

GREEN E-GENERATOR

Bhushan Rawool¹, Krishna Shahu², Piyush Sawant³, Ravi Sahani⁴

¹Student of Electronics & Telecommunication, Bharat College of Engineering, Maharashtra, India

²Student of Electronics & Telecommunication, Bharat College of Engineering, Maharashtra, India

³Student of Electronics & Telecommunication, Bharat College of Engineering, Maharashtra, India

⁴Student of Electronics & Telecommunication, Bharat College of Engineering, Maharashtra, India

Abstract - This project dwells with the implementation of a hybrid model of solar and wind turbine. The alternate configuration of wind turbine is proposed. Vertical Axis Wind turbine with the use of Magnetic Levitation Technology to optimize the performance. The system utilize the nature of permanent magnet as a replacement for ball bearings to levitate the turbine components and thus minimize losses in the energy while rotating, which is the major problem faced by conventional wind technology.

Key Words: Maglev VAWT, Hybrid System, VAWT, Vertical Axis Wind Turbine, Wind Solar Hybrid Model

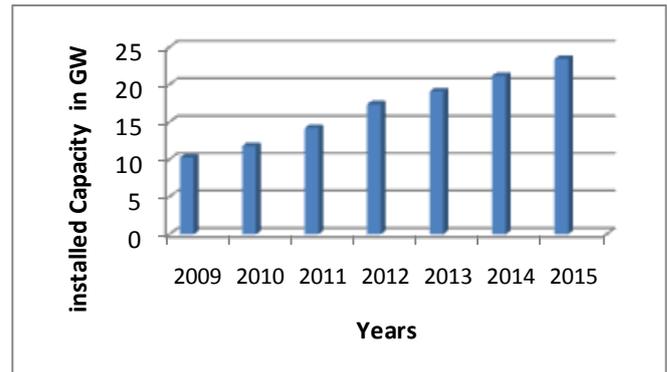


Fig -1: Growth in installed capacity of wind energy in India

1. INTRODUCTION

The popularity of renewable energy has experienced a significant upsurge in recent times due to the exhaustion of conventional power generation methods and increasing realization of its adverse effects on the environment. The exploration of renewable energy is the only approach to reduce our dependence on fossil fuels. Among the renewable energy sources Wind and Solar energy are the fastest growing renewable energy sources.

1.1 Wind Energy

The Indian Government in its 12th five year plan (2012-2017) has set a target of adding 18.5 GW of renewable energy sources to the generation mix out of which 11 GW is the wind estimation & rest from renewable sources like solar 4 GW & others 3.5 GW.

The wind potential in India was first estimated by Center of Wind Energy Technology (C-WET) at 50m hub height i.e. 49 GW but according to the new survey at 80m hub height, the potential grows as much as 102 GW. This figure was adapted by the government as the official estimate. However, Lawrence Berkley National Laboratory (LBNL) has stated the potential is over 300-400 GW.

1.2 Solar Energy

In India the annual global solar radiation is about 5 KWh/sq m per day with about 2300-3200 sun-shine hours per year. Solar radiations represent the earth's most abundant energy source. The perennial source of solar energy provides unlimited supply, has no negative impact on the environment.

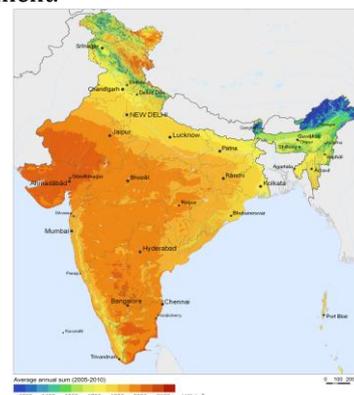


Fig -2: Solar Energy Intensity Graph

2. Design of System

This is hybrid model of generating electricity from renewable energy sources. The solar & wind energy is used. The solar panel & maglev wind turbine is to be made. The greater emphasis is given on the vertical axis wind turbine.

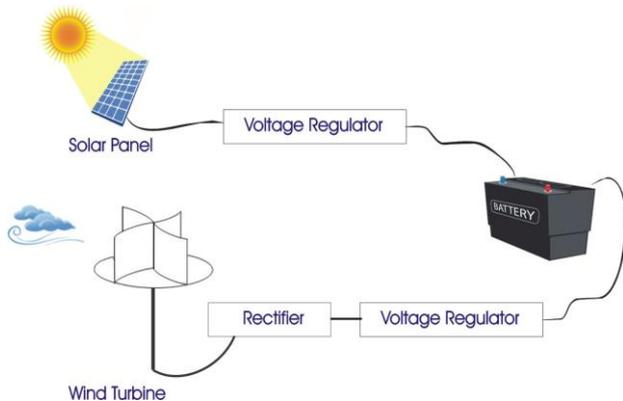


Fig -3: Block Diagram of System

VAWT

With the vertical axis wind turbines, the concept behind their operation is similar to that of the horizontal designs. The major difference is the orientation of the rotors and generator which are all vertically arranged and usually on a shaft for support and stability. This also results in a different response of the turbine blades to the wind in relation to that of the horizontal configurations.

Their design makes it possible for them to utilize the wind power from every direction unlike the HAWTs that depend on lift forces from the wind similar to the lift off concept of an airplane. The functioning of this model is dependent on drag forces from the wind. This drag force produced is a differential of the wind hitting by the inner part of the scoops and the wind blowing against the back of the scoops.

