Anna University,Chennai, India," IoT Based Real-Time Residential Energy Meter Monitoring System", 978-1-5090-3001-9/17/$31.00 ©2017 IEEE

7. Maha Aboelmaged*, Yasmeen Abdelghani*, Mohamed A. Abd El Ghany**Electronics Engineering Dept., German University in Cairo, Cairo, Egypt*Electronics Department, Germany," Wireless IoT based Metering System for Energy Efficient Smart Cites", 2017 29th International Conference on Microelectronics (ICM) 978-1-5386-4049-4/17/$31.00 ©2017 IEEE

8. F. Abate, M. Carratù, C. Liguori, M. Ferro, V. Paciello,Department of Industrial Engineering (DIIn)University of Salerno Via Giovanni Paolo II, 132 - Fisciano (SA) ITALY," Smart Meter for the IoT", 978-1-5386-2222-3/18/$31.00 ©2018 IEEE

9. S.V.Anushree 1, T. Shanthi 2 PG Scholar, Department of Electrical and Electronics Engineering, Kumaraguru College of Technology, Coimbatore, India," IoT Based Smart Energy Meter Monitoring and Theft Detection Using ATMEGA", International Journal of Innovative Research in Computer and Communication Engineering, Vol. 4, Issue 11, November 2016

10. S. Imran 1, Dr. K. Prahlada Rao 2 1P.G scholar, 2 Professor & principal JNTUA college of engineering , Ananthapuramu, A.P.,"IOT BASED ELECTRICITY ENERGY METER READING THROUGH INTERNET", International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES), Volume 3, Issue 11, November-2017

11. Birendrakumar Sahani, Tejashree Ravi, Akibjaved Tamboli, Ranjit Pisal, " IOT Based Smart Energy Meter", Vol.04, Issue 04, Apr.2017.