

# Renewable Energy Based Hybrid Technology for Power Generation System: Pollution Free from GHG

Swati Maurya<sup>1\*</sup>, Aishvarya Narain<sup>2</sup>, Rajan Kumar<sup>2</sup>

<sup>1</sup>Department of Electrical Engineering, Rajkiya Engineering College, Kanauji, India.

<sup>2</sup>Department of Electrical Engineering, Madan Mohan Malaviya University of Technology, Gorakhpur, India  
(swatimaurya1990@gmail.com, aishvarya.n89@gmail.com, rajan.cool042@gmail.com)

*Abstract—this paper is presented to study the conversion of renewable energy resources into electrical energy in a standalone hybrid power generation system. Recent power generation scenarios all over the world are not eco-friendly as the generation systems are mostly dependent on fossil fuels that produce greenhouse gas (GHG) which contributes to global warming. In this, the combination of two energy resources is taking place i.e. wind and solar energy. This process reviles the sustainable energy resources without damaging the nature. We can give uninterrupted power by using hybrid energy system. Mainly this system involves the combination of two energy system that will give continuous power. Solar panels are used for converting solar energy and wind turbines are used for converting wind energy into electricity. This electrical power generation can operate for various purposes. Generation of electricity will take place at a reasonable cost. This paper presents the Renewable Energy Based Hybrid Technology for Power generation that extracts the renewable energies in Sun and Wind to generate electricity. System control relies mainly on the microcontroller. It ensures the optimum utilization of resources and hence improves the efficiency as related to their individual mode of the generation system. 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 with reasonable cost without damaging the natural balance like Pollution Free from GHG.*

**Keywords---** Greenhouse Gas (GHG), Renewable Energy Resources, Hybrid Technology

## 1. Introduction

Electricity is most needed for our day to day life. There are two ways of electricity generation either by conventional energy resources or by non-conventional energy resources. Electrical energy demand increases in word so to fulfil demand we have to generate electrical energy. Now a day's electrical energy is generated by the conventional energy resources like coal, diesel, and nuclear etc. The main drawback of these sources is that it produces waste like ash in coal power plant, nuclear waste in nuclear power plant and taking care of this wastage is very costly. And it also damages he nature. The nuclear waste is very harmful to human being also. The conventional energy resources are depleting day by day. Soon it will be completely vanishes from the earth so we have to find another way to generate electricity. The new source should be reliable, pollution free and economical. The non-conventional energy resources should be good alternative energy resources for the conventional energy resources. There are many non-conventional energy resources like geothermal, tidal, wind; solar etc. the tidal energy has drawbacks like it can only implemented on sea shores. While geothermal energy needs very lager step to extract heat from earth. Solar and wind are easily available in all condition. The non-conventional energy resources like solar, wind can be good alternative source. Solar energy has drawback that it could not produce electrical energy in rainy and cloudy season so we need to overcome this drawback we can use two energy resources so that any one of source fails other source will keep generating the electricity. And in good weather condition we can use both sources combine.

The rest of the paper is organized as follows. Section II, Describes Renewable Energy Based Hybrid Technology. Methodology is given in Section III. Simulation models are provided in Section IV and results are estimated in Section V. Finally, conclusions are drawn in Section VI

## 2. Renewable Energy Based Hybrid Technology

Hybrid Technology system is the mixture of two energy sources for providing power to the load. In other word it can defined as "Energy system which is invented (fabricated) or designed to extract power by using two energy sources is called as the hybrid Technology system." Hybrid Technology system has good reliability, efficiency, less emission, lower cost and free from pollution. This paper presents the Renewable Energy Based Hybrid Technology for Power generation that extracts the renewable energies in Sun and Wind to generate electricity.

