Prepaid Energy Meter Using GSM Technology & Android Application

Savita Dhaygude[1], Sonalika Bhalshinge[2], Rajeshwari Rathod[3], Ashwini Shresthi[4],

[123]*Student, Dept of E&TC, MMIT, Maharashtra, India*
[4]*Professor, Dept of E&TC, MMIT, Maharashtra, India*

Savitadhaygude14@gmail.com,bhalshingesonali.33@gmail.com,rajeshwarirathod79@gmail.com, ashreshthi@gmail.com

ABSTRACT

Prepaid power meter is a new concept in the measurement of electricity consumption on periodic basis. This method of measurement and data collection discards the conventional method of taking the meter reading manually. Though the prepaid energy meter displays the number of electrical units consumed by the user at the load center but on the other side, there is an urgent need to develop a system which will transmit the units consumed by the individual user to the power development department (PDD).This paper reports the design of a prepaid power meter which will be able to communicate based on GSM network; for the transparency between the user and the PDD. The GSM Automatic Power Meter Reading System (GAPMR) consists of an energy meter connected with the compatible microcontroller, a display device and compatible software to capture, transmit and maintain the record of the electricity consumption data of a particular user.

Keywords: *Automatic Meter Reading, Digital Power Meter, Global System Mobil, Android application.*

I.INTRODUCTION

GSM technology is used so that the consumer would receive messages about the consumption of power (in watts) and if it reaches the minimum amount, it would automatically alert the consumer to recharge. This technology holds good for all electricity distribution companies, private communities, IT parks and self-containing housing projects. The development of GSM infrastructure in past two decades made meter reading system wireless. The GSM infrastructure, which has national wide coverage can be used to request and retrieve power consumption notification over individual houses and flats. Apart from making readings using GSM communication, billing system is needed to be made prepaid to avoid unnecessary usage of power. It replaces traditional meter reading methods and enables remote access of existing energy meter by the energy provider. Also they can monitor the meter readings regularly without the person visiting each house.To design the prepaid Energy Meter for MSEB and android application for billing system & minimize the error by introducing a new system of Prepaid Energy Metering using GSM.

II. OBJECTIVES

1. To study about the prepaid energy meter with GSM technology.
2. To reduce the loss of power & revenue due to thefts & other illegal activities like the queue at Electricity billing.
3. To reduce the billing delay & give better consumer service.
4. Reduce the unnecessary wastage of power.

III. AIM

To Design a Prepaid Energy Meter for MSEB using GSM Technology & Android Application.

IV. RELATED WORK

1. Prepaid Energy Meer With GSM technology[1]
From this paper we Refer-

The Project is to minimize the queue at the electricity billing counters and to restrict the usages of electricity if the bill is not paid. Through The GSM Technology all the data of consumption of electricity will be Recorded. In these project the GSM Technology is used so that the consumer would receive messages about the consumption of power(in watts)[1]

2. Design of a Prepaid Power Meter with Communication facility based on GSM Network"[2]
From this paper we Refer-

This paper reports the design of a prepaid power meter which will be able to communicate based on GSM network; for the transparency between the user and the PDD. The GSM Automatic Power Meter Reading System (GAPMR) consists of an energy meter connected with the compatible microcontroller, a display device and compatible software to capture, transmit and maintain the record of the electricity consumption data of a particular user. In this method Using GSM Technology and conventional metering the power consumption or the consumption of electricity is recorded.[2]

3."Design and Implementation of Low Cost Electronic Prepaid Energy meter" [3].
From this paper we Refer-

In these system they used electromechanical meter due to these many countries switched to electronic metering system .Due to these meters electronic nature it has got no moving parts and hence the problem of stability & accuracy due to temperature changes are solved.

