SMART ENERGY METER LOAD CONTROL

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ABSTRACT: In the Modern world intelligent control is adopted in every field, although the service provider for energy are still uses the conventional methods for getting the energy consumed by the customer. The conventional method is very time consuming and expensive which may also lead to human error. Our proposed method will automatically send the data of the digital energy meter to the service provider with the help of the GSM modem once in a day and hence the system will generate a report and send to the service provider once in a day through SMS. The same system can be used to check the last reading consumed by the consumer, when the demand request send by the user through the same methodology. It can also be used to control the load from both the ends with the help of relay circuit. An LCD display is provided to display the readings and to update the consumers information's such as tariff change or sudden power cut**.**

Keywords: INTELLIGENT Control GPS, LCD, ENERGYMETER

I. INTRODUCTION

Electricity is the driving force behind the development of any country. With the rapid increase in residential, commercial, and industrial consumers of electricity throughout the world, it has now become imperative for utilities companies to devise better, non-intrusive, environmentally-safe techniques of gauging utilities consumption so that correct bills can be generated and invoiced. Traditionally, the electricity meters are installed on consumer's premises and the consumption information is collected by meter-readers on their fortnightly or monthly visits to the premises. This method of gauging electricity consumption has the following disadvantages: (i) Sometimes the meters are installed inside people's homes and, if the consumer is not at home, the meter-reader cannot record the fortnightly or monthly consumption and then the utilities 'company has to resort to considering the average bill-amount of the previous months as an indicator of the likely consumption for the current month. This results in burden for both consumer and the electricity supply company. May be the consumer has not utilized similar amount of electricity and the current month as in the previous months for reasons such as, holidaying elsewhere or being in the hospital, etc. during the month, and sending him a bill for a larger amount based on his history of electricity consumption mat result in his/her financial hardship. This method of billing is also not suitable for the electricity supply company because it gives inaccurate in the consumer's area and may ultimately result in errors in future planning by the company. (ii) Hiring of a number of meter readers by utilities' companies and providing means of transportation to them is an expensive burden on the companies' budgets. Moreover, these visitors of the may use vehicles to reach the consumer's premises, generate pollution in the air which has negative impact on the environment and the greenhouse effect. (iii) Dissatisfaction of some customers who may consider meter-readers' entrance to their homes as some sort of invasion of their privacy. This is especially applicable in villages, where during the day most men are outside of their homes earning a living and only women are at doing the housework. (iv) The meter readers may make some mistake in reading the consumed unit which will lead to false billing due to human error.

The SMS has extended their service to content providers to deliver a wide of services to mobile phone users. SMS is one of the convenient mean of communication especially for reminder, notification and a short note when the mobile phone user is not expect to answer or respond immediately. With the advancement and booming of ICT and internet technology makes online information system application such as e-commerce are systems using Power Line Carrier (PLC) communications, Bluetooth and ZigBee were developed to address the above mention problems, but the above mentioned AMR are either short in operating distant and still require some intervention of human operators or prone to error and reliability issue due to noise and poor power quality in the transmission line, more importantly the above mentioned method does not allow control. With the rapid development of Global System Mobile (GSM) infrastructure

and Information Communication Technology (ICT) in the past two decades has made wireless automatic meter reading system more reliable and possible. The GSM Power Meter Reading and Control (GPMC) System takes advantage of the available GSM infrastructure nationwide coverage in the country and the Short Messaging System (SMS) cell broadcasting feature to request and retrieve individual houses and building power wirelessly and the control system will monitor the power of the appliances which consumes more power than its predefined limit the control system will control the power by means of different techniques for different types of loads like resistive and inductive load so as to reduce un necessary power consumption of appliances and to save the energy at the same time the energy provider can connect or disconnect the power supply to the home is there is an irregularity in the payment of the electricity consumed bill with the help of the same GSM modem. The followings are the objectives of the research project to ensure it meets the aim.

- To design a circuit which continuously monitors the meter reading and sends the message to User and electricity department.
- To design a mechanism that will monitors and controls the power of appliances from both ends.

An LED display with a speaker which will report the latest updates to the consumers regarding tariffs and if there is an sudden power cut. The GSM modem will report to the Service provider modem on daily basis and at the end of the month analysis of the energy consumed is done tariffs and vats are included and bill are sent to the consumers inform of mail SMS and hardcopy in the billing address provided by the consumers.

