# SMART ENERGY METER FOR SMART GRID WITH HYBRID SOURCES

[1]Sreelakshmi P, [2]Ambili B S, [3]Padmaraj P R, [4]Vivek A, [5]Rajesh P

[1]UG Student, [2]UG Student, [3]UG Student, [4] UG Student, [5]Assitant Professor

[1]Electrical and Electronics Engineering,

[1]Nehru College of Engineering and Research Centre, India

**Abstract:** The amount of electricity consumption is rising day by day and simultaneously the amount of electricity wasted is also rising. This paper aims to introduce a smart energy meter for microgrid with hybrid sources, which mainly tries to solve following main issues –

To automatically switch between the source

To remotely monitor energy usage anytime anywhere

To prepay the energy bill and predict the energy usage

To trip down when fault is detected

To automatically switch between loads on priority base

In this system a prepaid energy meter is installed in the house, which enables the system to communicate with the user. The user can monitor their real time energy usage through a web interface. The data like power consumption, available balance, individual current usage and status of depended source are uploaded to the web. So the users can monitor and reduce their consumption and also the errors while acquiring the meter reading is also solved.

## I.INTRODUCTION

Smart Meters with hybrid sources have modernized the way of metering the energy usage by consumers. The main purpose of SEM with hybrid sources is to create the necessary infrastructure for collecting information on energy consumption of household appliances and monitor the environmental parameters and provide the necessary services to home users. Using the proposed SEM, the following capabilities will be realized: - Monitoring and calculating the instantaneous power consumption, line voltage. Providing timely information to the customers about their current power consumption and the cost of consuming electricity up to now. Processing the power consumption data to provide useful information for both customers. The proposed system encompasses a program that predicts the monthly units which the user might consume at the end of the month. The consumers can cut the desired loads when they exceed their usage and also can cut the whole load whenever necessary. All these information will be displayed and can be controlled with the help of a webpage. Smart Meters have modernized the way of metering the energy usage by consumers.

## II. LITERATURRE SURVEY

Automatic Meter Reading of Electricity by using Power line Communication- Rahul S Puhkala, Sunil V Bavache, Poonam Borle, Energy management of smart microgrid in presence of renewable energy sources based on real-time pricing – Ferdowsi University of Mashhad, Mashhad, Razavi Khorasan, describes about the energy management process using the renewable sources and also provides the real time price of the energy consumption.Smart Energy Metering For Cost And Power Reduction In House Hold Applications, C Komathi,S Durgadevi,K Thirupura SundariT.R. Sree Sahithya,S. Vignesh, introduces a smart energy meter for

the reduction of the power usage. Advanced Microgrid Energy Management System for Future Sustainable and Resilient Power Grid-Fang Yang,xianyong Feng, Zhao Li, the energy management using the renewable sources is done in an advanced microgrid system, an advancement occurred. IOT Based Smart Energy Meter for Efficient Energy Utilization in Smart Grid- Bibek Kanti Barman, Nath Yadav,Shivam Kumar, Sadhan Gope, introduced a smart energy meter that can be accessed using the web and can be managed easily so the energy consumption can be monitored from anywhere easily. A Smart Power Meter to Monitor Energy Flow in Smart Grids-Rosario Morello,Claudio De Capua, Gaetano Fulco,Subhas Chandra Mukhopadhyay, this paper introduces a smart meter to monitor the energy flow in the grids and thus the peak power supplying sources can be easily accessed. Design and Operation of Smart Energy Meter for Effective Energy Utilization in Smart Cities-Qasim MalikAamir Zia,Rehan Ahmad,Muhammad Asim Butt,Zain Ahmad Javed, this paper introduces a smart energy meter for the smart cities thus the energy consumption can be monitored easily and automatically. Designing Prepaid Smart Energy Meter and Deployment in a Network-Sagar Rathee,Aayush Goyal,Anup Shukla, introduces a smart energy meter where the energy bill can be predicted before and which can be prepaid accordingly. Development of Smart Energy Meter for Energy Cost Analysis of Conventional Grid and Solar Energy-M. Faisal; Tahia Fahrin Karim; Abu Ridwan Pavel; Md. Shahadat Hossen; M.S. Hossain Lipu, a smart energy meter is developed for the cost analysis of the energy consumption for a conventional grid and solar energy. A Novel IoT based Smart Energy Meter for Residential Energy Management in Smart Grid Infrastructure-Gitanjali Mehta, Ruqaiya Khanam, Vinod Kumar Yadav, a smart energy meter which can be accessed from anywhere using web interface is introduced in this paper. Consumer Friendly Energy Meter for Home Application-S Radhika,A. Chandrasekar, S. Jothi,Vijayakumar K, an energy meter which can be easily accessed by any consumer to know about their monthly energy consumption is given introduced in this paper. Thus from all these paper a smart energy meter which can be prepaid and which works on the hybrid sources like the conventional grid and solar energy is developed.

