

# Review of Solar and Wind Hybrid Systems: A Study on Technology

Shravan.S.Pargaonkar\*, Vinaya.V.Patil\*\*, Prachi.A.Deshpande\*\*

\* Mechanical Engineering Department, University of Texas at Arlington 76019, Texas USA

\*\* Mechanical Engineering Department, Smt. Kashibai Navale college of engineering, Pune, India

**Abstract-** As now a days, the demand for fossil fuels is increasing there is a need for finding an alternative source for generating energy. This paper aims to present the solar and wind hybrid systems for generation of energy. The simulation results are taken into consideration for the system to be cost effective. Moreover these systems are reliable and as energy can be generated as per requirement which takes an advantage over other conventional energy generating sources.

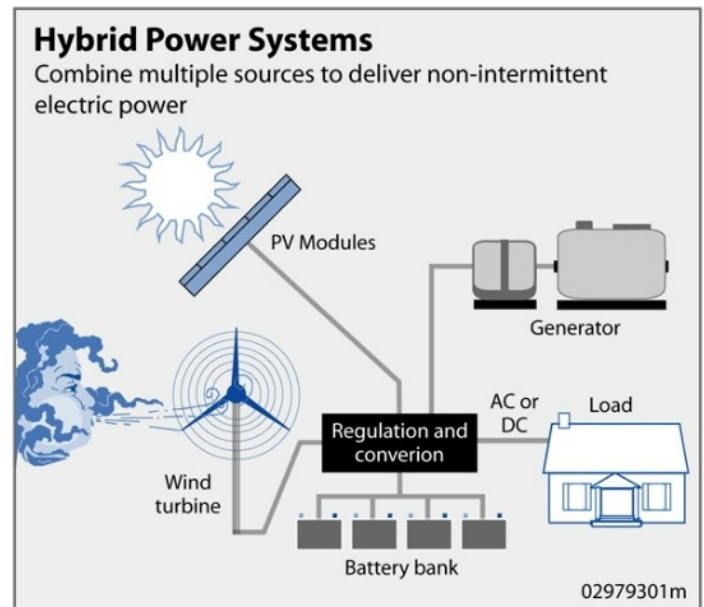
## I. INTRODUCTION

As we know that in day to day world solar energy is more effective source over the conventional system. But due to increasing demand for fossil fuels there was a need to develop an alternative source over conventional method. During this period many people are focusing on developing a use of the solar energy an alternative source for generating the power. But due to disadvantages occurring in solar system there is a need to develop some other source for generating the power and this is how concept of solar and wind hybrid power plant came into existence. "Hybrid power systems combine two or more energy conversion devices, or two or more fuels for the same device, that when integrated, overcome limitations inherent in either" (U.S. DOE Natural Gas 2001). This paper aims to presents how this power plant works and how more power can be generated by using renewable energy sources. According to M.Murlikrishna and V. Lakshmi Narayana the paper on solar and wind hybrid system for rural electrification, in INDIA more than 200 million people live in rural areas and out of which over 80000 villages does not get the supply of electricity because of scarcity, location and economy. Now, as we know that winds are stronger in winter and sun rays are stronger in summer the solar and wind hybrid power plant can overcome the variations that were coming in solar power plant and abundant amount of energy can be generated by using solar and wind hybrid power plant. Cost effective, convenient to use, and reliable power source are the three important characteristics of hybrid system through which energy can be saved.

## II. WORKING

The figure below illustrates the solar and wind hybrid systems consists of photo voltaic array, wind turbine, aero wind generator, solar controller, wind controller, battery banks, inverter and loads. Firstly numbers of photo voltaic panels are connected in series or in parallel by which together in produces DC output incident radiance. Along with the photo voltaic panels

wind turbine is also connected to the DC output which in turns rotates and generates the power. Now the aero wind generator which is one of the main components of the system which converts kinetic energy of wind into electrical energy and then converter is used to convert it into mechanical energy. Solar and wind controller are basically used as the safety values which indirectly look into the battery backup levels. Batteries are one of the crucial parts of the systems. It depends on us how many batteries should we use for storing the energy. Next comes the inverter which converts the DC output power into AC power. "Recent researches in the field of renewable resources shows that the solar and wind hybrid power generations system can work with increased output and increased practically" (Dixet, V. and Bhatia, J.S. 2013 p.40). Thus from above statement we can say that although if wind speeds are low, we can obtain the output from sun rays. Thus, we can generate energy in rural areas were there is considerable amount of energy were solar rays are available in abundant quantity.



