Implementation of Live Energy with Tempered Detection Meter Using Zig-Bee

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Article Info

Article History

ABSTRACT

This paper shows the project Smart Energy Meter is necessary in accordance with energy meter market requirements. The system now uses the communication protocol ZigBee system. As the application requires high speed data, low power and low cost, ZigBee is used for this purpose. The remote wireless energy meter reading system is presented in this project. This seeks to address the weaker energy meter reading technology by combining the ZigBee technology characteristics with the IEEE 802.15.4 standard, the AVR ATMega16 microcontroller. The implementation of the hardware was planned and the Energy Meter case analyzed. The live measuring system is intended to simplify and efficiently control the current electricity billing system. The standard dissipation system is manually completed. An electricity committee employee will come to read and enter the card. Manual errors, processing delays, disturbances to the meter and misuse of electricity from other sources are more likely. It requires so many workers, one group of employees to record reading and another to cut power if the payment is not paid in good time and the service is very poor.

Keywords : Android app, Electric Meter, Smart Meter, IoT, Smart City

I. INTRODUCTION

India has one National Grid with an installed capacity of 330.86 GW as on 30 November 2017 in utility sector. Sustainable power plants established for 31.7% of all out introduced limit. During the year 2016-2017, the gross power generated by utilities in India was 1,236.39 TWh and the complete power generated in the country was 1,433.4 TWh. In 2016-2017, the total power utilization was 1,122 kWh per capita. India is the third biggest electricity generator in the world and stands fourth biggest country in the electricity consumption. The electric power utilized by the agricultural sector was recorded 17.89% in year 2015-

16 among all countries. In spite of less expensive power tax in India, the per capita power utilization is low contrasted with numerous nations.

The power generation capacity in India is surplus but the adequate infrastructure for supplying electricity to all needy people is lacking. In order to develop the infrastructure to to supply adequate electricity to all the needy people in the country by March 2019, the Government of India launched a scheme called "Power for All". This scheme will ensure continuous and uninterrupted power supply to all industries, households, and commercial establishments by improving necessary infrastructure. It's a joint responsibility by the Government of India with states to share funding and create overall growth of the economy.

The electricity sector in India is dominated by fossil fuels, particularly coal, which produced about two thirds of all electricity in the year 2016. However, only the investment of renewable energy is increased by the Government. The Draft National Electricity Plan of 2016 prepared by the Government of India states that the country does not need additional nonrenewable power plants in the utility sector until 2027, with the commissioning of 50,025 MW coal-based power plants under construction and achieving 275,000 MW total installed renewable power capacity. India became the third largest producer of electricity in the world with 4.8% of global share. Out of the total power generated the renewable energy constituted for about 28.43% and the non-renewable energy constituted for about 71.57% [1]. Electricity is the vital requirement for leading a comfortable life. It is to be properly used and managed. At present, the human operator from the Electricity Board visits the resident to take the readings from the energy meter and produces the bill for the particular month manually. The idea is being proposed to reduce the human interference to collect the monthly reading and to minimize the technical problems regarding the billing process.

In the present billing system, the distribution companies are unable to keep track of the changing maximum demand of consumers. The consumer is facing problems like receiving due bills for bills that have already been paid as well as poor reliability of electricity supply and quality even if bills are paid regularly. The remedy for all these problems is to keep track of the consumers load on timely basis, which will held to assure accurate billing, track maximum demand and to detect threshold value. These are all the features to be taken into account for designing an efficient energy billing system.

ZigBee 's wireless meter reading refers to the use, for the automation of reading and processing data, of shortened wireless communication technology and computer network technology. The technology used to read automated measurements via wireless network can not only save human resources, it can increase precision and real-time meters so that the management sector has timely and accurate access to data messages. Cable wiring can not save human and material resources, so investments are very cost-effective. Fast connections to wireless communication, the engineering cycle can be significantly shortened and scaled better than the cable system. If a fault occurs, only check wireless data module for causes quickly, and then restore the system back to normal operation.

This framework empowers the power division to read the meter readings month to month without an individual visiting each house. This can be accomplished by the utilization of Arduino unit that ceaselessly screen and records the energy meter reading in its lasting memory location. This framework ceaselessly records the reading and the live meter reading can be shown on Android App to the utilizer on demand.

The section I explains the Introduction. Section II presents the literature review of existing systems and Section III present proposed system architecture

Section VI concludes our proposed system. While at the end list of references paper are presented.

II. LITERATURE REVIEW

Here proposed a system [1] by utilizing a GSM shield module on microcontroller together with LDR sensor and relay. The system includes a provision of sending an SMS to user for update on energy consumption along with final bill generation along with the freedom of load re-configuration via SMS.

