AUTOMATED MONTHLY ELECTRICITY BILL GENERATION & SMSALERT TO CUSTOMERS, POWER FACTOR CORRECTION USING SCADA & PLC

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ABSTRACT

In the Modern world, intelligent control is adopted in every field like communication, home gadgetry, medicine etc. Unfortunately, the service providers of electricity are still using the conventional methods for getting the information of energy consumed by the customer. The traditional method of energy meter billing is a long outdated, inefficient and time consuming one. Technology of e-metering (Electronic Metering) has gone through rapid technological advancements and there is increased demand for a reliable and efficient system i.e. Automatic Meter Reading (AMR). This paper presents the design of a wireless GSM based energy meter and its associated features for making power factor correction, the job of metering easier through PLC and SCADA. The proposed system replaces traditional meter reading methods and.

1.INTRODUCTION

Majority of the loads in the industries are highly inductive in nature such as induction motors, AC/DC drives, welding machines, arc furnaces, fluorescent Lightings, electronic controls and computers. There may be a few resistive loads for heaters and incandescent bulbs. Very rarely industries may have capacitive loads such as synchronous motors.

The process of calculating the electricity consumption at the consumer end is called Energy Metering & the device dedicated for this job is called an Energy Meter. Apart from the task of measurement of electricity usage, the distribution level imposes various other important duties on the electricity board like noting the meter reading, calculation of bill depending on the type of tariff & agreement, bill issuance to the consumer. However, the most important challenge faced by the department is

to ensure that the process of Energy Metering is not manipulated by the consumer which involves the illegal practice of electricity theft. The electricity will not be recorded on meter if consumed by illegal

2. Block Diagram:
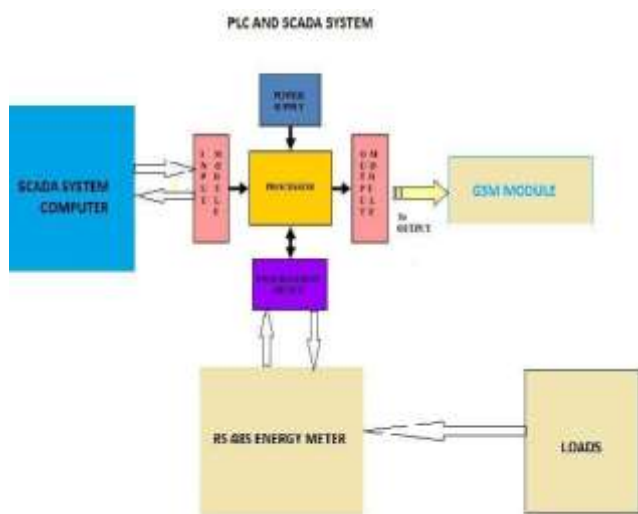
3. Working Principle

3.1Plc:

A **programmable logic controller** (**PLC**)or **programmable controller** is an industrial digital computer which has been ruggedized and adapted for the control of manufacturing processes, such as assembly lines, or robotic devices, or any activity that requires high reliability, ease of programming and process fault diagnosis. PLCs can range

from small modular devices with tens of inputs and outputs (I/O), in a housing integral with the processor, to large rack-mounted modular devices with a count of thousands of I/O, and which are often networked to other PLC and SCADA systems. They can be designed for many arrangements of digital and analog I/O, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. Programs to control machine operation are typically stored in battery-backed-up or non-volatile memory.

scada:

Supervisory control and data acquisition (**SCADA**) are a control system architecture comprising computers, networked data communications and graphical user interfaces (GUI) for high-level process supervisory management, while also comprising other peripheral devices like programmable logic controllers (PLC) and discrete proportional-integral-derivative (PID) controllers to interface with process plant or machinery. The use of SCADA has been considered also for management and operations of project-driven-process in construction.

RS 485 ENERGY METER:

An electricity meter, electric meter, electrical

meter, or energy meter is a device that measures the amount of energy consumed by a residence, a business, or an electrically powered device. Electric utilities use electric meters installed at customers' premises to measure electric energy delivered to their customers for billing purposes. They are typically calibrated in billing units, the most common one being the kilowatt hour [kWh].

They are usually read once each billing period. **RS-485**, also known as **TIA-485(-A)** or **EIA-485**, is a standard defining the electrical characteristics of drivers and receivers for use in serial communications systems. Electrical signaling is balanced, and multipoint systems are supported. The standard is jointly published by the Telecommunications Industry Association and Electronic Industries Alliance (TIA/EIA).

