



INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING, TECHNOLOGY AND MANAGEMENT

Volume 11, Issue 2, February 2024



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.580



+91 99405 72462



+9163819 07438



ijmrsetm@gmail.com



www.ijmrsetm.com

Prepaid Energy Meter & Theft Detection

Jadhav Yogesh Anil ¹, Matsagar Vishal Annasaheb ², Pathan Albaksh Yakub ³

Fartale Shubham Eknath ⁴, Kolhe Madhav Valmik ⁵

Lecturer, Matoshri Institute of Technology, Dhanore, Yeola, India¹

Student, Matoshri Institute of Technology, Dhanore, Yeola, India²

Student, Matoshri Institute of Technology, Dhanore, Yeola, India³

Student, Matoshri Institute of Technology, Dhanore, Yeola, India⁴

Student, Matoshri Institute of Technology, Dhanore, Yeola, India⁵

ABSTRACT: The theft of the electricity is the major concern of the transmission and distribution losses in the supply of the electricity worldwide. Mainly the electricity is being stolen via bypassing the poles therefore this system is utilized to overcome this type of the theft of the electricity and is very beneficial for the authorized agency to control its revenue loss as all of us know that the cost of fuel is increasing day by day hence the intensity of stealing the electricity and using it as a substitute is also increasing therefore it is needed much to design a system that can detect the theft of the electricity. It is a known fact that every investment made by either individuals or government should yield a positive profit returns in order to continue with different projects in other sectors of the economy. But it has always been a difficult task for the government of the day and the Electricity Company to achieve their aim due to power theft activities. A recent research conducted indicates that about 30 -35 percent of the profit generated by the electrical board goes waste due to power theft. Previous attempt to monitor the activities has not yielded positive results due to the corrupt practices of some of these personnel. This project aims at eliminating all these difficulties by designing a simple device to send a message whenever there is a power theft activity at a certain cluster of an area.

1. INTRODUCTION

Power theft is the biggest problem in recent days which causes lot of loss to electricity boards. In countries like India, these situations are more often, if we can prevent these thefts we can save lot of power. Now in India, there is not any technique to detect the specific location of the fault immediately. Power theft is another major problem faced by Indian electrical system. The aim of this project is to detect the power theft and prepaid energy meter using GSM. Power theft has become a great challenge to the electricity board. The dailies report says that Electricity Board suffers a total loss of 8 % in revenue due to power theft every year, which has to be controlled. . Microcontroller is giving control signals to tripping various equipment provides controlling feature. Output can then be displayed in the LCD (Liquid Crystal Display). The difference with other existing system is that even transmission line theft can also be detected apart from the meter bypassing. The additional feature of this system is that there is no need of manual interface as the entire system is fully automated and also meter reading also accurately calculated in this system, which overcomes the traditional manual meter reading. Now a days the traditional manual meter reading was not suitable for longer duration operating purposes as it spends much human and material resource. It brings additional problems in calculation of readings and billing manually. The human error can open an opportunity for corruption done by the human meter reader. So the problem which arises in the billing system can become inaccurate and inefficient. Electricity, since its creation has consistently been one of the crucial prerequisites for any advanced progress and its turn of events. Processing plants factories, Laboratories, Commercial foundations, traffic, correspondence, home lights, TV, PCS and mobile phones are only couple of models on the current circumstance of power realm. Advancement in the field of electrical energy has been focused on its age, transmission, circulation, security and line misfortunes, and so on however in all the ages of electrical influence advances, no huge changes in estimating strategies for power utilization were taken note. Power burglary has arisen as a difficult issue in force areas particularly in the non-industrial nations. A tremendous measure of income is lost because of power robbery. Now and again government needs to give endowments to the force area to keep a sensible estimated of power. Force burglary is a uneasy theme alike

in the majority proficient force framework be like in U.S.A. and modestly productive framework belike in MYS. Power burglary incorporates altering meter to display a dull meter perusing, taking power by passing a meter, charging inconsistencies & unsalaried notation.