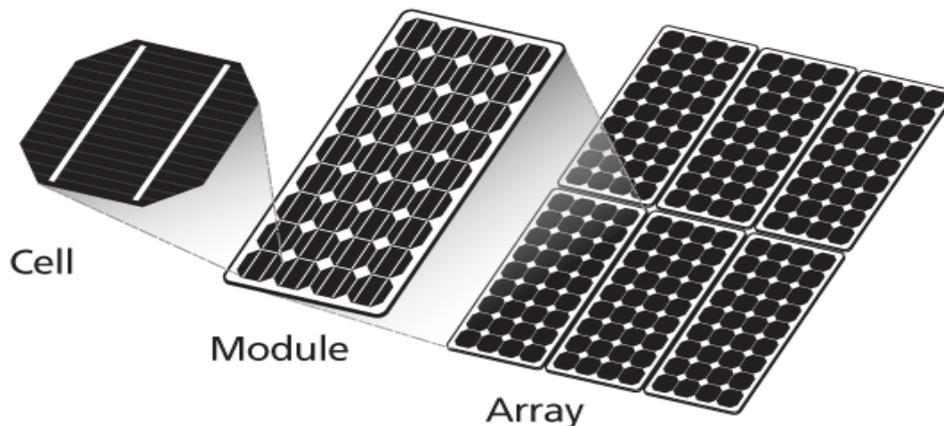
In this proposed system is the combined power generating system by solar photovoltaic modules and wind turbines power is used for generating power. Solar and wind has good advantages than other than any other non-conventional energy sources. Both the energy sources have better availability in all areas. It needs lower cost. There is no need to find special location to install this system.

Solar-Wind hybrid power system is the combined power generating system by solar photovoltaic modules and wind turbines. Using this system, power generation by the turbines when wind source is available and generation from PV module when sunlight is available can be achieved. Both units can generate power when both sources are available. Figure 1. shows the schematic of the solar-wind hybrid system to be modelled. The power generated from the PV modules system is of DC voltage which is converted through a DC-AC inverter. The output of the inverter is combined with the output from the wind turbines and stepped up by a transformer which is connected to the grid. In times when there is an excess energy production from the system, the transformer will feed the excess produced energy to the grid, and when the system does not produce enough energy to meet the demand, the deficit is fed by the grid to the transformer. Energy from the transformer is then supplied to the load, in our case Gwanda, India location.

### 2.1 Solar Energy Scheme

Solar power in India is a fast-growing industry and as of 31 December 2016, the country's solar grid had a cumulative capacity of 9,012.66 megawatts (MW) or 9.01 gigawatts (GW) [1]. In January 2015, the Indian government expanded its solar plans, targeting US\$100 billion of investment and 100 GW of solar capacity, including 40 GW's directly from rooftop solar, by 2022 [2]. The rapid growth in deployment of solar power is recorded and updated monthly on the Indian Government's Ministry of New and Renewable Energy website. Large scale solar power deployment began only as recently as 2010, yet the ambitious targets would see India installing more than double that achieved by world leaders China or Germany in all of the period up to 2015 year end.

Solar panel is use to convert solar radiation to the electrical energy. The physical of PV cell is very similar to that of the classical diode with a PN junction formed by semiconductor material. When the junction absorbs light, the energy of absorbed photon is transferred to the electron proton system of the material, creating charge carriers that are separated at the junction. The charge carriers in the junction region create a potential gradient, get accelerated under the electric field, and circulate as current through an external circuit [3].



**Figure 1.** Solar Cells Structure

A PV system is a combination of series-parallel connected array of solar cells. Solar cells are photo-conducted device which covert solar energy into electrical energy. These solar cells are made of silicon which is known as semiconductor materials. The developed model for PV is based on incremental conductance with integral regulator algorithm which provides maximum possible power from solar PV array. The converter is varying duty cycle due to which converter change the PV voltage such a way that operate the PV array towards its maximum power point. [4]

### 2.2 Wind Energy Scheme

The development of wind power in India began in the 1986 with first wind farms being set up in coastal areas of Maharashtra (Ratnagiri), Gujarat (Okha) and Tamil Nadu (Tuticorin) with 55 kW Vestas wind turbines. These demonstration projects were supported by the Ministry of New and Renewable Energy (MNRE). The capacity has significantly increased in the last few years and as of 31 Aug 2016 the installed capacity of wind power in India was 27,676.55 MW, mainly spread across the South, West and North regions. Although a relative newcomer to the wind industry, compared with countries such as Denmark or the United States, by year end 2015 India had the fourth largest installed wind power capacity in the world. (Behind 1. China, 2. USA and 3. Germany), having overtaken 5. Spain in 2015 and ahead of 6. UK [6].

