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# Design and Development of GSM Based Prepaid Energy Meter

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***Abstract* - The current method of preparing electricity bill payment is hectic and consumes lots of time in remote areas where technology advancement is taking place at a slower rate. Even the electricity supplier has to deal with many flaws of the current electricity distribution system such as meter tampering, non-payment of bill on time by consumers, electricity theft issues, difference in electricity generated and electricity consumed etc. The faulty system can contribute to many flaws such as mechanical errors, human errors, wrong photo of meter, blurred meter reading due to dust & dirt on energy meters. The remedy for this drawback is a prepaid energy billing. The automatic prepaid billing system can keep track of the real time usage/consumption. The consumer can recharge the system as per his/her need. The project aims to reduce the consumer lines at the billing counters. The project also aims to propose a system that will decrease the loss of power transmission agency and revenue loss due to power thefts and other illegal activities. The GSM technology is used so that the customer can receive SMS about the consumption of power (in kW/hr) and when it reaches a minimum balance, it would automatically alert the consumer to recharge. The results do provide good feedback and future scope for this project as it is bound to do away with flaws of current billing system e.g. the problems of unpaid bills and human error in meter readings are thereby will be reduced using this prepaid based energy meter.**

***Keywords:*** Automated Billing System, GSM technology, Prepaid, Utility.

## I. INTRODUCTION

In today's world the need for electricity and its reach is increasing at a massive rate. Electric power is the backbone of modern industrial society and is expected to remain so in the near future. The demand for electricity increases rapidly as a nation modernizes and develops its economy.

Our current method of electricity bill payment and manual collection of meter reading by man power is hectic, consumes lots of time, and leads to loss of revenue. The current system has loop holes in electricity distribution system and many takes advantage of this which causes loss to the government and mainly to the loss to the economy of our nation. Many people use illegal methods for electricity theft like energy meter tampering, stealing the electricity from government electricity poles etc. There is requirement for better system which can do away with these kinds of loopholes because for generation and transmission of electricity it requires lots of capital and government hires private companies for that. if the electricity distribution system won't run in profit or meet their requirement then the cost per unit increases and other fines also increases which puts burden on common people who honestly pays taxes and pay for their electricity consumption. The prepaid energy system is latest trend in the electricity distribution system. It makes the consumer to pay for their consumption units beforehand like using a prepaid mobile recharge facility. The prepaid energy system has many benefits and makes the system more efficient for both the supplier and consumer of electricity.

This system reduces losses, consumption of units is monitored in effective manner, and man power required for collection of meter reading and distributing the electricity bill is not needed which also reduces the cost to the supplier. The energy measurement and billing system is automated and is budget friendly, even in some cases of old analog meters there is no need to install the digital meters as this prepaid system can directly implemented on the analog electric energy meters.

## II. METHODOLOGY

The following components are used in this project:

- Arduino UNO
- GSM Module (SIM800A)
- 16x2 LCD
- Analogue Electricity Energy Meter
- Opt coupler 4n35
- Resistors 1K
- POT 10K
- Connecting wires
- Electric load
- SIM card
- Power supply
- Mobile Phone

 

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The electricity energy meter is interfaced with Arduino using the pulse LED of electricity Energy meter. It is connected to Arduino through an Opto coupler IC.

Once the system turns on, it reads the values stored in EEPROM and restores them into the variables and checks the available balance with the assigned value, it then takes action accordingly, for example: there are some fixed charges for each month which the consumer has to pay and it's like a limit above which one has to pay similarly in prepaid based energy meter suppose that limit is around Rs 20 then the consumer has to recharge above Rs 20 to continue the usage of electricity and if balance is less than Rs 20 rupees then Arduino sends a message to consumer to recharge the system to avoid the discontinuation of electricity . and if the consumer doesn't recharge soon and balance falls below Rs 10 then the Arduino will break the connection and sends the warning message of "Electricity Cut" to user and "Recharge soon" to use the service. GSM module has been used to send and receive messages.

To recharge the system, it can be done simply by sending a SMS to the system, through the user's Cell phone. eg. Like if we want to recharge of Rs 100 then we will send #100* [here # and * are prefix and suffix] to the recharge amount.

The System receives this message and extract recharge amount and update the balance of system. And system again turns On the electricity of the house or office.

This is similar to method like we recharge our phones, similarly first we recharge the system and then we use the service. By using such technology, the power distribution agency won't have to deal with recovery of due payment as here the customer has to recharge first and then only the electricity of his/her house will turn 'ON'.

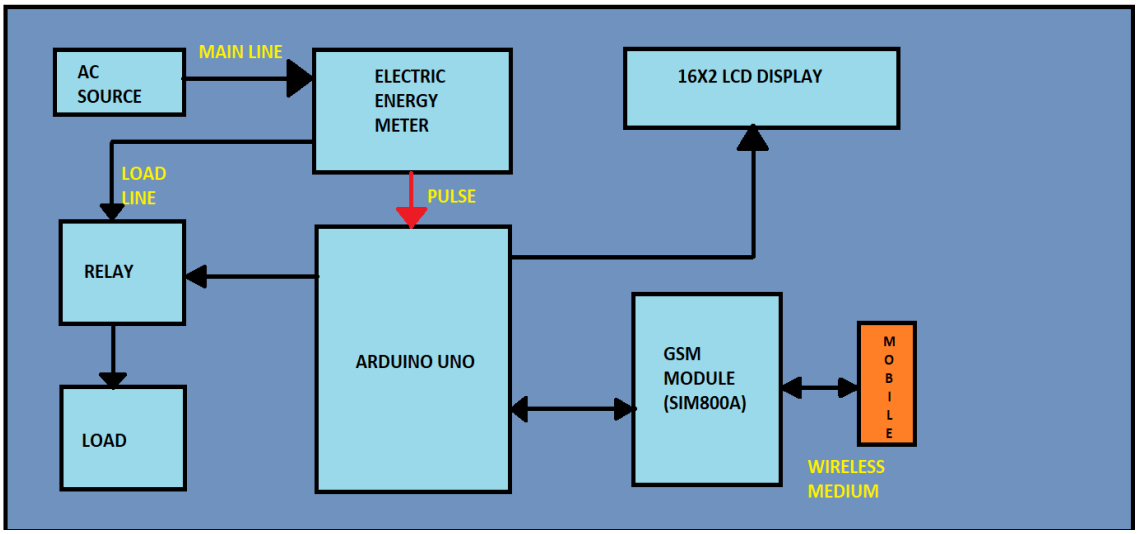


**Figure 1: block layout of the prepaid energy meter with GSM module**

## III. CONCLUSION

1. By using this project, man power required for taking meter reading each month can be reduced.
2. After installing these meters the electricity transmission and distribution agency can get their due payment on time.
3. Government can encourage customers to opt for prepaid meters on a voluntary basis by incentives to early adoption of this methodology.
4. This project can encourage people to use electricity as per their demand and unnecessary wastage of electricity can be avoided.
5. It is economical and easy to use.

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