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DEVELOPMENT AND IMPLEMENTATION OF ADVANCED ENERGY METER

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ABSTRACT

Electricity is one of the essential need for human beings, which is mostly used for domestic, industrial and agricultural purpose. High power consumption and power theft is the major problem now days which causes lot of loss to electricity boards, in countries like India. If we can prevent all these we can save more energy. This is achieved byAdvanced Energy Meter (AEM). In this project we are going to make develop an energy meter, we are going to install solar panel for generating power. In this meter we are going to develop the switching system between the solar panel and the load. This AEM will have the capacity of stabilizing whenever the AC mains power will have the fluctuations, due to which all the load connected to the meter will be protected. In this project we have a prepaid concept, we are going to monitor the meter reading to know the units consumed, once the units in the meter is reduced to zero then the power from that meter to the home will be cut-off.

Keywords: *ArduinoMega, Current Sensor,GSM,LCD, Solar panel*

I. INTRODUCTION

An energy meter is a device which is used to measure the amount of electric energy consumed by a business area, a residence place, or an electrical device. An electric meter is use in the consumer's home to have a record of billing purpose [2]. They are typically fixed for billing units, the most common one being the kWh. They are mostlyread once each period of billing. The most commonly used unit for measuringelectricity in meters is the kilowatt hour, which is equal to the amount of energy used by a load of one kilowatt over a periodof one hour, or 3,600,000 joules.

Some companies use the SI mega joule instead. Demand is measured in watts, but averaged over a period, most often a quarter- or Half-hour. Reactive power is measured in thousands of volt-ampere reactive-hours. By convention, a "lagging" or inductive load, such as a motor, will have a positive reactive power. A "leading", or capacitive load, will have a negative reactive power. Volt-amperes measures all power passed through a distribution network, including reactive and actual. This is equal to the product of root-mean-square volts and amperes [1]. Electric efficacy uses electric meter installed at customer's premises to measure electric energy delivered to their customers for billing purposes. Electricity meters operate by constantmeasuring of the rapid voltage(involts) and current (in amperes) to thegive energy used (in joules, kilowatt-hours etc.)[1]. Energy

meters are classified according to the principles and operations, Like Electromechanical meters, Electronic meters, automatic energy meter, digital meters etc.[1].

II.LITERATURE SURVEY

In today's world, electromechanical or digital energy meters are used for energy metering and billing, which Consumes considerable time and labour. The billing system is slow, costly, lacked flexibility andreliability [1]. Today, precision in electric billing is more desired. The intelligent energy meter gives real-time consumption and accurate billing. Wireless Energy Meter is able to send your data through wireless communication to your computer or mobile where monitoring and analysing of data can be done easily [4]. In smart metering, different techniques in the communication system likeGSM, Wi-Fi etc., are more popular [2].

Smart meteris the ultimate form of energy meter. Smart Meter is designed to send meter readings directly to your power supplier. Smart meter is the next generation of electricity meters. Along with your accompaniment at home shows, smart counters will help you keep track of the energy you use in your home, and will cut off the need for meter readings. Automatic meter readings are sent directly to your electricity provider. Smart meters will be equipped with displays that can be read at home. They will even give you minute information on how much energy unit you are using and how muchyou are paying for it [3].

III.PROPOSED WORK

In the present and past scenario energy consumption is very high to avoid and overcome this issue we are making use of solar energy in this project. Every device at home can't be stabilized individually therefore we are controlling the voltage fluctuations in the meter. Due to high consumption in energy the billing cost is high, due to lack of knowledge in consuming power the consumer doesn't know how much energy is used per day, hence we are introducing a prepaid concept where the consumer can recharge how much energy to be used per day or month.

3.1 Working Principle

In this project we have used the GSM from which our advanced energy meter can communicate with the KEB Station Directly without interference of the any user. Like it is used to update the units to the Energy Meter which will be sent by the KEB Station after paying the amount to them for units [4]. Even this GSM is used to transmit the warning message to the KEB Station about the theft made at the meter. Once again it is also used to receive the permitted message from from the KEB Station after the user has paid the penalty. The buzzer is used to alarm during the theft, Fuse blown when there is NO Units in the meter. Current Transducer is used to sense the current how much the connected Load is drawing and it will give the drawn current in the form of pulses. By the output pulses of the Transducer controller will count the number of units drawn from the load [5]. And then if the remaining unit has become zero then the load controlling relay will be switched OFF. By which load will be disconnected from the mains.

