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# IoT Based Power Theft Detection System

[1] N Kunan, [2]Chethan BN, [3]Suvidha Biradar, [4] Pramal Tekade,[5]Poornima BK
[1] [2][3][4] PG Student, Department of ECE, Dayananda Sagar University, Bangalore,
[5] Asst.Prof Department of ECE, Dayananda Sagar Univerisity,Bangalore

***Abstract* - Electricity theft is a major concern for the utilities. Many times power theft has been major impact on the economy as well as the development of the country. At present to monitor the various parameters like power consumption, the amount of load and to prevent electricity siphoning, an intelligent device would come handy to solve the problem for the power company and the clients.**

***Index Terms* – Current Sensor, GPRS module, Technical and Non Technical losses, Web Server**

## I. INTRODUCTION

Application of techniques of power monitoring allows to power monitoring systems to receive the information remotely and in relation to the coordinates and time. In this project we are using smart power meter which are fitted on both at the transmission and load side. These meters are capable of measuring power sent over the load and power consumed by the load over the time respectively. Both the parameters are sent to the base station wirelessly. Whenever there is a mismatch above the tolerance level parameters, then power theft is detected. The system will trigger the alarm to intimate to the concern authority so that they take necessary legal action and prevent power theft in the future.

## II. LITERATURE SURVEY

There are two types of power losses, technical losses and non-technical losses. Technical losses are naturally occurring losses due to power dissipation, for example I2R and copper losses. Non – technical losses are due to component break down and electricity theft. Component break down is due to environmental factors and weather conditions such as heavy rains. In [1] the power theft practices are meter tampering, illegal connection, billing irregularities and unpaid bills.

There have been various discussions on how to detect and prevent the power theft. [2] Proposes a system design which incorporates an android application and also indicates the exact zone on which unauthorized taping is done in the real time. It would provide a digital record in case of any judicial dispute. The design discussed in [3] directly computes the line current and meter current. If the line current is greater than the meter then an alert message is sent to the concerned authority with the help of GSM System. Power consumption and losses have to be closely monitored so that the generated power is utilized in a most efficient manner [4]. The system prevents the illegal usage of electricity. At this point of technological development the problem of illegal usage of electricity can be solved electronically without any human control. According to [5] increasing power theft in the countries has led to immense utility financial turmoil. Even in the most efficient system, theft account may lead to million dollars each year in revenue lost.

## III. SYSTEM IMPLEMENTATION

The system is a prototype implemented for both transmission line and distribution. Therefore to measure the power we need current and voltage from the mains supply. The voltage is measured from the lines passing through the step down transformer and a voltage regulator so that it gives the regulated dc output that is in the acceptable range of the microcontroller. We also measure the current consumed by the load simultaneously, using a current sensor acs712. A 100 watt bulb is taken, considering it as load.

Using the above parameters, the instantaneous power and apparent power are calculated. These values are displayed on the serial monitor. These parameters from the transmission lines and distribution lines are uploaded to the web server for remote monitoring. When an undetected load is attached to the system, the actual losses increase.

### *A. METHODOLOGY*

The method includes sending the power delivered across the line and measured power at the distribution end, determining the difference as in equation (1). If the difference Power loss is greater than some predetermined value which is the technical loss, then some discrepancies are indicated and it is notified to the authority. An on - going theft case will lead to an increase in the current. Sending the live data from monitoring system to the web server is done using GPRS module.

Power loss = Power Source – Power load- (1)

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Power Source–Power delivered across the line Power Load – Power calculated at the distribution

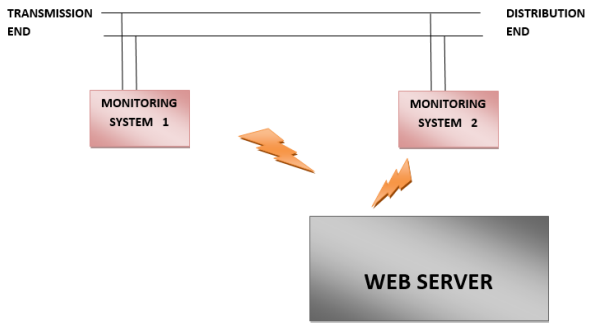


***Fig 1 Top level system design***

The block diagram of the power monitoring systems are as shown below:

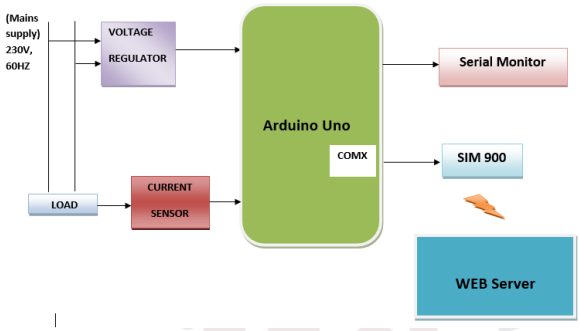


***Fig 2 : Block diagram of the power monitoring systems***

### *B. WEB SERVER*

A web server is created using Beagle bone Black. The scripting languages used are php and html scripting language for creating the webpage and apache2 for running a web server. MYSQL database is used for storing the data live. The calculation process at (1) is carried out at the server side. Also, sending notification is also carried out at this end.

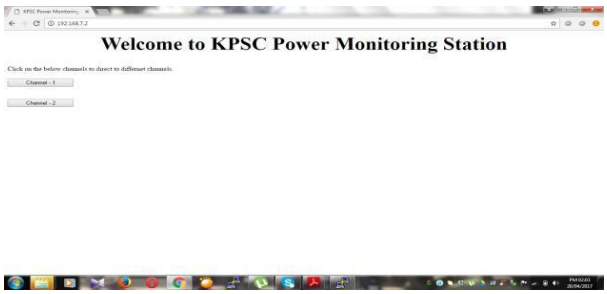


***Fig 3 Power monitoring web page***

At the server side, a continuous analysis on the power data from two ends will be performed. As shown in Fig 3, Channel 1 collects the live data from transmission end. Similarly, Channel 2 collects data from the load end. The data from both the channels are compared at regular interval of 10 seconds automatically. In case of any discrepancy other than the predetermined value an alert message would flashed at the screen at the monitoring station. Hereafter, the concerned authority can take legal action instantly.

## IV. ADVANTAGES

Considering current economic issue on the power/ electricity theft this system provides a secure way of monitoring the power across the line.

- The data from both the monitoring system would be sent to the server at every regular interval.
- The authority can have continuous access to the data on the power delivered over the time and the received power at load side remotely.
- Time saving and automated system.

## CONCLUSION

The progress in the technology is an unending aspect. Many technology and systems have been designed and proposed to the existing problems and financial losses due to electricity theft. The proposed system is makes a different with its remote monitoring station and it automatically detects power theft. The system provides a time saving method. Many power lines considering the transmission and load sides can be monitored in a base station at a time.

## FUTURE SCOPE

The system can be improved further by a camera module at every fixed distance at the power line such that the monitoring authority can locate the illegal tapping of the power line and take further action. The analytics can be further taken forward where data acquisition for user load profile collected by smart meters are carried out. User load profile can be used for user energy consumption analysis which is important for utilities to perform decision making or anomaly detection [6].

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