International Journal of Ethics in Engineering & Management Education
Website: www.ijeee.in (ISSN: 2348-4748, Volume 2, Issue 10, October 2015)

Zigbee Based Home Energy Management System Using Renewable Energy

.

Bhukya Govindu [1], A. Pedda Raju [2]

[1] PG Scholar, Dept of ECE, Aurora's Technological and Research Institute, Hyderabad, India, E-mail:govind2632@gmail.com.
[2] Asst Prof, Dept of ECE, Aurora's Technological and Research Institute, Hyderabad, India, E-mail:peddaraju567@gmail.com.

Abstract: **In this application we can produce the energy using renewable energy sources that is using solar energy, and wind energy and one more the optional source is conventional power .These energy sources are connected to the grid via battery and inverter, Parallel the battery output is connected to voltage sensor and voltage sensor is connected to micro controller unit read the battery voltage level. This 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.**

Key Words: **ZIGBEE, LPC2148, Voltage Sensor, AC Loads, and Inverter.**

I. INTRODUCTION

In this project we have shown the concept for Energy management system using renewable energy through solar and wind energy. in this system main concept is to control the load depends on the power schedule using grid controlled by microcontroller depends upon the voltage level of battery. When battery is low the automatically change the grid to normal voltage using relay. In Figure 1, The voltage sensors read the voltage of battery and down the battery voltage then automatically corresponding grid will be operated and then values are send to user PC and monitoring values.

These energy sources we are connecting to the grid via battery and inverter, battery output is connected to inverter and voltage sensor to microcontroller. We read battery voltage and battery voltage is normal then load will be on using inverter side and voltage is low then automatically change the Main supply voltage to AC Loads, all these status will be send through wireless communication by using Zigbee technology and all these status display on Liquid crystal display(LCD).

This application we use in industrial, in home energy management system using inverter through help of solar panel and wind energy. In existing system we can control the grids using PLC's and now we can control all the devices using controllers, using controllers low power consumption more efficient of application.

II. PROPOSED WORK

In this project Smart home energy management system including renewable energy based on zigbee. These energy sources we are connecting to the grid via battery and inverter, Parallel the battery output is connected to micro controller unit and this 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.

To control the loads depends on battery voltage and read battery voltage using voltage sensor find the voltage levels of battery and battery status is normal condition then load operated by inverter if battery voltage low level the control the automatically to connect main power supply.In this project we use solar panel and wind energy resources to charge the battery. All these information send to server section, save the data as to give daily report of the power schedule.

The proposed system mainly two parts to Energy gives to loads. One is main power supply another one is inverter. Inverter input power supply through solar energy and wind energy, and loads are connected to help of grids and control these load automatically depends upon the resources, all these information send to sever section using wireless sensor network.

Block Diagram:

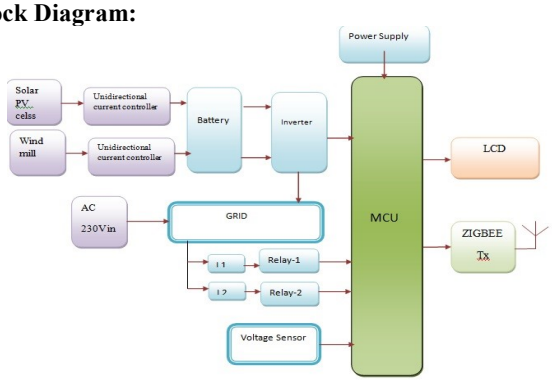

Fig: 1 Block Diagram of Smart Home EMS

International Journal of Ethics in Engineering & Management Education
Website: www.ijeee.in (ISSN: 2348-4748, Volume 2, Issue 10, October 2015)

Server Section:

Fig2: Control section/server section

2.1 Zigbee Module Interfacing with ARM7:

The microcontroller output is not compatible with the Zigbee module. To make it compatible we require the DB9 connector and the MAX 232 connector. This will enable the microcontroller to send a message to a predefined when action is performed.

2.2 LCD Interface with LPC2148:

The system also consists of a display system having in corresponding response display information on LCD. LCD module has 4-bit data interface and control pins as shown in Figure 3. In this display hardware interfacing with any pin of microcontroller with 4-bit mode in this mode we have 4 data lines and 3 control lines that is D0,D1,D2,D3 and RS,RW,EN pins. RW pin is make it ground why because of we use to write data on LCD that's why RW=0 always Zero. In this display we can display total character at a time 32 characters.

