

IOT Based Digital Energy Meter for Remote Monitoring with Automatic Grid Changing

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ABSTRACT

Electricity has become one of the basic requirements for human life, being widely used for domestic, industrial and agricultural purposes. In our work, we propose a digital energy meter which measures the energy consumption and the energy measured is transmitted periodically to the remote server or user or electricity board so that energy consumption can be monitored from remote end. Additionally, an important concept used here is the IoT (Internet of Things). IoT is an emerging system with unique identifiers and having the ability to transfer data over a network without human-to-human or human-to-computer interaction. Here using IoT the meter readings are uploaded into our specific web page for remote monitoring.

Keywords : IoT, PIC microcontroller, Energy meter, Web page, LCD Display

I. INTRODUCTION

Digital signal processor or high-performance microprocessors are used in digital electric meters. Similar to the analog meters, voltage and current transducers are connected to a high-resolution ADC. Once it converts analog signals to digital samples, voltage and current samples are multiplied and integrated by digital circuits to measure the energy consumed. There are many methods of error correction in digital electricity meters which are usually based on the known methods of A/D converters error correction. Most of these methods use software correction based on calibration process. While in digital electricity meter, percentage error could be as low as 0.01%. On the other hand consumers are also not satisfied with the services of power companies. Most of the time they have complaints regarding statistical errors in their monthly bills the present system only provides feedback to the customer at the end of the month that how much power is consumed in the form of bill. The

consumer has no way to track their energy usage on a more immediate basis. The consumers are growing exponentially fast and load on power providing divisions is rapidly rising. In the existing system meter tampering can be done easily and it's one of the major drawbacks for an energy crisis.

II. LITERATURE SUEVY

2.1 "Arduino and GSM based smart energy meter for advanced metering and billing system"

Every management system is trying to make automatic, portable and remote control. This work presents a novel smart energy meter for automatic and superior metering and billing system. The integration of arduino and GSM short message service (SMS) provide the meter reading system with some automatic functions that are predefined.

Firstly, we have simulated the project in PROTEUS 8.0 then successfully implemented on the circuit

board in laboratory. The proposed energy meter system can incorporate with embedded controller and GSM module to transmit the data like consumed energy in kWh, generated bill, security service (line cut/On) over GSM mobile network such as data can be then fed and integrated into existing energy management system located at power companies or organizations to provide the services among the customers without man-power. Our implemented project is able to provide all required services remotely for metering and billing with high fidelity.

2.2 “Design and Development of GSM based energy Meter”

Traditional metering method for retrieving the energy data is not convenient and the cost of the data logging system is high. So this paper presents the design and development of Automatic meter reading (AMR) system. AMR system is a boom for remote monitoring and control domestic energy meter. AMR system gives the information of meter reading, power cut, total load used, power disconnect and tempering on request on regularly in particular interval through SMS. This information is being sent and received by concerned energy Provider Company with the help of global system for mobile communication (GSM) network. Energy providers receive the meter reading within a second without visiting person. AMR minimizes the number of traditional visits required by employees of energy provider company. This system not only reduces the labor cost but also increases meter reading accuracy and saves a huge amount of time.

2.3 “Smart Energy Meter with reading Indication using GSM”

This paper proposed the smart energy meter with reading indication using GSM. It developed to decrease the electricity consumption bill by providing the energy meter reading to the user with an alert message before increasing of unit charge. The reading from utility administration as SMS is being

received by smart energy meter programmable interface and the action is performed by the meter according to provided information. Microcontroller can be used to monitor and record the readings. In case of a customer defaulter, no need to send a person to utility cut-off; the utility can cut off and reconnect the customer connection by short message service. A PC with a GSM receiver at the end, which contains the database, acts as the billing point. Live meter reading from the GSM-enabled energy meter is sent back to billing point periodically and these details are updated in a central database. Furthermore, the customer can check the status of Electricity from anywhere. It provides ease in taking the meter readings, accuracy.

