

# Review Paper on Hybrid Solar and Wind Energy

Dhananjay Kr. Jha<sup>1</sup>, Sumit Kumar<sup>2</sup>, Dr. Priti Singh<sup>3</sup>, Mr. Manoj Pandey<sup>4</sup>

<sup>1, 2, 3, 4</sup>Department of Electrical and Electronics Engineering, Amity University, Haryana, India

## Abstract

**Objective:** The switching of forms of energy using solar energy and wind energy with the help of controllers, rectifier, inverter and battery. This project is basically to save energy and to switch towards the renewable energy which will save the environment and humankind in long run. The advantages of saving the energy can be seen economically also as, renewable energy resources serve cheaper in long run. Our projects will lead society to different energy saving methods in different ways. This project provides cheaper and smaller methods of production of electrical energy. However, can be seen which is dependence on weather and natural conditions etc.

The previously existing research and results were taken into consideration while design parameters and calculation for dimensions of various parts of our projects.

In the project, size of solar panel depends upon the optimum requirement of common household and storage capacity. The size of wind mill dynamo depends upon the velocity of air, which we are using as demonstration.

**Result:** - combination of solar and wind energy uses gives good efficiency as compared to individual installation.

**Conclusion:** - switching is very important as it is very good to store the extra energy which are not used in loads. monitoring and switching accordingly increases the efficiency of the system.

## I. INTRODUCTION

In this document, the hybrid system is processed with the following image. It includes renewable energy sources (wind, solar cells) as main energy sources and electricity as a substitute source. To ensure an uninterruptible power supply, rechargeable batteries are used to store the excess energy and restore it in the event of a fault. It was also planned to use a dissipative charge (discharge) in case of overproduction, and the batteries were fully charged. All precursor elements involved in the overall system are connected via corresponding converters to a direct bus (DC bus). The main objective of this system is to create an insulated house and to ensure continuous energy production with mainly renewable energy sources, reducing the intervention of the traditional energy source (electricity). In addition to the uninterruptible power supply, the system must consider the function of each element, especially the battery, and impose optimal behavior to extend its life.

### A. Solar panel

The solar panel converts solar radiation into electrical energy. The physics of PV cells is very similar to the conventional diode with PN junction in semiconductor material.

### B. Windmill

A wind turbine is a machine that converts kinetic energy into wind for mechanical energy. Wind turbines may be subdivided into two basic types depending on the axis about which the wind turbine rotates.

### C. Inverter

A converter is needed to convert the DC output of the solar module to AC power so that it can be used properly at home.

### D. Application and advantages

- 1) System maintenance has been significantly reduced and made easier.
- 2) Renewable energy sources such as sun and wind are used to prevent waste production.
- 3) Producing clean, green and renewable energy sources.
- 4) When the system is designed, developed or manufactured, installation is easy.
- 5) The installation costs will be covered within a certain period of time.
- 6) If the system is damaged, the system or the entire subsystem need not be changed. Just change a damaged part.
- 7) Since the installation is easy every home can have their own hybrid system. which will reduce their dependence from non-renewable to renewable energy.

