



# IMPLEMENTATION OF HYBRID SOLAR AND WIND POWER ENERGY SYSTEM

## KEYWORDS

Solar energy, Wind energy, Renewable energy, PV cell, Hybrid power system

**Shrankhala Shrivastava**

**Mr. Tushar**

M.Tech Scholar Scope College of Engineering, Bhopal (M.P.)

Asst. Prof. Scope College of Engineering, Bhopal (M.P.)

**ABSTRACT** Renewable energy sources i.e., energy generated from solar, wind, biomass, hydro power, geothermal and ocean resources are considered as prime options for generating energy. But the energy generated from solar and wind is much less than the production by fossil fuels, therefore, electricity generation by utilizing PV cells and wind turbine are increasing rapidly in recent years. This paper presents the Solar-Wind hybrid Power system that extracts the renewable energies in Sun and Wind to generate electricity. System control relies mainly on micro controller. It ensures the optimum utilization of resources and hence improves the efficiency as compared with their individual mode of generation. Also it increases the reliability and reduces the dependence on one single source. This hybrid solar-wind power generating system is suitable for industries and also for domestic areas.

## I. INTRODUCTION

“Energy can neither be created, nor be destroyed, but it can only be converted from one form to another”. Most of the research now is about how to conserve the energy and how to utilize the energy in a better way. Research has also been into the development of reliable and robust systems to harness energy from nonconventional energy resources. Among them, the wind and solar power sources have experienced a remarkably rapid growth in the past 10 years. Both are pollution free sources of abundant power. With high economic growth rates and over 17 percent of the world's population, India is a significant consumer of energy resources.

Solar energy is energy from the Sun. It is renewable, inexhaustible and environmental pollution free. Solar charged battery systems provide power supply for complete 24 hours a day irrespective of bad weather. By adopting the appropriate technology for the concerned geographical location, we can extract a large amount of power from solar radiations.

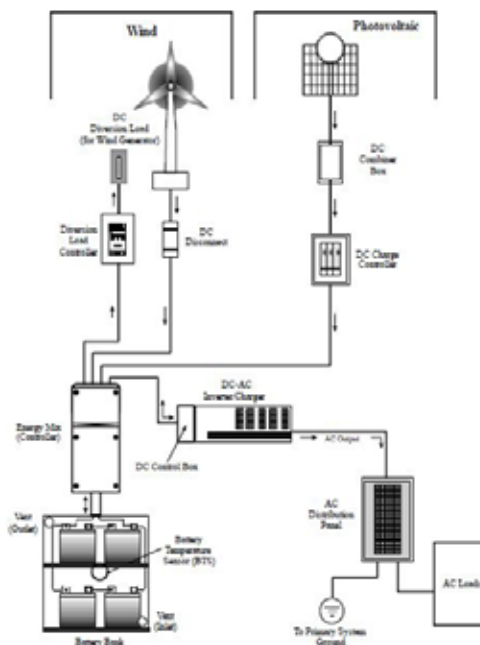
The global search and the rise in the cost of conventional fossil fuel is making supply-demand of electricity product almost impossible especially in some remote areas. Generators which are often used as an alternative to conventional power supply systems are known to be run only during certain hours of the day, and the cost of fueling them is increasingly becoming difficult if they are to be used for commercial purposes.

Wind energy is the kinetic energy associated with the movement of atmospheric air. It has been used for hundreds of years for sailing, grinding grain and for irrigation. Wind energy systems convert this kinetic energy to more useful forms of power.

Windmills for water pumping have been installed in many countries particularly in the rural areas. Wind turbines transform the energy in the wind into mechanical power, which can then be used directly for grinding etc. or further converting to electric power to generate electricity. Wind turbines can be used singly or in clusters called 'wind farms.

This paper presents the Solar-Wind hybrid Power system that harnesses the renewable energies in Sun and Wind to generate and supply electricity to a private house, farm house, a small company, an educational institution or an apartment house depending on the need at the site where used..

## II. OBJECTIVE:



**Fig 1. Hybrid Wind-Solar Renewable Power Generating System**

Solar-Wind hybrid Power system is the combined power generating system by wind mill and solar energy panel. It also includes a battery which is used to store the energy generated from both the sources. Using this system power generation by windmill when wind source is available and generation from PV module when light radiation is avail-

able can be achieved.

The power generated from wind mill is of AC voltage which is converted through AC-DC rectifier. A special type of converter is used to step up or step down through MOSFET switching called "SEPIC" converter for wind mill. For solar system cuk converter is used for the regulation. The micro controller incorporated in this scheme, which regularly refers the operation of sources and switches the corresponding converters and fed into change the battery or to the load through inverters.

### III. IMPLEMENTATION OF HYBRID ENERGY SYSTEM

Intermittent energy resources and energy resources unbalance are the most important reason to install a hybrid energy supply system. The Solar PV wind hybrid system suits to conditions where sunlight and wind has seasonal shifts. As the wind does not blow throughout the day and the sun does not shine for the entire day, using a single source will not be a suitable choice. A hybrid arrangement of combining the power harnessed from both the wind and the sun and stored in a battery can be a much more reliable and realistic power source. The load can still be powered using the stored energy in the batteries even when there is no sun or wind. Hybrid systems are usually built for design of systems with lowest possible cost and also with maximum reliability. The high cost of solar PV cells makes it less competent for larger capacity designs.