2.4 “An Improved ARM/AMI Approach for metering & Energy Monitoring”

The growing demand of energy in day to day life has also increased the demand of monitoring and managing it. So a connectivity solution for smart metering addresses the challenge of liable, secure and robust communications for remote metering and home energy management. Enabling remote metering with web connectivity is needed. In this paper, an AMR solution with standalone transceivers to complete system-on-chip with 32 bit ARM core and embedded memory.

III. METHODOLOGY

An electronic energy meter is presented in this paper which is capable to count bill, track theft. Current transformer (CT) is attached with line to measure current flowing through the load and a voltage divider network is connected to the line to measure terminal voltage of load. Then it multiplies them to get power in that instant. Then it processes these values of power to calculate the total power consumed by load.

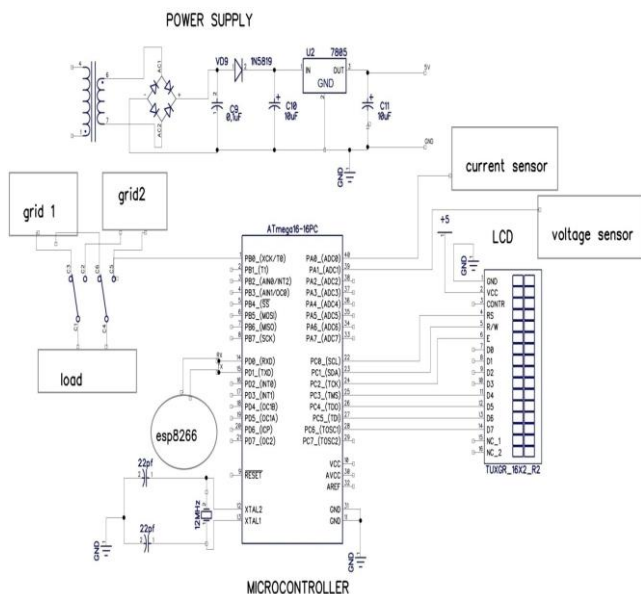


Fig 3.1: Smart Energy Meter

Automated billing of energy meter is made possible by connecting an IOT modem to the energy meter. As the authorities request for the units of energy consumption the same is send to them through IOT service from the energy meter. Automatic connection and disconnection can be done by passing a code such as a password from the board based on bill payment of the consumer through the IOT module. Once this code reaches the microcontroller at the consumer's end the supply to the load can be turned off or turned on. In case of industrial consumers, the maximum demand has to be recorded by a higher official from the board. Then this person has to official reset this maximum demand after recording it. This is a time consuming as well as a tedious job. Hence it is possible for the energy meter to transmit this data to the board and store it in a special register. This register can only be opened by a higher official from the board. This can be done by communicating the maximum demand with the board through IOT module. This detail with the energy meter serial number is stored in a particular register of the board's microcontroller and can be only accessed by a higher official using his password. Once this procedure is done then the maximum demand of the industrial consumer is reset. Detecting a fault in distribution system can be done by communicating between the distribution

transformer and the consumer's energy meter. If there is supply in the transformer and no supply in the consumers end it means that there is a line fault between the consumer and the distribution transformer. This communication is done with IOT.

IV. CONCLUSION

This system helps in control the energy consumption and avoiding energy wastage is very important. This is an Arduino based design and implementation of energy meter by using IOT concept. In the proposed system, meter reading system is designed to monitor continuously the meter reading and transfer the reading to certain server. This data can be access from anywhere on the globe at any time.

V. REFERENCES

- [1]. Sudhish N George and Ashna K, IOT based automatic energy meter reading system with instant billing, IEEE publications for International Multi-Conference on Automation, Computing, Communication, Control and Compressed Sensing (iMac4s), 2013 ,March 2013, pp. 65-71.
- [2]. Syed Khizar Ali Zaidi, Design and implementation of low cost electronic prepaid energy meter, Proceedings of the 12th IEEE International Multitopic Conference, December 23-24,2008, pp 548-552.
- [3]. H G Rodney Tan,C H Lee and V H Mok, Automatic power meter reading system using IOT network , The 8th International Power Engineering Conference (IPEC 2007) , pp. 465-469.
- [4]. A Geetha and Dr.K Jamuna, Smart metering system, International Conference on Information Communication and Embedded Systems (ICICES), 2013, pp 1-5.