ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 3, April 2016

EFFICIENT ENERGY MANAGEMENT IN MICROGRID USING LABVIEW

C. NAVITHA, PG Scholar, M.E Power Electronics and Drives, Anna University Regional Campus Coimbatore-46.

Abstract- ***This paper deals with the design and implementation of a 10 Watts solar–wind generator and associated Lab-view based monitoring energy management systems. So the source capacity may change at any point in time depending upon the availability of wind or the sun light. This project paper proposes a method for uninterrupted power supply to the load in such hybrid power generation units. This project uses a high speed PIC microcontroller and it has a whole lot of advantages over other controllers. Its fast operating speed, RISC architecture and some features such as internal ADC provide easy means for designing the whole system in a compact and in a cost effective manner. As the whole process takes place automatically there is a very lesser need for human interference and the electricity losses during the distribution area can be saved on a huge scale.***

Index Terms:-Labview, RISC architecture, ADC, automatically, human interference and electricity losses.

I. INTRODUCTION:

The project titled "Efficient Energy management in Microgrid using Labview" aimed to supply the power to load at all times using multiple generation units depending upon the load requirement and resource availability. Due to the increasing concern on environment and the rising fuel price, smart micro grids have been receiving more and more research attentions recently. Conceptually, a smart micro grid is made up of various generation sources (fuel cells, energy storage devices, small wind turbines, solar/photovoltaic systems, and small hydro turbines), different energy consumption devices, and/or energy management platform.

II. PROPOSED SYSTEM:

To implement a collaborative power system where in people can take power from it and also give power out when surplus. For the power that is taken from the common system the user has to pay, alternatively for the power they give back they get paid. An smart system that will manage all these demands and surplus and enable a optimum power utilization.

PIC Microcontroller (Embedded C Programming) used to control the overall energy conception of energy sources. Wireless communication used to exchange the energy information to the controller the load will on an all the times. The performance of the energy to the load we will analysis by using the Lab view software.

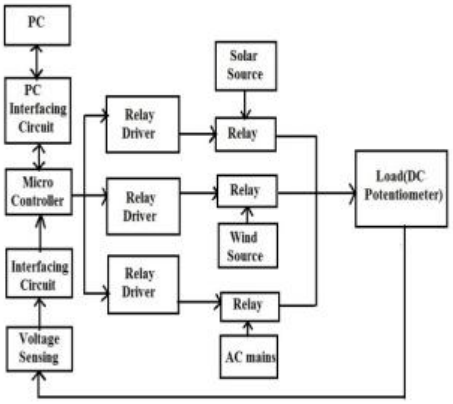

Figure 1. Block Diagram for Hybrid Generation Systems

BASIC COMPONENTS:

The Basic Components of the Hybrid Generation Systems are

- Renewable energy sources
- Power supply circuit
- USB driver Circuit
- Relay & Relay Driver
- PIC microcontroller
- AC Mains
- Load

RENEWABLE ENERGY SOURCES:

Wind Turbine:- In recent years, wind turbine generation has developed rapidly as a competitive and effective source of hybrid generation. Wind turbines use wind energy to generate electricity and have various ratings from a few KW to a few MW. To produce electric power, WT can be operated at

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 3, April 2016

variable or constant speeds and is coupled to induction generators. Nowadays, induction generators are widely used in WT and a variable speed generator is the preferred option in newer WT installations. In addition, another method of operating induction generators is by connecting the stator directly to the AC grid and connecting the rotor through a power electronic device, thus wound rotor induction machine can be used as a doubly fed induction generator (DFIG) as illustrated in recent years, doubly fed induction generators seem to be the major option in new wind farm installation, since it supports power system stability and reliability during peak load or disturbances. The WT with DFIG also requires smaller power electronic devices, thus control of the WT by DFIG becomes more flexible, where the active and reactive power can be controlled independently.

PHOTOVOLTAIC CELL

The Photovoltaic module is an unregulated DC power source that uses semiconductor cells. It generates direct voltage and current from sunlight that falls on the cells. In order to interface the array to the power systems, it has to be conditioned first and a DC/AC inverter has to be used. In addition, for maximum power point tracking (MPPT) purposes a DC/DC converter it is intended to extract the maximum available power at a given insulation level, which means maintaining the voltage level as close as possible to the maximum power point. PV systems have no moving parts, and thus require less maintenance and generate electricity without producing CO2.

SOLAR PANEL:- The solar panel is composed of solar cells that collect solar radiation and transform it into electrical energy. This part of the system is sometimes referred to as a solar module or photovoltaic generator. Solar panel arrays can be made by connecting a set of panels in series and/or parallel in order to provide the necessary energy for a given load. The electrical current supplied by a solar panel varies proportionally to the solar radiation. This will vary according to climatological conditions, the hour of the day, and the time of the year.