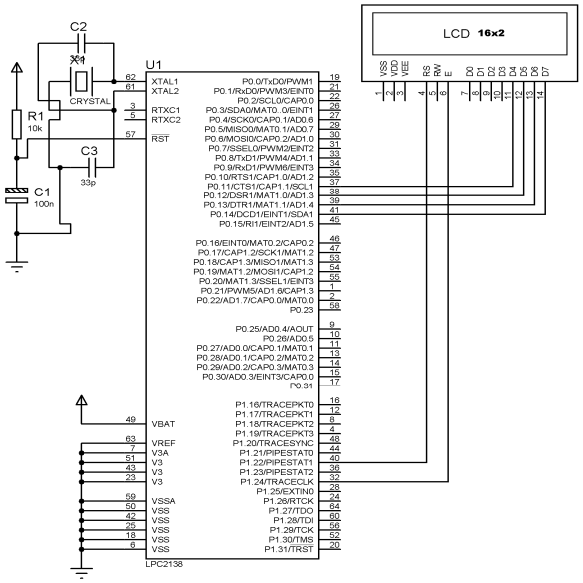

Fig 3. LCD interfacing with microcontroller

LCD display used here is having 16x2 sizes. It means 2 lines each with 16 characters.

2.3 Embedded Processor:

This implementation is designed with ARM7TDMI processor. In these different modules such as LPC2148, voltage sensors, 16*2 LCD, Inverter, AC Loads are used. It is implemented by using two modules Smart home EMS module and Server section module. The Smart home EMS module consists of Voltage sensor to read battery voltage levels and sends to server section and depends on voltage levels switching the grid and loads will be operated.

The LPC2148 are based on 16/32 bit ARM7TDMI CPU with real time emulation and embedded trace support, together with128/512 kilobytes of embedded high speed flash memory. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate .For critical code size applications; the alternative 16-bit Thumb mode reduces code by more than 30% with minimum performance penalty.

With their compact 64 pin package ,low power consumption, various 32-bit timers,4-channel 10-bit ,USB PORT,PWM channels and 46 GPIO lines with up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access control and point of scale. With a wide range of serial communication interfaces, they are also very well suited for communication gateways, protocol converters and embedded soft modems as well as many other general-purpose applications

This uses two power supplies, one regulated 5v for modules and other one is 3.3vforLPC2148.7305 three terminal voltage regulators is used for voltage regulation. Bridge type full wave rectifier is used rectify is used to rectify the ac output of secondary of 230/12v step down transformer.

2.4 MAX 232 (Communication Interface):

RS-232 (Fig. 4.) was created for one purpose, to interface between RS logic levels to TTL logic levels that means RS logic it's have like a single and doesn't know microcontroller that logic. Micro controller reads only digital logic voltages that's why we use communication between Zigbee and microcontroller we use max232 device. To employing serial binary data interchange. RS 232 is the most widely used serial I/O interfacing standard. In RS 232, a 1 is represented by -3 to -25 v. while a 0 bit is +3 to + 25 v, making -3 to +3 undefined. For this reason, to connect any RS 232 to a Microcontroller system we must use voltage converters such as MAX232 Device to convert the TTL logic levels to the RS 232 voltage level, and vice versa.
This chip is used when interfacing micro controller with PC to check the Baud rate and changes the voltage level because micro controller is TTL compatible whereas PC is CMOS compatible.

International Journal of Ethics in Engineering & Management Education
Website: www.ijeee.in (ISSN: 2348-4748, Volume 2, Issue 10, October 2015)

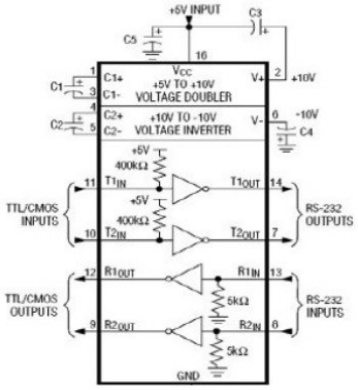

Fig 4. Operating Circuit of MAX 232

III. EXPERIMENTAL RESULTS

a. The main interface:

The main interface of server center where users can choose the operation is shown in Fig.5. In the main interface, the serial port should be set. Select the serial port 4, baud rate is 9600bps and take 8 data bits with no parity. After successful set .up, the situation of working node, go to terminal mode and open the input and output window and interfacing Zigbee to PC and show the all information of the target board. we get all information of voltage levels, grid status and Load control status as shown in Fig.6.