II. LITERATURE SURVEY

The Automatic Meter Reading (AMR) system was first introduced by Mr. Paraskevakos, who utilized advanced technologies such as wired or wireless systems including power lines, cable networks, RF modules, GSM modules, and LCD displays for viewing purposes. Building on this foundation, Mr. Jain Abhinandan et al. developed an Automated Energy Meter that offers remote monitoring and control features. The AMR system continuously observes and monitors the energy meter and sends meter readings to the service provider via SMS. Online payment options are also available, including credit card, debit card, or net banking. To eliminate errors caused by manual reading, the AMR system uses a GSM network for automatic electric meter reading. In the past, government employees would take approximately 150 meter photos each day, and data from these photos would be checked and stored on a server. However, there were issues with closed houses and inaccessible meters, which required repeated visits. To overcome these issues, the AMR system was introduced. For future improvements, a program can be written to update the tariff within the energy meter, making the billing process flexible for both users and companies. A review of the literature that includes works that have been published. The IEEE Explorer, journals, and works cited in the listed papers were all used in the search. The following section contains critical analyses of current publications on chatbot creation. The substantial rise in energy consumption, as well as the rapid growth of renewable energy sources such as solar and wind power, have posed major obstacles to energy security and sustainability, while also stimulating the development of energy networks in a more intelligent direction. The most fundamental components of intelligent energy networks (IENs) are smart meters. Smart energy meters can share information on energy use and the condition of energy connections across utility companies and consumers in addition to monitoring energy flows. In addition, smart energy metering can be used to track and control household appliances and other equipment based on the instructions of the customer. This study examines the creation and implementation of smart energy meters, such as smart electricity meters, smart heating meters, and smart gas meters, in detail. This article gives insights and directions for the future development of smart meters by exploring various functions and uses of smart energy meters, as well as related advantages and costs.

Objectives

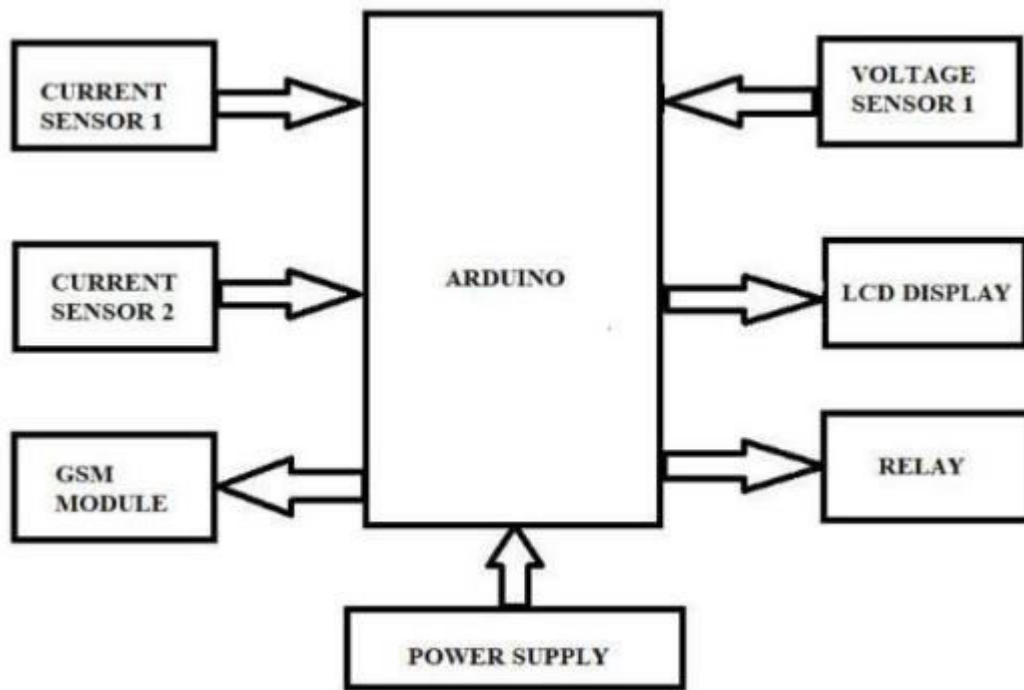
This framework would give a basic method to recognize an electrical force burglary with no interface. It would show accurate field & dissemination track on which unapproved tapping is made continuously. It would be efficient if appropriation organization work force take perusing by this remote strategy. It would give a computerized record in the event of any legal debate. To amplify the net revenue of force service organization.

1. This system would provide a simple way to detect an electrical power theft without any human interface.
2. It will indicate exact zone and distribution line on which unauthorized tapping is done in real time.
3. It will determine transmission line faults.

4. To maximize revenue generation by the power utility companies.
5. Its cost is less as compare to other present system.

III. METHODOLOGY

The first step before implementation was to review the project scope and research area. Then the next task was to design hardware structure for the electricity billing system and the final step was programming part and implementation of system. This model has the Arduino UNO as CPU. The entire system is interfaced with Arduino UNO. The GSM modem is serially connected with the Arduino Uno which is used as communication module between user and provider. The GSM uses its own network for the transfer of data. Special coding in Arduino IDE is used for programming ATmega328 microcontroller. The relay is used as switching device to cut off and restore power supply. The LCD is interfaced to microcontroller used in parallel connection. In this project the microcontroller-based system continuously measures the reading and the current meter reading can be sent to the electricity department on request. This system also can be used to cut off the power supply to the house in the case of non-payment of electricity bills. This GSM model with SIM card is essential for each energy meter.



