

# WIRELESS ELECTRICITY THEFT DETECTION AND MONITORING

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**Abstract** -Electricity theft can be termed as fraud which can be in the form of meter tampering, illegal connections, billing irregularities and unpaid bills. The financial records indicate that most of the theft of electricity is in the form of stealing of power . In this research we have focused on the most common practice of stealing power which is bypassing or tampering the meter. We have designed a system which can detect the theft of electric power in a line and inform the nearest substation with the location of line in which theft has occurred

**Keywords-** **Comparator, Electricity theft, Meter Tampering, Microcontroller, Power consumption, Theft detection, Energy meter (EM), Opto Coupler (OP)**

## INTRODUCTION

Electricity has become one of the most necessary elements of our daily life. Nowadays, it is something that people cannot live without. It has become a necessary element for the survival of maximum human beings. But with the increasing need of the electricity, the electricity theft is also increasing and it will keep on continuing until some measures are not taken to detect and control it[9]. However, various methods were introduced to overcome this

situation [3][4]. In this project, the electricity theft is detected and monitored by comparing the power generated by the energy meters. Basically, it consists of two energy meters. One energy meter (EM<sub>P</sub>) is present at the pole from where the power is supplied to the homes and the other energy meter (EM<sub>H</sub>) is present at the homes. Power supplied by the EM<sub>P</sub> and EM<sub>H</sub> are compared by the microcontroller. If the difference between the two is more than the particular value, then a relay which is interfaced with the processing unit will switch off the power supply of the homes. One more relay is interfaced with the microcontroller to activate the GSM calling. Through this, the information of the theft is sent to the respective sub-stations.

## LITERATURE SURVEY

In the past, various methods had been introduced to detect and control the power theft. A brief survey of various solutions is presented.

Thomas B Smith [1] carried out a deep study on the ELECTRICITY THEFT and its various ways. According to this research electricity theft can be termed as fraud such as metre tampering, billing irregularities, and unpaid bills. Electricity can be reduced by

introducing new technologies such as Tamper proof meters, managerial methods such as inspection and monitoring, and in some cases restricting power systems ownership and regulations.

Soma ShekaraSreenadh Reddy Depuru, LingfengWang, Vijay Devabhaktuni [2] focused on the factors that provoke the consumers to steal electricity. In view of these ill effects, various methods for detection and estimation of theft are discussed. This paper proposes an architectural design of smart meter circuit. Motivation of this work is to detect illegal consumers, and conserve and effectively utilize energy. As well as smart meters are designed to provide data for various parameters related to instantaneous power consumption.

G. L. Prashanthi, K. V. Prasad, [5] researched to record the power consumed by a model organization such a household consumers from a commonly located point. Recording the power means measuring the power consumed exactly by the user at a given time. The energy used by the user is measured and the records are sent to the controlling substation whenever needed by the person at the nearest substation. The feedback from any of the consumers helps in analyzing the usages between legal and illegal users which helps in controlling the power theft. Communication between the house hold meters and the substation is done with the means of wireless communication. The scope of this study is limited with the detection of power theft and not identifying the exact location.

A recent research conducted by Mr.M.V.N.R.P.kumar, Mr. Ashutosh Kumar, Mr. A.V.Athalekar, Mr.P.G.Desai, Mr. M.P. Nanaware [6] monitors that about 30-35 percent of the profit

earned by the electrical board goes waste due to electric power theft. Previous attempt to monitor the activities has not resulted in efficient manner due to some of the illegal practices of some of these employs and consumers. This research aims at reducing all these difficulties by fabricating a simple system to send a message whenever there is a power theft activity at a certain location

Pradeep Mittal (Assistant Professor), [7] studied the electricity theft detection using microcontroller. The wireless system reduces the cost of man power used to transfer the billing details as well as information regarding theft by consumers. The pointing feature of the proposed work is that no man power is required to note down the energy readings of electricity consumption.

Sahoo, Sanujit, [8] has proposed a temperature predictive model which uses smart meter data and data from distribution box meters to detect electricity theft in a particular location. The model was tested for varying amounts of power thefts and also for different types of circuit approximations.

### PROPOSED SYSTEM

The proposed system is designed to prevent the electricity theft happening in the present scenario. the increasing rates of the per unit electric power, because of theft of electricity due t this the electricity supplier companies are not able to recover the invested amount, thus they have to undergo a large loss of revenue and thus, they increase the rates of electricity unit which the consumer has to pay.

