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PREPAID ENERGY METER USING SMART CARDS

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Abstract - *The purpose of this project is to design and develop an intelligent energy metering system that can efficiently control the amount of electricity consumed by the user. Electricity users can buy specific amount of energy to use it only when they needed .This is achieved by interfacing energy meter with smart card technology.Financial card issuers are moving to replace magnetic stripe cards with chip cards to reduce counterfeiting and Fraud. This project features a smart card secure solution for a novel prepaid electricity system. Since the last decades of the past century, scientists and researchers have been worried about energy conservation. People spend much more power than what they actually need and that results in a huge loss of energy. Moreover, the continuous increase in the universal energy prices has resulted in a huge economical loss. Thus we are proposing a prepaid electricity smart card based system so people can buy specific amount of energy to use it only when they need. The purpose of this project is to reduce The power bill defaulter using smart card technology. Smart card based prepaid electricity is a unique and new concept which saves lot of time and power for electricity department. User can recharge the card whenever the power is required. People now can buy electricity in advance, using the so-called prepaid electricity cards in the form of smart cards. The proposed prepaid smart card can also be used to manage electricity consumption in a hotel room. Thus, people can consume only as much power as they really need.*

***Key Words*: Prepaid, Wastage, Billing System, Threshold limit, RFID Card, ATmega328, Relay, Software**

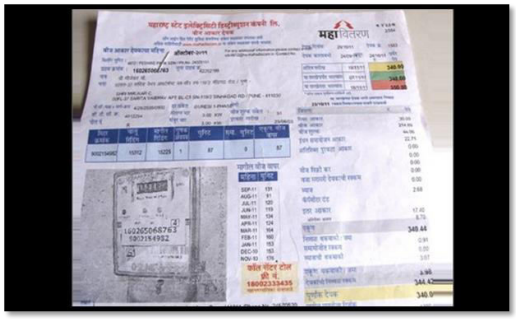
1.INTRODUCTION:

Every month we can see a person standing in front of our house from Electricity board, whose duty is to read the energy meter and handover the bills to the owner of that house. According to that reading we have to pay the bills. The main drawback of this system is that person has to go area by area and he has to read the meter of every house and handover the bills. The present billing system is minimally able to detect power theft and even when it does it is at the end of the month. Also, the distribution company is facing many problems in terms of losses. The distribution company is unable to keep track of the changing maximum demand for domestic 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 a timely basis, which will help assure accurate billing, track maximum demand, and detect online theft. These are all the features to be taken into account for designing an efficient energy billing system. The main motive of this system is pay before use. The main objective is to minimize the illegal usage of electricity, reduce power wastage due to its theft and to control the usage of power on the consumer side and thus increase the overall efficiency of power system. The conventional energy meters have not been replaced, but a small modification on the already installed meters can change the existing meters into prepaid meters, so these meters are very cheap.

1.1 PRESENT BILLING SYSTEM:

The present traditional billing system have many problems like problem of payment collection, energy thefts etc. due to which the traditional billing system is slow, costly and unreliable. The

present billing system has chances of error and it is also time or labor consuming. Man power required for the present billing system is also more. Present billing system is not secured.



1.2 PROPOSED SYSTEM:

a design of digital energy meter for improved metering and billing system.Poly-phase prepaid energy metering system has also been proposed and developed based on local prepayment and card reader. Another paper suggests prepaid energy mater using a microcontroller from microchip technology Inc. PIC family, used due to low cost of microcontrollers. The prolonged discussion clearly defines the architecture of smart metering system. The architecture proposed in this study is a multifunctional approach to read the energy meters located at the consumer sites. This report states that out of total energy generated only 55% is billed and only 41% is realized.

2. BLOCK DIAGRAM:

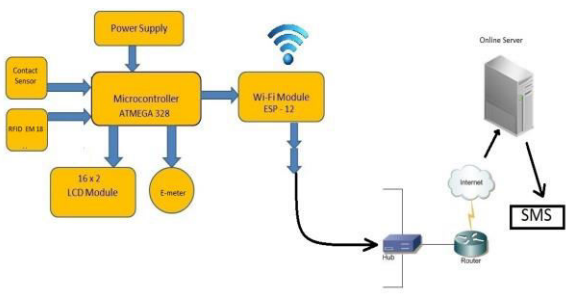


Fig.2.1.Block Diagram

The main components of this system are Microcontroller(ATmega328), RFID Card and card reader(EM-18), relay driver circuit, energy meter and optocoupler, Wi-Fi(ESP-12) and a regulated power supply. The figure -1 shows the block diagram of a prepaid electricity system.

The proposed system consists of two sections-a hardware section installed at the consumer side and a software section installed at the utility side. The software section is coded in "ARDUNIO IDE" and it enables two modes- recharge mode and reading mode. The simulation of the system is done in Proteus.

The regulated power supply system block consists of a step down transformer, rectifier and filter and a voltage regulator. The 230V supply is first stepped down to 12V and is the then rectified using a bridge rectifier. It is then filtered using an inductor-capacitor unit. The voltage regulator limits it to 5V .This is given as the input power to microcontroller and other units. The RFID card is given a default amount of Rs.5 The load is connected to the hardware section and the program coded in "ARDUNIO IDE" is run. The RFID card is swiped in the card reader. The amount credited in the card is read and is then passed on to the microcontroller. It checks if the amount is within the limits and if true then the consumer can consume energy. The pulses consumed are read by the energy meter and using an optocoupler it is coupled to the microcontroller. The OLED connected to the microcontroller displays the pulses and the amount being consumed. For each pulse consumed Rs.0.5 is deducted from the main balance and is always cross checked with the threshold value. Once it goes below the limit the relay coil is de-ignited but supply is not cut off at that point it goes negative value in consumer account and this amount is deducted from the next recharge which is done by the consumer all this things are done in programming. In order to recharge the information is passed on to the utility section. Using the

recharge mode in the software the card is again recharged for the required amount.

3. CONCLUSIONS

The prototype of the system has been developed and tested successfully. The advantage of the prepaid metering system and its design components have been discussed. This prepaid metering system minimize the human intervention in meter reading, bill calculations and billing delivery which ultimately reduces many defects than the currently existing postpaid billing systems. The modeling shows that the consumer is never allowed to consume more than what he has paid for an entitled to request a recharge for continued supply. According to the usage of every consumer, the default amount is entered in the program. Such that, when the user swipes the card on the meter the default amount gets recharged and the supply passes to the load. With the help of GSM module the intimation is passed to the server . if more such systems are implemented, then it can be connected to a server and functioned as same as mobile network. This system was specially designed for India but can also be implemented in any other country. This is certainly beneficial to both consumers and power distribution companies

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