

A Review on Smart Energy Meter for Power Consumption Monitoring with Over Power Detection for Household Applications

Shivani Singh¹, Gulhasan Ahmad², Pawan Kumar Tiwari³, C.K. Dwivedi⁴

^{1,2,3,4}Dept. of Electrical Engineering, Sri Balaji College of Engineering and Technology, Jaipur, Rajasthan, India

Abstract: Despite many efforts, Energy crisis is the present day problem and it is getting worse day by day. To overcome this situation people are finding various energy efficient resources. Among them, power is the main concern which needs to be monitored and controlled. With the rise in power consumption in every part of the world there is a subsequent rise in power theft and over usage of power. This is a serious problem which is being faced by the power utilities. Large amount of money every year. Electricity fraud can be define as a dishonest or illegal use of electricity equipment or service with the intention to avoid billing charge. It is difficult to distinguish between honest and fraudulent customers. Realistically, electric utilities will never be able to eliminate fraud. It is possible, however to take measures to detect, prevent and reduce fraud. Investigations are undertaken by electric utility companies to assess the impact of technical losses in generation, transmission and distribution networks, and the overall performance of power networks. The installed capacity of the electricity sector in India is 360.456 Giga Watts as on 31 July 2019, which includes renewable and non renewable sources. The per capita electricity consumption in India in 20162017 was 1,122 kWh. Every year 20-30 % average line losses according to WAPDA Company's loss more than RS.125 billion. India's T&D losses are almost 20% of generation, more than twice the world average and nearly three times large as T&D losses in the United States. Electricity losses are the result of technical inefficiency and theft, but in places with good technical efficiency and low theft, T&D losses generally range between 6% and 8%.

Keywords: Energy crisis, Monitor, Control, Power consumption, Over power

Literature Survey:

Pardeep Mittal et al. (2015) proposed the wireless electricity theft detection and billing system using microcontroller. The wireless system reduces the cost of wires used to transfer the billing data as well as information regarding theft by someone. The striking feature of the proposed work is that no person goes home to home to note down the meter readings of electricity consumption. There is always a contract between the consumer and the supplier that the consumer will pay for the electricity consumed by him. In India near about 32 % of the electricity is consumed but not paid for it i.e. it is being stolen by the consumer hence such a system was required that would overcome this theft of electricity but mostly the electricity is being stolen via bypassing the energy meter hence this system recognizes such type of theft of electricity The proposed method has been simulated on proteus and implemented on hardware using microcontroller programming.

Sonal G. Phuke et al. (2015) provides a survey on implementing wireless sensor network (WSN) technology based on smart monitoring and controlling mechanism of household electrical

appliances in different ways. For this purpose we briefly discuss the existing power management in smart homes/building, following with a review of advantages of adopting WSN technology for power management. Then it focuses on challenging factors influencing the design and development of WSN based power management and also on solutions for power management. It also provides improvements for further research.

J. L. Rojas-Renteria et al. (2016) proposed Electricity consumption is currently an issue of great interest for power companies that need an as much as accurate profile for controlling the installed systems but also for designing future expansions and alterations. Detailed monitoring has proved to be valuable for both power companies and consumers. Further, as smart grid technology is bound to result to increasingly flexible rates, an accurate forecast is bound to prove valuable in the future. In this paper, a monitoring and forecasting system is investigated. The monitoring system was installed in an actual building and the recordings were used to design and evaluate the forecasting system, based on an artificial neural network. Results show that the system can

provide detailed monitoring and also an accurate forecast for a building's consumption.

Alexander Martin Tureczek et al. (2017) proposed Smart meters for measuring electricity consumption are fast becoming prevalent in households. The meters measure consumption on a very fine scale, usually on a 15 min basis, and the data give unprecedented granularity of consumption patterns at household level. A multitude of papers have emerged utilizing smart meter data for deepening our knowledge of consumption patterns. This paper applies a modification of Okoli's method for conducting structured literature reviews to generate an overview of research in electricity customer classification using smart meter data.

Dishita Barai et al. (2017) proposed the rise in use of commercial appliances in large scale also results in large amount of power draw and hence huge amount of electricity bills to be paid. This results in a large difference between their power draw from the mains and the actual utilization as some amount of this energy is bound to be wasted in some form of energy. In this paper, various techniques that have been implemented previously for measuring the difference between the actual power draw and the utilized power draw, the steps to reduce the amount of power draw and hence saving the energy costs are mentioned.

