IOT Power Theft Identification and Monitoring

Abhijeet Kumar, Divya Gupta, Akshat Jadon, Anubhav Kumar, Jay Singh

Abstract: Now a days we can’t imagine today’s life without electricity, almost all the things, equipment and appliances we are using in day to day life are using ELECTRIC power to run smoothly. Ever since the advent of electricity it has become an integral part of our life. Solar energy is the alternative but it has some limitations like environmental changes, high initial cost etc. In todays present world every little appliance works on electricity from the electric toothbrush to huge motors. So from rural to urban and from domestic to industrial areas the use of electricity is increased but with the power theft hand in hand. Using IOT based power theft identification and monitoring a system can find the dishonest user by identifying the status of energy meter at the back end of power office.

Keywords: About four key words or phrases in alphabetical order, separated by commas.

I. INTRODUCTION

“Transmission Losses” due to unlicensed connections or tampering consume up to 42% of total electricity production in our country and also can be explained as 23% through total transmission and distribution losses and some states losses exceed 50% . (Source: BBC) Power theft is basically a non-legal way of getting the energy for different uses like transmission and distribution resulting in loss for utility companies also the loss consists of technical and non-technical losses. Annually there are about $25 billion of losses in the world [1]. Misfortunes can really make sense by finding the vitality provided, reducing the measure of vitality charged/paid. The vitality use in a power reticulation framework can comprise of the vitality utilized by buyers, specialized misfortunes and non-specialized misfortunes. The vitality devoted by the clients is estimated by the power wholesaler at a shopper estimating point, for example, a customary or a prepaid meter. The utility is liable for wholesaler at a shopper estimating point, for example, a customary or a prepaid meter. The utility is liable for

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III. PROPOSED SYSTEM

3.1 Description of System

Our proposed system claims to detect power theft in real time, along with location of theft. The system will have an online database which store all the data related to the distribution system along with the time and date. This data include power dispatched, voltage consumed at a pole and the serial no of the electric pole. The voltage value will be plotted against time. The pole number gives us with the location of the theft of power.

![Figure: Block Diagram of IOT based power theft detection](image)

The system will tabulate and form a statistical data for monitoring voltage levels in area where theft is taking place for a period of time the authorities can closely monitor the area and conduct a survey to find out where power theft occurs. We will compare the sending end and receiving end voltage levels, see demand of load if the difference is more than permitted value then a close check must be scheduled to look into abrupt rise of power demand. The authorities can use this to find the regions where there is really rise in power consumption and where power theft is occurring.

3.2 Working

The circuit consists of Arduino UNO, LCD, GSM, ESP8266 module, Energy meter, 2 transformer and loads. Energy meter is used to measure the input power supplied by the source. Two transformers are used to measure the voltage consumed in two different areas. The heart of this project is Arduino Uno controller. It is use to receive voltage signal from two transformers that are transformer-1 and transformer-2 by means of bridge rectifier. Than it compares the voltage magnitude with the voltage drop anointed for that locality. If there is no theft, than the voltage drop will be very low so there is no theft in the system. If theft occurs then the voltage drop will be high. Bridge rectifier is basically used to convert the AC to pulsating DC then the capacitor based filter circuit smoothen the DC power. Potentiometer and resistors are provided to reduce the voltage level and set it to 5volt. The voltage given by the transformer is multiplied by a value to represent the real voltage value being supplied. If the voltage shown by the transformers drops below a particular value mentioned, it means the load in the area has increased and so there is theft occurring and with the use of GSM it will alert the function through SMS and email.

An online database is created by making use of THINGSPEAK server where the data of voltages of different areas are stored and updated automatically. In it the analysis of data can be done by MATLAB and the location of monitoring can also be done. It gives us a graphical view of the change in voltage in an area.

LCD is used to display the load voltages of different areas. The ESP8266 Wi-Fi module allows the Arduino Uno board to connect the internet so that monitoring authority can get the information through the internet. The exact location of the power theft is determined by placing multiple transformers in load line at a specified distance by which monitoring authorities will be in a state to take legal action against the culprit.

