Scientific Journal of Impact Factor (SJIF): 5.71

e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 8, Issue 02, February -2021

SMART ENERGY METER

[1]Prof. Jitendra Musale, [2]Pranjal Tathawade, [3]Pranali Pharate, [4]Mayuresh Bagal, [5]Sushil Gorani

[1]*Department of Computer Engineering, Ananatrao Pawar College of Engineering and Research*

A. **Abstract** — *While innovative solutions are being developed continuously to meet ever increasing energy demands, progressive applications and technologies that need more energy are being developed simultaneously. Given that smart grids are being installed at various locations in the country to solve the problem of ever increasing energy demand and with the change in the grid type there is a change required to the conventional metering system. Therefore, a smart meter has been designed to address this problem. This smart energy meter incorporates Energy Management System and it is connected to the internet to provide a smooth and uninterrupted control over home loads.*

The designed energy meter presents the following characteristics:

1) ***CONTROLLING HOME EQUIPMENTS VIA IOT***

2) ***SMART PLUG***

3) ***LOAD SCHEDULING***

4) ***ENERGY METERING***

5) ***BI-DIRECTIONAL FLOW OF POWER***

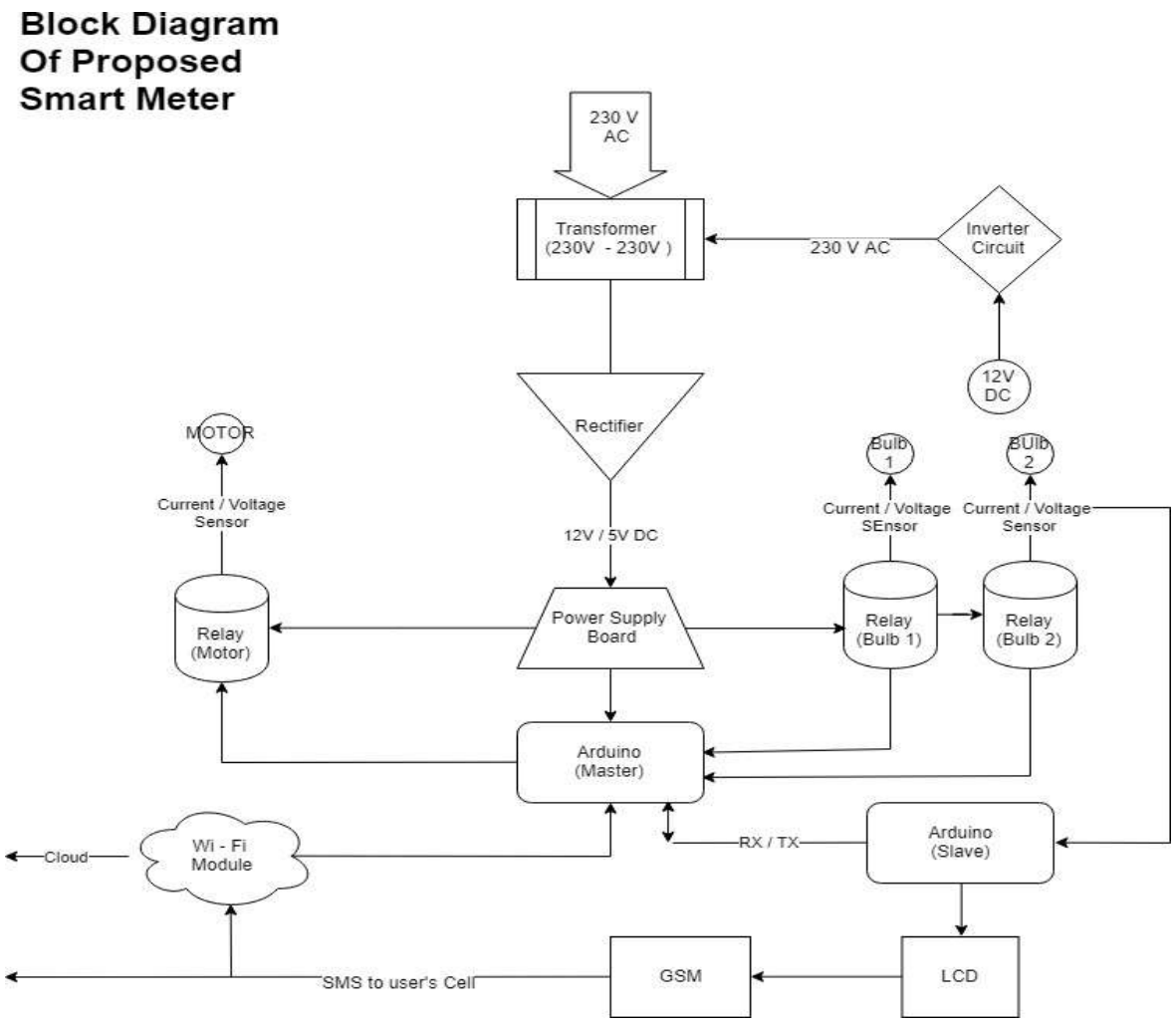
The designed smart meter is focuses around the concept of real time prices of electricity which fluctuate with time in the installed smart grids and a generalization that Electricity pricing is high during the day time and vice versa has been taken into consideration.