The suggested approach automates electricity billing and includes an overcurrent and fire warning device built on an ATMEGA 328p microcontroller. A GSM module is used to send messages to the owner and officials regarding the consumption of electricity and corresponding bills, eliminating the need for a manual human operator who devours the usages of each home and generates bills accordingly, reducing the cost of human time and labour. Each node's power consumption is measured using several voltage and current sensor pairs. As shown in the block diagram above, a set of current and voltage sensors monitor the amount of energy consumed at every point in the line and preserve it for future reference.

IV. WORKING

The concept of electronic energy meters has been introduced in the power sector to effectively record the units consumed for billing purposes and also monitor several other factors to reduce power theft and minimize losses that occurs due to conventional electromechanical energy meters. This is a multipurpose project that integrates all the functions including a prepaid billing arrangement and automatic message sending system to the utility company. It may please be noted that it is truly not ausable commercial product engaging actual prepaid card but uses a set of switches for understanding the

technology implemented behind it. This project uses an 8051 microcontroller to which a GSM modem is interfaced. From here the message is sent to the phone number that is auto saved by giving a missed call to the SIM number present in the GSM modem. There are a set of pushbuttons, which are used to load, any recharge amount required. Such arrangement is in lieu of an actual prepaid card for demo purposes. By pushing those buttons one can easily recharge the amount. As soon as the microcontroller receives any recharge amount, a switch is set, to deliver power to the load. Thereafter consumption of the load power is calculated by the energy meter, which is interfaced to the microcontroller through an Optical Isolator IC. The microcontroller program then starts to deduct the recharge amount as per the consumption of load power. Once the recharge amount reaches to zero then the microcontroller cuts the power supply to the load through a relay driven duly by a NPN transistor and also sends a message to the phone number stored that contains all the billing information. The concept can further be extended by integrating a RFID smartcard wherein each card is provided to automatically recharge the amount and send the same information via GSM module to the respective phone number stored.