## III.OBJECTIVE

Main objectives of this work can be illustrated as:

- To automatically switch between the sources
- To remotely monitor energy usage anytime anywhere
- To prepay the energy bill and predict the energy usage
- To trip down when fault is detected

## IV. METHODOLOGY

Smart energy meter for smart Grid with hybrid sources with microcontroller. The system is implemented in the following steps:

1.Interfacing of Arduino Nano to microcontroller

2.Measuring the power in the sources

3.Updating the user with the current status of source and shifts the loads based on priority

4.The functional system block diagram is provided in Figure 1.
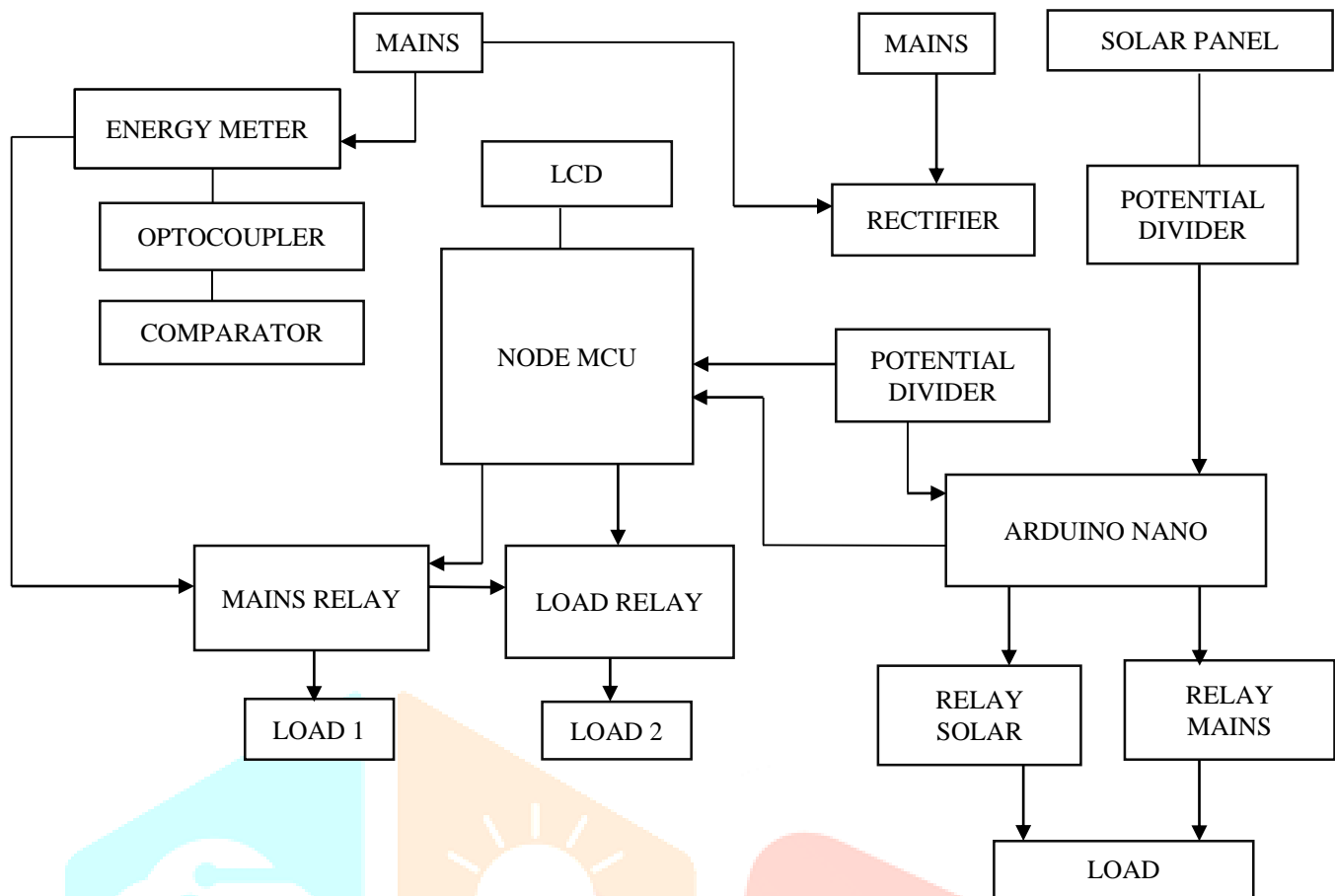
**Figure 1: Block Diagram**

