Review Paper on Power Theft Monitoring and Controlling using Various Technologies

Neha Chauhan[1] Shivamkumar Intwala[2]
[1,2]Department of Electrical Engineering
[1,2]Parul University, Vadodara, India

Abstract— Power burglary is the distinction between the power provided and client's utilization, in the circulation framework. Productive use and protection of vitality is the real need of all power utilities, transmitting the created capacity to client stacks through transmission and dissemination frameworks. Be that as it may, existing transmission framework, experience the ill effects of specialized misfortunes in electrical types of gear and non-specialized misfortunes in the dispersed circuits. Circulated misfortunes are chiefly caused because of burglary of provided power at the client premises. Along these lines, it is important to structure more intelligent methods at the dissemination framework, which are fit for recognizing and limiting burglaries at the client premises. This paper assesses the notable methods including Zigbee, IoT, GSM, electronic energy meter and microcontroller which are utilized to limit robbery in appropriation framework.

Key words: Zigbee, IOT, GSM, Electronic Energy Meter, Microcontroller

I. INTRODUCTION

Power stealing is that the biggest drawback in recent days that causes huge amount of loss to electricity boards. In the next few year the world is supposed to face several problem related to the power theft. In countries like India, the things square measure a lot of usually, if we are able to stop these thefts we have a tendency to can save huge amount of electrical power. Electricity companies losses money every year due to theft. Wattage stealing noticeion system is employed to detect associate degree unauthorized sound on distribution lines. Implementation a part of this method could be a distribution network of wattage provides system. Stealing additionally might occur by rewiring circuits to avoid an electrical meter, or by sound into another customer's electrical lines. Several methods and techniques have been reported for power theft. Some of them are Zigbee, IoT, GSM, electronic energy meter and microcontroller In this, paper we are going to compare these five techniques.

II. METHODS

A. IOT

Fig shows the block diagram of the electricity theft detection and prevention system.

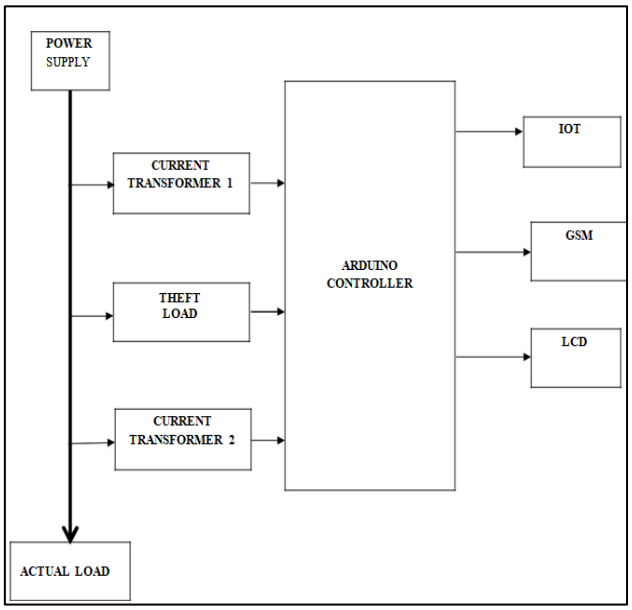

Fig. 1: Block Diagram of Theft Measurement using IoT

The system simply connects the meter to the Internet so that the utility company knows the status of the electricity meter to determine when the meter is altered. One good thing about the system is that the controller and the network interface units are packaged in a single module to reduce costs when two separate boards are procured, one as the controller and the other as the network interface.

The circuit consists of Arduino, GSM, LCD, ESP module and Current transformers. Meters cannot be used for high currents, so that current transformers can detect current. So there are two CTs used, one is connected to the load side to measure the current through load and another C.T is connected to the supply terminals to measure the source current.

The main component of this circuit is the Arduino controller. The current signal is received by the bridge rectifier from two current transformers. The current magnitudes are then compared by the conditional Operator. Since no theft load exists, both C.T.s show nearly the same values. Here the system is in good health.