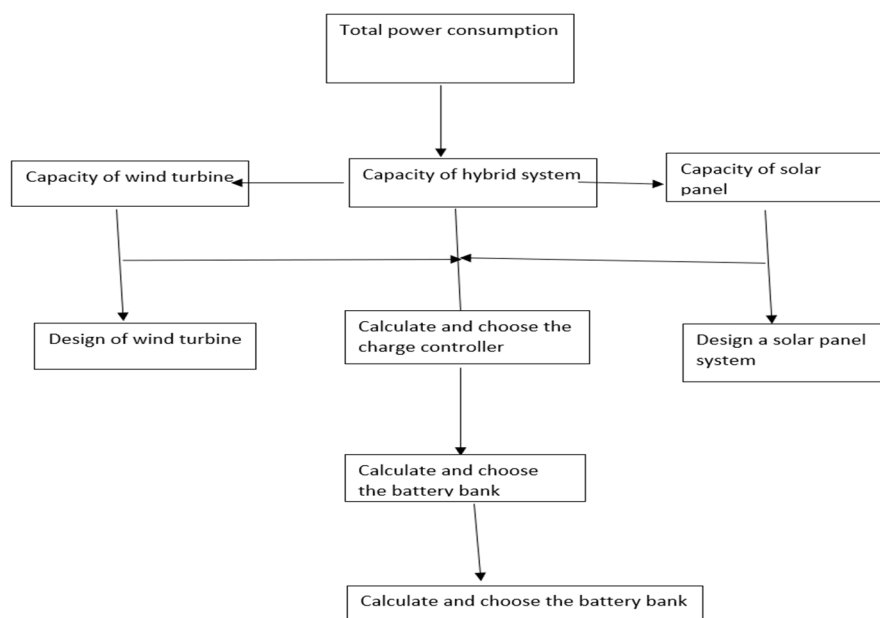


Figure 1 Design and Methodology

## II. DESIGNING METHODOLOGY

The power of the solar module is typically 1.3 times the estimated power. The maximum value of the total power in the photovoltaic modules corresponds to a fraction of the current of the solar cell modules and the absorption of solar energy.

The capacity of the battery bank for the solar system is the amount of batteries that provides enough energy for individual days when the solar panels do not produce electricity.

Generally, a double capacity inverter is selected from the wind turbine and the solar panel.

### A. Experimental Solar Result Table

| Measurement | I(A)without controller | V (without controller) | I(A)with controller | V with controller |
|-------------|------------------------|------------------------|---------------------|-------------------|
| 1           | 0.05                   | 15                     | 0.6                 | 14.33             |
| 2           | 0.05                   | 16                     | 0.6                 | 14.33             |
| 3           | 0.05                   | 16.5                   | 0.6                 | 14.33             |
| 4           | 0.05                   | 16.7                   | 0.6                 | 14.33             |
| 5           | 0.05                   | 16.7                   | 0.6                 | 14.33             |

### B. Parameters for Calculating The filter Components

|                                    |      |                              |      |
|------------------------------------|------|------------------------------|------|
| Grid Voltage (V)                   | 230  | Inverter side inductance(mh) | 17.7 |
| Output Power of the Inverter (kVA) | 1.5  | Grid Side Inductance Lg(mH)  | 5.7  |
| DC link Voltage (V)                | 400  | Filter Capacitor Cf(μF)      | 3.45 |
| Grid Frequency (Hz)                | 50   | Damping resistor R(Ω)        | 11.3 |
| Switching Frequency (Hz)           | 3000 | Cut-off Frequency(Hz)        | 1300 |

### C. Experimental Table Of Windmill

| Measurement | V   | I(A) |
|-------------|-----|------|
| 1           | 1.2 | 0.3  |
| 2           | 1.5 | 0.6  |
| 3           | 1.5 | 0.6  |
| 4           | 3   | 1    |

## III. COMPONENTS

### A. Solar panel

Calculation Of Collector Modules: The solar collector mode current is typically selected at 1.3 times the estimated power. The maximum value of the total power in the solar modules corresponds to a fraction of the current from the solar cell modules and the absorption of solar energy. The number of solar modules is a fraction between the peak value of the total power in the solar modules and the PV peak of the solar cell modules. The solar power is 681 Wh / day, the electricity from the photovoltaic system is calculated and the value is 885 Wh / day. The solar absorption value is 5.2 kWh / m<sup>2</sup> / day.

### B. Wind Mill

Wind energy has attracted much attention worldwide in recent years. It has been reported [1] that by 2020 10% of the world's electricity comes from wind power. The same reference also predicted that the annual growth of wind energy between 1998 and 2040 would be between 10 and 2040 40%. In one implementation, wind energy will account for more than 20% of global electricity consumption by 2040 [1]. These figures only show that the share of integrated wind turbines will increase significantly in the near future.

