International Journal of Engineering Research and Science & Technology

ISSN : 2319-5991
Vol. 6, No. 1
February 2017

www.ijerst.com

Email: editorijerst@gmail.com or editor@ijerst.com

International Journal of Engineering Research and Science & Technology

ISSN 2319-5991 www.ijerst.com
Vol. 6, No. 1, February 2017
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Research Paper

HYBRID ENERGY (WIND-SOLAR) FOR RURAL (REMOTE AREAS) ELECTRIFICATION

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This paper deals with the solar PV (Photo Voltaic) and wind turbine produce electrical power by using solar and wind when we are connected with grid or inter connected system we can take power from solar or wind.

Keywords: Pv cell, Wind turbine, Mosfet, Relay circuit, Comparator

INTRODUCTION

Solar Power

Renewable energy penetrations are increased in power sector to reduce dependency on fossil fuels (Khaligh and Onar, 2010). Solar PV (Photo-Voltaic) systems are now well recognized for trapping solar energy. Solar energy has the greatest availability compared to other energy sources. It has been estimated that the amount of energy supplied to the earth in one day is sufficient to cater energy needs of the earth of one year (Teodorescu *et al.*, 2011). For such solar PV systems, maximum power point tracking control is preferred for efficient operation (Teulings *et al.*, 1993; Esram and Chapman, 2007; and Villalva *et al.*, 2009). I have presented control system for solar PV system by utilizing steady state power balancing condition at DC link (Matsui *et al.*, 1999). It has further improved by Mikihiko for sensorless application (Mikihiko and De-H, 2001). Integration of PV system with the grid fulfil standard power quality requirements and it have been reported in Shen *et al.* (2012), Verma *et al.* (2012) and Moussa *et al.* (2012). The solar PV system has found many potential applications such as residential, vehicular, space air craft and water pumping system (Lawrance *et al.*, 1995). PV water-pumping is highly competitive compared to traditional energy technologies and best suited for remote site applications.

Wind Power

Wind power is the use of air flow through wind turbines to mechanically power generators for electric power. Wind power, as an alternative to burning fossil fuels, is plentiful, renewable, widely distributed, clean, produces no greenhouse gas emissions during operation, consumes no water, and uses little land. The net effects on the environment are far less problematic than those of nonrenewable power sources. Wind farms

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Figure 1: Wind Turbine

consist of many individual wind turbines which are connected to the electric power transmission network. Onshore wind is an inexpensive source of electric power, competitive with or in many places cheaper than coal or gas plants. In all types of wind mills the wind energy is first converted in to mechanical energy or rotation of rotor. The rotor drive a generator is connected when rotor rotates generator generates electrical energy.

