Anti- theft energy metering system

Mohit[1], Surendra Kr. Verma[2], Er. Ashish Jangid[3]

[1]Suresh Gyan Vihar University

[2]Research intern, Venture Era technical solution Pvt. Ltd

[3]Research scholar, Venture Era technical solution Pvt. Ltd.

ABSTRACT: ***The distribution company can never be 100% secure from theft. In many distribution company, the amount of theft is 1-2% of electricity generated. But the financial loss is high due to large amount of energy is distributed. Anti-theft metering system provides us fully protected metering system of electrical supply. The concept use in this system is that firstly we take the data from transformer side and after that we take data from consumer side and we compare both data. If data is on both side is same then its ok but when there is difference between both the data the system will send a message to grid substation and also send a location of region where the theft is being detected.***

Key words: Smart energy meter, GSM, wireless module.

I. INTRODUCTION

We can't imagine world without electricity. So electricity plays an important role in today's era of technology. In India there is a rapid development in other sector but there is small amount of percentage development are made in electricity sector.

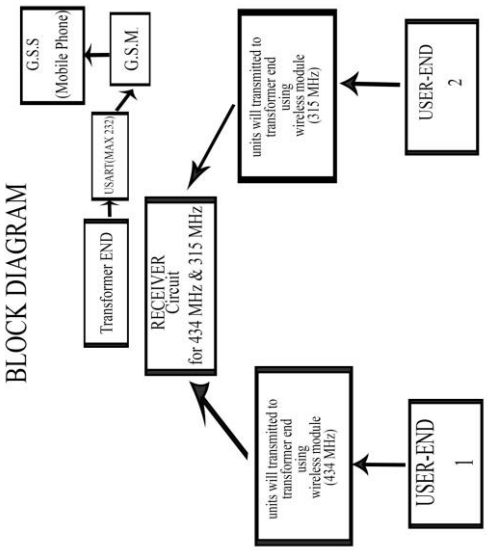
In today's era of technology power system network has grown up to a good extension which leads to both; on the first hand it provide an as of access that we have energy at our door step independent of required power on the other hand it also produce fear in the mind of distribution agency and the fear is of energy theft. The weighted average system loss in the power sector in totality is estimated at 35% which includes 21% Technical loss. The balance 14% is due to pilferage, theft and un-authorized use of electricity. In many distribution system the amount of theft is 1-2% in terms of electricity generated, so the financial loss is high due to this 1-2% of theft in distribution system. So to protect from this energy theft anti-theft metering system is developed.

Anti-theft metering system is a system where there is minimum chances of theft in power system. Now-a-days energy theft from distribution system or transmission line is major issue, so to protect and for utilize the energy generated anti-theft metering system is developed.
Due to parallel connection with all the consumers it's quite difficult to find exact location of tapping because we can't monitor individual consumption [1].

II. CONCEPT

Concept use in developing energy theft metering system to protect the energy from theft [3]. Concept use in research paper is firstly we will take data from distribution transformer side which deliver the power and then we will take data from the consumer side where energy meter is connected after that our system will compare both the data. If both data is same that means energy deliver by distribution transformer and energy received by energy meter in home is equal than system can't alert but when there is difference in both data that mean data from transformer side is more than data from consumer side then system will send a message to grid substation and it also send a location of region where theft is happening, then engineer can take action immediately [2].

III. BLOCK DIAGRAM



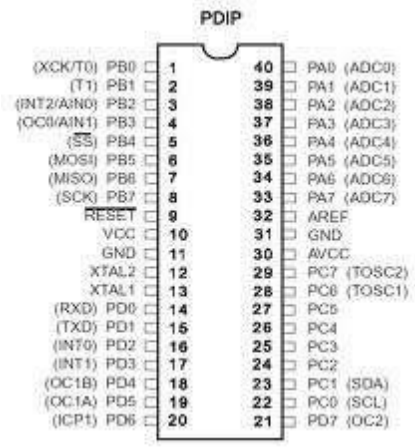
This is the basic block diagram of anti-theft metering system. It consists of many blocks like transformer end, User end 1&2, Wireless module 434 MHz and 315 MHz [5], USART, GSM. In this block diagram firstly transformer end is considering as the place of Distribution Transformer of distribution system. It delivers power to both user ends 1 and 2. User end 1& 2 ends are considering as the place of home, which consuming the power from distribution transformer. Wireless Module 434 MHz & 315 MHz are used to transmit the units which are measured at user ends. These units are received at transformer end. USART is universal synchronous asynchronous receiver and transmitter, which is used to serial communication between microcontrollers to GSM for sending messages through GSM. GSM [4] stands for global system for mobile phones, here it is used for sending messages to mobile phone when any theft source takes place.