Maglev

The characteristic that set this wind generator apart from the others is that it is fully supported and rotates about a vertical axis. This axis is vertically oriented through the center of the wind vent which allows for a different type of rotational support rather than the conventional ball bearing system found in horizontal wind turbines.

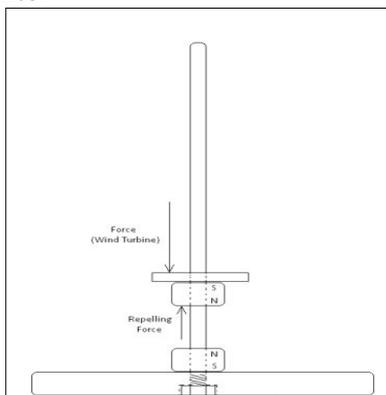


Fig -4: Maglev Concept

Solar Panel

A solar cell is a device that converts the energy of sunlight directly into electricity by the photovoltaic effect. Sometimes the term solar cell is reserved for devices intended specifically to capture energy from sunlight such as solar panels and solar cells, while the term photovoltaic cell is used when the light source is unspecified. Assemblies of cells are used to make solar panel, solar modules, and photovoltaic arrays. Photovoltaic is the field of technology and research related to the application of cells in producing electricity for practical use.

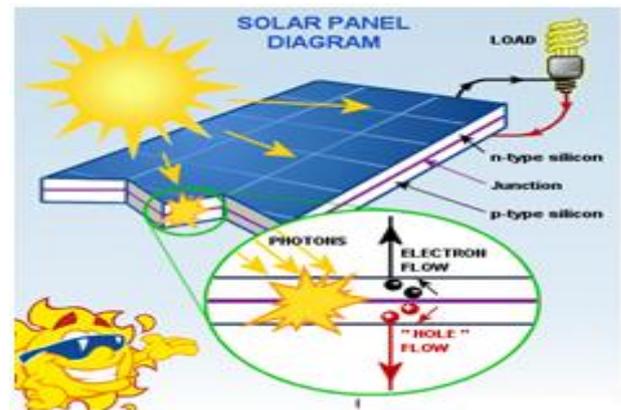


Fig -5: Solar Panel Working

3. Implementation of System

VAWT

The voltage will be generated by using the concept of induced emf. The neodymium magnets are placed on the rotor of the wind turbine & 8 coils of 500 turns of 26 gauge copper wire are connected in the series to get maximum voltage.

In the designed prototype, the stator and rotor are separated in the air using the principle of magnetic levitation. The rotor is lifted by a certain centimeters in the air by the magnetic pull forces created by the ring type Neodymium magnets. This is the principal advantage of a maglev windmill from a conventional one. That is, as the rotor is floating in the air due to levitation, mechanical friction is totally eliminated. That makes the rotation possible in very low wind speeds. Figure 6 illustrates the magnetic levitation in our prototype.

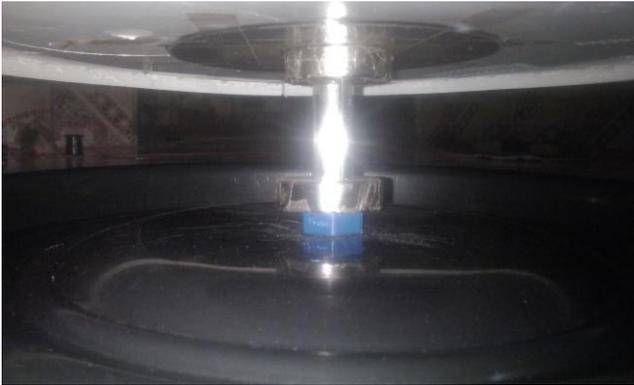


Fig -6: Magnetic Levitation

The blades used in this prototype are not of the conventional type. In this prototype, we have followed a blade structure known as Savonius type of wind blade. The blades are made of aluminium sheet. The height of the blade is 15cm. There is curve made of 15 degree so that the rotor can move only in the one direction irrespective of the direction of the wind. As aluminium is light metal so the wind turbine can move at low wind speed also. The blade structure is shown in the fig



Fig -7: Blade Design

4. Conclusion

This hybrid system is capable of generating more power as it is fusion of solar & wind turbine both. Both solar & wind turbine would produce power individually but as they share a single battery they will charge the battery in contributing way. Solar panels are as good as power supplies of an average of 12V in bright sunlight. The only problem is unregulated voltage due to variation in intensity of light.

The Maglev Vertical Axis Wind Turbine is more efficient than the normal VAWT. It produces more power than the normal wind turbine. At moderate wind speeds the power output of the generator satisfied the specifications needed to supply the LED load.

REFERENCES

- [1] Aravind, C.V.; Kamalinni; Tay, S.C.; Jagadeeswaran, A.; Firdaus, R. "Design analysis of MAGLEV-VAWT with modified magnetic circuit generator", *Electrical Energy Systems (ICEES), 2014 IEEE 2nd International Conference on*, On page(s): 82 – 86
- [2] Huachun Wu, Xiuzhen Wang, Yefa Hu."Development of Small Wind Generator Based on Hybrid Magnetic Bearing[C]", *Asia-Pacific Power and Energy Engineering Conference (APPEEC 2009)*, Wuhan, 2009:884-887.
- [3] Huachun Wu, Xiuzhen Wang, Yefa Hu "Study on Magnetic Levitation Wind Turbine for Vertical Type and Low Wind Speed """, *Asia-Pacific Power and Energy Engineering Conference (APPEEC 2010)*, Chengdu.
- [4] Website of Indian Wind Energy association <http://www.inwea.org/>