



Research Paper

# AUTOMATIC METER READING USING ZIGBEE WITH RENEWABLE ENERGY RESOURCE

T V Anathalakshmi<sup>1\*</sup> and P Naveenkumar<sup>2</sup>

\*Corresponding Author: **T V Anathalakshmi**, ✉ [ananthalakshmi.tv@ktr.srmuniv.ac.in](mailto:ananthalakshmi.tv@ktr.srmuniv.ac.in)

The automatic meter reading is the common approach for establishing two way communication between the households and grid. once smart grids came into line then every thing changes and a net metering of energy is to be monitored and send the data and energy back to the grid. since the energy is transferred back to the grid so we need to estimate the power transferring correctly. proposed paper is based on new monitoring approach for the smart monitoring and here we are transferring the energy back to grid and for this purpose we are going to produce the power using a renewable energy resource wind. In this way the Net metering is possible and customer can earn benefits.

**Keywords:** AMR, Smartgrid, Zigbee, Net Metering, Domestic Power Transfer

## INTRODUCTION

There is incorporation of mobile technology into MSEB automation system due to the rapidly advancing mobile communication technology and the decrease in costs. We propose a system that collects the energy consumption from residential as well as corporate zones and send it directly to the central server where processing is done on that data for preparation of bills. AMR system can be divided into wire AMR system and wireless AMR system according to communication medium used. In existing system for collection of energy consumption data is that the representatives of MSEB monthly comes and visit every residential, take the snap shot and corporate and manually reads the consumption

data from the meter. This collected data is recorded on a piece of paper along with a snap shot of the meter and finally submitted to the local MSEB office. There after the official's read the snap shot and meter readings and then gives it to the local software for bill calculations and generation of bill. We as a consumer then make the payment for the received bill. This process is so much hectic process. Man made mistakes can becountless. Human resources wasted and many other problems do occur. We finally thought of building a system that will do the above process automatically. Microcontroller is attached with our traditional energy meters that will Scan the meter reading after particular period. Wirelessly, these meters reading will transmitted to the centralized server along with their unique meter number. This

<sup>1</sup> Department of Electronics and Communication, SRM University, Chennai, India.

<sup>2</sup> Department of Embedded Systems, SRM University, Chennai, India.

data will be processed by the server and automatically generates the bill. After generation of bill it will send to every consumer via SMS facility.

### LITERATURE SURVEY AND RELATED WORKS

For measuring the usage of the consumption of energy electronic meter or electromechanical meter is fixed in existing system. Currently the meters take the recording kWh units. There are many AMR systems which are based on GPRS, Bluetooth, GSM technology. For long distance data transmission GPRS is used but it is impossible to implement as still the regular use of GPRS is not possible to common people. In GSM technology instant billing system is introduced but there may be chances of missing SMS which decreases system performance but in proposed system this problem is overcome.

### SYSTEM ARCHITECTURE

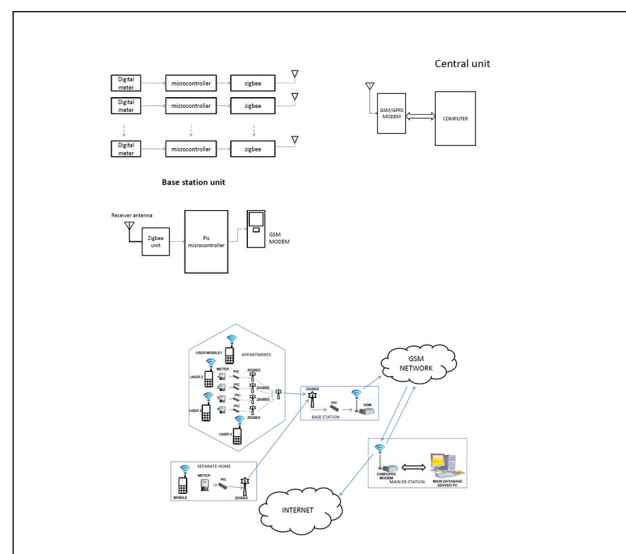
In proposed system, we replaced the traditional meter by metering module which consist of metering IC and microcontroller which scans the energy meter automatically after every month and transmits this collected data to the remote station. The AMR module will be having digital meter analog meter, microcontroller and zigbee module. The output from the digital meter will be pulse. All the data's will be stored in the temporary storage buffer. The microcontroller will be programmed such that for once in every thirty days the data, ie meter readings will be sent to the zigbee module. The power source will be operated by the Li battery of 5 volts. The AMR system will be in Sleep mode. once in thirty days the module will transmit the reading through the antenna ie Transreciever. through the GSM network. After receiving this data is stored in the database and process on it for the creation of bills. As soon as bills are generated, it will send to the consumers via GSM network.