IV. IMPLEMENTATION

I. Hardware:-

A. AVR ATMEGA16 Micro-controller

The ATmega16 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega16 achieves through puts approaching 1 MIPS per MHz allowing the system designed to optimize power consumption versus processing speed. It has 32*8 powerful instruction mostly used in single clock cycle execution.

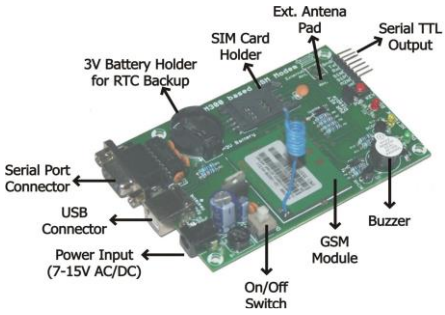


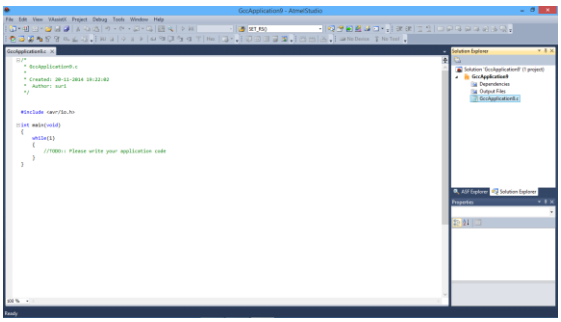
This is the pin diagram of AVR ATMEGA 16 microcontroller.

B. GSM module

- Provides the industry standard serial RS232 interface for easy connection to computers and other devices.
- Provides serial TTL interface for easy and direct interface to microcontrollers.
- Optionally available USB interface for easy interface to laptops, computers, etc.
- Power, RING and Network LEDs for easy debugging.
- On-board buzzer for general audio indication.
- On-board 3V Lithium Battery holder with appropriate circuitry for providing backup for the modules' internal RTC.
- Can be used for GSM based Voice communications, Data/Fax, SMS, GPRS and TCP/IP stack.
- Can be controlled through standard AT commands
- Module's operation mode can be controlled through the PWR Switch connected to the PWR pin (refer the SIM300 datasheet for more information)
- Comes with an on board wire antenna for better reception. Board provides an option for adding an external antenna through an SMA connector
- The SIM300 allows an adjustable serial baud rate from 1200 to 115200 bps (9600 default)
- Modem a low power consumption of 0.25 A during normal operations and around 1 A during transmission
- Operating Voltage: 7 – 15V AC or DC (board has on board rectifier)