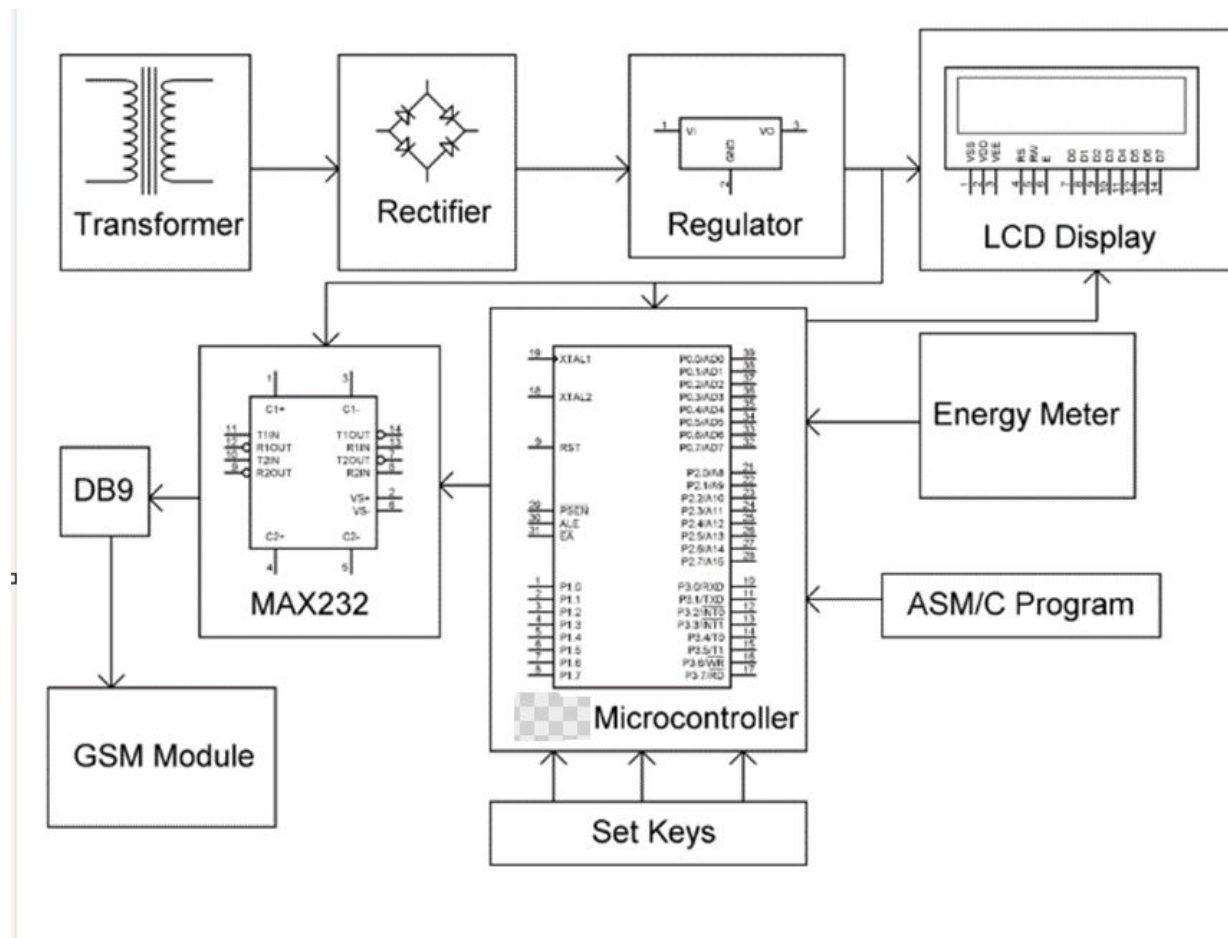


Fig. Block Diagram

V. COMPONENTS

SR.NO	NAME OF PARTS	QTY	RAW MATERIAL	SIZE OF PARTS/WEIGHT
1	Energy meter	01	Square	120mm*80mm*60mm
2	Relay	07	Square	20cmx20cm
3	Transformer	01	Square	60mm*80mm*120mm
4	LCD Display	01	Square	16*2 LCD Display
5	Controller	01	Square	60mm*60mm
6	SIM800L GPRS Module	01	Square	60mm-60mm
7	Other small Component's	30*	Square	-
8	PCB	01	-	600mm*600mm

VI.CONCLUSION

As a result of employing our technology, there will be no need for manual labour to bill the house power usage, Which consumes a significant amount of human resources and time since they must visit each home to check the meter and create a bill. The energy board can automatically switch off the power if the client fails to pay the bill. By doing so, we can reduce labour costs for billing as well as the paper needed for billing. By contributing to an eco-friendly billing system, we can also identify power theft. This effort would enable consumers to improve their management of power by employing peak hour and load warnings, as well as its utility in the Electrical Board's delivery system for commercial abilities.

REFERENCES

- [1] Md. Masudur Rahman; Noor-E-Jannat "Arduino and GSM Based Smart Energy Meter for Advanced Metering and Billing System", 978-1-4673-6676-, 2115/\$31.00 © 2015 IEEE Jahangirnagar University, Dhaka-I 342, Bangladesh, 21-23 May 2015
- [2] Abhinandan Jain, Dilip Kumar, Jyoti Kedia, "Design and Development of GSM based Energy Meter" in IJERT, 2012.
- [3] V.Preethi, G. Harish, "Design And Implementation of Smart Energy Meter", Inventive Computation Technologies (ICIT), 26- 27 Aug. 2016.
- [4] Sudarmanto Budi Nugroho, Ryoko Nakano, Eric Zusman, Regan Leonardus Kaswanto, "The Effect of Prepaid Electricity System on Household Energy Consumption – the Case of Bogor, Indonesia" in Urban Transitions Conference, Shanghai, September 2016.
- [5] Shubham M. Pakhale, Rupali R. Burele, Pooja V. Tonpe, Mohd. Shahejad, "A Review of Microcontroller Based Power Theft Detection".
- [6] Bibek Kanti Barman, Shiv Nath Yadav, Shivam Kumar, Sadhan Gope, "IOT Based Smart Energy Meter for Efficient Energy Utilization in Smart Grid", 2018 2nd International Conference on Power, Energy



and Environment: Towards Smart Technology (ICEPE).

[7] M. G. Wath, M. S. Ballal, “Design of standard revenue energy meter for electrical locomotive (Railway traction)”, 2018 International Conference on Power, Instrumentation, Control and Computing (PICC).

[8] M. Suguna, “Remote Power Theft Monitoring Using IoT”, 2021 International Conference on Advancements in Electrical, Electronics, Communication, Computing and Automation (ICAECA)

[9] A. K. Gupta, A. Mukherjee, A. Routray and R. Biswas, “A novel power theft detection algorithm for low voltage distribution network,” IECON 2017 - 43rd Annual Conference of the IEEE Industrial Electronics Society, Beijing, 2017, pp. 3603-3608.

[10] M. Golden, B. Min, “Theft and loss of electricity in an Indian State technical report,” Int. Growth Centre 2012.



INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING, TECHNOLOGY AND MANAGEMENT



+91 99405 72462



+91 63819 07438



ijmrsetm@gmail.com

www.ijmrsetm.com