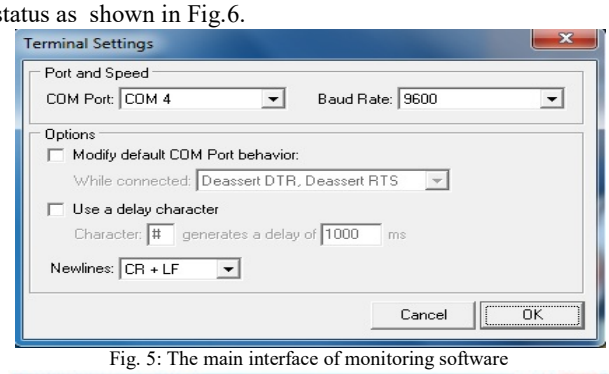

Fig. 5: The main interface of monitoring software

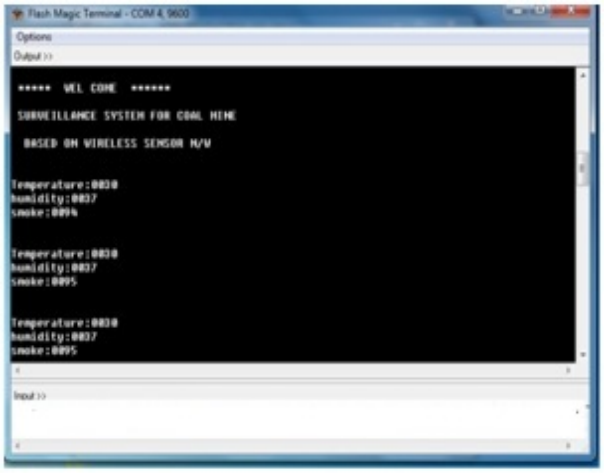

Fig. 6: output of the Smart home EMS.

Finally we get the value at server section and when it exceeds the threshold values then automatically corresponding sensors alert the miners.

IV. CONCLUSIONS

In this paper we design a system using renewable energy resources and also monitor the energy consumed by home appliances. We get output corresponding voltage levels and switch the grid voltage depend on the voltage. Final always we get the voltage through Solar panel and wind energy or Normal voltage supply. Voltage will be always read the values using voltage sensor if in case voltage level is low automatic grid will be change and all these information send to Server.

REFERENCES

[1]. Young-Sung Son and Kyeong-Deok Moon, "Home energy management system based on power line communication," in Proc. IEEE International Conference on Consumer Electronics, Las Vegas, USA, pp. 115-116, Jan. 2010.

[2]. Young-Sung Son and Kyeong-Deok Moon, "Home energy management system based on power line communication," IEEE Trans. Consumer Electron., vol. 56, no. 3, pp. 1380-1386, Aug. 2010.

[3]. Jinsoo Han, Chang-Sic Choi, Wan-Ki Park, and Ilwoo Lee, "Green home energy management system through comparison of energy usage between the same kinds of home appliances.

[4]. Chia-Hung Lien, Hsien-Chung Chen, Ying-Wen Bai, and Ming-Bo Lin, "Power monitoring and control for electric home appliances based on power line communication," in Proc. IEEE International Instrumentation and Measurement Technology Conference, British Columbia, Canada, pp. 2179-2184, May 2008.

[5]. Saeed Jahdi and Loi Lei Lai, "Grid integration of wind-solar hybrid renewable using AC/DC converters as DG power sources," in Proc.World Congress Sustainable Technologies, London, UK, pp. 171-177, Nov. 2011.

About authors:

A.Pedda Raju, Assistant Professor in aurora's tech.& research institute (parvathapur,uppal), completed post graduation from Geethanjali college of Engineering and Technology, in 2014 march, Hyderabad, India with an aggregate of 69%.

B.Govindu, Pursuing Post graduation as an Electronics and Communication Engineering in 2013-15,from aurora's tech.& research institute (parvathapur,uppal), Hyderabad, India, and Received the bachelor of technology degree in 2012, from Anurag engg. College Kodada, Telangana, India and participated many seminars on VLSI and digital based areas.