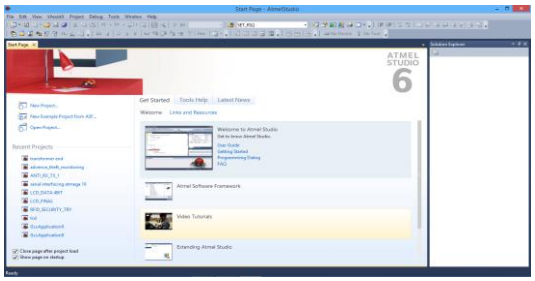
IJSER

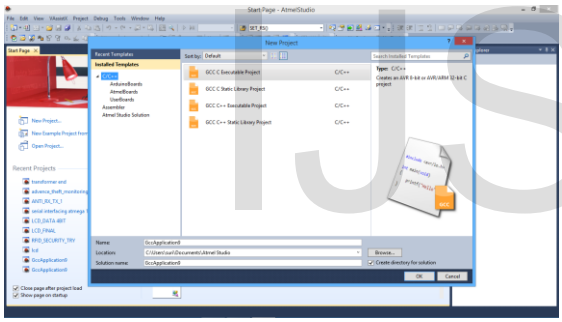




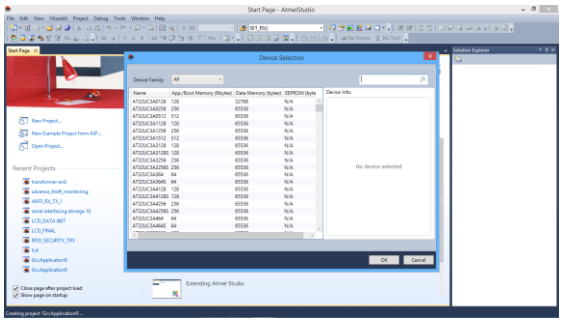
II. Software

1. Open AVR and open a new project



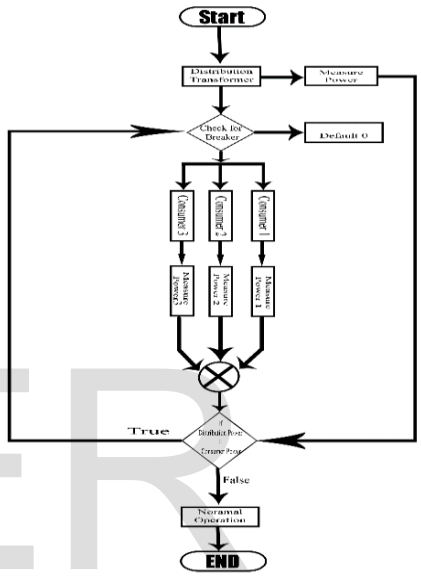


2. Device selection



3. Build the Project

V. Algorithm



According to algorithm power is generated from source, then it's transmitted and distributed to consumers. From distribution side we calculate the power distributed to consumer with the help of energy meter. We also calculate the power received by consumer side by energy meter. After that we compare both the sending end power and receiving end power. If sending end power is greater than receiving end power then message is generated automatically and it is send to concern person so that he can trip the circuit breaker from the region electricity has been theft. If the sending end power is equal to receiving end power then the process will keep on working.

VI. RESULT

Final Assembly of Project:

IJSER

1. ***Results from user end 1 :-***

From user end 1, units are transmitted through 434 MHz transmitter ant these are received using receiver at transformer end. There is a blue led in transformer end circuit, which glow when the both receiver and transmitter are ready for communication.

2. ***Results from user end 2 :-***

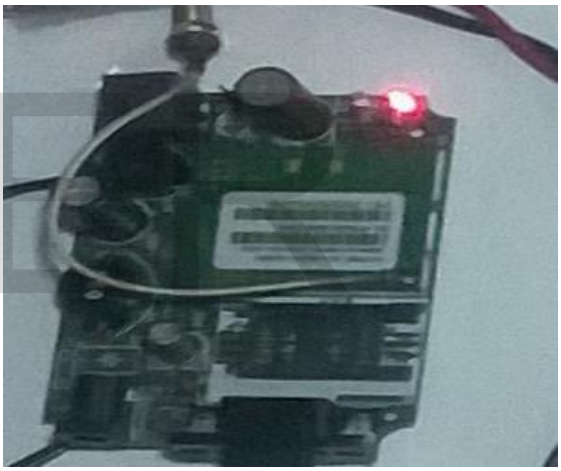
From user end 2, units are transmitted through 315 MHz transmitter ant these are received using receiver at transformer end. There is a white led in transformer end circuit, which glow when the both receiver and transmitter are ready for communication.

3. ***Results from Transformer End :-***

From transformer end, units are received using receivers 434 MHz and 315 MHz, and there is already a microcontroller which stores the units which are measured at the time of delivering power.

4. ***Results from GSM Interfacing :-***

From GSM interfacing, when any theft source occurs across entire system GSM will send messages to a mobile phone (or a no. of mobile phone). GSM is communicate to transformer end using USART which is used for serial communication.



VII. Conclusion

From the above result it can be concluded that the proposed anti-theft energy meter can be used to find out where theft is occurring. The prototype we have design working accurately and precisely. This particular proposed method can be extended to industrial purpose. For industrial purpose we have to calculate the losses in transmission and distribution network.

VIII. FUTURE ASPECTS

- The prototype model of ADVANCED ANTI THEFT METERING SYSTEM has represented in our research. Use of anti-theft metering system can

be extended to industrial purpose if we consider the loss in transmission and distribution lines.

- As earlier, Government of India has declared a tender for Anti-Theft Metering System, but they want some more features which can be added in our projects. Government wants such a system, where the data will be uploaded to server, and they will able to know that which user consuming high power or low power etc.
- In future we want to add online data uploading on server and want to make it for industrial purpose. If we want to design this project for industrial purpose, than we will replace simple wireless module to transceiver module for perfect transmission of units from user end to transformer end.

IX. REFERENCES

[1] Sagar Patil, Gopal Pawaskar, Kirtikumar Patil, "Electrical Power Theft Detection and Wireless meter reading", IJIRSET, vol-2, issue 4, April 2013, ISSN: 2319-8753

[2] Parul Ranjan, Namita Mehra, Prof. T. A. More, Shripad Bokand, " Wireless design for power theft monitoring", IJCTEE, volume 2, Issue 2, ISSN: 2249-6343

[3] Sapna Ganurkar, Paresh Gour, "Prepaid energy meter for billing system using microcontroller and recharge card", Internation journal of core engineering & management (IJCSM), April 2014, ISSN: 2348-9510

[4] E. Moni Silviya, K. Meena vinodhini, Salai Thillai, Thilagram. J., " GSM based automatic energy meter system with instant billing", ICSECSRE'14, ISSN:2278-8875

[5] Shraddha Make, Pallavi Vethekar, Kavita More, Prof. V. K. Bhusari, "A smart wireless electronic energy meter reading using embedded technology", Internation journal of engineering research and application, volume 4, issue 1(version 3), January

IJSER