

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 3, March 2018

Hybrid Solar Wind System for Generation of Electricity

Ashwini Pise¹, Ashwini Bhowate², Sailee Potey³, Yogesh Mundhada⁴

B.E. Scholar, Department of Electrical Engineering, JDCEM, RTMNU, Nagpur, India

Assistant Professor, Department of Electrical Engineering, JDCEM, RTMNU, Nagpur, India

ABSTRACT: As the result of increasing pollution with growing technologies, on-renewablesources, which are main source of energy provider are diminishing day by day. Due to this, effort on effectual utilization energy source is increase now a day. Solar and wind is most efficient alternative for energy resource. The most popular renewable energy technology is hybrid energy system is contain wind energy and solar energy source because system is safe and favourable in nature. This paper is focus on synchronisation of photovoltaic cell(solar energy) and wind energy for sustain electrical generation for partially cover electrical power demand. In synchronisation, solar and wind get same voltage the system get synchronise means solar energy is directly used to charge the battery and wind is run the load or vice versa. This will be beneficial in day as well as in night time.

I. INTRODUCTION

Electricity plays an important role in human life. It is essential part of growth and economic develop of country. Conventional as well as non-conventional energy source is used for electricity generation. Due to continue used of conventional source they are going too vanished day by day. Due to sudden rise in electricity consumption and huge amount of storage in electricity which will increase the cost of electricity. India is also facing this same problem. In environment our primary source of generation is coal, natural gases and oil. Energy is used for industrial, agriculture, commercial as well as domestic purpose.

Our world energy demand increasing day by day. Many source like coal, fossil fuel, oil, other gases are harmful for our environment that's why there are some limitations for using this sources which are limited in nature. Due to global warming and pollution in environment need to clean the energy source. Now a today's world is focus on eco green energy, it means it generate the energy without harming the environment. Some of nature friendly renewable energy source are solar and wind are widely used in electrical power generation because they are favourable for nature.

In summer the wind is calm and in cloudy days the wind is strong that's why wind and solar energy conversion is popular [1]. The uninterrupted power generation is can be done irrespective of whether condition. In other side, renewable energy source gives the real investment opportunity for country.

Many studies have been carried out on the use of renewable energy sources for power generation. [8]

As the world crisis and awareness in people about environmental protection, solar and wind energy paid attention as well as elaborate rapidly. The complementary nature of wind and solar determine the advantage and potential in hybrid power generation system.

Wind and solar hybrid system is can be further divided into two parts i.e off grid and on grid system. off grid hybrid system is mainly used in road lamp system[3], highway monitors, communication station. In this paper hybrid system is consist of wind solar power generation. The synchronisation of solar and wind energy determine in this off grid system.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 3, March 2018

1.1 SOLAR POWER

The photon is incident on photovoltaic cell and electron are emitted generates the power. The process of converting sun energy into the electricity

This can be done in two ways

- 1) By using the photovoltaic cell
- 2) By using the concentrated solar power in system, in this process we focus the intensity of sun by using the lenses, mirror and tracking system.

In solar power system the solar panels are made up of PV cells which are semiconductors made up of crystalline silicon which is emits the electron on absorbed the heat, and then convert the solar energy into electrical energy. Secondary is used I.e. battery is used to store the generated power. Electrons moves and it will produce the electric current. The life of PV module is generally considered as the life of the system. [4]

1.2 WIND POWER

Wind is main source to generate the wind power. For conversion of wind energy to electrical energy we use wind turbine. Air flow through wind turbine to mechanical power generator for generation of electricity. For this speed and direction of wind plays an important role. Wind power is gives variable power which is consistently vary from year to year but which has significant variation over shorter time period. Wind power used in the conjunction with other electric power to give steady supply.

In wind farm consist of individual turbine are connected to electrical network which will create plentiful, renewable, clean, expensive.

1.3 HYBRID ENERGY SYSTEM

The proposed scheme of hybridization is developed from the basic idea discussed in [10] and [11]. Hybrid system is said to be combination of two or more energy resources such as solar and wind etc. solar and wind combination is treated as best module because it is safe and eco-friendly. Atstandalonesystems of this combination have some disadvantages that wind cannot flow continuously and solar radiation is present approx.i.e 8to10 hours a day. Hybrid energy systems are now becoming an integral part of energy planning process to supply previously electrified remote area [5]. That's why this combination is hybridized with energy storing batteries.

At summer wind speed is low as compared to sun light is more brighter and longest, and at the winter time the wind is more and sunlight is available less. Because peak operating time for solar and wind system is occur at different time in day and year, this system is mostly produce power when you want it.