### C. Inverter

A power conversion unit that generates a multi-level sine waveform is called a sine wave converter. In order to better distinguish converters with significantly lower distortion performance than those developed by the (three-stage) modified wave inverter, manufacturers often use the term "pure wave inverters". Almost all consumer converters sold as pure sine wave inverters do not produce a smooth and smooth ripple effect, but less power than the square wave (two stages) and the modified (at most three). This does not necessarily require most electronic products if they handle the output quite well.

When power amplifiers replace normal utility power, their wave power is desirable because many electrical products are designed to work best with a sinusoidal AC power source. Standard power tools provide a sine wave, usually with small errors, but sometimes with significant distortions.

## IV. RESULT

The estimated value of the energy produced by the solar system and the wind turbine model varies with real time values by 6.22% and 7.18%, respectively. For photovoltaic wind hybrid systems, the difference is 6.66%. By examining given energy load conditions, the capacity of the solar wind turbine was determined for a given load requirement.

The charging of battery is only possible if the voltage of solar panel or windmill increases the charging limit value of battery 12v in this case.

## V. CONCLUSION

In the current scenario, autonomous solar cells and wind systems have been promoted to a greater extent worldwide. These independent systems cannot provide a continuous source of energy since they are seasonal. Solar energy and wind energy complement each other in nature. By integrating and optimizing solar cells and photovoltaic systems, the reliability of the system can be improved and the cost per unit minimized, Energy per unit. Photovoltaic wind hybrid systems are designed for nationwide electrification based on the required load with a fixed power failure probability (DPSP). A new method has been developed to determine the size of the hybrid PV hybrid system using positional parameters, types of wind systems, types of solar PV systems, number of days of battery life and lifetime. of the system. A main model has been developed to optimize the PV wind hybrid system at a specific location, taking into account the DPSP and REPG parameters. The developed model deals with input parameters relating to wind speed, sun protection, ambient temperature, load distribution, wind parameters and solar cells such as electricity. Module, capacity of solar panels and wind systems.

