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Controlling of Power Grid using Renewable Energy Source

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Abstract: ***In this paper, a household power unit which is able to automatic switching and communicate through the Non-conventional energy sources like solar energy will become more reliable. Further it will have made ready to end-user through electrical setup. The program loaded on this device will be work as Real time operating system. It is necessary to process, control and communication. Other services are provided on top of embedded device. It includes communication with server about the real-time information on energy meters at customer`s location. Real time energy source scheduling, energy source selection, power-up the connection and disconnection are some of the services that are provided through the online server system. The web browser available at authorities can act as an interface to these services provided. Impact on the operation of distribution feeders within the balancing areas of numerous electrical utilities are caused by the integration of distributed energy generation systems. Greater integration of renewable energy generation may be achieved by facilitating battery energy storage systems like integrating remote access to manage the set up like Ethernet, Web communication etc. The smart energy management of the resources is very important aspect. It allows collection of energy from multiple sources. The generated power at distribution level can be directly fed to the utility distribution network. In this paper, the smart energy management system is used where the dual battery monitoring system works alternately. ARM 7 microcontrollers is used to regulate the actual operating function on the charger. It is ideally appropriate for residential premises along with commercial applications.***
Keywords: LCD, Relay, Inverter and Microcontroller.

I. INTRODUCTION

In present time, we all are contributing to the carbon emissions of this planet earth cumulatively. Applications of nonconventional Energy Sources in domestic electric grid have always been the great effective method to minimize the proportion of carbon emissions. Global warming has raised because of these carbon emissions and depletion of the ozone layer. We can reduce carbon emission at individual level upon the environment by using alternatives like solar water heaters, solar cooker, bio-gas plant. But these solutions are dependent on location and climate. The restructuring the electrical setup of the entire home is a lengthy and expensive process for the residential user. The use of generated renewable energy can be efficiently utilized if the way to use the power supply of their homes will be as per necessary. The contribution among the total carbon emissions due to the power generation from conventional energy sources can be minimized by these alternative solutions. Energy is the basic factor required for progressing the human life. The utilization of energy by the human beings for their needs is the dominant parameter used to measure the economic, social and industrial development of a country. Energy demands for industrialization and transportation are increasing day by day as the population is increasing. It leads to energy crisis. The Web of Things **[1]** comprise of a number of Internet enabled Embedded devices which provide such an inter face to the user by means of Web services. The end user can access this through a web browser of any computer with an Internet connection. The potential of renewable energy sources is large enough and they can meet demand of energy of the world many times. Renewable energy sources like wind, biomass, solar, hydropower, and geothermal can provide sustainable energy, based on the use of widely available, enough resources. Solar energy is available during day time only and solar irradiation levels are varying due to sun intensity, change in weather and also unpredictable shadows caused by clouds, birds, trees etc. The no. of power systems like PV/FC combined have been proposed and discussed. Because of relatively high cost compared with other traditional energy sources, many PV systems are not gaining popularity. Fuel cell cannot store energy. Also it has several shortcomings as slow response, it is difficult to cold start and its output fluctuates as the load gets vary. Since strong winds are mostly flow during nighttime. Wind power and battery are complementary to some extent. Because, battery has dynamic response and peak power capacity. It also enhances the power generation capability as it compensates the load by

charging and discharging. Hence a hybrid generation system can offer high reliability to maintain continuous power output than any other individual power generation systems.

II. LITERRATURE SURVEY

In this paper, Smart Grid architecture is implemented with the help of Web of Things. Web of Things comprise of a set of Web services provided on top of a number of Internet enabled Embedded devices. The Web browser on any computer can act as an interface to the services provided by these Web of Things. The Embedded devices are ARM Processor based devices with Ethernet capabilities. Real Time Operating System is used for process control on each of these embedded devices. Low IP Protocol Stack is implemented on top of each of these devices so that IP connectivity can be established. The Web interfaces provide us real time information on each of the energy meters that are installed on site and communicate to the Embedded Internet devices using Ethernet communication protocol. Real Time energy source scheduling, energy source selection, power connection and connection are some of the services that are provided to an online authenticated user. Renewable Energy Sources and their usage in residential electrification has always been the most effective way to reduce the proportion of carbon emissions that we are cumulatively contributing the carbon release of this planet earth. Global warming has raised because of these carbon emissions and depletion of the ozone layer. We can reduce carbon emission at individual level upon the environment by using alternatives like solar water heaters, solar cooker, biogas plant. But these solutions are dependent on location and climate.