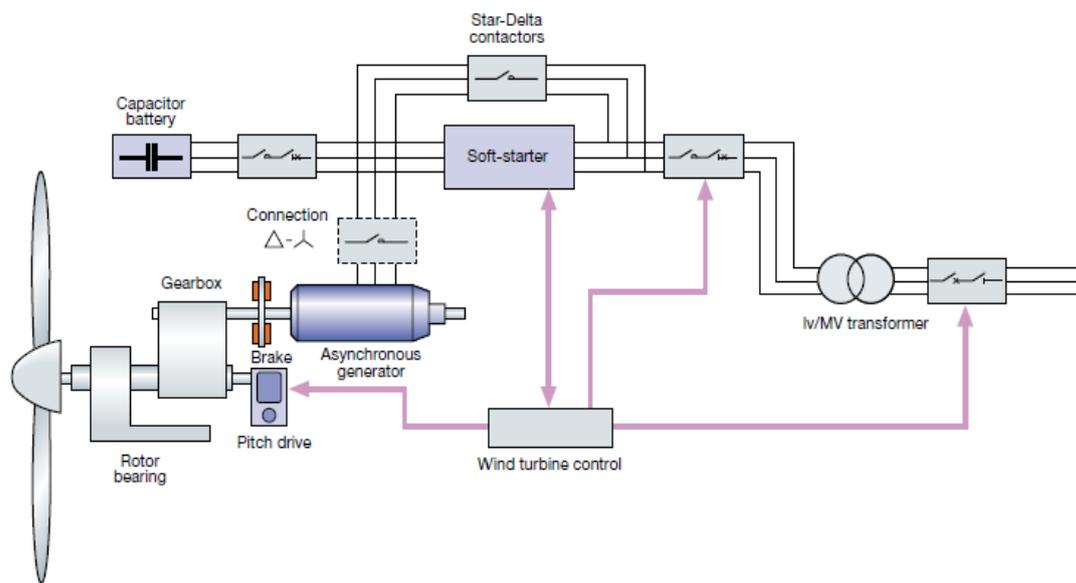
The broad based National programme includes wind resource assessment activities; research and development support; implementation of demonstration projects to create awareness and opening up of new sites; involvement of

utilities and industry; development of infrastructure capability and capacity for manufacture, installation, operation and maintenance of wind electric generators; and policy support.

Wind in India are influenced by the strong south-west summer monsoon, which starts in May-June, when cool, humid air moves towards the land and the weaker north-east winter monsoon, which starts in October, when cool, dry air moves towards the ocean. During the period March to August, the winds are uniformly strong over the whole Indian Peninsula, except the eastern peninsular coast.

**3. Methodology**

Wind energy is the energy which is extracted from wind. For extraction we use wind mill. It is renewable energy sources. The wind energy needs less cost for generation of electricity. Maintenance cost is also less for wind energy system. Wind energy is present almost 24 hours of the day. It has less emission. Initial cost is also less of the system. A wind turbine is complete made of two main components and having looked at individual of them, the rotor blade design, the Wind Turbine Generator is an electrical machine used to generate the electricity. The wind energy is a nonconventional source of energy. A wind turbine is a conversion device that converts the wind's kinetic energy into electrical energy. Wind turbine system are accessible running from 50W to 2-3 MW. Figure 2 below shows as block diagram of a wind control system.