3.2 General Block Diagram

This is the general block diagram of Advanced Energy Meter (AEM), which shows the basic block and the basic working of AEM

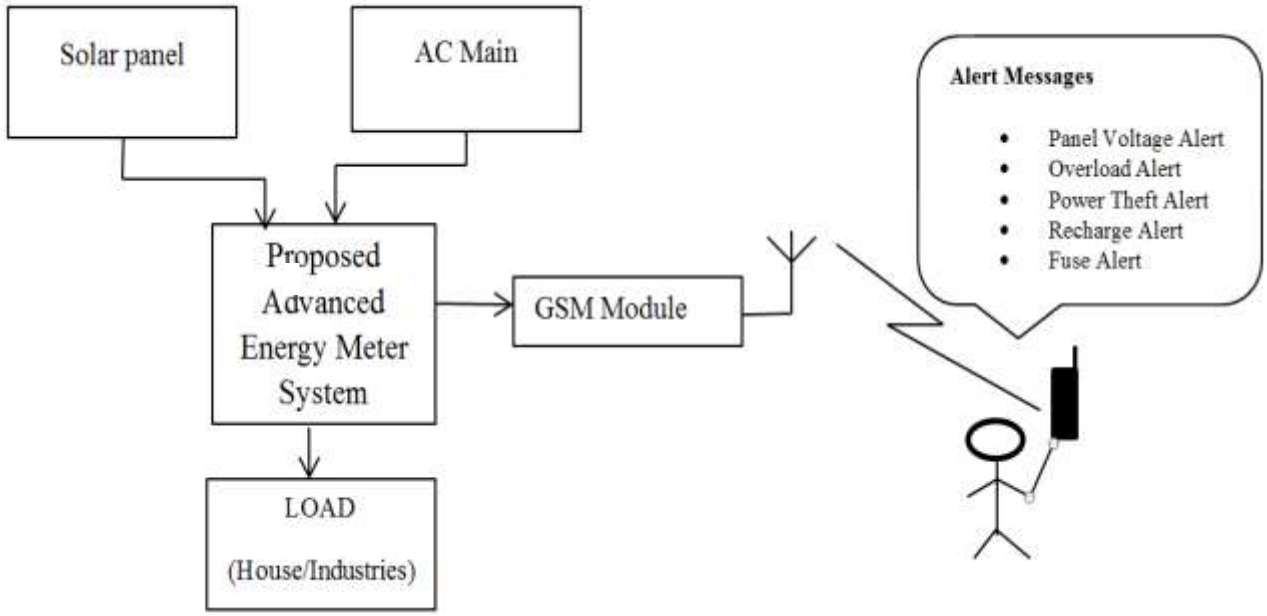

Fig.1 Proposed block diagram of advanced energy meter

- We are going to make development for an energy meter; we are going to install solar panel for power generation.
- In this meter we are going to develop the automatic switching system between the Solar panel and the Ac Main.
- This energy meter will have the capability of stabilizing, whenever the AC mains power will have the fluctuation , Due to which all the load connected to the meter will be safe guarded.
- In this project the currency will be pre paid, we are going to monitor the meter reading to know the units consumed.
- Once the units in the meter are get reduced to zero then the power from that meter to the home will be cutoff.
- When there is a power theft, fuse blown out and overload is detected there will be a warning message alert using GSM module.
- It has a digital display so that in which the readings of the meter and the warning messages will be shown.