The Arduino does not have access to the current signal. So we have to interface the C.T. by means of voltage only. We must convert the current signal to voltage signal. It can be converted by placing a resistor in series and transferring the voltage over the resistor to an Arduino. The resistor is used because the transformer's secondary should never be opened. With calibration, the corresponding current can be obtained. The calibration can be carried out by connecting different loads and measuring the different voltages and current.

We can also use a rectifier to convert the current signal to the voltage signal. As the rectifier converts the AC signal to the DC signal, the output through the connected

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resistor can be taken as the voltage signal in the rectifier circuit. The C.T secondary is attached to the bridge rectifier input. Capacitor is used to reduce the output ripple contents. On the output side, a resistor is connected to measure the voltage over it.

The arduino receives this voltage signal and the corresponding current can be calculated using the calibration. In order to access the Arduino controller, the current signal from the C.T has been converted to the voltage signal.

For the C.T. also the same procedure is repeated. At the load side connected. The program is written to access the rectifier circuit voltage signals. The condition for comparing the voltage magnitudes is specified in the program. If the variation is more than the specified value, that means the condition is violated. Then the control moves to the alert functions namely SMS and twitter.[1]

B. GSM

In this planned system GSM technology accustomed transmit the meter reading to the client and government with the specified value. This method is happen once required meanings if SMS is received from incensed sever mobile transmission between client and government. Then the energy thievery controlled by IR sensing element, Bypass detection. Additionally cut the ability offer mechanically as per request of licensed server mobile. In this system current transformer are used, her one current transformer is placed in input side of the post line. Other current transformers are placed at the distribution point of the house lines. The output of CT value is given as input to PIC microcontroller convert analog input to digital. Then PIC compares the input current and the same of output current. If we compare result have any negative values then this particular post is detected as theft point. This compared value is transmitted to electricity board, this value display in LCD display. The information will then be quickly processed by the microcontroller and a SMS will then be send through the GSM technology.[2]

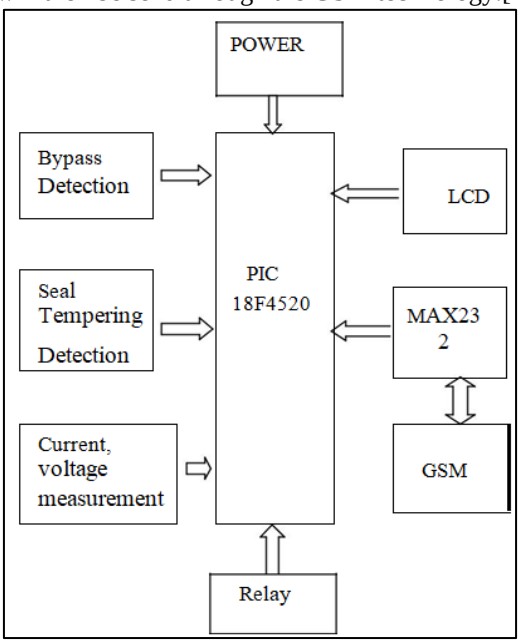

Fig. 2: Block Diagram of Theft Measurement using GSM System

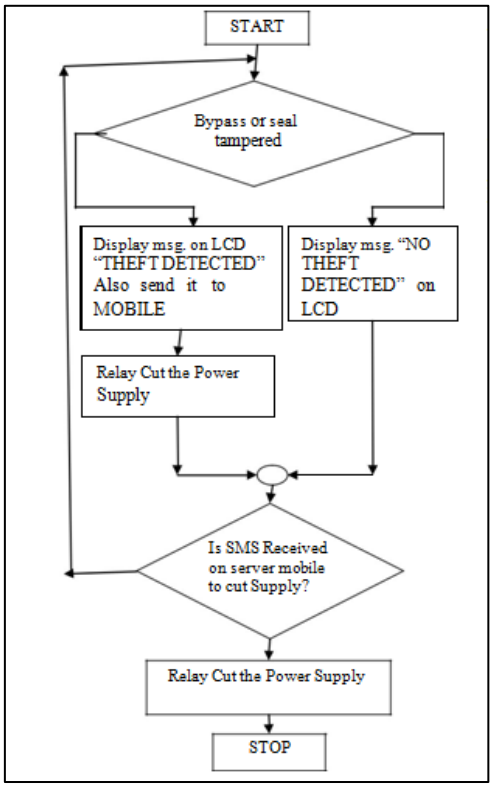

Fig. 3: Flowchart of GSM Based System

C. MICROCONTROLLER

In this system, a micro controller is interfaced with an energy metering circuit, current sensing circuit, RF communication link & a contactor to make or break power line. At the sub-station end a pc is connected with a RF link to communicate with all energy meters & a buzzer.

