

ZIGBEE BASED HOME ENERGY MANAGEMENT SYSTEM USING RENEWABLE ENERGY SOURCES

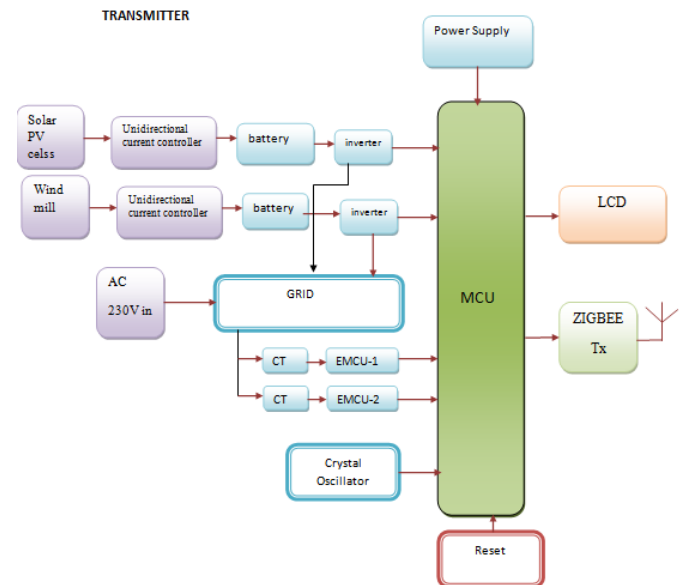
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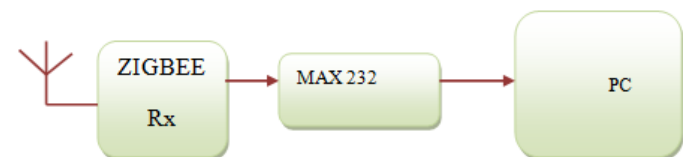
ABSTRACT: *In this application we can generate the energy using renewable energy sources one is by using solar energy, another one is wind mill and one more the optional source is conventional power. These energy sources we are connecting to the grid via battery and inverter, Parallely the battery output is connected to micro controller unit and these microcontroller is connected to LCD for displaying which source is available and also for displaying the battery voltage. Whenever the load is connected some units will be consumed, these units will be calculated and displayed on the LCD by using controller and the total transmitter section information is transmitted to receiver section and displayed on the Pc through a wireless communication by using Zigbee technology.*

of energy to meet the requirements, taking into account environmental and economic objectives”.

Block Diagram:



RECIEVER:



INTRODUCTION

Energy management systems are also often commonly used by individual commercial entities to monitor, measure, and control their electrical building loads. Energy management systems can be used to centrally control devices like HVAC units and lighting systems across multiple locations, such as retail, grocery and restaurant sites. Energy management systems can also provide metering, submetering, and monitoring functions that allow facility and building managers to gather data and insight that allows them to make more informed decisions about energy activities across their sites.

Energy management includes planning and operation of energy-related production and consumption units. Objectives are resource conservation, climate protection and cost savings, while the users have permanent access to the energy they need. It is connected closely to environmental management, production management, logistics and other established business functions. The VDI-Guideline 4602 released a definition which includes the economic dimension: “Energy management is the proactive, organized and systematic coordination of procurement, conversion, distribution and use

As home energy use is increasing and renewable energy systems are deployed, home energy management system (HEMS) needs to consider both energy consumption and generation simultaneously to minimize the energy cost. Here a smart HEMS architecture that considers both energy

consumption and generation simultaneously. ZigBee based energy measurement modules are used to monitor the energy consumption of home appliances and lights. The current energy crisis has required significant energy reduction in all areas. The energy consumption in home areas has increased as more home appliances are installed. Energy saving and renewable energy sources are considered as methods of solving home energy problem. Both energy consumption and generation should be simultaneously considered to save the home energy cost.