Figure 2. Solar Panel

POWER SUPPLY UNIT

The power supply unit consists of a step down transformer, bridge rectifier, bypass capacitor, voltage regulator and a low pass filter. The step down transformer converts the 230V AC power supply into 12V.The bridge rectifier converts AC to DC. The bypass capacitor acts as a filter. The output is given to a voltage regulator which maintains a constant AC voltage. The high frequency components are removed by the low pass filter.

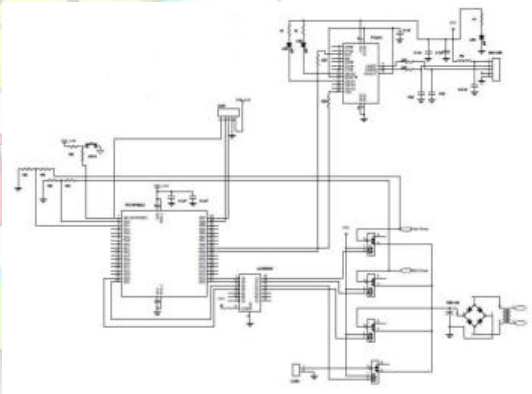

Figure 3. Functional diagram of Power supply unit

USB DRIVER CIRCUIT (FTDX)

Function Description

The FT231X is a USB to full handshake serial UART interface device which simplifies USB implementations and reduces external component count by fully integrating an MTP memory, and an integrated clock circuit which requires no external crystal. It has been designed to operate efficiently with USB host controllers by using as little bandwidth as possible when compared to the total USB bandwidth available.

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 3, April 2016

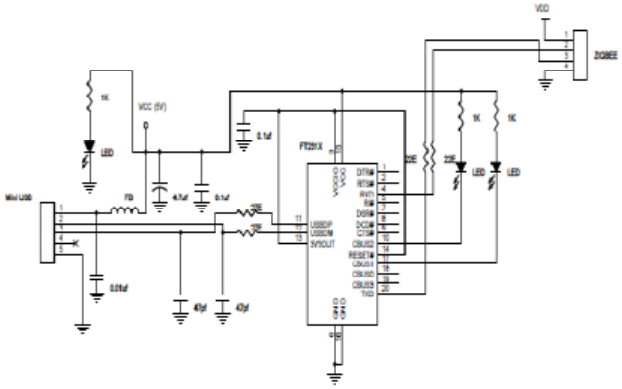

Figure 4. USB Driver Circuit Diagram

USB Pin Diagram

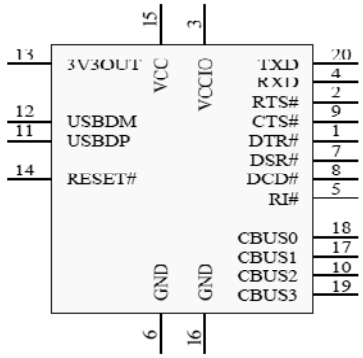

Figure 5. USB pin diagram

RELAY

Operation of Relay

Relays are electromechanical switches that can be controlled by ordinary digital pins. A simple electromagnetic relay consists of a coil of wire wrapped around a soft iron core, an iron yoke which provides a low reluctance path for magnetic flux, a movable iron armature, and one or more sets of contacts (there are two in the relay pictured). Christo Ananth et al. [6] discussed about a system, in this project an automatic meter reading system is designed using GSM Technology. The embedded micro controller is interfaced with the GSM Module. This setup is fitted in home. The energy meter is attached to the micro controller. This controller reads the data from the meter output and transfers that data to GSM Module through the serial port. The embedded micro controller has the knowledge of sending message to the system through the GSM module. Another system is placed in EB office, which is the authority office. When they send "unit request" to the microcontroller which is placed in home. Then the unit value is sent to the EB office PC through GSM module. According to the readings, the authority officer will send the information about the bill to the customer. If the customer doesn't pay bill on-time, the power supply to the corresponding home power unit is cut, by sending the command through to the microcontroller. Once the payment of bill is done the power supply is given to the customer. Power management concept is introduced, in which during the restriction mode only limited amount of power supply can be used by the customer. When an electric current is passed through the coil it generates a magnetic field that activates the armature and the consequent movement of the movable contact either makes or breaks (depending upon construction) a connection with a fixed contact. If the set of contacts was closed when the relay was de-energized, then the movement opens the contacts and breaks the connection, and vice versa if the contacts were open.

When the current to the coil is switched off, the armature is returned by a force, approximately half as strong as the magnetic force, to its relaxed position. Usually this force is provided by a spring, but gravity is also used commonly in industrial motor starters. Most relays are manufactured to operate quickly. In a low-voltage application this reduces noise; in a high voltage or current application it reduces arcing.

