

Smart Energy Home Management Using Hybrid system

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Abstract: Energy balance is one of the main criteria to operate the grid in stable condition. If there is any energy imbalance occurs due to increase in demand then the grid will not operate in stable condition. Increase demand is one of the major issues facing by grid. To address this problems many countries promoting the renewable energy generation this will support the grid to avoid energy imbalance problem. Prosumer play a key role in this situation, where they can utilize the generated energy and remaining surplus power can integrate it to the grid. While utilising the renewable power generate it should be controlled and monitored effectively so that we can reduce the tariff cost. Solar panels installed in house need to be monitored continuously to improve the performance of battery. In this paper, the power line communication (PLC) compliant with Home Plug is implementing to check energy consumption. The system design is composed of three components: Driver circuit, ac supply, and smart device application. This system will switch over from solar energy consumption to AC supply according to the load requirement. This scheme will maintain the performance of a PV system and contribute to enhancing home energy management system. The system design was stimulated with Matla band verified with the hard ware results.

Keywords: Smart devices, Energy management & PV system

1. Introduction

Conventional generation and distribution system which was following over a long period of time have more disadvantages like air pollution, availability of the source, transmission loss etc. Development of semiconductor devices and power electronics components, eradicate the above disadvantages in renewable energy likes solar, wind, geothermal and tidal sources and it popularized the usage of micro grid. In this paper, renewable and non renewable energy advantages are clubbed together by using power electronics components and arduino for effective management of energy in home.

Literature survey there has been many methods till now for smart energy management. In this paper (1) smart algorithm was implemented for dynamic load response in smart building which will reduces the tariff cost. (2) Bi-level model which will examine solar panel and battery management in a smart home. (4) Hybrid technique was used to balance the load during peak hours. From the literature surveys we have observed that smart energy management will effectively reduces the tariff cost to the consumers and encourage the prosumer to participate in the generation to support the demand.

Outline: The respite of this paper is organized as follows. Section II introduces the proposed system design, simulation and hardware result. Section III conclusion of the paper.

2. Design of Proposed System

A. Objective:

The main objective is to study and analyse the implementation of control algorithm/ program to reduce the tariff cost and for effective management of battery system using ARDUINO.

B. Framework design:

The proposed block diagram consists of (Fig 1)

- Solar panel (3Watts),
- Battery(6V),
- Arduino controller,
- Transformer(230/120V)
- Relay
- Inductor(330UH)

- MOSFET(IRFZ44)
- LCD display

Solar panel converts the light energy from the sun into direct current and it's stored in the battery. The stored DC is filtered and boosted by the converter. Power supply is given to the converter through driver board and it's monitored by Arduino controller. The filtered DC supply is fed into the inverter which will convert the direct current into alternating current with the help of MOSFET switches. Transformers boost this alternating current supply to the required level which will meet the load demand.

Relay switched to renewable energy supply when the availability is more. During cloudy season or unavailability of renewable supply relay will be switched to supply from the grid. Thus it will easily switch over from solar supply to Grid supply according to the demand response. By using this proposed method the electric bill cost will be reduced and energy will be saved.

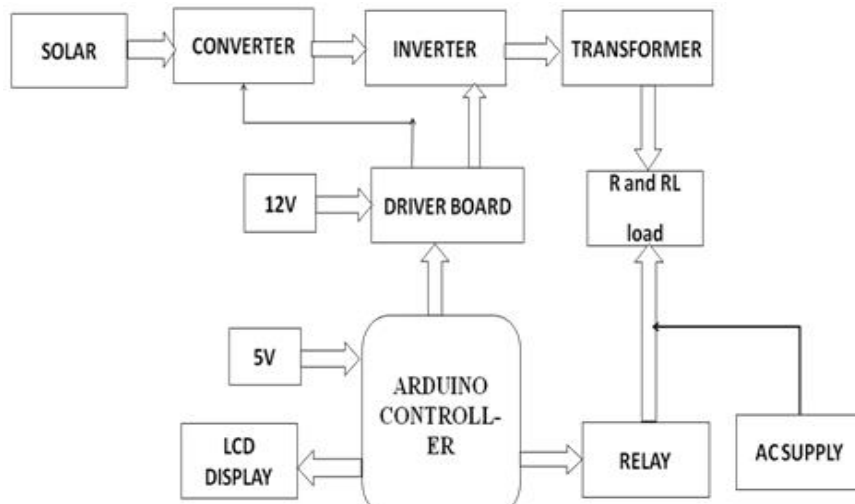


Figure 1. Block diagram of Smart Energy Home Management using Hybrid system

The proposed system is simulated using Matlab software.

