

“IOT based Energy Management System Including Renewable Energy using Arduino and Zig-Bee”

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Abstract - Energy is one of the most crucial aspects of country's technological progress. With the assessment of modern technology, the usage of energy escalating gently. Almost amount of electrical energy demand are met by conventional sources like coal, oil, gas etc. which are going to deplete in future, which lead to sever energy demand in future. Increasing cost and demand of energy has lead many organizations to find smart ways for monitoring, controlling and saving energy. A energy management system (EMS) can contribute towards cutting the costs while still meeting the energy demand. Energy saving is one of the main challenge in our day to day life. Energy saving is done only when the energy consumed by the load is monitored. Once the load is monitored, suitable control methods can be adopted to operate the load in a optimized way to save the energy. There are different technology are developed to overcome this problem. IOT (internet of things) technology is one of them. Home energy management system considers both energy consumption and generation simultaneously to minimize the cost. This paper offers a smart HEMS which consider both energy consumption and generation using Zig-Bee based energy monitoring module technology. It takes energy data from numerous home serves, and compares them, and create useful information. Considering both energy consumption and generation the proposed HEMS predicted to optimize home energy use and home energy cost saving.

KEY WORD: (Energy management, IOT, Renewable energy)

1. INTRODUCTION:

Electrical energy forms an vital constituent when it comes to human ease. Diverse activities wouldn't be possible without the aid of the electrical energy. The production and consumption of the electrical power influence on the human budget as well as the environment. To reduce the cost of the fossil fuel power, and to reduce the impact on the environment, the installation of renewable energy sources increased dramatically in the past two decades. There has been present and quite much publicity about “Internet of Things”.

1.1 NEED OF ENERGY MANAGEMENT:

Energy is one of the most imperative aspects of countries technological progress. Efficient use of energy and its saving is essential for sustainable development. The process of energy saving is referred to as energy

management. Thus the process of planning energy saving measures, monitoring energy utilization, controlling, and conserving energy in a building is termed as energy Management.

