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# Smart Power System For Metering Network

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**ABSTRACT—RFID is one of the wireless technology used as a replacement for bar codes. It has a tag and a RFID reader. A RFID tag is sometimes called a transponder which consists of a chip, memory and an antenna. RFID reader acts as both transmitter and the receiver. Hence it is very easy to deploy a Smart power system using RFID. IR sensors are built for sensing the unit from theEnergy meter. This paper explains about the Smartway of using the metering networks.It makes an easy way to pay the electricity bill by recharge method using RFID reader.It reduces the time duration and problem faced by standing in long queues at the electricity board office.**

**Keywords---Smart metering network, Energy meter, Smart grid.**

## I. INTRODUCTION

The electric transmission and distribution networks gain smartness from the use of renewable energies and latest measurement technologies also the utilize become smart .In a modern utility several energy sources are present and energy efficiency has to be guaranteed. Therefore in order to be a smart utility it has to be equippedwith a measurement and control network to efficiently manage the various energy sources and loads ([1]-[7]). The key element of such a measurement and control network could be a smart meter. In this the energy meter measures the amount of electric energyconsumed by a residence. Electric utilities use electric meters installed at customers' premises to measure electric energy delivered to their customers for billing purposes. They are typically calibrated in billing units, the most common one being the kilowatt hour [*kWh*].They are usually read once each billing period. When energy savings during certain periods are desired, some meters may measure demand, the maximum use of power in some interval. "Time of day" metering allows electric rates to be changed during a day, to record usage during peak high-cost periods and off-peak, lower-cost, periods. Also, in some areas meters have relays for demand response load shedding during peak load periods.Electricity meters are required to register the energy consumed within an acceptable degree of accuracy. Any significant error in the registered energy can represent a loss to the electricity supplier, or the consumer being over billed. The accuracy is generally laid down in statute for the location in which the meter is installed. Statutory provisions should also specify a procedure to be followed should the accuracy be disputed.

For the United Kingdom, any installed electricity meter is required to accurately record the consumed energy, but it is permitted to under-read by 3.5%, or over-read by 2.5%.Disputed meters are initially verified with a check meter operating alongside the disputed meter. The final resort is for the disputed meter to be fully tested both in the installed location and at a specialist calibration laboratory.Approximately 93% of disputed meters are found to be operating satisfactorily. A refund of electricity paid for, but not consumed (but not vice versa) will only be made if the laboratory are able to estimate how long the meter has been unregistering. This contrasts with gas meters where if a meter is found to be under reading, it is assumed that it has under read for as long as the consumer has had a gas supply through it.By knowing information regarding energy usage and prices, consumers can manage their activities and energy expenditures accordingly. Service providers can maintain system security and reduce the cost through a series of operating activities including remote reading, configuration disconnection outage identification resolution of serviceproblem,and load control. A smart energy meters enables more efficient energy production and consumption, which help to reduce redundant capacity of generation and distribution. Due to the rapid development of IENs and increasingly strict requirements on metering and transparent information, smart metering technologies have been broadly applied in many European countries and United States and a great number of technical progresses have been achieved.

Acomprehensivereview on the features and technologies that can be integrated with a smart electricity meter is achieved. The outlined various

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features and challenges involved in design, development, utilization and maintenance of smart electricity grids and addressed the need for implementing smart meters especially in developing countries. There is a huge and urgent requirement to save energy in the heating sector by improving energy efficiency of heat supply and adapting effective load management on the demand side, whichimplies a great potential for the implementation of smart energy meters.

## II.SMART METER

SMARTMETER is an electronic device that records consumption of electric energy in intervals of an hour or less communication information at least daily back to the utility for monitoring and billing. Smart meters enable two-way communication between the meter and the central system. Unlike home energy monitors, smart meters can gather data for remote reporting. Such an advanced metering infrastructure (AMI) differs from traditional automatic meter reading (AMR) in that it enables two-way communications with the meter.

They offer additional functionality including a real-time or near real-time reads, poweroutage notification, and power quality monitoring. They allow price setting agencies to introduce different prices for consumption based on the time of day and the season.Another type of smart meter uses to automatically determine the number and type of appliances in a residence, how much energy each uses and when. This meter is used by electric utilities to do surveys of energy use. It eliminates the need to put timers on all of the appliances in a house to determine how much energy each uses.