This system [2] gives the information on meter reading, power cut and the alert systems for producing an alarm when energy consumption exceeds beyond the specified limit. It extends the design and implementation of an energy monitoring system with the pre-intimation of power agenda using Arduino micro controller and a GSM module. Use of GSM makes complex and costly system to implement.

This system [3] controls and estimated the energy consumption by using ESP 8266 12E, a Wi-Fi module and uploads it to the cloud from where the consumer or producer can view the reading.

In paper [4] presented study about the computational needs of a futuristic smart energy meter. It presents performance analysis of such an energy meter on a single core and multi-core microcontroller platform. This study will help in understanding the computational needs of a futuristic smart energy meter and also in the design of a best fit and light weight RTOS for smart energy meters.

In [5], by utilizing the IoT capabilities, author designed and implemented a smart energy metering platform which consist of smart plugs, gateway and cloud server. The main purpose of SEM is to create the necessary infrastructure for collecting information on energy consumption of household appliances and monitor the environmental parameters and provide the necessary services to home users.

The methodology presented in [6] converted the existing system into an intelligent and efficient mechanism which would benefit both the ends i.e. the base station and the consumer. In this paper, a wireless method is proposed which puts emphasis on Intelligent Energy meter (IEM) reading and bill generation using Arduino Mega and Ethernet Shield. The monthly generated bill will be sent to the consumer through SMS using GSM900 and power of unpaid consumers would be disconnected utilizing a relay which would be controlled wirelessly by using the concept of the Internet of things (IoT).

In recent years many reforms have brought various changes to improve power services benefits across the country. Still there are a few issues in the framework, which influence the nature of administrations and in this manner the level of fulfilment of end clients or open. Among numerous uncertain issues, one of the issue is knowing the consumption by consumer's zone wise/region wise. Indeed, even after establishment of more precise electronic or advanced meters, the issue is proceeded in numerous areas across the country. In present framework the system received by the greater part of intensity supply organizations/offices for getting perusing for power utilization is the manual meter perusing or a portion of its variations like photograph realistic perusing, perusing SMS etc [7].

Some of recognized limitations of such methodology are ime expending, requires more human resources, efforts and Possibility of incorrect or purposeful manipulated controlling the power consumption etc. The proposed model evaluates previously mentioned methodology drawbacks and the present techniques with a computerized framework to remotely gather /control energy meter readings getting a capacity to continuous observing the power utilization. The model recommends establishment of Wi-Fi/GPRS

empowered energy meters at consumer end.

Such meters have capacity to get associated with the system (through remote or GPRS framework). Such system associated meters can be connected remotely to the server, status of perusing information and also other required information put away in the meters' memory can be gathered whenever [8].

These planned techniques will perform operations like consequently associating with the particular meters through their IP Address. Getting current information from the device. Refreshing reading tables at servers. Preparing list of consumer meters with any connection error or any invalid data. Thereby Initiating error reporting and removal routines according to the errors observed. The information gathered through remote meters in each calendar, at that point might be used from the database by the billing programs, the greater part of which are as of now in utilized by the power supply offices. As the framework does not require much changes in existing billing information/programs, it very well may be advantageously added to the present providers. The model through its planned automated activities, may carry higher execution with condition of control in power supply units.

Automation is a technique for controlling apparatuses naturally for the comfort of clients. Controlling of electrical gadgets in the home that can be modified utilizing a principle controller or even by means of mobile phone (GSM) from anyplace in the world [8]. It likewise includes turning on and off electrical apparatuses like air conditioners or refrigerators when a desired temperature has been reached. It additionally is utilized to secure a house from thieves by sending caution messages to the closest police station.

The main idea of the study [9] is to modernize our billing system using GSM. The GSM is a technique works on the principle of TDMA – time division multiple access and operates at the frequency off 900MHZ. The details of power displaced in the energy meter are transferred to the mobile using GSM and it also shows the units consumed by the load. If the number of units consumed by the total load exceeds certain limit means it will give a warning based on tariff and also we are doing to turn ON and turn OFF the load by setting a password to each load using GSM technique. Thus, with the help of this project, we can reduce the electricity bills.

III. SYSTEM ARCHITECTURE

System Architecture

The proposed system consist of following components

1. Energy Meter
2. Interfacing Device
3. Data Communication Media
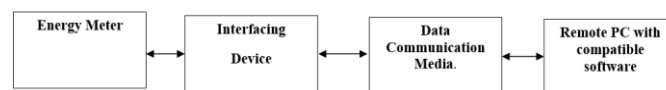4. Remote PC with compatible software
5. Zig-bee

Figure 1 Block Diagram

1. Energy Meter:

Energy meter is a device which is used to measure the energy consumed by the customer .Basically energy meter is of two types Electro-Mechanical meter and Digital meter. Now a days digital meter are used because they are having high accuracy, with limited control and theft detection capability at nodes.

