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Smart Electricity Meter

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***Abstract*— The design and developing of Smart electricity meter it can be monitoring as well as controlling the system. In Electric system smart electricity meter are the electronic devices which is used to measure numbers of units consumed by the consumer. Traditional electricity meter have no ability to detect or deal with tampering because they only measure energy based on the voltage and current It is a difficult job for the electricity board Official person to take manually meter readings and Stores their records &calculate bill as it is time consuming and requires man power. The system principal monitor electricity of household appliances calculates the units and units by billing.**

***Keywords*— IOT, smart electric meter (SEM), billing, power tempering, GSM GPRS.**

I. INTRODUCTION

In Wireless communication techniques are rapidly develop using controllers, there are variety implementation for reducing man power in previous electric meter. The present electricity meter was not suitable longer operating purposes as it spends much human and material resource. Energy meter billing is an important part of energy distribution. Each time a person from the authority side come and collect the meter reading and produce the bill to the consumer.

The problem of previous electricity meter systems, it requires lots of manpower means the person from authority side comes once in a month capture the image of the meter and according to nos of units consumes billing of the energy meter and store this readings in storage device and system becomes time consuming. So here comes the need of "**SMART ELECTRICITY METER**" which will provide bill to consumer in both ways i.e. SMS along with other inbuilt features such as tamper proof, fault detection etc. The energy meter utilizes a GSM module to transfer energy consumed to the authority side. Similarly authority side also uses these GSM service to send back the bill. Electricity stealing is also common issue now. The main disadvantage of mechanical meter was it was less reliable, less accurate and non-tamper proof. Now a day, Electronic energy meters used by electricity board is not completely tamper proof. In energy meter also have the feature of detecting faults in the distribution system, made by checking the status of supply at distribution transformer and that at consumer.

Smart Electricity meter is electronic device that records the consumption electric energy and communicates the information of the electricity supplier, Authority member for monitoring and billing. Meter tempering in the broadcast sense is an illegal method employed by consumer to gain entry, break in or some cases break the meter to deplete key functionalities with goal of reducing or completely eliminating the cost of energy usage traditional electricity meter have no ability to detect or deal with tampering because they only measure energy based on the voltage and current flowing between the inlet and outlet terminals in such meter tampering is easy and detection is harder. More granular billing data requirements This migration was made possible by reducing cost of the technique and auto billing requirements for all consumers.

II. METHODOLOGY

The focusing on tampering detect in electricity using the updated and advanced system design we can provide a solution for detection of Tampering which ensures that neither adding any additional meter nor we are making as system or design is more complicated

1) A main system will consist of five elements
   - Master unit
   - Sub (slave) unit
   - Microcontroller
   - GSM GPRs
   - Relay
2) Isolated area consist the no of energy meter associated with readings of each sub meter & store in master unit as the energy consumption and giving those reading to controller.
3) For tampering Detection separately we are given readings from the sub meter to the controller.
4) Microcontroller compares the original reading from master unit and sub unit if through are same the tampering is not detected, otherwise tampering gets detected.
5) Depending on this microcontroller will do the calculations as per unit consumes and extra charges on tempering and process of billing done.
6) All the data related to the meter GSM GPRS through upload on the web page.
7) AS per the response or detection of thefting relay take its action either **live** or **dead.**

III.BLOCK DIAGRAM &HARDWARE DESCRIPTION

In this project we are using three meter.one is master meter &another two sub meter,client 1 and client 2 respectivily. All the data monitoring related to every submeter is stored in master meter.we are using energy meter ic(ade7761) output of this metering ic is in the form of pulses this output through optocoupler,is given to lpc2148, microcontroller compare the reading of submeters & master meter if those are same then there is no tempring done otherwise tampring is detected through gsm gprs all the data is transmitted on the web page.