Keywords- *component, formatting, style, styling, insert*

I. INTRODUCTION

A Smart Grid is a digital electrical grid that makes it easier to gather and distribute the information with regard to the usage of power by suppliers and consumers. This will enable the electricity services to become more reliable, efficient, cost-effective, and environmentally conscious. Smart grid always comes equipped with smart meters which are actually a next generation meter for both gas and electricity. They are a replacement for standard meters, which use technology created decades ago which were very venerable to the conventional meters and require households to track their own readings and submit them to suppliers if they want accurate bills. Smart meters use a secure national communication network (called the DCC) to automatically and wirelessly send your actual energy usage to your supplier. This means households will no longer depend on estimated energy bills or have to provide their own regular energy readings.

Smart meters will also have an in-home display. This display gives the household real-time usage information, including kWh usage and cost. In this project, the designed system depicts a smart meter where in a smart house is created with the help of NODE MCU, Smart Plugs, Digital Meter, GSM Module, Arduino and an online interface.



With the rise in energy demand, the sustainable energy systems have gained popularity in both residential and commercial areas. Smart meters are becoming an integral part of smart grids in the distribution side connected to local electricity utilities to know about the day to day energy usage and billing information on a daily basis. These smart meters are replacing the existing digital and analog electric energy meters. The energy consumption information can be transmitted back to the utility on a much more frequent schedule by the Digital meters than analog meters that require a meter reader to transmit information. Electric energy use will be recorded every hour or less at your home.

II. EXISTING SYSTEM

In existing system, the traditional energy meters only display the quantity of used power and we are not able to monitor the Voltage, current, active power, reactive power and apparent power of the system. Distribution and maintenance of electricity is owned by local state electricity board in existing system. In this process, bills are generated after taking reading by visiting door-to-door and manually noting it. These generated bills are sent to user using member of workforce or by postal service.

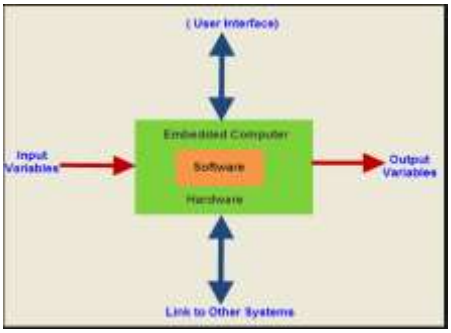
III. GAPS IN EXISTING SYSTEM

In existing system, the electricity board has to note the electricity usage manually by going door-to-door. Also storing and sending bills to so many customers become difficult for the electricity board. This sometimes results in generation of inaccurate bills. Also, many customers use electricity in very inefficient manner and sometimes they don't even pay for months. This results in loss to the electricity board and loss of electrical energy as well.

