

# Power Theft Detection System Using the Advanced Technology of Internet of Things

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**Abstract:** Since electricity is essential for both home and industrial development, it must be protected in order to distribute power to consumers effectively. Technical and nontechnical losses are the two different categories of losses. According to the power ministry, the average annual line losses for electricity firms are 20-30%. WAPDA Company's loss exceeded RS. 125 billion. Electricity theft is a major concern everywhere in the world, but it has a particularly negative impact on the Indian economy. The electrical company's ARR reflects the loss due to the quantity of theft. Thus, the increased energy prices are a common method of passing these expenses along to the customers. Electricity theft occurs in many different ways and is supported by a range of groups, including utility employees, customers, labour union leaders, political figures, bureaucrats, and senior utility managers. Electricity, or the use of utility company electricity without the firm's consent, is the issue that power companies around the world are facing. Significantly, it is sufficient to completely destroy the nation's power sector.

**Keywords:** IoT, Arduino Uno, Energy meter, LCD Display, current sensor

## I. INTRODUCTION

Theft of energy raises the price farmers must pay and may have detrimental effects on their safety. In particular, the provider may be held liable for generation, network, and balancing costs related to entering estimates of the amount of electricity taken by that person into the settlement system when it discovers electricity theft by one of its customers. Physical inspections by the firm that provides the electricity have historically been used to detect theft of electricity. The intelligent IoT system discovered the stolen electricity. This method calculates the total amount of electricity consumed by the farmer and stolen by the unauthorized licensee. On the other hand, it will measure the operating electricity losses, which can be taken into account for a more accurate assessment of power theft. Theft is frequently committed via breaching the physical security of metres or by connecting loads directly to power distribution wires. Because of insufficient levels of enforcement and monitoring, payment default has been a significant issue. The main causes of this issue were a lack of technology and insufficient distributor incentives. The high incoming current from the power metre is measured using a voltage divider circuit and shown on an LCD screen.

Large amounts of power are lost during the transmission and distribution of electricity. Due to the fact that the amount of this loss is increasing daily, the power authorities are experiencing losses in their revenues, and a new technique to identify the fraud clients is being presented. Electricity is in great demand, and the supply and demand are never balanced. The overall coordination of all the power system's components is necessary for the power systems to operate satisfactorily. Both conventional and renewable energy sources are considered when generating electricity. But in order to get electricity to the consumers with the least amount of loss, the transmission of power is equally crucial. Therefore, for efficient and effective electricity distribution, proper maintenance of the transmission and distribution networks is essential. While the transmission and distribution losses cannot be properly and precisely quantified, the losses related to generation can be precisely described. More data is needed in addition to the data sent from the sending end because there are many parameters involved. Additionally, non-technical elements as well as technical aspects affect transmission and distribution losses. One such factor in underdeveloped nations is power theft. Power theft accounts for a considerable income loss to power providers in India, where it is estimated to be 420MW.

When they have a better understanding of their consumption, the electricity bills are only then issued. In India, bills are only distributed once every month. Therefore, the consumer won't be aware of their energy usage throughout this time. To effectively manage the energy consumption over the course of a month, this technique must be repeated many times. It will be a huge step forward in energy management if customers can monitor their energy consumption on their phone or laptop instead of monitoring the energy metre. Since almost everyone is currently online constantly, it would be beneficial if they could monitor their energy consumption online from anywhere in the world.

Electrical energy production, transmission, and distribution all incur significant operational losses. Although transmission and distribution losses cannot be exactly calculated using information from the sending end, losses associated with generating can be described technically. This exemplifies how nontechnical parameters might affect a transmission and distribution system.

Overall technical losses occur naturally and caused because of power dissipation in transmission lines, transformers, and other power system components was discussed in [1]. Technical losses in transmission and distributions computed with the information about total load and energy billed. On the other hand, nontechnical losses cannot be precisely computed. It can be estimated from the difference between the total energy supplied to the customers and the total energy billed. This kind of loss can be a power theft in the form of meter tampering, stealing or illegal connections billing irregularities, and unpaid bills. Power theft, so has become a serious concern for the utility company and the government [2]. It has also different impact like financial and quality of supplied power

## 2. Literature Survey

In [3], a new approach towards Nontechnical loss (NTL) detection in power utilities in order to detect and identify load consumption patterns of fraud customers using artificial intelligence based technique and pattern classification technique. In this system customer committing fraud activities before the two year period will not be detected by the FDM. Although, this method reduce theft but require large man power. Due to dishonesty of staffs this methods fails .