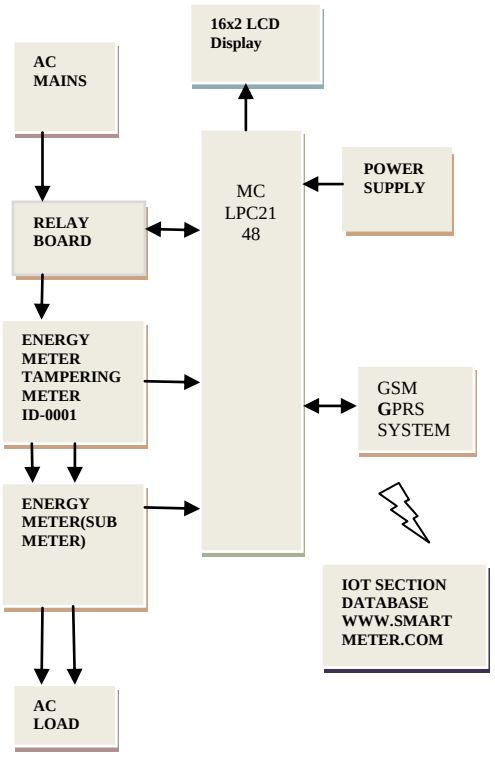

Fig.1.System Block Diagram

A 78xx regulator Ic used for voltage regulation. It is three terminal Ic. The 7805 is used LCD display, displayed the message related energy meter. The lm 317 is used for controller. The 7812ic is used for GSM GPRS module for communication. Controller requires the 3.3v the lm317 is In this project used the regulated 12v,5v, 3.3v power supply.

In this method we are using lpc2148 because it is energy efficient i.e. It consume less power, it has higher clock rate & faster response too and has two Uarts. Energy Meters which is already installed at our houses are not replaced, but a small modification on the already installed meters can change the existing meters into smart meters. The use of GSM module provides a feature of notification through SMS. Only authority side access the meter working through web page that we designed. Current reading with cost can be seen on web page. On & off of relay is possible. The unique meter id and unit consumed are given to lpc2148.these readings are displayed on LCD Display as well as send to main controller.

A. ENERGY METER

The ADE7761 is a low cost, single chip solution for electrical energy measurement. This product is another in the long line of Analog Devices' energy meter solutions. Incorporated within this design is a highly accurate ADC system comprised of four analog-to-digital converters and voltage reference. An integrated oscillator is incorporated within the ADE7761 to provide the system clock. In addition, various functions are realized within the fixed function DSP.

Fig.2. Energy meter display

This meter incorporates several anti -tampering features in the design. The ADE7761 has two FAULT conditions that will continue to measure power. The ADE7761 monitors the phase and neutral currents. A FAULT condition occurs if the two currents differ by more than 6.25%. The power calculation is based on the larger of the two currents. The meter will correctly calculate the power if no current exists in either the phase or neutral wire. A second FAULT mode is unique to the design of this meter. If neutral is disconnected from the meter, the meter will go into a missing neutral fault condition. The meter will continue billing based on current input only with the voltage input missing.

B. CONTROLLER(LPC2148)

The LPC2148 is microcontrollers 16-bit/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 package. 8 kB to 40 kB of on-chip static RAM and 32 kB to 512 kB of on-chip flash memory.Multiple serial interfaces including two UARTs.On-chip integrated oscillator operates with an external crystal from 1 MHz to 25 Mhz. Operating voltage 3.3v..32-bit code execution at the maximum clock rate.

C. GSM Modem - RS232 – SIM800A

This GSM (global system for mobile) communication its widely used in modem system. It is an Open and digital cellular technology used for transmitting and receiving voice and data services which are operating at the 850MHZ, 900 MHZ, 1800 MHZ frequency bands. Its having data rates of 64Kbpsto 120Mbps respectively.

GSM modem connected to serial port of microcontroller by using MAX232. It is used to transmit and receive the SMS & prepare/receive voice calls. It is also used in GPRS to connect to Internet network and processes many applications for data use and control. This GSM modem is a highly flexible. It is plug and play quad band Device.SIM800A GSM modem is easy integration to RSmax232 applications. Supports features like Data/Fax, Speech, Message services.

D. MAX 232

The MAX 232 IC is used for serial communication with components that are wi-fi module and GSM Module it is used to provide TTL to those components as per requirements. The MAX 232 IC is used in this project to make interface between microcontroller and GSM modem. It is dual driver it converts the TTL/CMOS logic levels into requirements of devices.