A. Hardware Units

1) *Non-conventional Energy Sources:* We are preferring a non-conventional energy source, it's a solar panel is there to supply clean energy and to charge the battery.
2) *Electrical Setup:* It consists various circuits like battery, inverter, switch etc. Initially output from energy sources is fluctuating and it needs to be stable so battery will properly charge. The Embedded system and few others will require DC power to function. The DC power supply is separate unit which has input from mains. Battery is attached to output of charge controller to supply DC power in case of failure of energy sources. Inverter is there to gain AC output from DC input signal to supply further public grid. When the both energy sources are not able to supply necessary amount of energy or in case of maintenance, the public grid is switched to mains. For this, we are preferring the relay logic circuit.
3) In this setup an ARM cortex M3 processor is used todesign an embedded system device. The LPC1768 processorfrom NXP **[2]** is used as our version of ARM processor. Theprocessor is interfaced with a RS 232 port, LCD andEthernet port. A Real time operating system called CMSIS**[3]** is used for task optimization .On top of that a smallprotocol stack called LwIP is used to support TCP/IPcapabilities on the board.

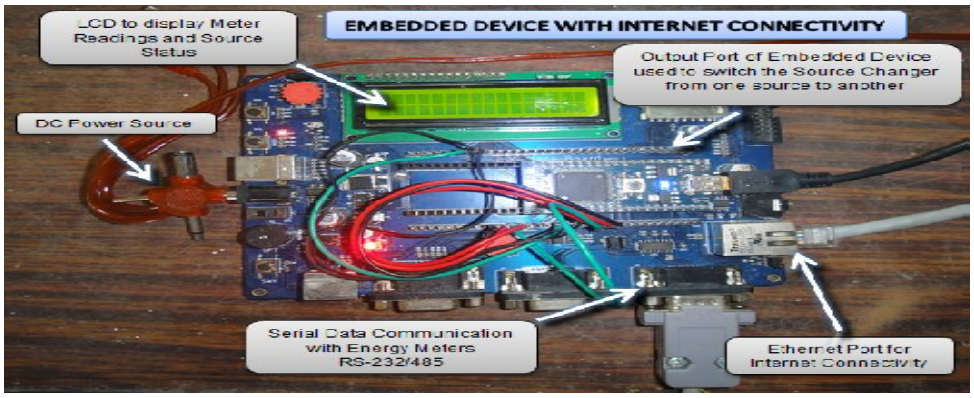

Figure 1.ARM Processor based Internet Enabled Embedded Device

B. User Interface

A User Interface is designed in graphical form and it is provided to the user by using visual basic. It will be operated on computer connected to the Ethernet. The user may be subscriber, operator or any authority. The user is authenticated after he/she registers himself/herself for a connection. This can be done on the login screen. These options available at this user interface are like power units consumed by subscriber, current energy source and other parameters. This helps to analyze the his/her energy needs and he/she can plan the scheduling of his/her power needs and he/she can plan the scheduling of his/her power sources as per the his/her needs. He/she can learn his/her power usage such as daily use, monthly usage or yearly usage. The data can be compared to consumption

of different times of energy sources. “Smart Grid with Renewable Energy” by Mrs. N. V. Vader, Research student (Reg.141012208) JJT University,
Rajasthan Head of Elect. Power System Depart V.P.M.’s Polytechnic, Thane India Mr. Mandar V. Bhadang, Lecturer, and Electrical Power System Depart. V.P.M.’s Polytechnic, Thane, India published in Renewable Research Journal (Issue1-2013) – JJT University and COSIA [4].