Cheap cost as compared to the PV cells. Battery system is needed to store solar and wind energy produced during the day time. During night time, the presence of wind is an added advantage, which increases the reliability of the system. In the monsoon seasons, the effect of sun is less at the site and thus it is apt to use a hybrid wind solar system. The system components are as follows.

#### 1. Photovoltaic solar power

Solar panels are the medium to convert solar energy into the electrical energy. Solar panels can convert the energy directly or heat the water with the induced energy. PV (Photo-voltaic) cells are made up from semiconductor structures as in the computer technologies. Sun rays are absorbed with this material and electrons are emitted from the atoms. This release activates a current. Photovoltaic is known as the process between radiation absorbed and the electricity induced. Solar power is converted into the electric power by a common principle called photo electric effect. The solar cell array or panel consists of an appropriate number of solar cell modules connected in series or parallel based on the required current and voltage.

#### 2. Wind Power

The wind energy is a renewable source of energy. Wind turbines are used to convert the wind power into electric power. Electric generator inside the turbine converts the mechanical power into the electric power. Wind turbine systems are available ranging from 50W to 3-4 MW. The energy production by wind turbines depends on the wind velocity acting on the turbine. Wind power is able to feed both energy production and demand in the rural areas. It is used to run a windmill which in turn drives a wind generator or wind turbine to produce electricity.

#### 3. Batteries

The batteries in the system provide to store the electricity that is generated from the wind or the solar power. Any required capacity can be obtained by serial or parallel connections of the batteries. The battery that provides

the most advantageous operation in the solar and wind power systems are maintenance free dry type and utilizes the special electrolytes. These batteries provide a perfect performance for long discharges.

#### 4. Inverter

Energy stored in the battery is drawn by electrical loads through the inverter, which converts DC power into AC power. The inverter has in-built protection for Short-Circuit; Reverse Polarity, Low Battery Voltage and Over Load.

#### 5. Microcontroller

The microcontroller compares the input of both Power system and gives the signal to the particular relay and charges the DC Battery. The DC voltage is converted into AC Supply by Inverter Circuit. The MOSFET (IRF 540) is connected to the Secondary of the centre tapped transformer. By triggering of MOSFET alternatively, the current flow in the Primary winding is also alternative in nature and we get the AC supply in the primary winding of the transformer.

### IV. EXPERIMENTAL SETUP

The hardware of Solar PV Wind hybrid energy system is implemented and the output is fed to the load is shown in fig.2.. The current and voltage values from the wind turbine, solar panels, battery group and load are measured in the implemented system. Production and consumption of power for each module are calculated.



**Fig.2 Experimental Setup of Hybrid Wind-solar Power System**

### V. CONCLUSION:

In the present work a Solar PV Wind Hybrid Energy System was implemented. A portion of the energy requirement for a private house, farm house, a small company, an educational institution or an apartment house depending on the need at the site where used has been supplied with the electricity generated from the wind and solar power. It reduces the dependence on one single source and has increased the reliability. Hence we could improve the efficiency of the system as compared with their individual mode of generation.

### VI. REFERENCES:

- [1] Arjun A. K., Athul S., Mohamed Ayub, Neethu Ramesh, and Anith Krishnan, " Micro-Hybrid Power Systems – A Feasibility Study", Journal of Clean Energy Technologies, Vol. 1, No. 1, January 2013, pp27-32.
- [2] J.B.V.SUBRAHMANYAM, P.K.Sahoo and Madhukarreddy, " Local PV-Wind hybrid systems development for supplying electricity to industry" Acta Ele ctrotechnica, Vol.53, No.1, 2012, pp10-15
- [3] N.Sivaramakrishna & Ch.Kasi Ramakrishna Reddy, " Hybrid Power Generation through combined solar –Wind power and modified solar panel"

International Journal of Engineering Trends and Technology (IJETT) - Volume 4 Issue 5- May 2013, pp1414-1417.

- [4] [www.Hybrid Solar Wind Electricity.htm](http://www.HybridSolarWindElectricity.htm)
- [5] I. A. Adejumo, A. A. Esan, and A. B. Okunuga "Discovering Potential sites for Small Hydro Power (SHP) in Nigeria", *Journal of Advanced Material Research*, Trans Tech Publication, Switzerland. 18-19, 93- 97(2007) ; (online at <http://www.scientific.net>).
- [6] L. Fagbale . "Estimation of Total Solar Radiation in Nigeria Using Meteorological, *Nigeria Journal of Renewable Energy* 1,1-10. (1990)
- [7] M.B. Olajide and J.O. Oni "Application of Solar Energy for offices and homes, Workshop Seminar Paper, International Training School and Workshop on Solar Energy, organized at University of Agriculture, Abeokuta, 9th-11th June, 18-29. (2009),
- [8] M. Thomas (Ed) "Solar Electricity", John Wiley and Sons Ltd, Chichester, 2<sup>nd</sup> Edition. (2004).
- [9] W.W.S. Charters. "Solar and Wind Power Technologies for Remote Applications". CSC Technical Publication Services No 187, Commonwealth Science Council. (1985).
- [10] S.I. Iwuoha. Wind Powered Horizontal Maize Grinder, *NJRE*, 11, 46-57(2003).
- [11] B.K. Gupta . Weibull Parameters for Annual and Monthly Wind Speed Distributions for Five Locations in India, *Solar Energy*. 37, 469-477. (1986)