## REFERENCES

- [1] R. W. Johnst.oi aId (XV. J. Newill, V\-aliabl) p51)eed(1id111(1 io1 imiotorl (Irive vsstem for1 iidstridial applications" lin (Conf.cc. 190 5th Anno .1l'ct. IEEE llttd. Gme. App/. Group, pp D I P -)81 ).
- [2] B. L. Jones and B. J. Cory, "Polyphase thyristor inverters, iti Proc. Conf. Application of Large Industrial D)rives. In (n,"orif. Rcc., IEE Power Divis'ior., 1iJ0(toin May 5-7, 1965, pp. 241-252.
- [3] L. A)raham, K. lleuinniu, amiu F. Koppelnaiuil, "'liverter for speed control of s(quiirrel catge imtors (in ( ermai 4LG .lHitteilungen, vol. 54, nio. 1/2, pp. 89-106, 1964.
- [4] J. M. Carrasco, L. G. Franquelo, J. T. Bialasiewicz, E. Galvan, R. C. Portillo Guisado, M. A. M. Prats, J. I. Leon, and N. Moreno-Alfonso, "Power-electronic systems for the grid integration of renewable energy sources: A survey," IEEE Trans. Ind. Electron., vol. 53, no. 4, pp. 1002– 1016, Jun. 2006.
- [5] F. Blaabjerg, Z. Chen, and S. B. Kjaer, "Power electronics as efficient interface in dispersed power generation systems," IEEE Trans. Power Electron., vol. 19, no. 5, pp. 1184–1194, Sep. 2004.
- [6] E. Roman, R. Alonso, P. Ibanez, S. Elorduizapatarietxe, and D. Goitia, "IntelligentPVmoduleforgrid-connectedPVsystems,"IEEETrans.Ind. Electron., vol. 53, no. 4, pp. 1066–1073, Jun. 2006.
- [7] Schdnung and D. Stemmler, "Static frequency changer with subharmonic control in conjunction with reversible variable drives,' Brown Boveri Rev., Aug./Sept. 1964.
- [8] J. B. Casteel and R. G. Hoft, "Optimum PWM waveforms of a microprocessor controlled inverter," in Conf. Rec. IEEE 1978 Power Electronics Specialists Conf., Syracuse, NY, 78CH 1337-5 AES.
- [9] W. Xiao, W. G. Dunford, P. R. Palmer, and A. Capel, "Regulation of photovoltaic voltage," IEEE Trans. Ind. Electron., vol. 54, no. 3, pp. 1365– 1374, Jun. 2007. J Castillo "Small scale vertical axis wind turbine design", Tampere University of Applied Sciences, December 2011.
- [10] A.A.Safe, M.Moniruzzaman, M.T.Feroz & M. T Islam "Design, fabrication & analysis of a helical vertical wind turbine", International Conference on Mechanical Engineering and Renewable Energy, 257, 2013/12/24.
- [11] T.S. Balaji Damodhar and A. Sethil Kumar, "Design of high step up modified for hybrid solar/wind energy system," Middle-East Journal of Scientific Research 23 (6) pp. 1041-1046, ISSN 1990-9233, 2015.
- [12] Walaa Elshafee Malik Elamin, "Hybrid wind solar electric power system," report, University of Khartoum, Index-084085, July 2013.
- [13] Sandeep Kumar and Vijay Garg, "Hybrid system of PV solar/wind & fuel cell," IJAREEIE, Vol. 2, Issue 8, ISSN 2320-3765, August 2013
- [14] (1999) Greenpeace and Wind Industry Unveil Global Energy Blueprint. The European Wind Energy Association (EWEA).
- [15] E. Welfonder, R. Neifer, and M. Spanner, "Development and experimentalidentificationofdynamictimodelsforwindturbinesandtheirfluctuating power generation," in Proc. Vol. From the IFAC Symp., Dec. 6-8, 1995, pp. 73–81.
- [16] V. Akhmatov, H. Khudsen, and A. H. Nielsen, "Advanced simulation of windmill in the electric power supply," Int. J. Elect. Power & Energy Syst., vol. 22, no. 6, pp. 421–434, Aug. 2000.
- [17] V. Akhmatov and H. Khudsen, "Modeling of windmill induction generators in dynamic simulation programs," in Proc. IEEE Power Tech. Conf., Budapest, Hungary, Aug./Sept. 29-2, 1999, BPT99-243-12
- [18] Mir NahidulAmbia , Md. Kafiul Islam , Md. AsaduzzamanShoeb, Md. Nasimul Islam Maruf, " An analysis & Design of a Domestic Solar- Wind Hybrid Energy System " IEEE 2010 2nd International Conference.
- [19] Wei Zhou, Chengzhi Lou, Zhongshi Li, Hongxing Yang, " Current status of research on optimum sizing of standalone hybrid solar-wind power generation system " , Science Direct 2009
- [20] K. Lahiri, A. Raghunathan, and S. Dey, "Battery-driven system design: a new frontier in low power design", in Proc. IEEE International Conference on VLSI Design, pp. 261–267, 2002.
- [21] S. Roundy, Energy Scavenging for Wireless Sensor Nodes with a Focus on Vibration to Electricity Conversion. Ph. D. Dissertation, Dept. of EECS, UC Berkeley, May 2003.
- [22] V. Raghunathan, C. Schurgers, S. Park, and M. Srivastava, "Energy aware wireless microsensor networks", IEEE Signal Processing Magazine, vol. 19, iss. 2, pp. 40–50, March 2002.
- [23] R. Min, et al., "An architecture for a power-aware distributed microsensor node", Proc. IEEE Workshop on Signal Processing Systems, pp. 581– 590, 2000.