### SYSTEM DESIGN

This GSM energy meter is constructed using the microcontroller, a display, GSM modem and microchip. In this, meter is designed using embedded GSM modem and by using existing GSM network to send wirelessly its energy consumption value as SMS to energy provider. At the time of sending the message every time, this data is stored in the non-volatile memory (EEPROM). We use RTC module also with meter to have all recording of usage details about energy consumption. In the office, the this GSM unit will receive these collected data and local software will process on that data and calculate the total power consumption of each user. The system design can be discussed as two broad categories, Hardware implementation and software web portal design implementation.

#### Hardware Implementation

In this system power supply is provided to meter. A GSM unit shows the interfacing with the microcontroller. Transmission of usage details is send to office modem using user modem. Every consumer has unique number provided by corresponding authority. Hardware implementation includes following points as discussed below.



### Power Supply

Power supply is provided to microcontroller and other device from direct ac lines or from AC to DC adapter.

### Eternal Eeprom Memory

This EEPROM memory device is used for storing the data in the form of amount of unit the user consumed the energy at the time of transmission of SMS i.e. for off line process.

### Real Time Clock (RTC)

RTC is used mainly for maintain the real time and date in the state of the system when power supply is off. RTC used for this system is DS1307 as it can run long years and also it has low cost.

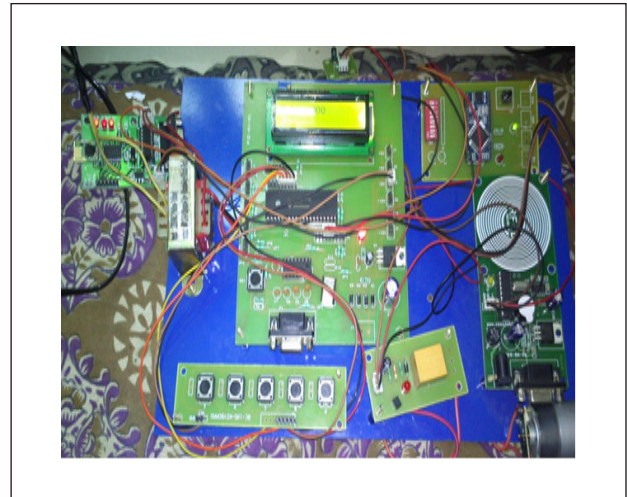
### Implementation

In The metering IC creates the output in the form of pulses which are counted using the default timer of PIC microcontroller unit. These pulses are identified by the transition of high and low voltage of the automatic voltage regulator. A TTL inverter circuit is used to reverse the produced pulse before applying to the counter. For reading the data from the metering IC, microcontroller is programmed using software interfacing. When microcontroller reads the energy usage, this data is stored and updated in software. In this, meter is measured for 1 unit of energy is used to update time date information. EEPROM is used to stored the content.

### Software Design Implementation

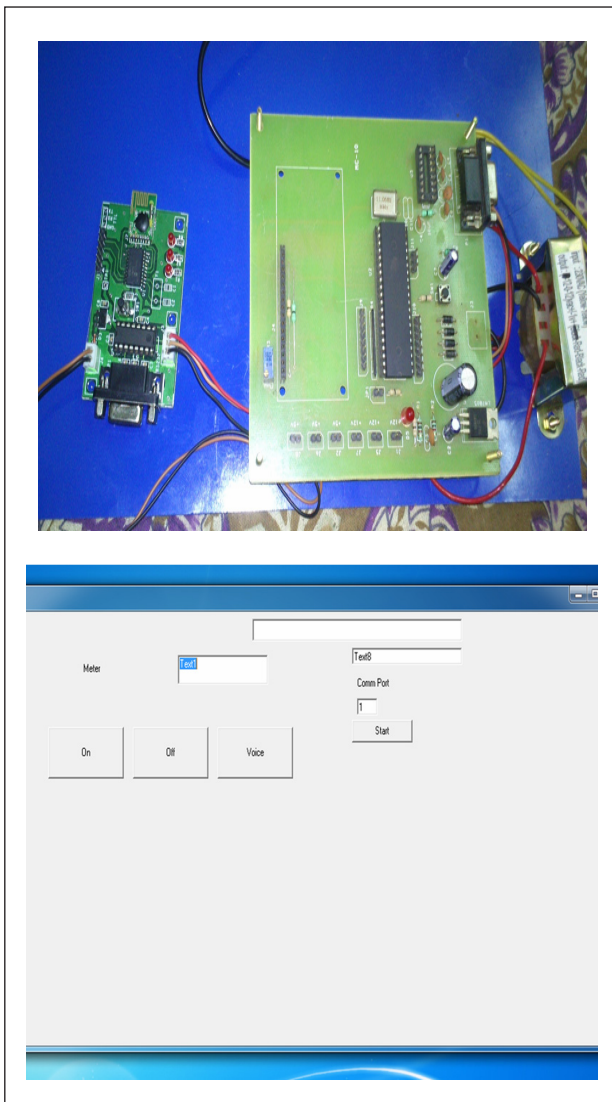
In software design part we have created web portal design. In this users are categorized as consumer and staff. Any time any where user can login using login option. Administrator can perform various tasks like registration, updating the database, message setting. Using serial port/USB admin can connect the GSM modem to web portal. For that initially hardware setup is required then selecting particular port admin can connect