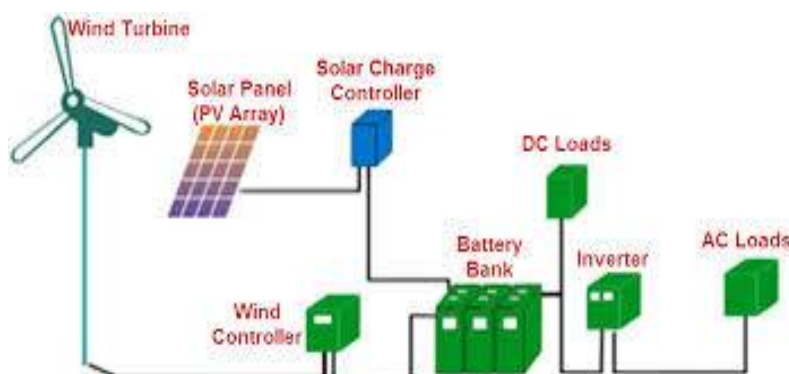


Fig: Solar wind hybrid system

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 3, March 2018

1.3.1 PV Panels

The number of PV panel is connected in series and also we connect it in parallel the output will be DC out of the incidence irradiance. Orientation and tilt the panels most important part in designing parameter



Fig: Solar panels

1.4 CONSTRUCTION OF SOLAR

The photovoltaic cell is called as “solar cell”. It is made up of the number of solar cells (with silicon material) which are weather proof in environment. Solar cells are diode which are used to convert solar energy into electrical energy.

1.5 WIND TURBINE

Wind turbine is used to convert the mechanical energy into electrical energy. It produces kinetic energy through the rotation of the turbine. These are installed on the top of the tower and convert it into electrical energy. This turbine is manufactured on the basis of vertical and horizontal axis. This is now an important growing source of intermittent renewable energy. In addition, the generation of electricity using wind turbines is well suited for isolated places with no connections to the outside grid [7]. When the output power of the fan is too large, if you still need to charge the battery, then part of the power must be removed through uninstalling the circuit in order to avoid damage of generation system [9].



Fig : wind turbine

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 3, March 2018

1.5.1 Construction of Wind Turbine

The wind turbine basic equipment is rotor blades (three rotor blade), the blades are made up of the GRP(glass fibre reinforced-plastic),steel. They are place on pole type long stand with long height so that air and energy is tracked very easily.

We have used the DC generator for generation purpose. The generator is quite interesting DC generator which started generating pure electricity that movement the shaft get rotated. Wind turbine is operating on simple principle. The energy in the wind turns into three propeller like the blade which are present around the rotor. The rotor is connected to the main shaft, which spins the generator to create electricity.

1.6 LOADS

This system can be operated for AC as well as DC appliances that get the electricity from the system. For this hybrid system we particular use stadium lights for generation of electricity. At day time LCD, AC, laptops work on solar and wind energy and at night time load are totally shift on wind energy.

1.7 CONTROLLERS

Control battery bank charge and discharge reasonable with safety.

1.8 INVERTERS

Inverter is used to get the supply of DC to AC as per need of system.

1.9 BATTERY

We used battery as secondary in our system .The battery are single or, multiple batteries are connected to create one large battery of the voltage and amp hour capacity. Battery configuration is important part.

1.10 WORKING OF SOLAR AND WIND POWER SYSTEM

Solar and wind hybrid system are designed by using the solar panel and small wind turbine generating electricity.

Generally hybrid system gets used small capacity. Solar panel, battery are used to store the converted power. Solar is gives DC and with the help of inverter it get converted to AC and get to output in AC connect to the load. we used 40 watt solar panel which is having efficiency of 13-16% connect to the load in the system also the wind turbine used in the system at the night time it will work.

If the solar energy is having maximum power then the solar is get directly connected to the load .And if the wind energy is more then it get directly connected to load. And when solar and wind energy is combine then same amount of the supply comes in circuit then solar is used to store the charge in battery and wind is directly connected to the load or vice-versa. Generally electricity into battery bank with help of solar charge controller and wind controller. The DC load is stored in battery and it will convert the AC load with help of inverter



Fig: Working Of Wind And Solar Hybrid System

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 3, March 2018

II. METHODOLOGY

2.1 Purposed Calculation

Total power generated = power generated by solar panel + power generated by wind turbine
Mathematical representation,

$$PT = NW * Pw + Ns * PS$$

Where,

PT is total power generated

Pw is the power generated by wind turbines

NW is the no of wind turbine

PS is the power generated by solar panels

Ns is the no of solar panels used

2.2 Calculation For Wind Energy

The power generated given by,

$$\text{Power} = (\text{density of air} * \text{swept area} * \text{velocity cubed}) / 2$$

$$PW = 1/2 * \rho * AW * V^3$$

P is power in watts

P is the density in kilogram per cubic meter

AW is the swept area

V is the wind speed in meter per second [6].