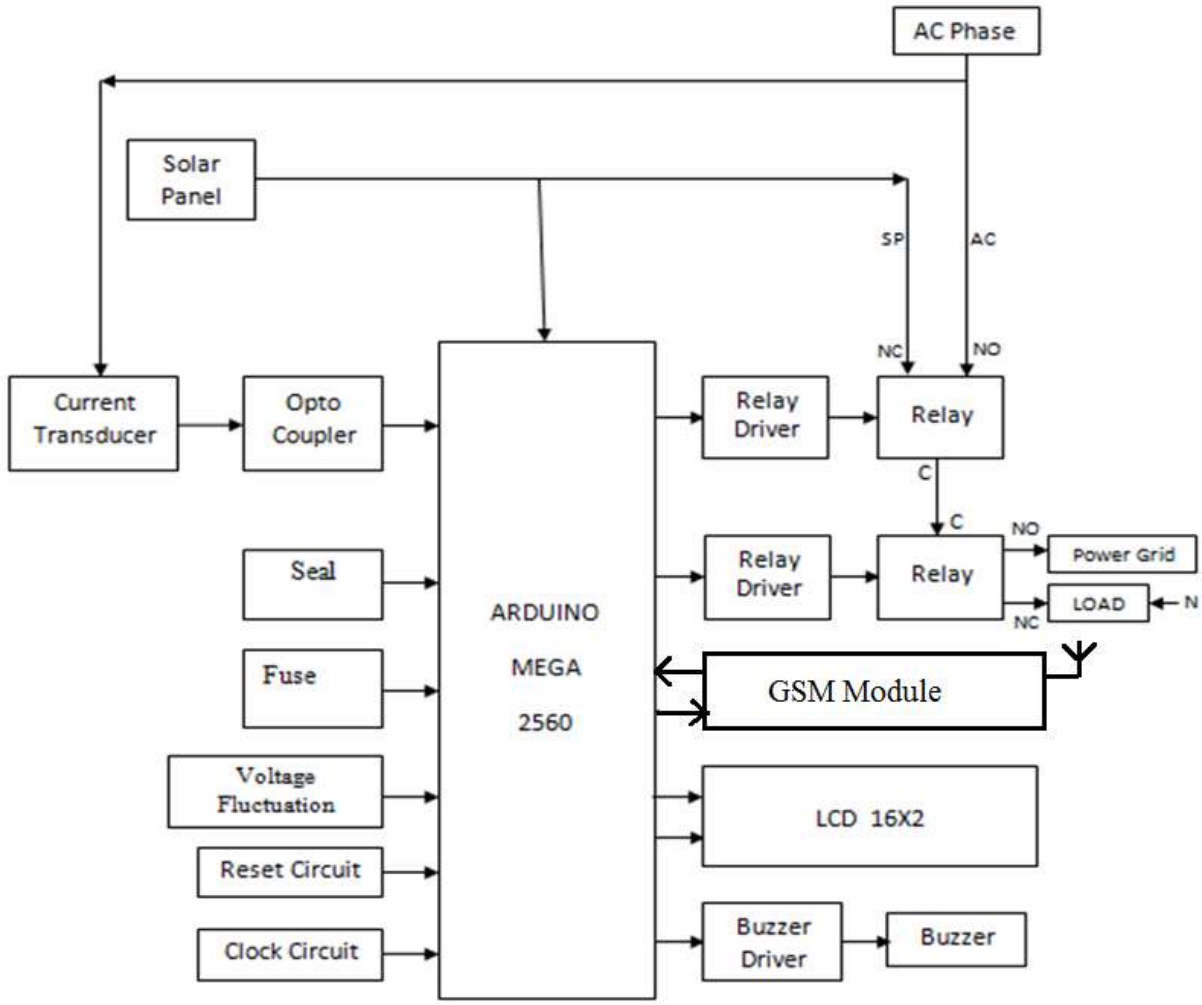

Fig.2 Block diagram of Advanced Energy Meter

Arduinomicrocontroller is an open-source platform used for electronic based projects. Arduino has so many advantages compared to other controllers.Arduino boards are relatively in expensive, Programming is easy than c,c++, Flexibility is more in arduino.

GSM module is used for establishing a communication between a personal computer and a GSM system.It just requires a SIM card like the mobile phones to activate communication with the network. Also they have IMEI number similarly like the mobile phones for their recognition. Receiving, sending or deleting SMS messages in a SIM is done using GSM.

An Optocoupler is a device which is used for transferring electrical signals between two isolate circuits with the help of light. Optocouplerprevents the circuit from getting affected or damaged by high voltage in the receiving signal.