## V. WORKING

The power supply to the design is given from a 230V ac supply and this is directly given to the energy meter. Power supply using a solar panel is also provided in the device. The selection of the source depends upon the power which is more than the provided threshold. This data is send to the Arduino Nano and the information is displayed on the 16X2 LCD. In prepaid technology the units consumed is obtained from the number of pulses generated by the CAL LED of the energy meter. This generates pulses according to the load connected. These pulses generated are then processed in microcontroller to obtain the count. From the energy meter the CAL LED generates pulses according to the intensity of load given to it. According to the input of the optocoupler, output pulses are generated which is interfaced with the microcontroller or Arduino board. According to the pulses, microcontroller decrements the balance amount and increments the units consumed. When the balance amount is completely used microcontroller cut out the relay interfaced through a driver. 16X2 LCD display is also interfaced with the microcontroller which displays the current status of balance amount and units consumed. A user friendly web interface helps customers to easily get all the information related to their energy usage, real time consumption, electricity bill and even provide an prediction of the estimated electricity bill and they can regulate their load through this web interface

Advantages:

1. Load can be controlled from anywhere through web.
2. Real time information is available for consumers.
3. Warning message is given to the consumer when starting and when there is low balance and is about to cut-off
4. Units consumed, available balance, amount is available to the user anytime through the web.
5. No need for manual meter reading.
6. Low manufacturing cost.


Disadvantages:

1. There is a small-time delay in load controlling.
2. Predicted value may sometime vary from real time value.

## VI. APPLICATION

- Can be used in domestic loads or houses to reduce the energy consumption
- Can be used in small shops and buildings.
- Helps to monitor the energy

## VII. FUTURE SCOPE

For the future research, we intend to collect more data to get more significant and effective features. We are aiming to add more power sources in the system thus energy conservation can be done more. In addition, all the features from the web page can be incorporated into a mobile application.

## REFERENCES

1) Energy management of smart microgrid in presence of renewable energy sources based on real-time pricing – Ferdowsi University of Mashhad, Mashhad, Razavi Khorasan,2017

2) Smart Energy Metering For Cost And Power Reduction In House Hold ApplicationsC Komathi,S Durgadevi,K Thirupura SundariT.R. Sree Sahithya,S. Vignesh,2018

3) Advanced Microgrid Energy Management System for Future Sustainable and Resilient Power Grid-Fang Yang,xianyong Feng, Zhao Li,2019

4) IOT Based Smart Energy Meter for Efficient Energy Utilization in Smart Grid- Bibek Kanti Barman,Shiv Nath Yadav,Shivam Kumar, Sadhan Gope,2018

5) A Smart Power Meter to Monitor Energy Flow in Smart Grids-Rosario Morello,Claudio De Capua, Gaetano Fulco,Subhas Chandra Mukhopadhyay2022

6) Design and Operation of Smart Energy Meter for Effective Energy Utilization in Smart Cities-Qasim MalikAamir Zia,Rehan Ahmad,Muhammad Asim Butt,Zain Ahmad Javed,2019

7) Designing Prepaid Smart Energy Meter and Deployment in a Network-Sagar Rathee,Aayush Goyal,Anup Shukla,2021

8) Development of Smart Energy Meter for Energy Cost Analysis of Conventional Grid and Solar Energy-M. Faisal; Tahia Fahrin Karim; Abu Ridwan Pavel; Md. Shahadat Hossen; M.S. Hossain Lipu,2016

9) A Novel IoT based Smart Energy Meter for Residential Energy Management in Smart Grid Infrastructure-Gitanjali Mehta, Ruqaiya Khanam, Vinod Kumar Yadav,2015

10) Consumer Friendly Energy Meter for Home Application-S Radhika,A. Chandrasekar, S. Jothi,Vijayakumar K,2019