Multiple receivers may be connected to such a network in a linear, multidrop bus. These characteristics make RS-485 useful in industrial control systems and similar applications RS-485

RS 485 MODULE(SIEMENS):

RS-485 supports inexpensive local networks and multidrop communications links, using the same differential signaling over twisted pair as

RS-422. It is generally accepted that RS-485 canbe used with data rates up to 10 Mbit/s or, at lower speeds, distances up to 1,200 m (4,000 ft). As a rule of thumb, the speed in bit/s multiplied by the length in metres should not exceed 10^8. Thus a 50-meter cable should not signal faster than 2 Mbit/s.

In contrast to RS-422, this has a driver circuit which cannot be switched off, RS-485 drivers use three-state logic allowing individual transmitters to be deactivated. This allows RS-485 to implement linear bus topologies using only two wires. The equipment located along a set of RS-485 wires are interchangeably called nodes, stations or devices.[4] The recommended arrangement of the wires is as a connected series of point- to-point (multidropped) nodes, i.e. a line or bus, not a star, ring, or multiply connected network. Star and ring topologies are not recommended because of signal reflections or excessively low or high termination impedance. If a star configuration is unavoidable, special RS-485 repeaters are available which bidirectionally listen for data on each span and then retransmit the data onto all other spans

.

CAPACITOR:

The effect of a capacitor is known as capacitance. While some capacitance exists

between any two electrical conductors in proximity in a circuit, a capacitor is a component designed to add capacitance to a circuit. The capacitor was originally known as a **condenser** or **condensator**

CONTACTOR:

A contactor is an electrically-controlled switch used for switching an electrical power circuit. A contactor is typically controlled by a circuit which has a much lower power level than the switched circuit, such as a 24-volt coil electromagnet controlling a 230- volt motor switch.

GSM module:

GSM (Global System for Mobile Communications, originally Group Special Mobile), is a standard developed by the European Telecommunications Standards Institute (ETSI). General Packet Radio Service (GPRS) is a packet oriented mobile data service on the 2G and 3G cellular communication system's global system for mobile communications (GSM). GPRS was originally standardised by European Telecommunications Standards Institute (ETSI) in response to the earlier CDPD and i- mode packet-switched cellular technologies. It is now maintained by the 3rd Generation Partnership Project (3GPP)

MCB:

A **Miniature Circuit Breaker** (**MCB**) is an automatically operated electrical switch used to protect low voltage electrical circuits from damage caused by excess current from an overload or short circuit. MCBs are typically rated up to a current up to 125 A, do not have adjustable trip characteristics, and can be thermal or thermal-magnetic in operation.
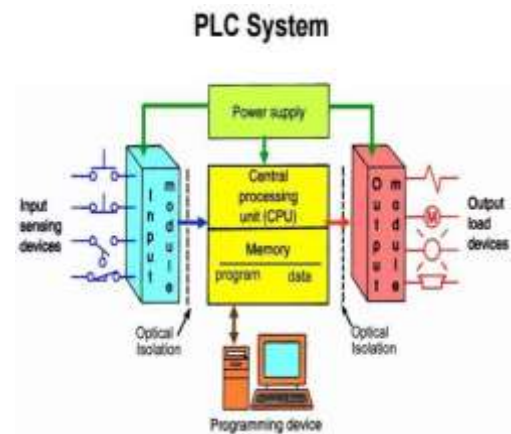
4. CONCLUSIONS

In this paper, it has been proposed that a smart meter which takes advantage of the GSM/GPRS network that has virtually access to every household and area across different countries can be used as a smart solution for minimizing human efforts and maximizing the efficiency for an energy provider. GSM and PLC based energy meter is easy to install and beneficial for both energy provider and consumer. It not only

solve the problem of manual meter reading but also provide additional feature such as automatic generation of energy bill, informing customer when and how much bill is generated and giving detailed summary of the energy consumption by him/her. This can help energy provider to use his human resource in more needed areas. Now, Service provider would not have to worry about the bill generation and meter reading process. Everything will be done automatically. This will also make sure that there is no hampering in the units consumed at the time of reading as it may happen in case of human involvement. Moreover, with some additions, this system can be further designed to have the feature of automatic cuts if the customer has older dues or if he fails to payhis dues in the given time.

Also it can have features like constant load check and alerts, with which, customer can be alerted every time he/she used the load more than that imprinted in his/her agreement. Also it can facilitate customer with information about current bill details, current meter reading, status of line and many more and let's conclude with that in this rapid growing world of technology this device will play a very important role in coming future.

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