The proposed system will prevent the theft of electric power as much as possible. This system will not only detects the theft of electricity but also trace the

location of theft and will trip the power supply of stolen power and also notify the nearest substation authority about this theft with exact location of the theft. This system will be installed at the supplier end but not at the consumer end. This system will need a background support in which separate lines for each connection will be installed from distribution boxes which are installed after the area transformers. The design system consist of 2 meters, 1 will be installed as the domestic meter which will monitor and indicate the power consumption of the house, and other will be installed inside the distribution box on the line the connection, which will indicate the power consumption of the line which starts from the distribution box and ends up at the house. Thus, every house will be having 2 meters, other than this there will be a processing unit which is programmed accordingly and with the help of 2 meters of a connection this unit can identify theft, if it identifies theft then the system automatically cut of the power supply of that particular connection and will notify the nearest substation that theft has been occurred at this location. One additional feature which is added to the system is that it can detect any kind of problem arising due to electricity such as short circuit. This part will be interfaced with the system and sensors are used to sense problem if any problem sensed the supply will be cut of and the LCD screen will display the problem.

### BLOCK DIAGRAM

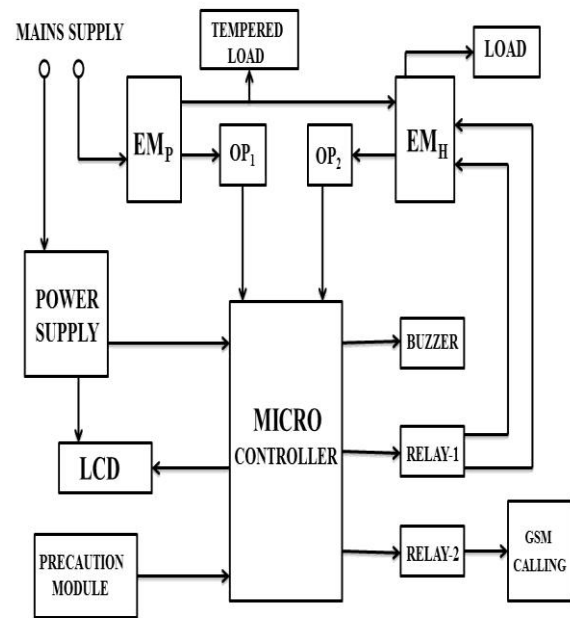


Fig 1.(EM<sub>P</sub>-Energy Meter pole, EM<sub>H</sub>-Energy meter Home, OP- Opto Coupler)

### METHODOLOGY

To design the proposed system as described earlier in the document. We use 2 analog energy meters, 1 indicating the pole/distribution box reading or the power consumption of the line, and the other indicating the power consumption of the house i.e. the home meter. These analog meters generate pulse on consumption of electricity, thus we count those pulses and measure the reading accordingly. To count these pulses we use optocoupler ICs which converts the analog pulses from the meter to the digital pulses which can be detected and counted by the microcontroller. The microcontroller we used is of 8051 family, IC-AT89S52/C51 this microcontroller counts the pulses and measures the readings of both the meters i.e. home meter and pole meter. Ideally both these readings i.e. the power consumption of the line of the connection and the house should be equal if the they are no T&D losses, but if there is some theft happening between pole and the house then

reading of both meters will be different. Thus, the reading of the pole meter will be greater than that of the home meter and the micro controller will detect this and thus the power supply will be cut off of that connection the microcontroller will call the nearest substation with the help of the cell phone this will notify the connection number of the theft and LCD screen is used to display theft message which will be in the substation which indicates the line and location of the theft in addition of this a buzzer will also start in the substation indicating theft has occurred. Now, the precaution module consist of sensors which can be of any kind Fire, voltage, moisture etc. due to which short circuit can happen which can result in serious damage, the voltage from the sensor will be compared to the supply voltage if the problem occurs there sensor will be triggered and the comparators LM-351 used will give the signal to the microcontroller and it trips the supply of the house. The supply of the house i.e. the load is operated through a relay so that the microcontroller can trip the supply

### RESULTS

Results include the successful operation of the electricity theft detection and monitoring system. The system contains two energy meters  $EM_P$  and  $EM_H$ . We observe that when the power sent by the  $EM_P$  is equal to or nearly equal to the power consumed by the  $EM_H$  then there is no power theft but when there is the difference between the two, then there exist a power theft which will get detected.

	$EM_P$	$EM_H$	Is theft detected?
No. of units consumed	1	1	No
	2	1	No
	3	1	No
	4	1	Yes

It became more clear from the above table that when the difference in the units of  $EM_P$  and  $EM_H$  is more than 2, then theft is detected.

### CONCLUSION

A Wireless Electricity Theft Detection and Monitoring has been designed and developed with proper integration of both the hardware and the software. Relays are interfaced with the microcontroller and this interface is synchronized with the whole process of the theft detection and monitoring. For this project, the knowledge of electrical and electronics application had been proven.

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