4." Rechargeable Prepaid Energy Meter Based On SMS Technology" [4]
From this paper we Refer-

In this paper a method is proposed to develop and design of Prepaid Energy Meter based on SMS (Short Messaging Service) technology. A Microcontroller is used as heart of the system. Energy Meter IC is giving output pulse to microcontroller, proportional to the energy consumed which is calculated by using counter and timer of microcontroller. A relay is used to make connection of load. If sufficient Energy unit is not available relay acts as open circuit. A LCD is used to display the how much energy unit left. A single phase prepaid energy meter is design to measure up to 40A and 220 V line to neutral line. To get the power signal, voltage signal and current signal of supply is multiplied. The amount of balance is stored on EEPROM of microcontroller. When balance is zero GSM modem will send SMS to customer for further recharge of energy units and power cut off until recharge is done. To make it more user friendly a warning massage is coded so that when fifty unit energy left customer will get an warning SMS. Two water heater of ratting 500Watt each (equivalent to total 1kW load) are used as load.

V. PROPOSED SYSTEM ARCHITECTURE

Explanation-

The primary contributions of this paper are as follows:

- Microcontroller:
  . *The ARM7TDMI processor core implements ARM architecture v4T. The processor supports both 32-bit and 16-bit instructions via the ARM and Thumb instruction sets.* which is heart of project.

- Buzzer
  A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke.

- Display
  4-bit data interface for compatibility with other Xilinx boards LCD_E, LCD_RS, LCD_RW line 16x2 Character

- Relay:
  It is on/off switch which uses 12V supply. It is use to make the switch on or off.

- Android
  Android is a software stack for mobile devices that includes an operating system, middleware and key applications. The Android SDK provides the tools and APIs necessary to begin developing applications on the Android platform using the Java programming language.

- GSM:
  The GSM technology is nothing but Global System for Mobile communication. It is a standard developed by the European telecommunication standard institute to describe protocols for 2G digital cellular networks used by mobile phones. It accepts SIM cards, and operates over a subscription to a mobile operator, just like mobile phones. It uses frequencies between 900-1800 MHz. Here SIM900 module is used. Through this GSM modem, SMS is delivered automatically to the subscriber about the transaction.