IV. PROJECT DESCRIPTION

Proposed system is a smart meter with control and automation capabilities. The smart meter to be made must exhibit Load Scheduling, bi-directional flow of power i.e. achieved with the help of an inverter circuit. Microcontroller (Arduino UNO), power supply board (12V, 5V), loads (AC / DC), NODE MCU (for enabling IoT), Relays, LCD and GSM are the

major components used in the design. An online user interface is provided for control of the load appliances and the synchronous response is obtained through any stable internet connection. The proposed system has a current sensor, Voltage sensor, Arduino board, relay, loads and a GSM module. The current and voltage sensor will sense the current and voltage if the load is turned on, i.e. the current and voltage values will be recorded by the sensors and the values will be uploaded to the cloud services. It can be also seen on the LCD display. The values and the billing amount will be sent via

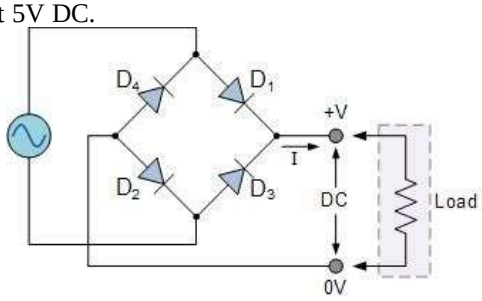


a message to the user mobile with the use of GSM once the loads are turned ON.
An active switch for power scheduling is provided which facilitates the users to automate the loads during low pricing conditions i.e. during the night hours. Once the load scheduling switch is turned on it does not allow manual control over the loads. All these operations are controlled and via internet. Thus, we get to know the amount of energy consumed by different loads and the billing amount need to be paid.

MODULES:
The whole system consists of four modules. Module one is responsible for stepdown of voltage supply and converting 12v AC to 12v DC. Module two is responsible for communication interface using NODE MCU, GSM module, Arduino and LCD screen. Module three is responsible for depicting loads i.e. AC bulb and DC motor, along with GSM module. Module four is responsible for bidirectional flow of power in case of power failure.

Module 1

In this module, 230V AC will be getting converted to 12V AC. This 12V AC voltage is further rectified using rectifier circuit to convert 12V AC to 12V DC . A full wave rectifier circuit with four diodes 1N4007 (as shown in Figure 2) is used to convert AC supply to DC source. To obtain multiple voltages from the power supply board additionally voltage regulator 7805 is used to give constant 5V DC.



Module 2
The communication interface of the designed system is depicted in this module. A perfect communication protocol is achieved with the help of embedded system. An Embedded system is a controller programmed and controlled by a real-time operating system (RTOS) with a dedicated function within a larger mechanical or electrical system, often with real-time consumption of embedded systems computing constraints.
Block diagram of embedded computer assembly where in an input is fed to the software via user interface and gives the output variable is shown in Figure 3.

Module 3
This module consists two types of loads. The loads that have been used are 2 bulbs as AC load and a motor as DC load. Bulb is being supplied with line and the controlling is achieved through a relay which actuates the neutral of the ac supply to light up the bulb. Upon turning on the bulb via user interface the relay gets excited and in turn lights up the bulb. This bulb can be turned off again via the same switch. Similarly control over DC motor is achieved by turning on the respective switches which again excites the 2nd channel relay. The energy consumed by these loads is summed up and the same gets displayed on the LCD screen. This enables the user to monitor the energy consumed by the loads over a period of time. The energy consumed is then multiplied by the per unit pricing (price per unit kWh) and the bill generated is sent to the consumer's cell phone via the GSM module.

Module 4

In this module the Bi-directional flow of power is achieved in this module by embedding an inverter (Figure7) which converts the stored DC into 230V AC. This converted AC supply can either be used to power up the home appliances or even to feed the grid.

VII. APPLICATIONS

Smart Meter can be used in houses, factories and companies.
Energy consumption can be monitored by users.

VIII. CONCLUSION

With the help of proposed system the users will be able to monitor the energy consumption easily and regularly. They will also be able to recharge the smart meter online as per their needs and due to the use automated online computerized system the process of payment procedure for electricity will be accurate and easy for users as well as electricity board.

REFERENCES

Last-Meter Smart Grid Embedded in an Internet-of-Things Platform
Smart Plug Prototype for Monitoring Electrical Appliances in Home Energy Management System
System Architecture for Smart HomeMeter
Design and implementation of low-cost universal smart energy meter with demand side loadmanagement.
Bidirectional power flow control of a single-phase current-source grid-tie battery energy storage system
Design and Implementation of SmartPlug
GSM Based Monthly Energy Meter Billing via‘SMS’
Design and Implementation of a Smart Meter with Demand Response Capabilities