**Figure 2.** Wind Power Generation system.

The major disadvantages of using independent renewable energy resources are that unavailability of power for all time. For overcoming this we use solar and wind energy together. So that any one source of power fails other will take care of the generation. In this proposed system we can use both sources combined. Another way is that we can use any one source and keep another source as a standby the unit. This will leads to continuity of generation. This will make the system reliable. The main disadvantages of this system are that it needs a high initial cost. Except that it is reliable, it has less emission. Maintains cost is less. The life span of this system is more. Efficiency is more

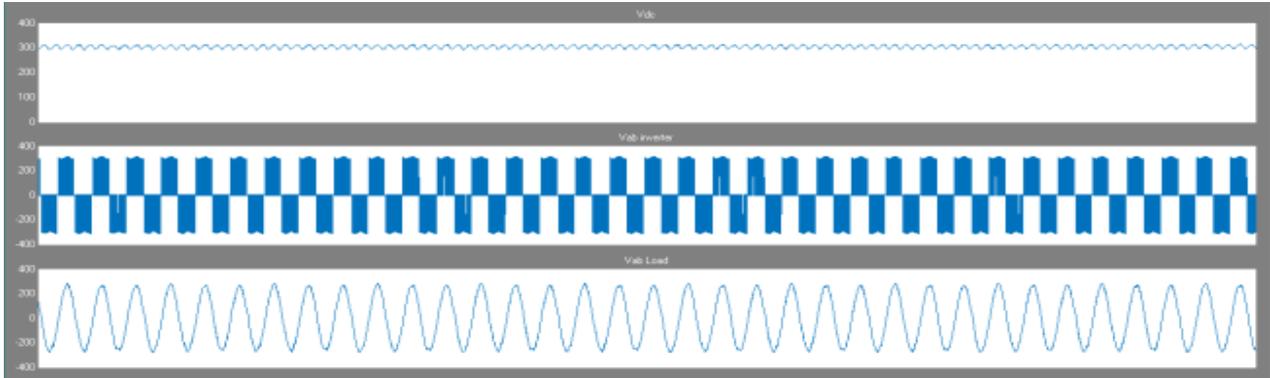
**4. Simulation Model Set**

As mentioned below, this paper presents a new contribution on design of renewable energy resources based hybrid system. It consists of a buck/buck-boost converter and a full-bridge inverter as appeared in "Fig.3"  $V_{pv}$ , and  $V_{wind}$ , are acquired from the PV exhibit and the rectified wind turbine output voltage individually and utilized as info dc sources voltage. By applying pulse-with-modulation (PWM) control.

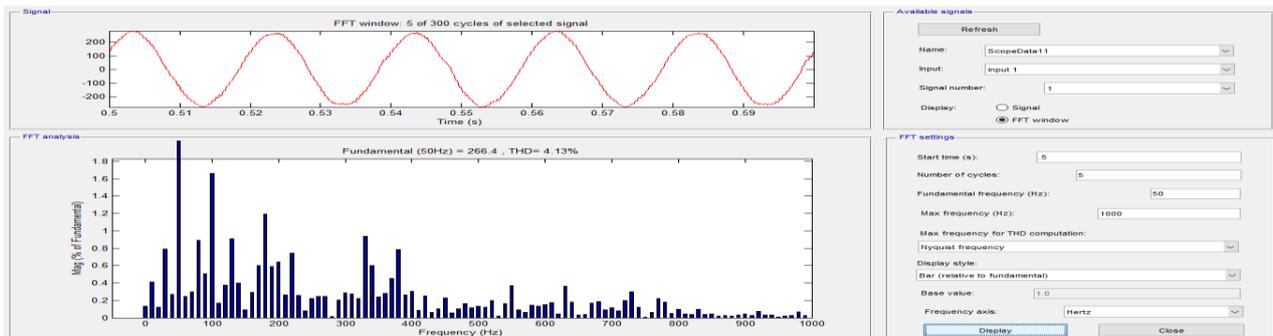


## 5. Results

The waveforms analyses of the entire system are seen in Figure 5 The output of inverter input and output waveform and THD of the Output Voltage are shown in Figure 6.



**Figure 5.** The output of inverter input and output waveform and filter output waveform



**Figure 6.** THD of the Output Voltage

## 6. Conclusion

In this paper, a sustainable and environment friendly Renewable Energy Based Hybrid Technology for power Generation System which is free from Pollutions. Renewable energy technologies are one of the fastest growing technologies in the world, which will significantly contribute to economic growth in many countries in the near future. Furthermore, renewable energy such as wind, solar provides substantial benefits for our climate, our health, and our economy

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