Gonçalo Marques et al. (2017) proposed the National Action Plan for Energy Efficiency sets targets for the years 2016 to 2020 in which energy efficiency is a European priority covering all Member States. Energy efficiency has been increasing its importance over the years National and international laws have been introduced to reinforce that concept. The Internet of Things (IoT) is a concept created to define the technological revolution of the devices used in day-to-day connected to the global Internet network. Thereby associating the need for monitoring of energy consumption to the paradigm of the Internet of Things, we intend to design and build an automatic system that allows monitoring and control of electrical devices connected to the Internet via Wi-Fi denominated by iPlug. This system is a smart plug that fits a generic socket and provides information of power consumption (s) device (s) connected to it by calculating the current and the line voltage, this information is stored in a database. The iPlug also lets you know whether the outlet is on or off, change your

status, and access to consumption data through two applications, a Web portal and an application for iOS.

Srujana Uddanti et al. (2017) proposed the expansion of the intelligent devices has created a new start to the machine to machine communication at any time and at any place. As intelligence spreads beyond devices to anything, this connectivity has created a more noteworthy vision on Internet of things. The Internet of things has made a virtual network between the human and this physical world and has drastically changed the way business works[1]. Numerous associations are finding the inventive approaches to make information trade with more protection and decreased expenses. The way to pick up the genuine business esteem from Internet of things is viable end-to-end correspondence. This compelling correspondence can be accomplished by sending the ideal stage between the both gadgets that are included in trading the information. This Paper describes the design and implementation of energy meter utilizing IoT concept. The Proposed System takes out the human involvement in the power administration. The consumer needs to pay for the use of power on the calendar, in the event that the user couldn't pay, the electricity distribution can be turned-off from the distant server. The user makes any unauthorized usage of power i.e., if any theft detection is found the power goes off automatically from the remote place. GSM module sends energy meter data on to the webpage thus performing IoT operation.

Abhiraj Prashant Hiwale et al. (2018) proposed the digitization of load energy usage readings over the internet. The proposed system design eliminates the involvement of human in electricity maintenance. The user can monitor energy consumption in watts from a webpage by providing a channel id for the load. The Webpage utilizes the THINGSPEAK analytics to analyze the energy usage to give more detailed description and visualization of the energy usage statistics. Wi-Fi unit performs IOT operation by sending energy data of the load to the webpage which can be accessed through the channel id of the device. In the proposed system, consumer can do power management by knowing energy usage time to time. This proposed system utilizes an Arduino microcontroller. The unit which is generated can be displayed on the webpage through the Wi-Fi module.

Harsha Khandel et al. (2018) proposed a model is designed which aims to control and monitor power

consumption of a particular area or sector. The designed model monitors the power consumption of the end users and cut off the power supply when it exceeds the set limit. The device sends the power consumption data to the supplier's blynk server using Internet of Things (IoT) technology. The designed model can be placed before the transmission of the load in each house of that particular area. It consists a meter that generates a continuous unit pulse which can communicate with network through an Internet gateway WI-FI. With the help of internet accessibility, communication will be possible between end-user and the supplier. The supplier can monitor and control the power consumption of the end user from a remote place. Along with that the device sends notification to the supplier about status of power consumed and data sheet will generate using LabVIEW.

Ms. Raksha R. Sharma et al. (2018) proposed recent years, the demand for electricity has increased in households with the use of different appliances. This raises a concern to many developed and developing nations with the demand in immediate increase of electricity. People are unaware of energy consumed by various appliances. An electricity meter is a device that measures the amount of electric energy consumed by various electrical appliances. The main drawback of previously used traditional meters is that they do not provide information to the consumers, which is accomplished with the help of Talking Energy Meter. As power consumption is increasing day by day there should be more focus on understanding consumption patterns. Traditional electromechanical energy meters are now replaced by electronic meters in domestic as well as commercial applications. This project is aims to design a circuit which helps the consumer in taking care of the electrical energy consumption. This system helps the users by alerting them about the billing status and unit consumption. The "Talking Energy Meter" using ATMEGA328 Microcontroller is an exclusive system which is used to help the deaf and dumb people to announce their requirements using voice module aPR33A3. This aims to provide a user friendly interaction.

Conclusion: The over power usage by building a system which will govern the power consumption of the loads. If the power consumption increases a certain level the power supply will be cut. The major motive of designing such system is that it will eventually and ultimately reduce the illegal used of

electricity and will save lot of money because it directly affects the economy of nation as well as the consumer who suffers a lot of loss due to the usage of the power exceeding the definite limit. With the help of power consumption monitoring of a customer is monitored. When the user exceeds his limit of power consumption the supply of power will cut off automatically. Supplier will be notified about the power consumption of the entire region or sector. The supplier can monitor and control the power usage of the user as well as the entire region. If the generated data is provided to the customers, they can compare their usage with the data sheet. So this will help to identify the fraudulent user who is using more power than defined. Variable voltage and variable power will set according to electricity board section as well as it provide safety as the limit of meter will change by the authorized person.

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