C. Software Requirements

1) Keilμ Vision: Used for programming in Embedded C.
2) Visual Basic for GUI
3) Proteus: Used for simulation purpose
4) Flash magic: to download the code in MCU

D. Hardware Requirements

1) ARM LPC2148
2) LCD (16x2) – HD44780U
3) Relay module as Switches
4) Inverter with battery
5) Ethernet module/Wi-Fi modem
6) Solar Panel

E. Advantages

1) Easy to Maintenance
2) Reduces Electricity Bills
3) Low Maintenance Costs
4) Technology Development
5) Less Power Consumption

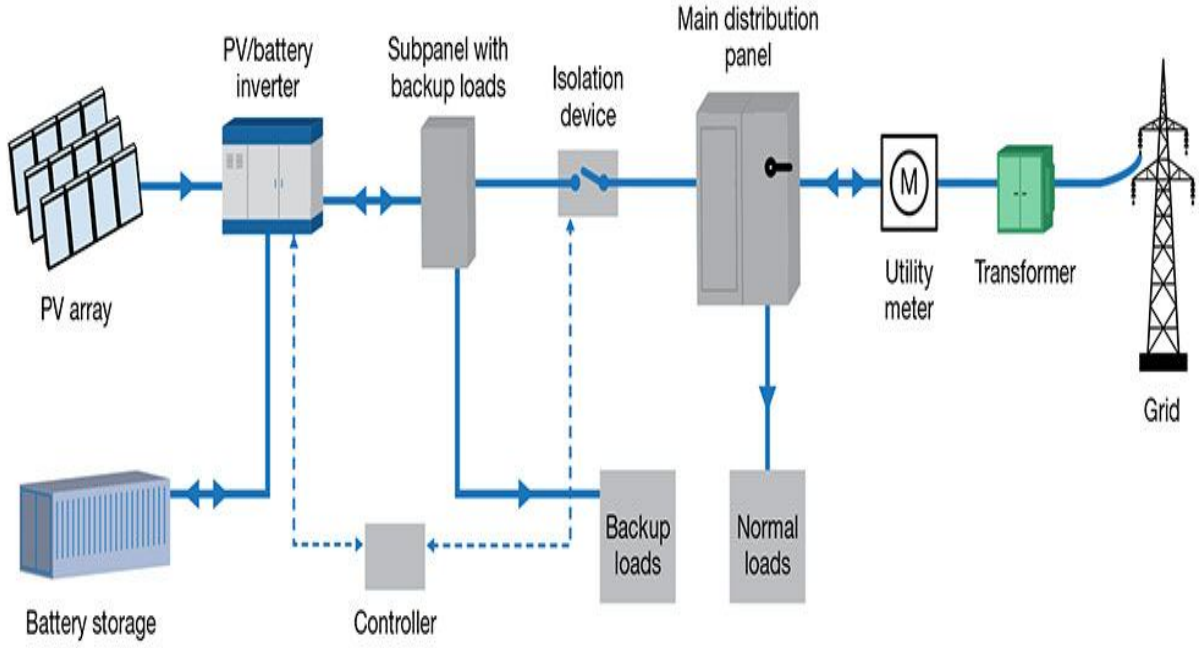

Figure 2 This figure shows a schematic diagram for a dc-coupled solar microgrid in which the PV array and energy storage system both connect to the dc bus of a multiport power converter.

III. FUTURE SCOPE

The presented model is reliable to build up on existing meters installed at residential locations. The whole set up can be developed with the electrical components and these can be chooses according to size of the project. So it will be a cheaper installation on a country side region. It can be expanded up to a large scale project with high security. Now days, most services are made available through the Web, the operations and procedure scan be reconfigured from remote and it depends on requirements and feedback from user side. The additional services can be managed frequently at the time when the necessary is there. This resultant model of market is very dynamic in the transition point of view due to its distributive feature. This is becoming feasible because of the immediate availability of energy as it depends on wind, sunlight and other similar different sources. **[5]**

IV. CONCLUSION

The described system can be easily built up and it is also scalable according to requirements. It gives an effective way to use our renewable energy sources. It has been underutilized otherwise. We can conclude that; it gives very efficient techniques for deploying green energy concept on a scale which may vary from domestic applications to industrial. The integration of Ethernet with existing architecture of subscriber power grid will offer lots of opportunities to us for advancements in our techniques to save energy.

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