2.3 Calculation Of Solar Energy

To determine the size of PV module, we need to calculate the solar power which is given by,

$$PS = Ins(t) * AS * Eff(pv)$$

Where,

Ins(t) is the insulation at time t

AS = area of single pv panels

Eff(pv) = overall efficiency of the pv panels

The overall efficiency is given by,

$$Eff(pv) = H * PR$$

Where,

H is the annual average solar radiation on tilted panels

PR is the performance ratio.

Solar and wind hybrid system want only initial investment. This will effectively work on the conventional source. When accounted for the lifetime of reduced or avoided utility cost. Cost is depend on factor which we will chose, wind resource, electric cost, battery bank required. Cost of solar and wind hybrid system is Can be reduced by using non-conventional energy source.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 3, March 2018



Fig: Represented the solar and wind hybrid system

III. CONCLUSION

The utilization of renewable is highly demanding in world. The world facing the problem of global scarcity of electrical power and pollution is easily overcome by renewable energy. That's why the presented paper is based on natural resource which can easily get from environment. The paper gives overview of solar wind hybrid system. This is standalone system and this paper is focusing on the synchronisation of solar and wind energy in system. Various aspects such as methodology, Calculations are specially reviewed. Future trends, new challenges are also presented in the paper. Overall the aim of the research study to utilised the presented literature for developing the purposed research work.

REFERENCES

- [1] Abhish S. Ingole , Prof. Bhushan S. Rakhode (2015) Hybrid Power Generation System Using Wind Energy and Solar Energy, *International Journal of Scientific Research Publications*, volume 5, issue 3, March 2015 ,ISSN 2250-3153.
- [2] Arul, P. G, Ramachandaramurthy, Vigna K, Rajkumar, R. K." Control strategies for a hybrid renewable energy system: A review", Journal "Renewable and Sustainable Energy Reviews", Volume 42, Year 2015.
- [3] XIA Jicheng ZHANG Huaqiang WANG Zhixin. Research on Battery Charging Control Strategy in Stand-alone Wind/Photovoltaic Hybrid Street Lamp Lighting System. *Water Resources and Power*. 2008,26(6): 182-185.
- [4] Dufo-López R, Bernal-Agustín JL. Design and control strategies of PV–diesel systems using genetic algorithms. *Solar Energy* 2005; 79(1):33–46.
- [5] Wichert, B. "PV-Diesel hybrid energy system for remote area power generation-A review of current and future development". *Renewable and Sustainable energy reviews*. Volume 1, No. 3, September 1997 pages 209-228.
- [6] B. Chitti Babu and K. B. Mohanty, "Doubly-fed Induction Generator for Variable Speed Wind Energy Conversion Systems-Modeling & Simulation," *International Journal of Computer and Electrical Engineering*, Vol.2, No.1, February, 2010, 1793-8163, pp. 141-147
- [7] E. Muljadi and H. E. Mckenna, "Power Quality Issues in a Hybrid Power System," *IEEE-IAS 2001 Conference Chicago, Illinois*, September 30, 2001-October 4, 2001 (To be presented).
- [8] Ahmed, Nabil A. Miyatake, Masafumi Al-Othman, A. K. "Power fluctuations suppression of stand-alone hybrid generation combining solar photovoltaic/wind turbine and fuel cell systems", *Journal "Energy Conversion and Management"* Volume 49 , Year 2008.
- [9] Wang Qunjing, Wang Tao, Li Guoli. □Research on MPPT for Small-scale Hybrid Photovoltaic-wind System□ [J]. *Electric Drive*. 2009,39(5):40-43.
- [10] M. HashemNehrir, Brock J. LaMeres, et. al. "An Approach to Evaluate the General Performance of Stand-Alone Wind/Photovoltaic Generating Systems", *IEEE Transactions on Energy Conversion*, Vol. 20, No. 2, June 2005.
- [11] Torihiro Hirose, Hirofumi Matsuo, "Standalone Hybrid Wind-Solar Power Generation System Applying Dump Power Control Without Dump Load", *IEEE Transactions on Industrial Electronics*, Vol. 59, No. 2, February 2012.