Inverter Working Procedure

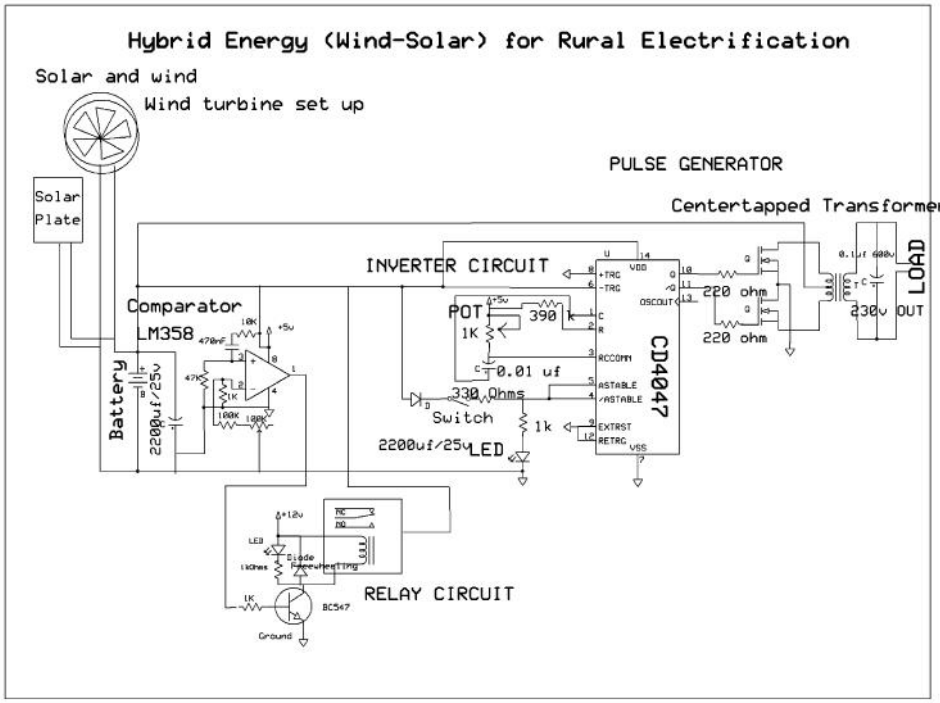
Inverter Circuit Using CD 4047

CD 4047 is used for generating the 100 Hz pulses and four 2N3055 transistors for driving the load. The IC1 Cd4047 wired astable multi vibrator produces two 180 degree out of phase 100 Hz pulse trains. These pulse trains are pre amplified by the two TIP122 transistors. The out puts of the TIP 122 transistors are amplified by four 2N3055 transistors (two transistors for each half cycle) to drive the inverter transformer. The 220V AC will be available at the secondary of the transformer.

Description

- A 12 V car battery can be used as the 12 V source.

Figure 2: System Configuration and Principle of Operation



Note: Schematic diagram and interfacing of components to IC 1CD4047, DC motor, relay, comparator, Battery, motor, solar are considered.

- Use the POT R1 to set the output frequency to 50 Hz.
- For the transformer get a 12-0-12 V, 10A step down transformer. But here the 12.
- 0-12 V winding will be the primary and 220 V winding will be the secondary.
- For 10 A rated transformer, we get a 5A output. But the allowed out put power will be reduced to 60 W. Use a 10 A fuse in series with the battery.
- Mount the IC on a IC holder.