IV.RESULTS

Overthrow of energy conservation is achieved, for every single operation quick retort is achieved through GSM module, the overall model of the project is shown in the below figures. LCD board is used to display the commands and outputs.

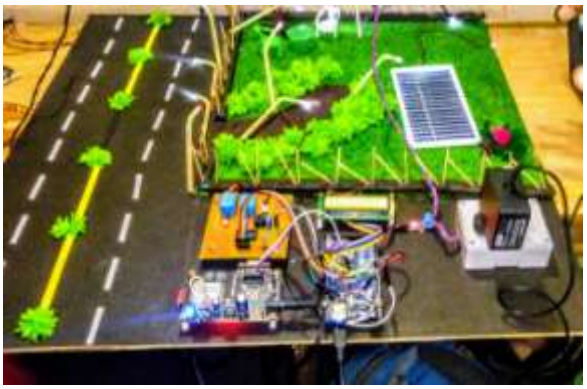

Fig.3 overview of the project model

Solar panel is used for power generation. Switching is done between the solar panel power and the AC mains. GSM module is used for communicating between the KEB and the customer by sending the alert messages.

Fig.4 LCD Display

LCD display is used for displaying the commands and output generated by the GSM module, in this project we have used LCD display to even display the balance amount of the unit recharged by the consumer.

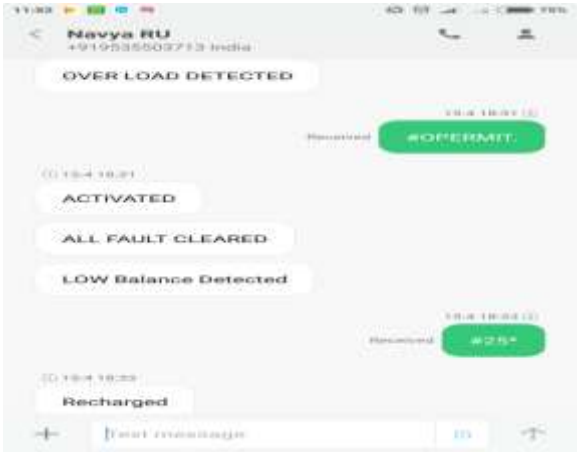

Fig.5 Alert message communication between the Advanced Energy Meter(AEM) and KEB

The figure 5 shows the communication between the AEM and the KEB, where the alert for power theft (tampered) and overload is monitored.

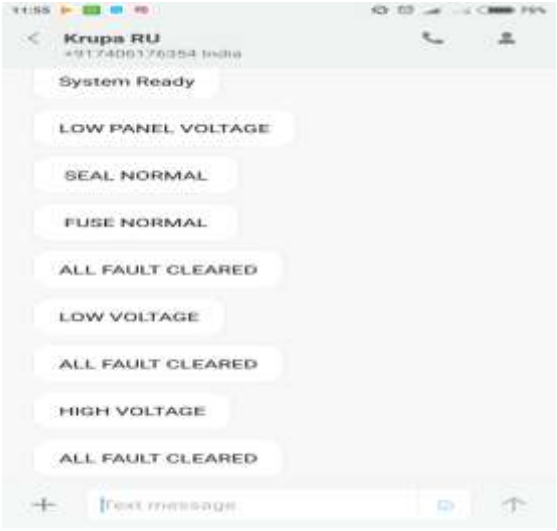

Fig.6 Alert message communication between Advanced Energy Meter (AEM) and Consumer

The figure 6 shows the communication between the AEM and consumer, where the alert for any abnormality/out of order of the AEM will be alerted to the consumer.

V.CONCLUSION

The main objective of our project is energy meter will have the capability of stabilizing whenever the AC mains power will have the fluctuation more than the normal condition. Due to which all the load connected to the meter will be safe guarded. Current Transducer is used to sense the current how much the connected Load is drawing and it will give the drawn current in the form of pulses. By the output pulses of the Transducer controller will count the number of units drawn from the load. And then if the remaining unit has become zero then the load controlling relay will be switched OFF. By which Load will be disconnected from the mains. Here in this project we are achieving the solution for the major problem in now a day is waste of energy, Energy conservation is achieved and knowledge of energy usage is given. Hence energy usage will be minimised.

VI.ACKNOWLEDGMENT

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