2. Interfacing Device:

It is a device which takes out readings from meter and passes those readings to the remote pc through communication media. It also consists of a circuit which can switch ON/OFF power supply of customer.

3. Data Communication Media:

For transporting the data from the energy meter to the Host PC a communication media is necessary. Communication can be done by two ways, a. Wired Communication: power lines, phone lines, dedicated lines. Wireless Communication: RF, GSM, GPRS. Service provider can use any communication media depending upon the services available to the service provider.

4. Remote PC with compatible software:

The heart of the meter reading station is the Meter Reading Software which resides in the PC at the Meter Reading Station. It is a standalone system which is responsible for collecting meter reading, storing them to the data base, calculation of bills, switching ON/OFF of power supply, and providing analysis facility.

Working Methodology

The flow of the android app consist of following steps:

1. When the various appliances of the household consume energy the energy meter reads the reading continuously and this consumed load can be seen on meter.
2. We can see that the LED on meter continuously blinks which counts the meter reading. Based on
3. The blinking, the units are counted. Normally, 3200 blinks is one unit.
4. In our project we are trying to develop, a system in which Arduino Uno act as main controller, which continuously monitor energy meter.
5. As per the blinking of LED on energy meter the Arduino will measure the unit consumption.
6. The measured reading with the calculation of the cost will be continuously displayed on web page that we have designed.
7. Threshold value can be set on webpage with the help of Wi-Fi, as per the consumer's requirement. When the consumers reading will be near about to the set threshold value it will send a notification value to the consumer.

8. This threshold value notification will increase the awareness amongst the consumer about the energy.
9. When the consumer gets the notification he can visit the webpage and change the threshold value.
10. If the consumer is not aware with the threshold notification, then the meter will automatically get off. Then the consumer has to visit the webpage again and increment the threshold value. By the incrementation, the meter will automatically get ON.
11. Finally the overall monthly bill with cost will be sent to customer as well as service provider in the form of text at first day of every month.

IV. CONCLUSION

Great governance will be conceivable with this model. We could able to monitor the energy prerequisites of each consumer with very small time gap. It is low-cost, flexible, and robust system to continuously monitor the energy meter. Since it has low-power qualities, which empower it to be generally utilized in home and building environments. This system will be one more advancement towards the Digital India.

V. REFERENCES

[1] A Balasubramani, H U Sunil Kumar, N Madhu Kumar,"Cashless automatic rationing system by using GSM and RFID Technology", 2nd International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud), IEEE 2018.
[2] Subhasini Shukla ; Akash Patil ; Brightson Selvin,"A Step Towards Smart Ration Card System Using RFID & IoT", 2018 International Conference on Smart City and Emerging Technology (ICSCET), IEEE 2018.
[3] B. Gaikwad Priya, Sangita Nikumbh, "E-Public distribution system using SMART card and GSM technology", International Conference on Intelligent Sustainable Systems (ICISS), IEEE 2017.

[4] R Padmavathi, K.M Mohammed Azeezulla, P. Venkatesh, Kanchan Kumar Mahato, G Nithin,"Digitalized Aadhar enabled ration distribution using smart card",2nd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT), IEEE 2017.

[5] Chaitali Chandankhede, Debajyoti Mukhopadhyay,"A proposed architecture for automating public distribution system", International Conference on Computing, Communication and Automation (ICCCA), IEEE 2017.

[6] Md. Masudur Rahman, OhidulIslam, Md. SerazusSalak in," Arduino and GSM Based Smart Energy Meter for Advanced Metering and Billing System," Pabna University of Science and Technology, Pabna, Bangladesh 2015 IEEE.

[7] G. L. Prashanthi, K. V. Prasad, "Wireless power meter monitoring with power theft detection and intimation system using GSM and Zigbee networks", Journal of Electronics and Communication Engineering, vol. 9, no. 6, Nov - Dec. 2014.

[8] 8. K Ashna, Sudhish N George, "GSM Based Automatic Energy Meter Reading System with Instant Billing", This project was supported and financed by National Institute of Technology Calicut IEEE, 2013.

[9] Himshekar Das, L. C. Samika, GSM Enabled Smart Meter and Automation of Home Appliances, National Institute of Technology, Silchar, India 2015 IEEE

Cite this article as :