## III.RELATED WORK

The standard business model of electricity retailing involves the electricity company billing the customer for the amount of energy used in the previous month or quarter. In some countries, if the retailer believes that the customer may not pay the bill, a prepayment meter may be installed. This requires the customer to make advance payment before electricity can be used. If the available credit is exhausted then the supply of electricity is cut off by a relay. In the UK, mechanical prepayment meters used to be common in rented accommodation. Disadvantages of these included the need for regular visits to remove cash, and risk of theft of the cash in the meter. Modern solid-state electricity meters, in conjunction with smart cards, have removed these disadvantages and such meters are commonly used for customers considered to be a poor credit risk. In the UK, customers can use organisations such as the Post OfficePayPointnetwork, where rechargeable tokens (Quantum cards for natural gas, or plastic "keys" for electricity) can be loaded with whatever money the customer has available.

In South Africa, Sudan and Northern Ireland prepaid meters are recharged by entering a unique, encoded twenty digit number using a keypad. This makes the tokens, essentially a slip of paper, very cheap to produce. Around the world, experiments are going on, especially in developing countries, to test pre-payment systems. In some cases, prepayment meters have not been accepted by customers. There are various groups, such as the Standard Transfer Specification (STS) association, which promote common standards for prepayment metering systems across manufacturers. Prepaid meters using the STS standard are used in many countries.[19][20][21]

## IV.EXISTING METHOD

The significant increase in energy consumption and the rapid development of renewable energy, such as solar power and wind power, have brought huge challenges to energy security development of energy networks towards a more intelligent direction. Smart meters are the most fundamental components in the intelligent networks.in addition to measuring the energy flows, smart energy meters can exchange the information on energy consumption and status of energy networks between utility companies and consumers.Measured data are usually displayed on an analogue counter and have to be manually recorded. Smart meters are operated in two-way communication regarding the information of energy consumption and billing and the status of energy networks.The capability of operating two-way communication is the most important feature that distinguishes conventional meters and smart meters.

InElectricitymeters variety of models available on the market today but they all work on the same basic principle. The meter is plugged into an outlet, and the appliance to be measured is plugged into the meter. Such meters can help in energy conservation by identifying major energy users, or devices that consume excessive standby power. Web resources can also be

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used, if an estimate of the power consumption is enough for the research purposes. [19] A power meter can often be borrowed from the local power authorities. [20] or a local public library.[19][2o]

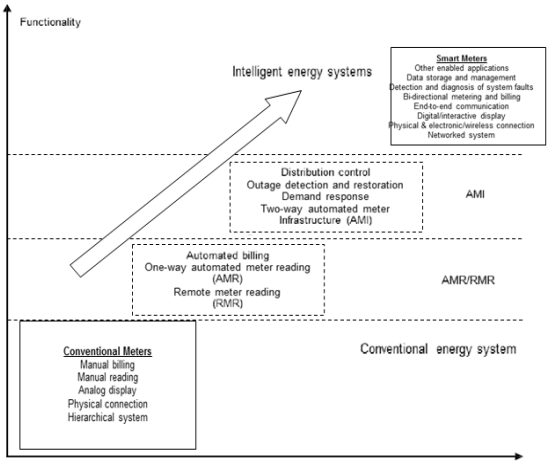


Figure 4.1 Development of Smart Energy System

## v.PROPOSED METHOD

The proposed method explains about the Smart way of using the metering networks. It makes an easy way to pay the electricity bill by recharge method using RFID reader. It reduces the time duration and problem faced by standing in long queues at the electricity board office. The GSM (global system for mobile communication) used to get intimation before the recharge amount gets zero.

**Advantages of proposed system:**

- Easy way to pay our electricity bill**.**
- Manual billing and manual reading is reduced**.**
- Analog display is replaced by digital display.
- Reduced time duration.

### *A.MICROCONTROLLER*

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the Industry-standard 80C51 instruction set and pin on the AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry.