3.3 Components:-
- Arduino UNO
- ESP8266
- GSM SIM800
- LCD (16x2)
- Transformers
- Bridge Rectifier
- Energy Meter
- Load
- Resistor
- Capacitor

IV. ADVANTAGES, APPLICATIONS AND RESULT

4.1 Advantages:-
- Safety is automatic in this system.
- The alert can be generated through GSM even in the case of failure of internet through sending text SMS.
- It will not affect the power transfer capability of line.
- IOT based power theft identification and monitoring will eliminates the need of human power by making it automatically.
- It will inform the supplier side about any theft that is happening in the distribution side or consumer side.
- A user can be aware of their electricity consumption.
- Theft of electricity can be avoided by tamper proof energy meters.
- The proposed framework eliminates the human involvement in electricity maintenance.
- A user can also monitor their energy meter reading online from anywhere.

4.2 Applications:-
- Its use in distributed system.
- It is use in AMR.
- A system can be incorporated for almost all type of users.
- The concept is well suited especially for the villages and interior areas.
- The power stealing can be effectively control by detecting where the tapping occurs through the IOT based device.
4.3 Result:-
- Due to the use of IOT based power theft detection, the losses from tapping can be reduced.
- The time which is consumed by regular checking of transmission lines will be reduced.
- The requirement of manpower will be reduced.
- The cost will also be reduced.
- This will also increase the economic growth in upcoming time.

We used the IOT based system for the purpose to implement and minimize electricity theft because electric energy is a necessary resource in everyday life. This can be designed by installing OS on raspberry pi and energy meter communicate with raspberry pi through GPIO pins. After this, raspberry pi connect with the internet. At the back end, government person see the status of energy meter in the form of graphs. This paper supports two energy meters. The results obtained after execution are shown below. In below figures, level 0 shows that meter condition is ok and nobody tries to theft the electricity. But at level 10, it shows that someone theft the electricity.

![Fig:1-When no theft of electricity occur](image1)

![Fig:2-When theft of electricity occur](image2)

**V. CONCLUSIONS**

Using IOT, power theft identification and detection kit has been implemented and it is also done using GSM for the purpose of backup protection through sending e-mail. In case of internet failure the alert will be made through text message via SMS. By using above GSM and IOT techniques the crime of stealing power may be brought to an end by sending SMS and e-mail, thereby a new florescence may be expected in the economy of our motherland and also there will be less scarcity for power utilization.

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Dr. Jay Singh received his Ph.D., M.Tech and B.Tech degrees, all in Electrical Engineering, where he received his Ph.D. degree (in year 2015) from Indian Institute of Technology (ISM) Dhanbad, M. Tech. (in year 2010) from Maharshi Dayanand University Rohtak, India and B.Tech (in year 2005) degree from Madan Mohan Malviya Engineering College
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(Formerly known as Madan Mohan Malviya University of Technology) India. Dr. Singh has been awarded as best faculty from several institutions. Also he has received the best paper award from 1st IEEE Uttar Pradesh Conference in year 2015. He has published 46 research papers in reputed international journals / conferences. Dr. Singh is the reviewer & editor of several reputed International Journals. Currently he is supervising 5 Research Scholars of IITs and state Gov. Universities. His research areas are Load frequency controllers, Two degree of freedom internal model control, Model Order Reduction, etc. He has organized 4 IEEE International conferences, 1 International Seminar, 1 National seminar, 4 FDPs sponsored by government funding agencies. He has completed several tasks given by All India Council for Technical Education New Delhi. Currently he is working as Associate Professor in the department of Electrical & Electronics Engineering, GL Bajaj Institute of Technology and Management Greater Noida, U.P. India, where he is the officer In-charge of ISTE Chapter New Delhi, IEEE student branch Chapter, NBA and NAAC activity. Also he was the executive committee member of IEEE Uttar Pradesh Section India in year 2017. Dr. Singh encourages to his colleagues, students, neighborhood friends to make pollution free environment by using Cycle for office and local visit purposes. He has also established Cycling Club in his institute to make more awareness towards green environment.

Apart from holding several academic and administrative responsibilities, he is also senior member of numerous national & international professional bodies.

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