to the system. For receiving SMS from meter. It is disconnected only when administrator disconnects it. Registration of consumers, preparation of bills is performed in this part.



### Automatic Bill Software

For managing all SMS readings, e-billing, updating the database we created web oriented GUI. It computes monthly bill, notify it to consumer through SMS facility and authority is provided for preparation of bills and analysis of collected of data. Net Beans 7.0 is used as integrated development environment with java framework. It is used to develop GUI and applications with the window form applications, websites, and web applications with proper coding. For this system source code is written in java. Once it is hosted user can access it through internet. In this application, we categorized users as a administrator and consumer. Administrators have various facilities like View customer details, View bill history and Add scratch card. New users have online registration facility through he/she gives all required details which is stored in database. Consumer also have various facilities provided like View current bill, View bill history, Recharge account, View account balance and Change pass



## CONCLUSION

Electronic meters have been developed at the higher level. The GSM networks plays an important role because it has good coverage facility and to manage fault tolerance. In this system, it manages the energy flow. The proposed system is highly effective as it provides security, accuracy at the higher level. SMS rates are standard for sending message to every consumer as per their electricity usage. The collected data is transmitted to the centralized sever in very fast manner therefore this system will be able to calculates the bills instantly.

## REFERENCES

1. A Abdollahi, M Dehghani and N Zamanzadeh (2007), "SMS-based Reconfigurable Automatic Meter Reading System", *IEEE International Conference on Control Applications* pp. 1103-1107.
2. C Brasek (2004), "Urban Utilities Warm up En-gineering", Vol. 15, No. 6, pp. 10-14.
3. C Jägerlind (2006), "Improvements for the Automatic Meter Reading Process in Electricity Distribution Companies", *Master Thesis, Dep. Industrial Info and Control Systems, Royal Institute of Technology, Stockholm, Sweden*.
4. C Nunn, P Moore and P Williams (1992), "Remote Meter Reading and Control Using High-performance plc Communication Over the Low Voltage and Medium Voltage Distribution Networks", in *7th International Conference on Metering Apparatus and Tariffs for Electricity Supply*, pp. 304-308.
5. H G Rodney Tan, C H Lee and V H Mok (2007), "Automatic Power Meter Reading System Using GSM Network", *Conference (IPEC)*
6. J Tsoi (2006), "Device Management of Largescale Amr Systems", MSc thesis, Dep. of Industrial Information and Control Systems, Royal Institute of Technology in Stockholm (KTH), Stockholm, Sweden 2006. T El-Djazairy, B J Beggs and I F Stewart, "Investigation of the use of the Global System for Mobile Communications (GSM) network for metering and load management telemetry", *Electricity Distribution. Part 1: Contributions. CIRED. 14th International Conference and Exhibition on (IEE Conf. Publ. No. 438)*.
7. Liting Cao Jingwen Tian Yanxia Liu (2008), "Remote Real Time Automatic Meter Reading

System Based on Wireless Sensor Networks”, Proceeding of 3rd *International Conference on Innovative Computing Information and Control*, (ICICIC-08), pp. 591 - 591.

8. Subhashis Maitra (2008), “Embedded Energy Meter-A New Concept To Measure the Energy Consumed by a Consumer and to Pay the Bill”, *Proceeding of Joint International Conference on Power system Technology and IEEE Power India Conference*, pp. 1-8.



**International Journal of Engineering Research and Science & Technology**

**Hyderabad, INDIA. Ph: +91-09441351700, 09059645577**

**E-mail: editorijerst@gmail.com or editor@ijerst.com**

**Website: www.ijerst.com**