In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM con-tents but freezes the oscillator, disabling all other chipfunctions until the next interrupt or hardware reset. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

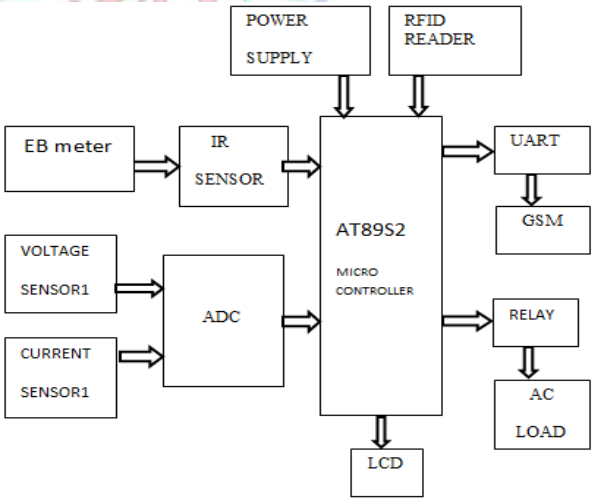


Figure 5.1 Block Diagram

### *B.GLOBAL SYSTEM FOR MOBILE COMMUNICATION—GSM*

The GSM system is the most widely used cellular technology in use in the world today. Global System for Mobile Communications was designed as a second generation (2G) cellular phone technology by using a

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digital TDMA (time division multiple access approach). GSM cellular technology uses 200 kHz RF channels. These are time division multiplexed to enable up to eight users to access each carrier. In this way it is a TDMA / FDMA system. *BSS – the base station system (BSS) is composed of one or more base station controllers (BSC)*and one or more base transceiver stations (BTS).

The BTS contains one or more transceivers(TRX). The TRX is responsible for radio signal transmission and reception. BTS and BSC are connected through the interface. The BSS is connected to the MSC through the A interface .When a call is established towards a GSM subscriber, a GMSC contacts the HLR of that subscriber, to obtain the address of the MSC where that subscriber is currently registered. That MSC address is used to route the call to that subscriber. Christo Ananth et al.[5] discussed about E-plane and H-plane patterns which forms the basis of Microwave Engineering principles. Christo Ananth et al.[6] discussed about principles of Semiconductors which forms the basis of Electronic Devices and Components.

*C. SENSORS*:

1. *Voltage sensor*

Voltage amplification is required for a class of sensors that create small voltages. Often sensors of this type are converting some sort of physical energy such as acceleration, temperature, or other minimal physical force into a voltage. This conversion is often an inefficient conversion and the measured energy is minimal which results in very small voltages generated by the sensor. To make these small voltages meaningful, they must be amplified to a usable level. Voltage amplification is required for a class of sensors that create small voltages. Often sensors of this type are converting some sort of physical energy such as acceleration, temperature, or other minimal physical force into a voltage. This conversion is often an inefficient conversion and the measured energy is minimal which results in very small voltages generated by the sensor. To make these small voltages meaningful, they must be amplified to a usable level.

2. *Current sensor*

A current sensor is a device that detects electrical current (AC or DC) in a wire, and generates a signal proportional to it. The generated signal could be analog voltage or current or even digital output. It can be then utilized to display the measured current in an ammeter or can be stored for further analysis in a data acquisition system or can be utilized for control purpose. AC current input, analog output, which duplicates the wave shape of the sensed current bipolar output, which duplicates the wave shape of the sensed current unipolar output, which is proportional to the average or RMS value of the sensed current .DC current input, unipolar, with a unipolar output, which duplicates the wave shape of the sensed current digital output, which switches when the sensed current exceeds a certain threshold.

D. *LIQUID CRYSTAL DISPLAY:*

Liquid Crystal Display (LCD) consists of rod-shaped tiny molecules sandwiched between a flat piece of glass and an opaque substrate. These rod-shaped molecules in between the plates align into two different physical positions based on the electric charge applied to them.When electric charge is applied they align to block the light entering through them, where as when no-charge is applied they become transparent.Light passing through makes the desired images appear. This is the basic concept behind LCD displays. LCDs are most commonly used because of their advantages over other display technologies. They are thin and flat and consume very small amount of power compared to LED displays and cathode ray tubes (CRTs). LCDs have become very popular over recent years for information display in many ‘smart’ appliances. They are usually controlled by microcontrollers. They make complicated equipment easier to operate.

*E. BUZZER*

Beeper (BUZZER)is a signaling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows. It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound. Initially this device was based on an electromechanical system which was

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identical to an electric bell without the metal gong., it is more popular to use a ceramic-based piezoelectricsounder which makes a high-pitched tone.