## III. WHY THEY ARE EFFECTIVE?

Solar and wind Hybrid systems are the convenient source of generating the energy compared to conventional system because solar and wind hybrid system consists less number of parts compared to conventional methods. So lesser the number of parts, lesser and convenient will be the system to use. In addition

to that, the need for AC TO DC converter is reliable and has more durability in solar and wind hybrid systems. "The solar and wind hybrid system needs only the initial investment, it will complete well in generation with conventional energy sources" (Ingole and Rakhonde 2015). Let us take example, in INDIA at our home we have installed the solar power plant at our terrace and which generates the energy from the sun rays. Firstly numbers of photo voltaic panels are connected in series or in parallel by which together in produces DC output incident radiance. As sun rays are free of cost, and they fall on the panel the energy is generated and saved in the battery and used for various purposes conveniently. Moreover more energy can be generated because "Recent researches in the field of renewable resources shows that the solar and wind hybrid power generations system can work with increased output and increased practically" (Dixet, and Bhatia, 2013 p.40). Thus from above statement we can say that although if wind speeds are low, we can obtain the output from sun rays. Therefore, we can generate energy in rural areas where there is considerable amount of energy were solar rays are available in abundant quantity.

Solar and wind Hybrid systems are cost effective source for generating the energy compared to conventional system because solar and wind hybrid systems produce more energy in free of cost. In order the system to be cost effective we can use the software called mat lab and calculate the simulation results for it. After calculating the results the we can supply or generate only specified quantity of energy needed. So if more energy is generated we can save the excess amount of energy in the battery pack and supply the remaining energy whenever required (Sharma and Goyal 2015). Let us take an case study, which collected the sample data of a village, computed the total cost occurred for generating energy by using mat lab software and finally they computed the cost of solar power and thus the results were proved that solar and wind power plant cost less or comparatively equal to cost of conventional power plants (Tiwari 2014). Moreover now days the fossil fuels are depleting and for this reason the prices for generating the energy will ultimately rising day by day.

The Solar and wind Hybrid systems are the reliable source of generating the energy compared to conventional system because these systems it can produce the energy in rural areas 365 days in a year. As we know that, during the winter season wind blows fast but there is shortage of sun-rays, so the windmills can generate the energy and in case when there is summer when sun rays are strong enough to generate the energy. In addition to that spring is the season when both sun rays and wind can be seen thus results the more output. According to (Tiwari 2014) "By using solar and wind hybrid system we can electrify remote areas also it is applicable for metro cities in future to avoid unwanted load shedding" (pp.1077). Let us take an example of my friends village where solar and wind power plant is installed .We can say that energy generated from there is reliable because there are no worries for emissions which may cause harmful effects on health of human beings. In addition to that, Solar and wind controller in hybrid systems are basically used as the safety values which indirectly look into the battery backup levels. Batteries are one of the crucial parts of the systems. It depends on us how many batteries should we use for

storing the energy, and thus if excess of energy is generated is stored in the batteries thus ensuring the safety of surrounding.

#### IV. CONCLUSION

To sum up with, solar and wind hybrid systems can be used as an alternative to fossil fuels which ultimately result in saving the nonrenewable sources. In addition to that, reducing the emissions from conventional methods can also be achieved. There are many ways through which electricity can be generated such as solar, wind, and bio-gas. The individual use of this system is costly but combination may be cheaper depending upon the requirement of the power. Moreover, the space required in solar wind hybrid system is less than conventional plants. For the future when demand of energy will increase in metro cities the small plants can get the desired energy and will avoid the load shedding that now currently going in many cities. The desired or variations in the energy can be calculated in mat lab and that much amount of system can easily be setup, thus reducing the additional cost that may be required. In addition to that the effect of green house can also be eliminated and this system will not produce any kind of noise. Also the cost of developing electricity in these remote areas requires high capital investment because of factors such as high lead time, low load factor poor voltage regulation. To overcome this disadvantage in rural areas the abundant wind and sun rays available; by using the solar and wind hybrid power plants we can generate the power and solved the issue. Thus, use of solar and wind hybrid systems can be an alternative source to the conventional methods.

#### REFERENCES

- [1] Burch,G.D, (2001). Hybrid renewable energy systems. Retrieved from: <https://www.netl.doe.gov>.
- [2] Dixet, V. , and Bhatia, J.S. (2013). Analysis and design of a domestic solar wind hybrid energy system for low wind speeds. *International Journal of computer applications*,72(22), 40-44.
- [3] Ingole, A.S. , and Rakhonde, B.S. (2015). Hybrid power generation system using wind energy and solar energy. *International journal of scientific research and publications*, 5(3), 1-4.
- [4] Sharma, R., and Goyal, V. (2015). A hybrid model of solar wind biomass power generation system: a review. *International conference on computing for sustainable global development*,1201-1203.
- [6] Tiwari, A.S. (2014). Solar and wind hybrid system for rural electrification. *International journal on recent innovation trends in computing and communication*, 2(5), 1704-1077.

#### AUTHORS

**First Author** – Shravan.S.Pargaonkar, Mechanical Engineering Department, University of Texas at Arlington 76019, Texas USA

**Second Author** – Vinaya.V.Patil, Mechanical Engineering Department, Smt. Kashibai Navale college of engineering, Pune,India

**Third Author** – Prachi.A.Deshpande, Mechanical Engineering Department, Smt. Kashibai Navale college of engineering, Pune,India