In normal condition, micro controller reads energy pulses & current signals. If current is drawing & energy pulses are normal, then no power theft is being done & the o/p is connected. If current is drawing & energy pulses are not coming, then it indicates the power theft. So microcontroller trips the o/p using relay. This information is sent to substation using wireless communication in the substation it receives the information in the form of digital codes & on decoding it we will know in which house power theft has occurred.[3]

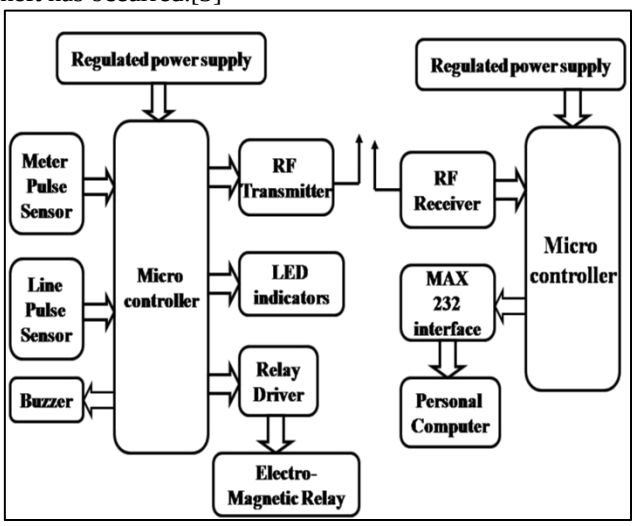

Fig 4: Diagram of Theft Measurement using Microcontroller

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D. ZIGBEE

Here this technique utilizes the technique named Zigbee as a result of all the issues related to the wired techniques. There are a lot of problems related with the wired techniques like installation problem, complexity and price also matters in the case of long standing time. The main problem associated is regarding the agricultural areas where it's really very much difficult to install the wired system to convey the information. The Zigbee module provides an efficient way to convey this data to the authorized official at low price as compare to that of the GSM Modem and also utilizes a cell-phone to send the message to the officials having a long battery life. The other wireless techniques such as Bluetooth, infrared etc. are having the limitations of range and also of the efficiency. The wireless system based on GSM/GPRS is well known. But the fees are needed for using GSM/GPRS network, and also the cost of hardware system is very high. In this system Zigbee technology works in international free frequency band and access self organization function is adapted to solve the problem in this wireless electricity theft detection system.[4]

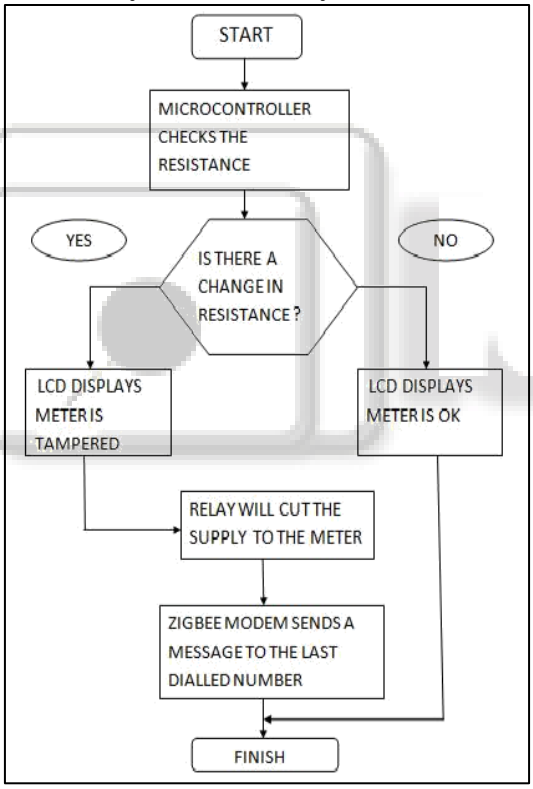

Fig. 5: Flowchart of Zigbee system

E. ELECTRONIC ENERGY METER

1) What is Electronic Energy Meter?