Figure 3: Solar Development Graphs

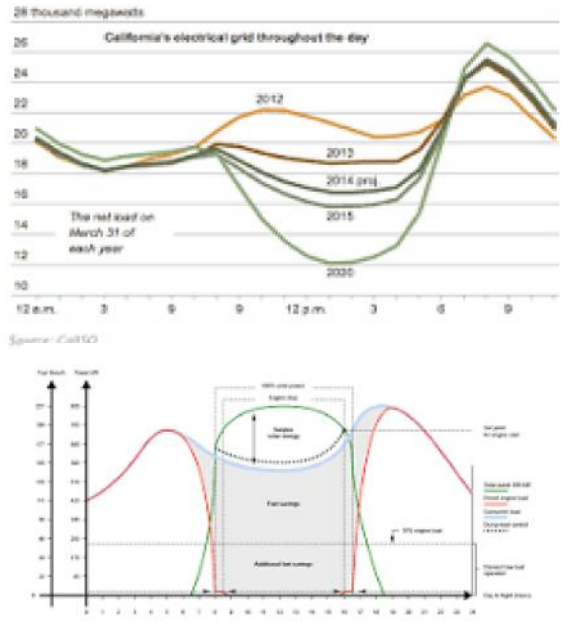


Figure 4: Wind Development Graphs

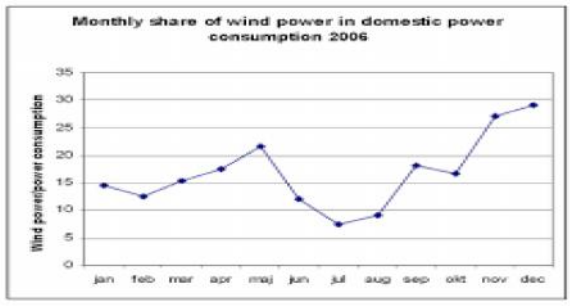
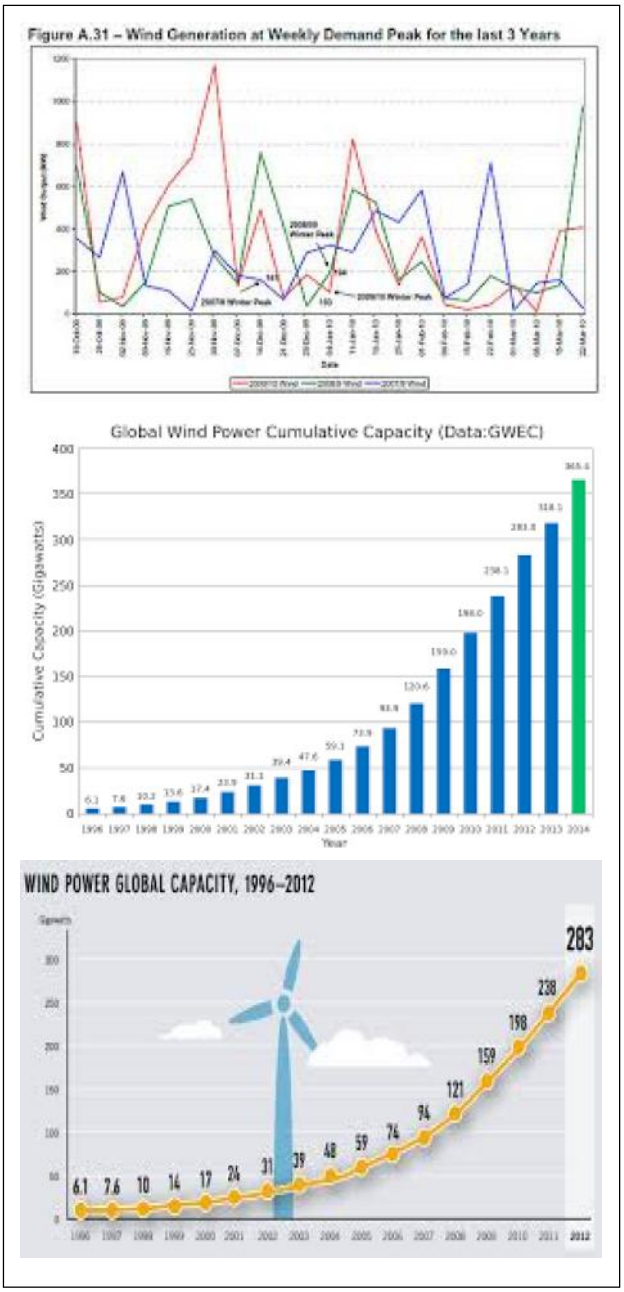


Figure 4 (Cont.)



Advantages and Disadvantages

Advantages

- This system helps in wind energy generation.
- Storing of Solar energy
- Efficient and low cost design.
- Low power consumption.
- Easy to operate.

Disadvantages

1. This system requires periodic monitoring and maintenance.
2. This system fails to work if the load is heavy.

Applications

- In industries, streets, etc., which can be practically implemented in real time.
- Agricultural applications, water pump control, fencing control, street light control.
- Houses, etc.,

RESULTS

The project "Hybrid Energy (Wind-Solar) for Rural Electrification" was designed such that to deliver power to switch on the loads like water pump. The dynamo uses electromagnetic principles to convert mechanical rotation into Direct Current (DC) using wind energy. The system generates electrical power as non-conventional method by wind energy power using wind turbine set up. We also use solar energy and hydel energy to charge the battery.

CONCLUSION

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

FUTURE SCOPE

Our project "Hybrid Energy (Wind-Solar) for Rural Electrification" is mainly intended to design a wind based energy generation system for emergency head lamp applications.

The entire system involves three types of power generations solar, wind based power generation systems. The battery which is used can be recharged with the two generation inputs like solar and wind turbine. From this energy the water pump can be controlled using inverter design. The battery is connected to the inverter. This inverter is used to convert the 12 volt DC to the 230 volt AC. This 230 volt AC voltage is used to activate the loads like water pump.

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