When the coil is energized with direct current, a diode is often placed across the coil to dissipate the energy from the collapsing magnetic field at deactivation, which would otherwise generate a voltage spike dangerous to semiconductor circuit components. Some automotive relays include a diode inside the relay case. Alternatively, a contact protection network consisting of a capacitor and resistor in series (snubber circuit) may absorb the surge. If the coil is designed to be energized with alternating current (AC), a small copper

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 3, April 2016

"shading ring" can be crimped to the end of the solenoid, creating a small out-of-phase current which increases the minimum pull on the armature during the AC cycle.

Figure 6. Relay

RELAY DRIVER CIRCUIT

Description

The ULN2002A, ULN2003A, ULN2003AI, ULN2004A, ULQ2003A, and ULQ2004A are high-voltage high-current Darlington transistor arrays. Each consistsof seven npn Darlington pairs that feature high-voltage outputs with common-cathode clamp diodes for switching inductive loads. The collector-current rating of a single Darlington pair is 500 mA. The Darlington pairs can be paralleled for higher current capability. Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED and gas discharge), line drivers, and logic buffers. For 100-V (otherwise interchangeable) versions of the ULN2003A and ULN2004A, see the SN75468 and SN75469, respectively. The ULN2003A and ULQ2003A have a 2.7-kΩ series base resistor for each Darlington pair for operation directly with TTL or 5-V CMOS devices. ULN/ULQ2003A and the required voltage is less than that required by the ULN2002A.

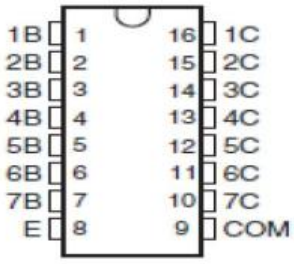

Figure 7. Relay Pin Diagram

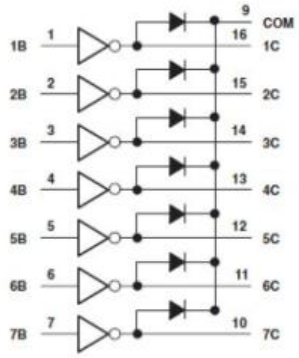

Figure 8. Relay Logic Diagram

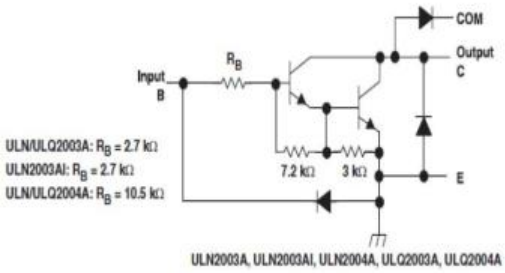

Figure 9. Relay Circuit Diagram

PIC CONTROLLER

PIC18LF45K22 is the microcontroller used in the project. The controller has peripheral features like inbuilt ADC, required to get the signals from the various sensors Maximum clock frequency is 20MHz and Based on RISC and Harvard architecture and hence even more faster. Embedded C is used for programming the microcontroller. Microcontroller plays important role in this project the energy information for the sources will be receive and transmitted based on the wireless communication.

AC MAINS

Alternating current is a current which continually varies in amplitude above and below zero. It is usually a sinusoidal waveform, but other wave shapes may also be considered as AC Mains is the general-purpose alternating current (AC) electric power supply. In the US, electric power is

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 3, April 2016

referred to by several names including household power, household electricity, power line, domestic power, wall power, line power, AC power, city power, street power, and grid power. In Canada, it is often called hydro, because much of the Canadian electrical generating capacity is hydroelectric.

LOAD

A Potentiometer measuring instrument is essentially a voltage divider used for measuring electric potential (voltage); the component is an implementation of the same principle, hence its name. Potentiometers are commonly used to control electrical devices such as volume controls on audio equipment. Potentiometers operated by a mechanism can be used as position transducers, for example, in a joystick. Potentiometers are rarely used to directly control significant power (more than a watt), since the power dissipated in the potentiometer would be comparable to the power in the controlled load.