An electronic energy meter as its name suggests is the measuring device of the energy consumed in kWh. It unlike a conventional electromechanical meter uses basic electronic devices to compute the energy consumption.

2) Working:-

Basic Electronic Energy meter measurement takes place by counting the LED pulses at the rate of 3200 pulses per unit of electricity. A unit of electricity refers to the kilo watt units of power consumed in the given time in hours. The digital Energy meter is connected to an optoisolator and the for every electrical signal input from the Energy meter, the LED sends light pulses to the optotransistor, which converts them to electrical high and low pulses which are send to the Microcontroller. The Microcontroller is also interfaced with few push buttons to allow the user to enter relevant information about the number of hours. Based on this information and the input pulses from the optoisolator, the microcontroller makes necessary calculations to calculate the energy units consumed.

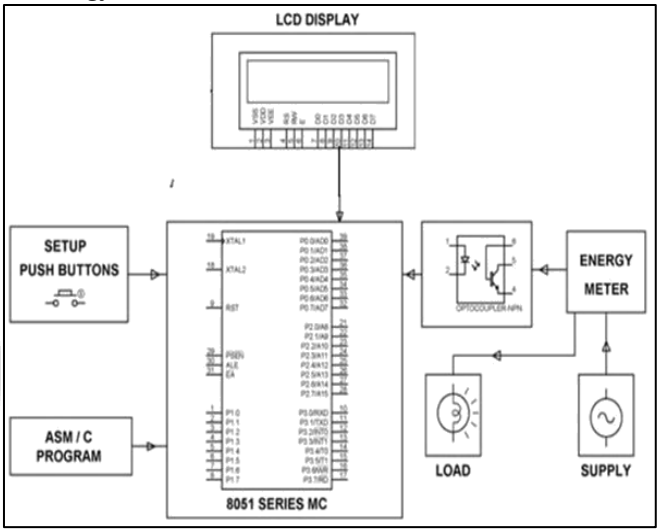

Fig. 6: Diagram of Measurement using Electronic Energy Meter

III. TABLE OF COMPARISION

Technology	Advantages	Disadvantages
IOT	Security is automated. Economy of country is saved.	Difficult to maintain the network. Internet shutdown may create problem.
GSM	Reduce energy wastage. Optimized use of energy.	Cannot determine who is stealing. Lot of time required for implementation.
MICROCONTROLLER	Exact location can be detected. Less loss of energy.	Exact location cannot be determined. No complete information is provided.
ZIGBEE	Provides network security. Provide higher reliability	Additional modem and personal computer is required for maintain the network. Costly

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ELECTRONIC ENERGY METER	Eliminate manual meter reading. Monitoring the electric system more quickly. Avoiding the capital expense of building new power plants. Reducing pollution from vehicles driven by meter readers.	Paying additional fees for the new meter. Managing and storing vast quantities of metering data.

IV. CONCLUSION

The power robbery is a financial wrongdoing that antagonistically influences every single utility client. Utilities gauge that 0.5 to1.0 percent of all clients take from them and that their yearly misfortunes surpass $ 1.7 billion in power and $ 1.3 billion in flammable gas control robbery is a non unimportant wrongdoing that is much counteracted. In this way, for this we have to utilize best technique among all strategies to avert control burglary.[16] This work has examined five power burglary techniques that permit Checking and controlling the power burglary the execution of intensity robbery procedures are unique in relation to one another (i.e. iot, GSM, Zigbee ,microcontroller and electronic vitality meter). While looking at these five techniques we have recognized the favorable circumstances and burdens of the advances. From the individual investigation of every system, we reached this resolution that utilizing electronic vitality meter is the best power burglary controlling and checking technique as it contains three things they are GSM, microcontroller and IR sensors. So this is the best strategy for power robbery identification.

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