Energy Management and Communication Unit (EMCU)

In the energy consumption part, the EMCU is a key component; it is composed of measurement and communication blocks. The measurement block measures the power, energy, and power factor of plugged home appliances. It uses an energy metering IC for measuring them. The metering IC measures the voltage and current in a sample period; it multiplies them; it integrates them continuously. The power and energy is calculated with this process. The power factor is measure based the phase difference between voltage and current. The measurement block stores only the accumulated energy data at a memory; it calculates the power and power factor on demand in real time. The measurement block includes the power control block that supplies or blocks the electricity to connected home appliances.

Maximum Power Point Tracking Technique. This technique can be simply done by using two LDR and a DC motor.

Wind turbine: Wind turbine is used to absorb the wind from atmosphere and using the kinetic energy from wind to generate the electrical power. Battery with Charge controller: Here 12v battery can be used to store the power from wind turbine and solar panel. Both can produce above ranges then it can be controlled by using Charge controller circuit. Here a NPN transistor should be used to provide the safety purpose for drive the power from renewable energy to battery supply and maintain to don't send the power from battery to renewable energy sources such as solar panel and wind turbine.

Inverter: It can be used to convert the 12v to 230v supply for providing the power to the home appliances form solar and wind. Step up transformer can be used to increase the power from 12v–230v power supply.

Current Sensor: Current sensor is a device used to sense the current from solar panel, wind turbine and main panel for knowing the power generation and consumption by home appliances. This current sensor is worked based on the principle of Hall Effect. To convert the current into power by using the $P=VI$ formula. It is also possible to measure the DC and ac supply directly from the source.

Zigbee: It is the wireless device for transmitting and receiving purpose or simply it called as Transceiver. Zigbee is based on the IEEE802.15.4 protocol. The range of the Zigbee is covered as 100m. It range is 10 times better than bluetooth device so it can be more preferable one in wireless device. The data rate is very low for transmission while using this device.

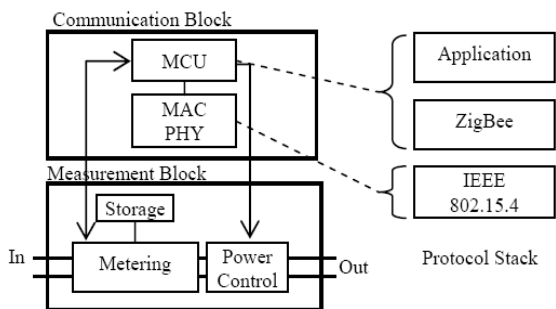


Fig. 3. Energy measurement and communication unit (EMCU) and protocol stack.

Solar Panel: A solar panel is consists of many Photo voltaic cells. It used to absorb the sun rays at day time and take a backup for use it night time. In today world the usage of the solar panel is very high to reduce the power consumption. To increasing the power generation in solar panel by using

The communication block supports data transfer between the EMCU and the home server. It adopts ZigBee and IEEE 802.15.4 wireless personal area network (WPAN) as communication methods. It transfers not only the measured energy, power, and power factor but also the voltage and current.

Fig. 3 shows the data transfer message that is loaded on the ZigBee payload. The MCU in the communication block controls the state of the power control block in response to the

command from the home server.

Energy (4B)	Power (3B)	Voltage (3B)	Current (3B)	Power Factor (2B)
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Fig. 4. Data transfer message format in a ZigBee payload.

APPLICATIONS

1. Energy cost can be reduced
2. Increase the power generation
3. Energy Monitoring
4. Know the cost of energy usage

CONCLUSION

The smart home energy management system is works well on real time. The system can be fully controlled by controller. Power consumption details are successfully uploaded into the web server continuously. Solar power and wind energy are enough for production of power to supply the home appliances. The implementation cost of the system is low and this System is also reducing the cost of the power. During peak hour the heavy load home appliances kept off to maintain the energy management and save the energy for nature and upcoming future generations. The benefits are we can not only have the power but also have the knowledge of consumption.

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