IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 4, December 2025
Impact Factor: 7.67

IoT and GSM Based Smart Energy Meter with Overload and Theft Detection

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Abstract: *In this examination paper we study and plan energy meter theft alert on IOT. Electrical power theft is a noteworthy issue in power framework organize everywhere throughout the world, which is unlawful and ought to be carefully precluded. Power theft can be characterized as the use of the electrical power with no agreement with the provider. So as to kill control theft, the area of intensity theft is to be known so suitable move will be made on the lawful offenders. In this framework we decrease the human cooperation in electrical energy support. The theft of the electricity expands the costs paid by client. Henceforth this framework is utilized for the discovery of theft. The Arduino checks the fundamental meter and sub meter perusing. In the event that the distinction between the fundamental meter and sub meter is happened, at that point that theft has happened message will be show on the LCD show and furthermore getting message on telephone. Client can get message from wherever. By utilizing the purchaser number, it tends to be access on the globe at the whenever*

Keywords*:* Internet of thing (IOT), Electric power, LCD display, electrical energy

I. INTRODUCTION

Electrical energy generation, transmission, and distribution suffer from technical and non-technical losses, including electricity theft. Technical losses occur naturally in transmission lines, transformers, and system components, while non-technical losses are difficult to assess from sending-end data. Electricity theft increases consumer costs, creates safety risks, and distorts market efficiency for power providers. In today's world, electricity is essential for all devices, making it a massive global industry. To address these issues, an IoT-based smart energy meter system is proposed. Using Arduino ESP8266 and GSM, it monitors energy usage, detects overloads, sends real-time data to users, and reduces manual billing errors.

II. PROBLEM STATEMENT

Three-Traditional energy meters lack real-time monitoring capabilities and are prone to various limitations, including delayed billing, manual readings, undetected energy theft, and no mechanism to prevent overloads. These issues lead to energy losses, revenue leakage for utility providers, and inconvenience for consumers.There is a pressing need for a smart solution that can continuously monitor power usage, detect abnormalities like overloads and unauthorized power access (theft), and communicate data instantly to both users and providers. The solution must be accessible, reliable, and operable in both urban and rural areas with minimal manual intervention.

III. LITERATURE REVIEW

The global energy crisis is a major challenge that requires efficient utilization rather than increased energy generation. Energy wastage can be reduced by continuously monitoring consumption, but consumers are often unaware of their usage due to monthly billing systems. In India, electricity bills are issued once a month, leaving consumers uninformed about real-time energy usage. Online monitoring through IoT-based smart meters can help users track consumption anytime and anywhere. Since most people are constantly connected to the internet, this approach can greatly improve energy management. Reducing household energy consumption is an effective way to address the energy crisis.

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IV. METHODOLOGY

The design implements the energy meter using the IOT concept. This whole procedure based on the Arduino. The internet of things is the internet operational of physical devices which permits objects to exchange data in the above system energy meter is connected to the internet by using IOT. So there is a method to track their energy consumption time for consumer so that they can use as they plan. The system is suitable for consumers and supply. This method removes man power during the connection and disconnection upload. It plays an important role to notify supplier about any theft that is taking place In the sensor.

V. WORKING

The energy meter continuously measures voltage, current, and power consumption using sensors. A microcontroller processes this data and calculates real-time energy usage. When consumption exceeds a preset limit, the system detects overload and can automatically cut off the supply. The meter also monitors wiring conditions to identify theft attempts such as bypassing or meter tampering. A GSM module sends consumption data, alerts, and tamper notifications to the user or utility provider via SMS/IoT cloud. The IoT platform stores and displays readings remotely through a mobile or web dashboard. This enables remote monitoring, billing automation, and immediate action on overload or theft events.

VI. BLOCK DIAGRAM

COMPONENTS USED:

AC SUPPLY
GSM MODULE
VOLTAGE REGULATOR
ENERGY METER
BUZZER
WIFI MODULE

VII. COMPONENTS DESCRIPTION

AC SUPPLY

AC (Alternating Current) supply is a type of electricity that periodically reverses direction, unlike DC (Direct Current), which flows in only one direction. This constant reversal occurs at a specific frequency, typically 50 or 60 times per second (Hertz), and is ideal for long-distance power transmission due to the ability to change voltage easily using transformers. AC power is the standard for homes and industries, used in everything from household appliances to large electric motors.

GSM MODULE

The GSM module is used for wireless communication between the energy meter system and the user. It enables sending meter readings, alerts, and theft or overload notifications through SMS. The module operates using a SIM card and communicates with the microcontroller via serial communication. This allows real-time monitoring without the need for manual meter reading.

WIFI MODULE

The Wi-Fi module enables wireless internet connectivity for the smart energy meter system. It allows real-time transmission of energy consumption data to cloud platforms or mobile applications. The module communicates with the microcontroller to upload data and receive control commands. This ensures remote monitoring and efficient energy management through IoT.

VIII. ADVANTAGES

- It provides real-time energy monitoring through IoT, helping users track consumption accurately.
- Automatic GSM alerts notify consumers and authorities about abnormal usage or faults.

DOI: 10.48175/568

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• The system offers overload protection, preventing equipment damage and reducing fire risks.
• It supports remote meter reading, eliminating manual meter checking and reducing human error.
• Consumers can better manage power usage, reducing electricity bills.
• Utility companies gain improved billing accuracy and faster fault response.
• Overall, it enhances energy security, transparency, and system reliability.

IX. LIMITATIONS

1. The system depends heavily on internet and GSM network availability, which may be unreliable in remote or rural areas.
2. Initial installation and hardware cost is higher compared to conventional energy meters.
3. Data security and privacy risks exist due to wireless data transmission over IoT networks.
4. GSM message delays or failures can affect timely alerts during overload or theft conditions.
5. Regular maintenance and firmware updates are required to ensure accurate performance.
6. The system may face compatibility issues with existing power infrastructure.

X. CONCLUSION

The IoT and GSM-based smart energy meter provides accurate, real-time monitoring of electricity consumption. It sends live usage data to a cloud platform, allowing users and utility providers to track energy usage remotely. It also identifies theft attempts such as meter tampering or bypassing and immediately sends GSM alerts. Users receive SMS notifications for abnormal consumption or faults. The system reduces manual meter reading and enhances billing accuracy. Overall, it improves safety, transparency, and efficiency in energy management.

XI. FUTURE SCOPE

We can make an lot system where a user can monitor energy consumption and pay the bill Online. We can make a system where a user can receive SMS, when he/she crosses threshold of electricity usage slab. We can make a system which can send SMS to the concerned meter reading man of that area when theft detected at consumer end .

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