II. PROPOSED WORK

To implement this system, an ARM controller or an PLC based board is used. Module, UART module to interface a GSM modem and energy meter. The energy meter is having a LED which blinks for a specific number of times to indicate the energy consumed (e.g.1 Unit = 1600 pulses). These pulses are fed to ARM based system which is programmed to count these pulses. The system reads these pulses it increments the internal counter by one which indicates the number of units consumed. The system also contains a relay circuit and an LCD display which is interfaced with the modem and the control circuit as shown in figure 1.Now, when the service provider sends a message to read the energy meter data, GSM modem, which is connected through UART interface, interrupts ARM. This causes ARM to read the number of units burnt and sends the data to the UART. Further, the UART sends the data to GSM modem which sends this meter reading data to service provider. At the end of the month the total unit consumed is detected, tariffs are included and sent to the consumers in forms of SMS, email, and hardcopy of bill to the address of the user. If now, the service provider detects that the message will be sent by the service provider, which results in disconnection of energy supply goes further to home/office through a relay circuit, which is again controlled by ARM system or the PLC. The service provider can now inform the customer regarding the current bill or status using the customer's registered phone number by either a message. The system will also contain a display system with a speaker which will report latest information to the consumers.
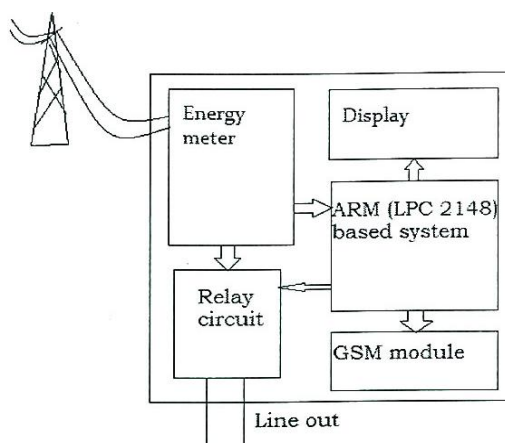

Fig. 1 Block diagram of proposed system
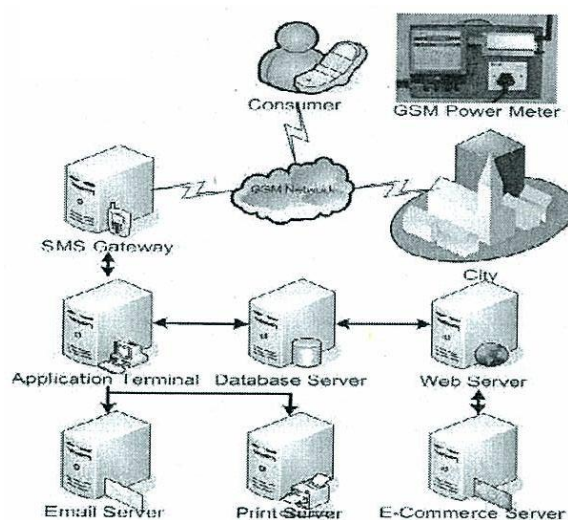
III. SYSTEM OVERVIEW

Fig.2 Proposed system

The complete system over view of the system is shown in the fig.2 the complete system is made up of GSM power meter (GPM) in every consumer unit and SMS gateway, application terminal data base server email server printer server and e-server installed at the distributed site the system is working in conjunction with GSM network to retrieve power meter reading using SMS. The GPM is a single Phase digital KWh which utilizes the GSM network to send the power usage reading back to the energy provider wirelessly once in a day through SMS gateway. The consumer can also check the latest reading of the energy meter in form of SMS when demanded by the users. A sim card with the unique service no is required for the GPM to receive and reply it's to the energy provider the special service no. sim card is work similar with the mobile phone no: except it is not meant for voice service. The sim card is also used to identify and retrieve the customer details from the data base server for billing purpose. The fig 2. Shows the structure of the system in the service provider's end. At the end of the month the total unit consumed is detected, tariffs are included and sent to the consumers in form of SMS, email, and hardcopy of bill to the address of the user. The same above meter can also be used to control the load. If the consumer wants to control the load from the far end they can do it with the help the above GSM modem. The distributors can also control the load from the far end with the help of the same GSM modem if the consumer fails to pay the money on time. All the load control is made possible with the help of relay connecter to the meter. This system will also have an LCD display and a speaker interfaced with the modem with the help of ARM controller or the PLC that will display the important message cut or information regarding tariff to the consumer.