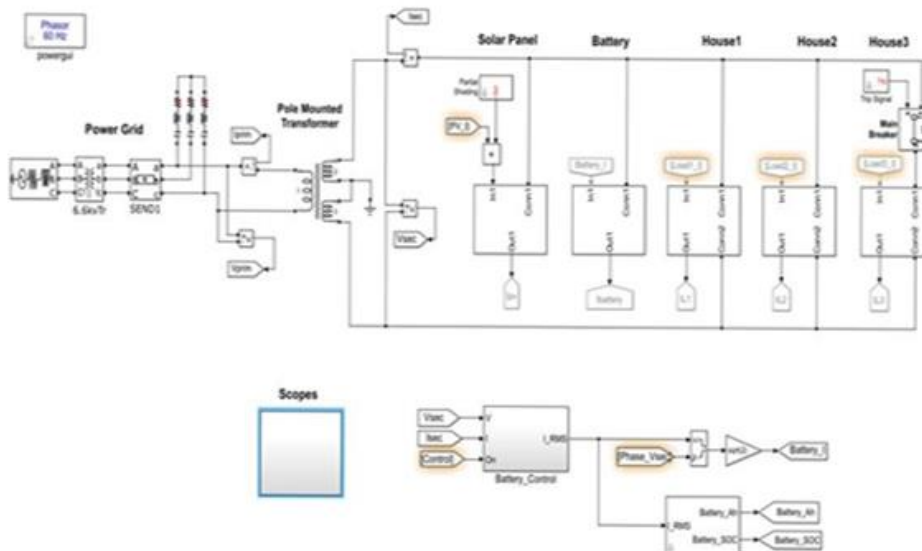


Figure 2. Matlab Simulation of Smart Energy Home Management using Hybrid system

- Proposed a smart energy management using hybrid system hardware set up is shown in the figure.3. Solar power and energy management in battery were stimulated and verified with hardware kit.
- Observation made from the simulation result was that implementation of control algorithm reduces the tariff cost based on generation and smartly manage the energy system in house.

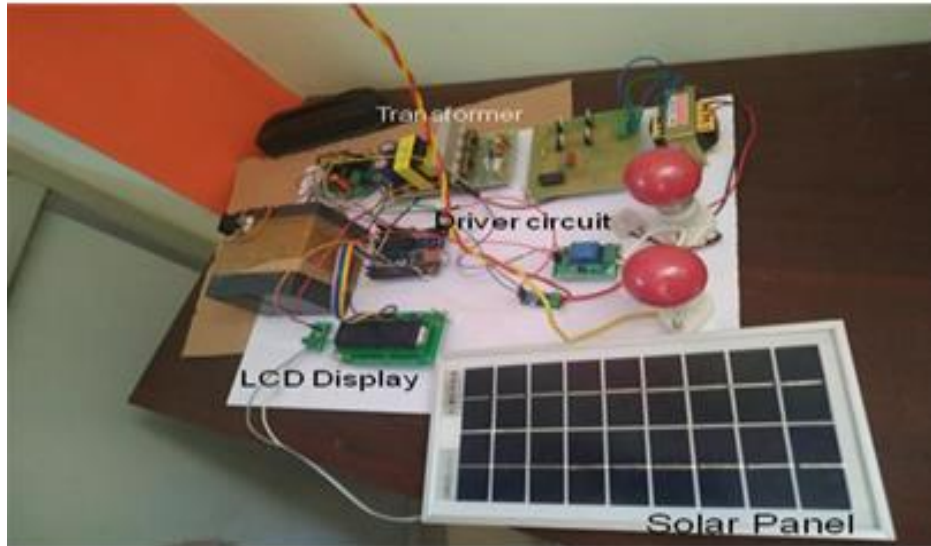


Figure 3. Hardware set up of Smart Energy Home Management using Hybrid system

- Additionally, micro grid capital cost will be more which will not be economically feasible for short range of operation. Proper design should be incorporated while planning for short range of operations.

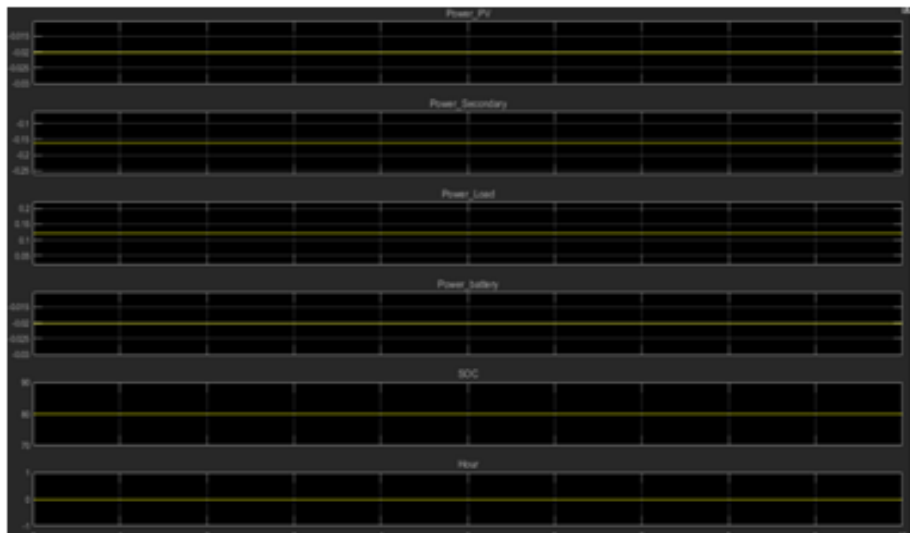


Figure 4. Matlab Simulation result of Smart Energy Home Management using Hybrid system

Also, for some household appliances, such as dishwashers and washing machines that consume an extensive amount of energy in a short period of time, transferring the loads to a time based upon the generation rate. Either utilizes the generated power when the tariff rate is high or brought the power when the tariff rate is low. The Hardware set up is shown in the figure which will match with the simulation results

3. Conclusion

The implementation of smart energy management using hybrid system will reduce the tariff cost and the prosumers can sell it to the grid. Government of Tamil Nadu through Tamil Nadu Energy Development Agency (TEDA) had initiated installation roof top solar power house through subsidiary. When the proposed work comes into picture it will have a great impact in the reduction of electricity cost and supply from the grid. The proposed system will also encourage the usage of Micro grid.

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