E. RELAY (SWITCH):

A relay its device used as switch. The relays operate as electromagnet to mechanically switch, other operating mode is solid-state relays. It is used for need to control the circuitry for low power signal, few circuit need to be control by single signal. A relay is an electromechanical device that uses small electrical currents and voltages to control larger electrical currents and voltages. Relays have unlimited possibilities ranging from industrial applications to consumer electronics such as microwave ovens and television sets.

F. LCD DISPLAY

LCD it is Liquid Crystal Display interfacing with LPC2148 Microcontroller program is very Simple an Straight forward that display a text in **16x2 LCD** module. LCD its very helpful in providing user interface as well as for the purpose of debugging. LCD its Flat panel Display that uses light modulating properties of liquid crystels.**16x2 LCD** character interface card with both modes 4 Bit and 8 Bit interface and also facility to adjust contrast through trim port.smart electricity meter related data like meter ID , numbers of unit consumes and name of project is display on LCD.

G. INTERNET OF THINGS

The IOT allows objects to be sensed or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into the computer based systems and resulting in improved efficiency accuracy and economic benefit in addition to reduced human intervention. when IOT is augmented with sensors and actuators the technology becomes an instance of the more general class of the system which also encompasses technologies such as smart grids, virtual power plants. Smart homes and smart cities. Each thing is uniquely identified through its embedded computing system but is able to interoperate within the existing infrastructure.

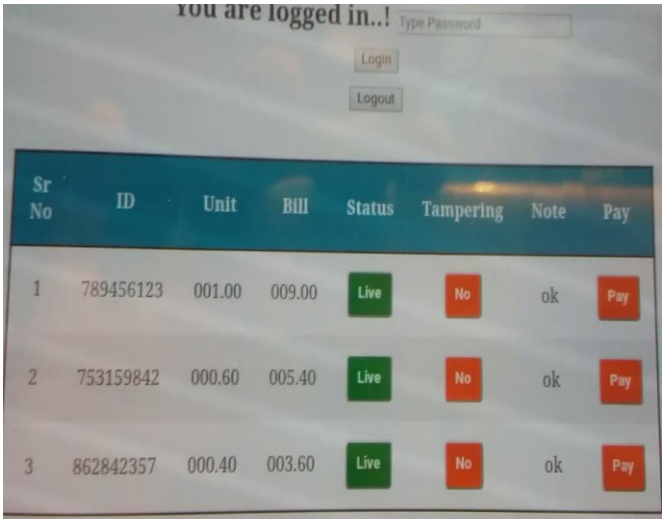

Fig.3.Web page units are uploaded

IV. CONCLUSION

In our project "**IOT based Smart Electricity Billing Meter**" Tampering gets Detected and remotely all data related to the Energy meter transmitted on the Web page and stores, if Tampering is done accordingly with tampering Charges Energy bill prepared. The user can control loads with PC and mobile through RF communications. User can monitor data through both the channels and can control from both the channels.

V.REFERANCES

[1]. Elisa Spanò, Luca Niccolini, Stefano Di Pascoli, and Giuseppe Iannaccone, "Last Meter Smart Grid Embedded in an-Internet-of-Things Platform",IEEE TRANSACTIONS ON SMART GRID, VOL. 6, NO. 1, JANUARY 2015.

[2]. Nagender Kumar Suryadevara, Student Member, IEEE, Subhas Chandra Mukhopadhyay, Fellow, IEEE, Sean Dieter Tebje Kelly "WSN-Based Smart Sensors and Actuator for Power Management in Intelligent Buildings**"** 564 IEEE/ASME TRANSACTIONS ON MECHATRONICS, VOL. 20, NO. 2, APRIL 2015

[3]. Jithin Jose K 1, Leneesh Mohan 2, Nijeesh U K[International Journal of Engineering "Smart Energy Meter" Trends and Technology (IJETT) – Volume22 Number 4- April2015]

[4]. Shikha Rastogi, Pratibha Varshney International Journal of Computer Applications "Internet of Things based Smart Electricity Meters" (0975 – 8887) Volume 133 No.8, January 2016

[5]. http://i4energy.org/mission-statement "Smart Grid meter"

[6]. Evaluation of Advanced Meter System Deployment in Texas – Meter Accuracy Assessment"; Navigant Consulting (PI) LLC; July 30, 2010.