2. PROPOSED SYSTEM:

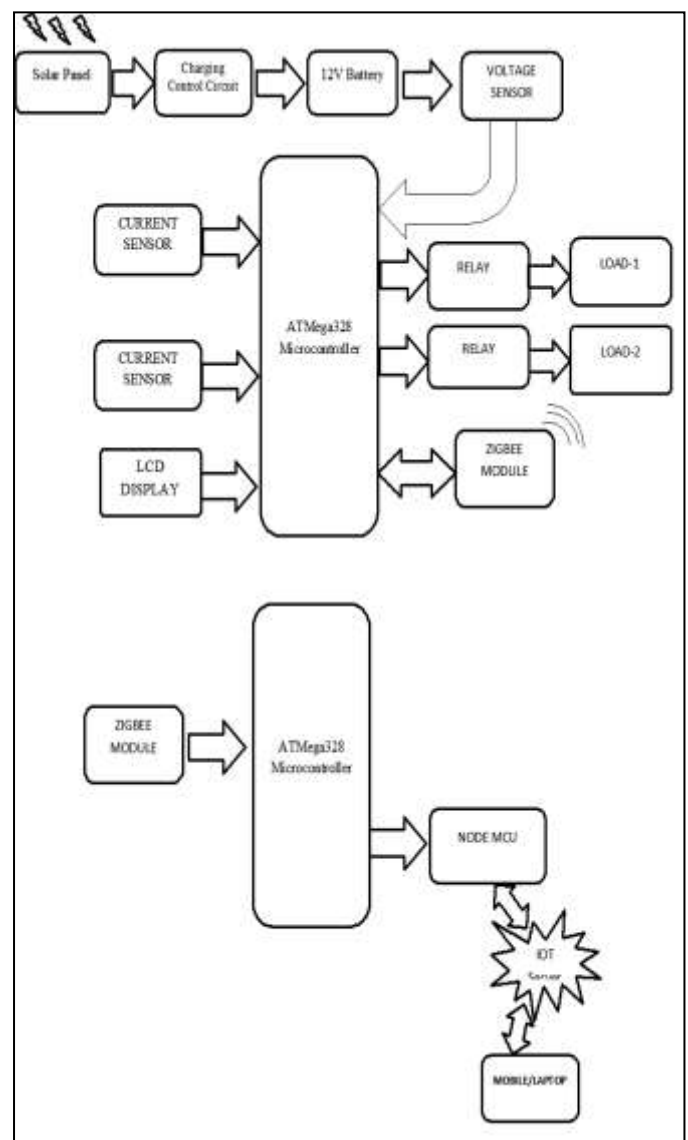


Fig (1): Block diagram of proposed system

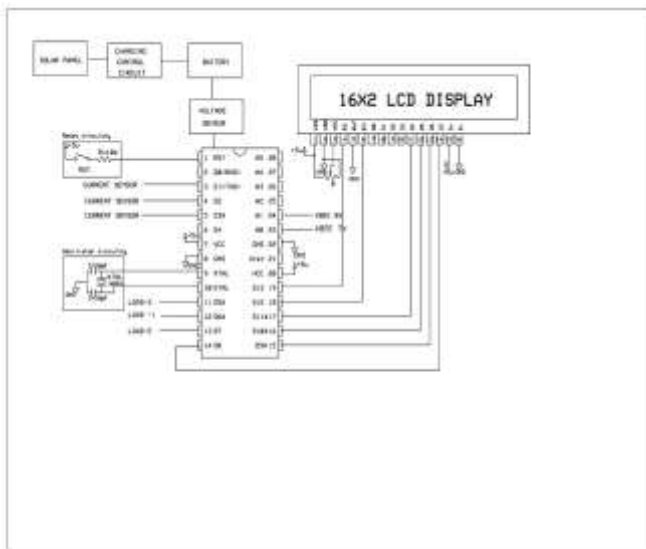


Fig (2): Circuit diagram of proposed system

3. RESULT AND DISCUSSION:



Fig(3): Overview of the Proposed System

We are using a 3W solar panel for generation of energy, this generated energy is stored in 12v battery. The energy which we are getting from solar is not in a pure AC or pure DC, it's a pulsating DC. Due to this there is problem with the life span of the battery may reduce, to avoid this we are using charge controller circuit. Which avoid the reverse flow of current, which is used as isolation between panel and battery. The output of the battery is given to voltage sensor, this sensor gives the required voltage to the Arduino for the operation i.e 5v because the Arduino comes under TTL family, hence it is capable of handling only up to 5v. The current sensor used here is ACS LM12 which is connected to our microcontroller to measure the current, in the Arduino, all the programmes are dumped, according to the programs it will calculate the voltage and current and displayed on the LCD. Two relays blocks are used for particular loads. There are two loads one is of 20W and another is of 100W. whenever we give the supply to the board, the Arduino starts calculating the the current and voltage, if the generated voltage is sufficient for the load to operate then both the loads will turn on, if the generated energy is not sufficient then the LCD will display if there is overload in the system then the second load is tripped automatically. In this way the management of energy is taking place. Then comes to ZigBee, it is a two-way communication/duplex communication module which is connected to the microcontroller, which means it can transmit and receive the data simultaneously. Node MCU is having two parts one is microcontroller and wifi module. The information of the loads is given to the IOT which is adafruit which is having a particular IP address which is connected with our laptop it will display the result in the laptop or mobile.



Fig(4): Output of the system when Load is ON



Fig(5a): LCD display output



Fig(5b):LCD display

4. CONCLUSION:

As residential homes have installed renewable energy sources to save the energy cost, it is important that both energy consumption and generation are simultaneously considered in HEMS. This paper proposes the smart HEMS architecture that considers both consumption and generation. In the energy consumption, the EMCUs are installed in outlets and lights to measure the energy usages of home appliances and lights based on ZigBee; they transfer the gathered data to the home sever. With this scheme, the home server figures out the home energy usage pattern. In the energy generation, arduino controller modems are installed in each solar panel to monitor its status. The REG gathers the status data of the solar panels based on arduino controller and the generation data from inverters based on RS -485; it transfers the gathered data to the home server. This arduino controller monitoring technology can monitor each solar panel for maintenance. The home server can estimate the energy generation based on a weather forecast. Using the obtained energy information, the home server can control the home energy use schedule to minimize the energy cost. Users can access the home energy information through smart devices. The HEMS provides the comparison and analysis of each home energy usage. By considering both consumption and generation, the proposed architecture is expected to enhance home energy management and to save the energy cost.

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