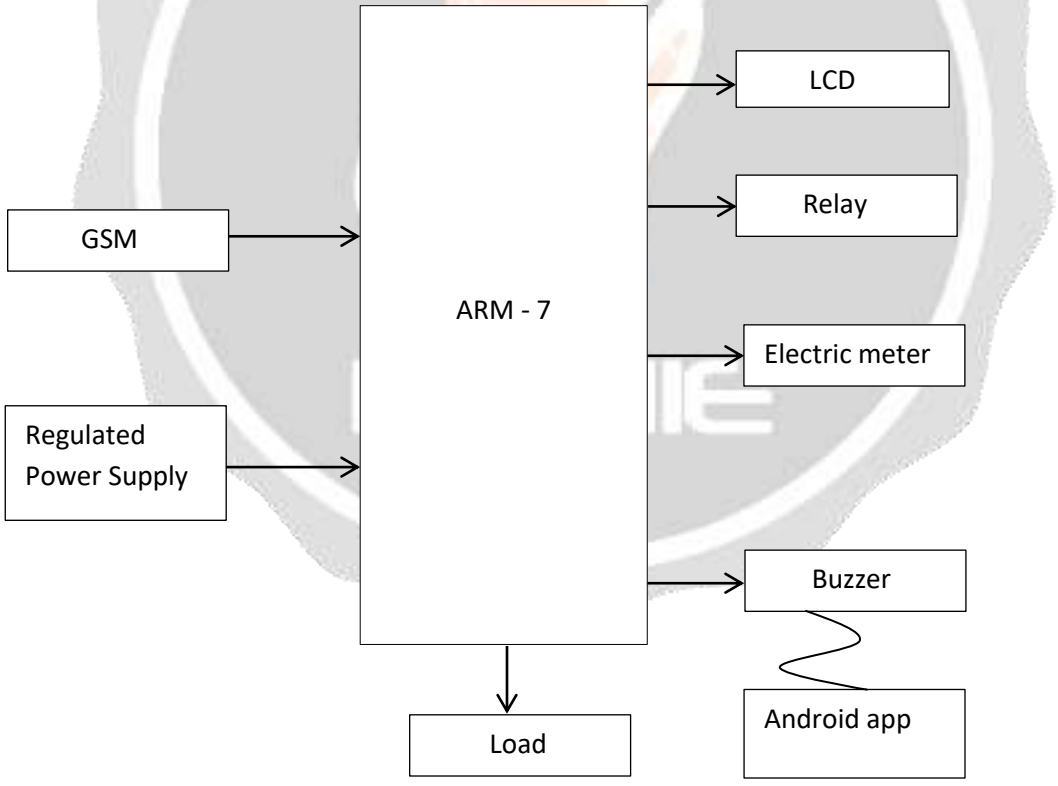

Fig1: Block Diagram

Explanation-

The Power Supply Provides 5V DC Supply to the Microcontroller , All the operation of the system will be controller and monitored by the controller. It is the heart of the system .

The GSM is used to make the transparency between the user and MSEB Through this GSM modem, SMS is delivered automatically to the subscriber about the transaction. LCD is used to display the information about the usages of electricity, amount of recharge, remaining power(in watts). Relay is used to on/off the switch. The MSEB recharge the no of power units to the users electric meter according to the recharge amount. Then the recharged power units(in watts) recharged by the MSEB is display on the electric meter. Buzzer indicates to recharge the electricity meter when the recharge amount reduces near to zero. The android application is develop to keep all the information about the transaction of electricity.

CONCLUSION

The design of Smart Energy meter using GSM technology can make the users to pay for the electricity before its consumption. In this way, consumers hold credit and then use the electricity until the credit is exhausted. If the available credit is exhausted then the electricity supply is cut-off by a relay. This reduces human labour and at the same time increases the efficiency in calculation of bills for used electricity. Smart energy meters will bring a solution of creating awareness on unnecessary wastage of power and will tend to reduce wastage of power. This module will reduce the burden of energy providing by establishing the connection easily and no theft of power will take place. This paper work exposes the purpose of energy monitoring and controlling by implementing prepaid system. It is hoped that this work helps the consumers for better energy management and its utility in the distribution system for economic liability of the Electrical Boards.

REFERENCES

[1] Mareena Johan Jubi K. "Prepaid Energy Meer With GSM technology" Year- IEEE 2013

[2] Rohit Nargotra,RitulaThakur ,Dr.S.Chatterji "Design of a Prepaid Power Meter with Communication facility based on GSM Network", IEEE January 2013

[3] Syed khizar Ali Zaidi,Hura Masroor,Syed Rehan Ashraf and Ahmed Hassan, "Design and Implementation of Low Cost Electronic Prepaid Energy meter", Proceedings of the 12th IEEE International Multitopic Conference, December 23-24, 2008,pp548-552.

[4] Subhasis Kar, Sayantan Dutta, Anusree Sarkar, Sougata Das The University Of Burdwan, West Bengal " *Rechargeable Prepaid Energy Meter Based On SMS Technology"*International Journal of Engineering and Innovative Technology (IJEIT) Volume 3, Issue 10, April 2014

[5] Ling Zou, Sihong Chu and Biao Guo.,"The Design of Prepayment Polyphase Smart Electricity Meter System," International Conference on Computing and Integrated Systems
(ICISS), pp. 430-432, 22-24, Dec 2010.

[6] Loss, P et al., "A Single Phase Microcontroller Based Energy Meter," IEEE Instrumentation and Measurement Technology Conference. St. Paul Minnesota, USA, May 18-21, 1998

[7] Devidas, A.R., Ramesh, M.V. "Wireless SmartGrid Design for Monitoring and Optimizing Electric Transmission in India," 2010 Fourth International Conference on Sensor Technologies and Applications (SENSORCOMM)," pp.637-640, 2010

[8] Md. Mejbaul Haque "Microcontroller Based Single Phase Digital Prepaid Energy Meter for Improved Metering" International Journal of Power Electronics and Drive System (IJPEDS) December 2011, pp. 139~147