IV. HARDWARE IMPLEMENTATION

A large part of the project involved choosing the appropriate hardware components to take the meter reading from the meter and send it to user and to server remotely and to control the power consumption and provide a wireless link. The initial idea was to search for an all-in-one solution that would have all the components integrated, allowing for the smallest size possible. Initially it was thought that a simple circuit could be built and attached to a microprocessor to control the power. But the cost of the circuit with microprocessor is very high. It was decided that designing a simple circuit, whit the help of the microcontroller and would provide accurate power controlling and the measurement of meter reading. The following sections describe the research process as well as the implementation was done in Eagle 6.0 which is having the facility of PCB layout print. It can also be designed with PLC when being used in industrial automation purpose still work is in industrial automation purpose still work is in progress in this field so that proper interfacing can be obtained with maximum efficiency and less cost.

V. SOFTWARE IMPLEMENTATION

According to the hardware circuit design features, meter reading terminal program flowchart was introduced as shown in fig 3. and fig .4 When receiving the command, meter send the current status along with the energy consumption.
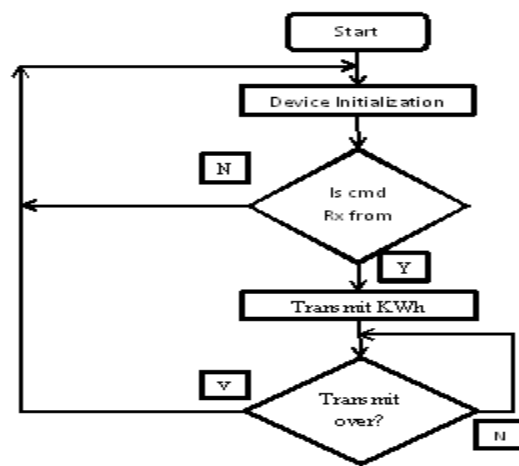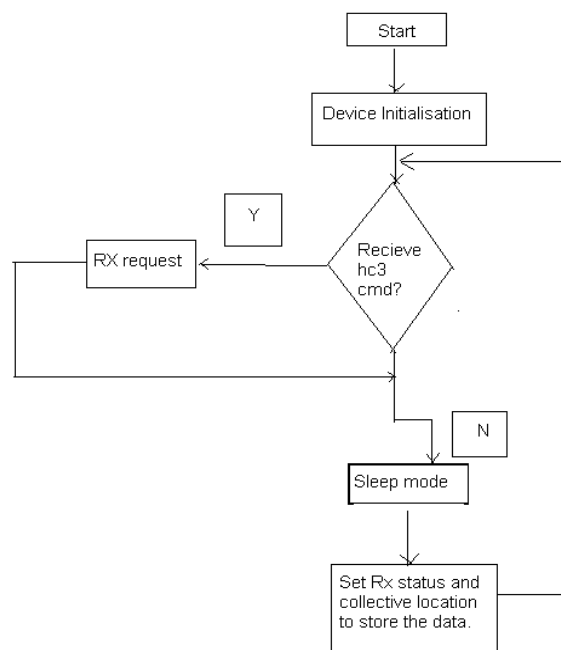

Fig 3: Meter side flowchart

Fig 4. Server side flowchart

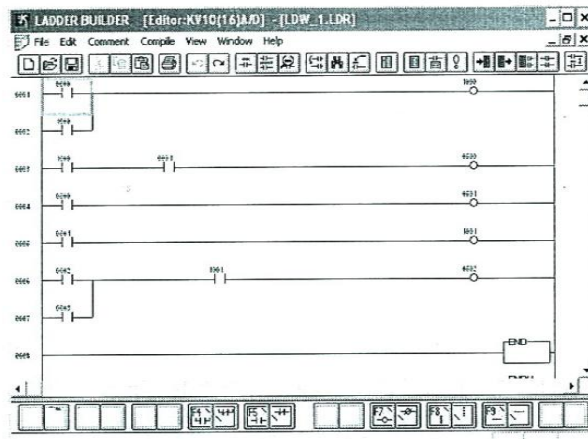### VI.SIMULATION WITH PLC (KEYENCE LADDER BUILDER VERSION 1:5)