Some of the technical ways to detect stealing are done in [4], authors developed a paper on real time system in which transmission and receiving of data is done by wireless technique using PLC. This will provide an additional facility of wireless meter reading with the same technique and in same cost. Due to this it will protect distribution network from power theft done by tapping, meter tampering etc. The proposed system is an automated system of theft detection which found to be little bit complex. A similar work is done in [5] but here zigbee technology is used for theft detection and this system have the advantages that it can also be used to detect the theft of the gas, fuel and oil simply by changing the measurement meter used in this system.

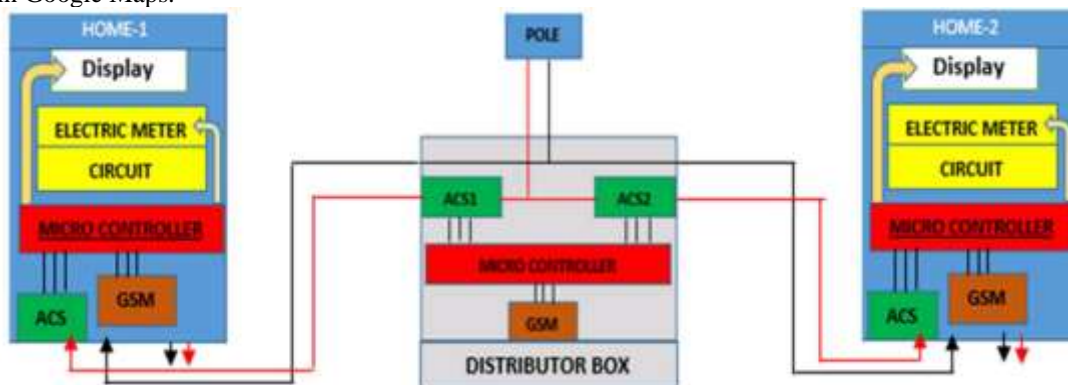
[6] Proposed a power theft identifier using. Their system used an embedded microcontroller to compare the difference in energy consumption between two energy maters. The system calculates energy supplied by the distribution system on digital energy meter 1. The energy consumption on the residential side is also calculated and recorded by digital energy meter 2. For instance, if digital energy meter 2 is consuming eight units, this data is stored at a smart hardware microcontroller; this data is, however, compared with the energy reading at digital meter 1 .

## 3. Problem Statement

1. The primary goal of our project is to automatically identify and stop electrical power theft.
2. Using IOT, globally access information about power theft via the internet on smartphones from any location (Internet of Things)
3. Make the system inexpensive and incredibly small so that it may be easily integrated into the current energy meter system.

## 4. Proposed System

Both the hardware and software components of this approach require work. The customised electric metre and distribution box are examples of the hardware, and the creation of a website and a mobile application is an example of software. It is necessary to learn fundamental components such the digital electric metre, GSM module, ACS712 module, microcontroller, and ADC as well as how they function in order to design the hardware first. For the software component, an international website will be created using web development for every user for the payment system and analytics of theft, and an android-based web-based mobile app will be created for the authorised officials who are in charge of detecting theft. A key part of the whole system is played by the database and server side programming. The mobile app will be created in a way that will enable the server to regularly receive current values from the GSM module, compare them, and display the region of theft with the user's information that is being stolen and directions in Google Maps.



**Fig. 1: Block Diagram of Proposed System**

The theft of power was discovered using the current division rule. This rule states that a parallel circuit functions as a current divider because the voltage is constant across all of the branches while the current is divided among them. The current across the circuit impedance is calculated using the current division rule. We link an ACS712 current sensing module to the house's installed metre as well as the distribution box. ACS712 current is routed into a microcontroller (Arduino Uno). After the Arduino is connected to the GSM-GPS module, the data from both sides is then delivered to the authorised database. The data are so compared, and if the discrepancy exceeds the specified threshold, POWER THEFT is discovered.

The hardware and software required for our solution is:

- ✓ Arduino Uno
- ✓ Current Sensing Module (ACS 712)
- ✓ GSM (SIM 800)
- ✓ GPS Module
- ✓ Database (using My SQL)

**Advantages:**

- By using the Internet and wireless technology, this system would offer a quick means to identify an electrical power theft without the need for a human interface.
- Increase the power utility company's profit margin by monitoring voltage and current remotely and performing disconnections and reconnections without the need for human labour.

**CONS**

- Requires internet connection

**5. Conclusion**

This wireless Internet of Things-based method is very helpful in identifying electricity theft all across the world. The most efficient way to steal electricity globally, in comparison to other methods like unauthorized consumption of electricity, is to steal power beyond the limit, which is why authorized officials need to find it in order to control revenue losses. This system helps to eliminate manual mistake and provides an effective technique to identify the bypassing of the energy meter since the limit of the transformer will only be changed by the authorised person of the electricity board section, and the supply interrupted by this system can only be reset by them.

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