## VI. CONCLUSION

This project presents the design and modelling of a RFID Reader -based Energy Recharge System forprepaidMetering. The present system of energy billing in India is error prone and also time and labour consuming. Errors get introduced at every stage of energy billing like errors with electromechanical meters, human errors, processing errors. The aim of the project is to minimize the problem by introducing a new system of Prepaid Energy Metering using RFID Reader. The process of reading of energy meter is done by LCD which is more simpler than that for analog meter .If the consumer will not pay the bill then there is no need of man to go & cut the power supply, here the model has the advantage that if consumer will not pay the money then after consuming the rest unit it will automatically disconnect the load from power supply. This energy meter has the potential to change the traditional billing system. The energy billing system may help the energy distribution companies to reduce costs and increase profits, to improve metering and billing accuracy and efficiency, and to contribute the energy in a sustainable way.

## VII. REFERENCES

[1]. E.g., Minnkota Power's Load Management System, accessed 22 August 2009.

[2]. Graeme Gooday The morals of measurement: accuracy, irony,and trust in late Victorian electrical practice, Cambridge University Press, 2004 ISBN 0-521-43098-4, p 232–241

[3]. Whyte, Adam Gowans (1930). Forty Years of Electrical Progress. London: Ernest Benn. pp. 31,**159**.

[4]. Eugenii Katz. "Blathy". People.clarkson.edu. Archived from the original on June 25, 2008. Retrieved 2009-08-04.

[5]. Christo Ananth, S.Esakki Rajavel, S.Allwin Devaraj, M.Suresh Chinnathampy. "RF and Microwave Engineering (Microwave Engineering).", ACES Publishers, Tirunelveli, India, ISBN: 978-81-910-747-5-8, Volume 1,June 2014, pp:1-300.

[6] Christo Ananth, S.Esakki Rajavel, S.Allwin Devaraj, P.Kannan. "Electronic Devices.", ACES Publishers, Tirunelveli, India, ISBN: 978-81-910-747-6-5, Volume 2,December 2014, pp:1-300.

[7] .The Electrical engineer, Volume 5. (February, 1890)

[8]The Electrician, Volume 50. 1923

[9]"Genus Power Infrastructures Ltd". The Times Of India.

[10] Chen and J. D.Mccalley,"Identifying high risk N-k contingencie for online security assessment," IEEE Trans. Pow. Syst., vol. 20, no. 2 pp. 823–834, May. 2005

[11] J. Mitra and C. Singh, "Incorporating the DC Load Flow Model in the Decomposition–Simulation Method of Multi-Area ReliabilityEvaluation," IEEE Trans. on Power Systems, Vol. 11, No. 3, pp. 1245– 1254, Aug. 1996

[12] Graph Matrices. Available online at: http://www. Compalg inf.elte.hu/tony/Oktatas/TDK/FINAL/Chap, 2010.PDF

[13] R.Diestel, Graph Theory. Elec. Ed Springer-Verlag New York: 2000.

[14] Chandler, T. 2005. "The technology development of automatic metering and monitoring systems". Power Engineering Conference, 2005. IPEC 2005. The 7th International, Vol., No., pp.1-147.

[15] Syed Khizar Ali Zaidi I, HuraMasroor I, Syed Rehan Ashraf I and Ahmed Hassan, "Design and Implementation of Low Cost Electronic Prepaid Energy Meter", NED University of Engineering and Technology, Karachi, Pakistan, 2010.

[16] HuraMasroor I, Syed Rehan Ashraf I and Ahmed Hassan, "Design and Implementation of low cost Electronic Prepaid Energy Meter', NED University of Engineering and technology, Karachi, Pakistan, 2010.

[17] Jain and Bagree , "A prepaid meter using mobile communication" , International Journal of Engineering, Science and 164 Technology, Vol. 3, No. 3, 2011, pp. 160-166.

[18] RichaShrivastava and Nipun Kumar Mishra, "An Embedded System for Wireless Prepaid Billing of Digital Energy Meter," International Journal of Advances in Electronics Engineering, pp. 322-324.

[19] H.G.RodenyTan,C.H.Lee and V.H.Mok, "Automatic power meter reading system using GSM network", IEEE , pp.465-469, The 8th International Power Engineering Conference (IPEC 2007).

[20] Dr.MohdYunus B Nayan1, AryoHandokoPrimicanta2009. Hybrid System Automatic Meter Reading.International Conference on computer technology andDevelopment,(ICCTD -09), pp: 264-267

[21] Kwang-il Hwang 2009. Fault-tolerant ZigBee-based Automatic Meter Reading Infrastructure. Journal ofInformation Processing Systems, Vol.5, No.4, pp:221-228.