Figure 10. Schematic diagram of Potentiometer

III. SIMULATION RESULTS

Figure 11. Hardware Diagram

Circuit Board Diagram

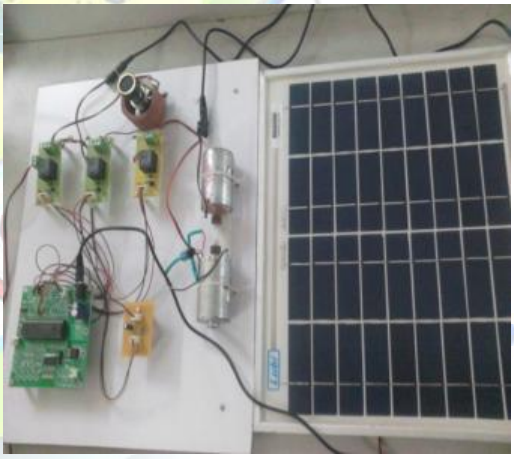

Figure 12. Circuit Board Diagram

RENEWABLE ENERGY SOURCES LAB VIEW MONITORING

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 3, April 2016

Figure 13. Renewable Energy Sources Lab view Monitoring Panel

WIND ENERGY MONITORING PANEL

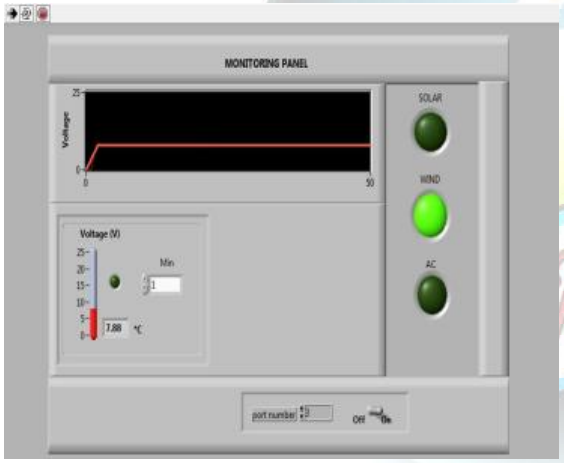

Figure 14. Wind Energy Monitoring Panel

EB MONITORING PANEL

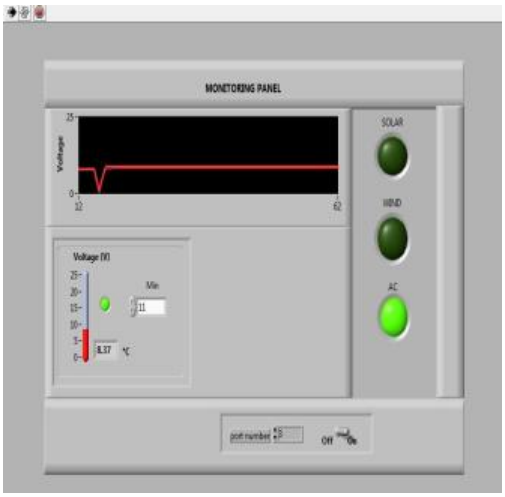

Figure 15. EB Monitoring Panel

IV. CONCLUSION

This paper presents the design and implementation of energy management system for a hybrid (solar-wind)generation system using labview simulation software. The proposed PIC controller is designed by maintaining a uniform delay in all transfer paths through an embedded C approach. The proposed system strategy has been verified with simulation and experimental results. The basic circuit element is developed using relevant method. The simulation circuits are developed using elements of Lab view software. The simulation is successfully done and the simulation results coincide with the theoretical results.

V. REFERENCES

[1] Nagesh, D. Y. R., Krishna, J. V. V. and Tulasi ram, S. S.,(2010), "A real-time architecture for smart energy management, *Innovative Smart Grid Technologies (ISGT), 2010*, vol., no., pp. 1–4, 19–21.

[2] Baosheng, W. (2009), "A controllable rectifier wind and solar hybrid power system based on digital signal processor developed", M.S.thesis in electrical engineering, National Taiwan University of Science and Technology, Taipei,Taiwan.

[3] Lidstrom, S. (2009), "Maximizing Overall Energy Efficiency in Data Centres',CTO, Netpower Labs AB, Green Building Power Forum.

[4] Pouchet, J.(2009), "Renewable Energy & Data Centres" Direct Energy Initiatives, Emerson Network power, Green Building Power Forum.

[5] Bharanikumar, R. and Kumar, A.N. (2010), 'Analysis of wind turbine driven PM generator with power convertor,' Int.J.Comput.Electr.Eng.,vol.2, no.4,pp.766-769,

[6] Christo Ananth, Kanthimathi, Krishnammal, Jeyabala, Jothi Monika, Muthu Veni, "GSM Based Automatic Electricity Billing System", International Journal Of Advanced Research Trends In Engineering And Technology (IJARTET), Volume 2, Issue 7, July 2015), pp:16-21

[7] Priolkar, J.G. and Doolla,S, "Analysis of PV-hydro isolated power systems", India conference, Annual IEEE (2013)pp.1-6.

[8] Nilsen, R. and Sorfonn, I. (2009), "Hybrid Power Generation System", Power Electronics and Applications,. EPE '09. 13th European Conference on 2009, pp.1 - 9.

[9] Nakamura, N. (2010)'Concept of Fukuoka Smart House-Achievement of Hybrid System in Renewable energy and Grid ,Smart Energy Laboratory, Green Building Power Forum.

[10] Zhengmin, L. and Minzong, C. (2010) 'Small stand alone wind turbines devices characteristics analysis',M.S. thesis in electrical engineering ,National Taiwan University of Science and Technology ,Taipei,Taiwan,vol.35.