

A Survey on GSM based Prepaid Meter

Akshay Gautam

Electrical Department

Career Point University, Kota, India.

Ravindra Meena

Electrical Department

Career Point University, Kota, India.

Abstract - Many households indulge in different forms of electricity theft and illegal tampering of electric metering devices. These lead to distribution system faults and overload as well as loss of revenue by the distribution companies, this paper envisages the utilization of the global system for mobile communication (GSM) into the prepaid energy meter for increased generation of revenue in developing countries. This paper discuss the various way to design smart energy meter based on GSM networks and application of prepaid metering in Indian society.

Keywords – smart prepaid meter, GSM, Indian Society.

I. INTRODUCTION

Electric energy meters, the direct billing interface between utilities and consumers for long, have undergone several advancements in the last decade [1]. The conventional electromechanical meters are being replaced by new electronic meters to improve accuracy in meter reading. Still, the Indian power sector faces a serious problem of lean revenue collection for the actual electric energy supplied owing to energy thefts and network losses. One of the prime reasons is the traditional billing system which is inaccurate many times, slow, costly, and lack in flexibility as well as reliability [2]. Therefore, attempts are being made to automate the billing systems. Even though more accurate and faster meter readings have seen the light of day, bill payment is still based on an old procedure. They require an individual/agent to personally come down to customer place and note the meter readings and report the amount one has to pay to the household/office [3-4]. The rest of the paper is organized as follows. Related Work are explained in section II. Concluding remarks are given in section III.

II. RELATED WORK

Jain and Bagree [5], This paper presents a model for prepaid meter using mobile communication. This is an effort towards upgrading existing electrical energy meters through their fusion with a prepaid card aiming at collection of bills prior to consumption of energy thus improving the revenue collection for the scheduled supply. Thus the work presented in this paper mainly models the prepaid card proposed to be embedded to the existing meters. The proposed card opens up a contactor once prepaid balance is over. The proposed prepaid meter has been successfully implemented in a software model which has been implemented with the help of Matlab. The proposed prepaid block is modeled in Simulink to monitor the prepaid balance and it duly trips a contactor once the consumer runs out of the balance. The modeling shows that the consumer is never allowed to consume more than what he has paid for and is entitled to request a recharge for continued supply. The power utility recharges the prepaid card through mobile communication once they get the prepayment from the consumer for recharging prepaid meter. The mobile infrastructure caters to two way communications between the power utility and the prepaid meter enhancing the smart nature of the scheme. The major benefit of proposed prepaid meter is that it doesn't require replacing the already installed energy meter but it will just upgrade the already installed energy meter to prepaid meter with attachment of prepaid card. The authors hope that this proposed prepaid meter will be very useful for the power utilities in developing economies like India which has large population of traditional energy meters as the proposed prepaid meter is achieved by upgrading the existing energy meters which is very economical instead of replacing them fully with another prepaid meters.

Omijeh and Ighalo [6], In this paper, a single phase Intelligent prepaid energy meter has been designed and modeled. It has a satisfactory efficiency in the measurement of rated load, power factor, output voltage, output current and system behavior. It is reliable in monitoring of energy consumption; and in graphical display of energy consumption behavior of different loads with different impedance. It also has the intelligence property of detecting

peak energy consumption period which is a very important information for power utility company. This design is therefore recommended for implementation by power utility companies.

Omijeh and Ighalo [7], In this paper, GSM-Based Energy Recharge Scheme for Nigerian Power Utility Company has been modeled. The entire system can be cost effective and significant amounts of time and money can be saved by implementing it, as opposed to one involving the human element. Human errors in billing would be totally eliminated and a more convenient way of purchasing energy credits and recharging Energy Meter. It's reliable as consumers are only allowed to use what they pay for thereby reducing revenue loss due to unpaid bills. If fully implemented by Nigerian Power Sector, revenue collection will increase.

Omijeh and Ighalo [8], A methodology of the SMS recharge model for prepaid energy meter has been presented. The SMS recharge protocol has been developed and the overall idea has been simulated too. The recharge and billing efficiency of the proposed system have been tested and the results obtained show good system performance. It is strongly observed that the amount of energy recharge units purchased determines the amount of energy consumed by the user. This indicates good reliability, dependability and efficiency of the proposed system. If fully implemented by power utility sector proper energy accountability will be obtained. The rate of energy purchase will increase since consumers can within the comfort of their houses recharge with SMS without the stress of visiting utility company for activation.

Dike et al. [9], The design, simulation and construction of a GSM-based prepaid meter has been achieved. It x-rayed various forms of electricity theft which include unaccountability of servicemen, irregularities of billing leading to a reduction of funds by the utility companies has also been achieved as this work prevents one on one contact between the end user and the workers. With remote monitoring of the meter reading and sending SMS whenever there is abnormal readings in the customer electricity meter, the developed system may be able to help Utilities reduce the incidences of household electricity theft. Automation of the customer billing system has been achieved as the meter keeps track of the consumers load on a timely basis. This design, therefore, removes the manual reading of meters with its attached consequences of time consuming system and bill manipulation which reduces revenue generation by utilities while adding higher bills to the consumer. The work also revolves around the automatic disconnection and connection when the recharge is low or high respectively and extra cost due to reconnection is removed. Further improvement will be needed in including miniaturized monitoring cameras in the customer meter which will monitor physical activities around the meter in each household to check other illegal acts that were not covered in this work.

Koay et al. [10], in their work, designed and implemented a Bluetooth energy meter where several meters are in close proximity, communicated wirelessly with a Master PC. Distance coverage is a major set-back for this kind of system because the Bluetooth technology works effectively at close range. In their paper [11], the viewed home-automation systems as Multiple Agent Systems (MAS) was displayed. Home automation system was proposed where by home appliances and devices are controlled and maintained for home management. It is only a home management system and does not measure the amount of energy consumed by users. [12] in their paper, proposed the use of Automatic Meter Reading (AMR) using wireless networks. Some commercial AMR products use the internet for data transmission. A design and implementation of SMS -based control for monitoring systems was presented[13]. The paper has three modules involving sensing unit for monitoring the complex applications. The SMS is used for status reporting such as power failure. Issues on billing system for electricity board usage were not considered. Prepaid meters can also make use of state of art technologies like WiMAX owing to the idea of centralized accounting, monitoring and charging. It brings telecommunication to the core of its activities to support more Smart Grid applications such as Demand Response and Plug-in electric vehicles [14] Prepayment polyphase electricity metering systems have also been developed consisting of local prepayment and a card reader based energy meter [15]

III.CONCLUSION

This paper shows the various techniques to design Smart energy meter and advantages and limitations of techniques. In present scenario smart energy metering technique needed to find theft of electricity.

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