Fig. 5 Energy meter data reading

The simulation is done in Keyence ladder builder software version 1.5 which shows that the program can be successfully implemented in PLC. Today delta PLC is available in market which helps in easier implementation of the above required purpose. For simulation purpose we are using Keyence ladder building software. The simulation result shown is divided into two parts one part is for energy meter data reading while the other part is for energy meter data reading while the other part is for load control. The sensor senses the units and stores it in memory when the 24 hours timer turns high it transmits the data it will save the data en at the end of receiving the data it will save the data an at the end of 30 days the stored data in distribution side is counted tariff, vat are added and sent to the user in form of message, mail and printed hard copy in the mentioned address. The second part the PLS program shows the load control. When the GSM senses load control command from the Consumer side it turns on the control which is designed to control the load accordingly. When the sensor receives load control signal from the energy provider side it disconnects the system from the supply with the help or relay circuit load control.
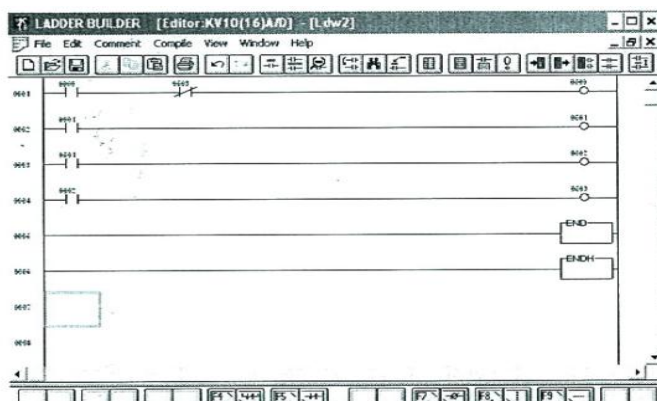

Fig 6. Energy meter load control

VII. RESULT

The project is having the facility of getting the meter reading at any time by the customer request. The fig 7 shows the message which is send by the customer to the energy meter and the consumer receives the present reading in his mobile

phone as show in the following image. At the end of the month the consumer will receive a mail, printed hard copy in the postal address mentioned and SMS in his mobile phone relating al about bill details.
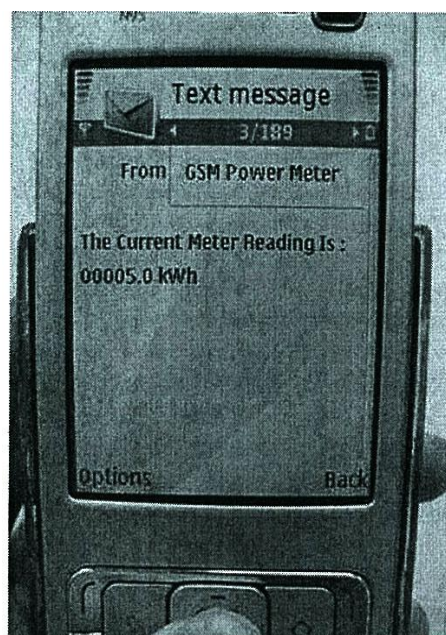

Fig.7 SMS send to meter side from customer

Fig.8 SMS received by customer from meter

The system designed reduces the efforts of manual data collection of energy meter. Also, data which is received at service provider side is easy to manipulate for bill generation and other such tasks. With this system we can collect the reading as well as control the supply to the user. With addition of software at service provider side, the customer can be informed of current meter reading, bill for current cycle, status of the line and other parameters to the customer with either message or a phone call.

VIII. CONCULSION

A complete working prototype of this system is being done to demonstrate an automatic power meter reading using the GSM network. The system takes the advantage of the existing GSM infrastructure that have virtually full coverage of all housing and building area across the country which lead to low infrastructure Implementations cost, simple and easy installation of GSM power meter at consumer site as GSM. Power meter is no different from existing analogue or digital meter installation the complete E billing system help in easy billing and delivering of the bill in from of SMS, email and printed hardcopy the system is effective reliable and efficient wireless automatic power meter reading with automatic load control. Thus it reduces the operation cost and human operator meter reading, making the system error free with the help of the GSM modem, the only drawback with the system is that it way sometimes leads to slow delivery of message to the distribution side GSM modem.

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BIOGRAPHY

Dr.K.P.Satheyamoorthy has 30 years of experience in Tamil Nadu Small Industries Development Corporation. After retirement from the above corporation, joined as a Principal, New Prince Shree Bhavani College of Engineering of Technology Chennai in the year 2008 and worked for one year and six months. Then worked for two years from 1-3-2010 to 28-12-12 as Principal in Lord Venkateswara Engineering College, Kanchipuram from 1-3-2012 to till date working as a Dean in EEE Dept at Dr. M.G.R Educational and Research Institute, University, Chennai.