

Energy Generation Using Solar and Wind in a Hybrid Model

SolWin Energy Generation

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Abstract- There is tremendous need of energy in every walk of life all over the planet. Since centuries, mankind generated power for his needs by burning fossil fuel and other non-renewable sources. But we have also opened up ourselves to options that go hand in hand with the nature and generate power by using renewable sources. In this paper we have shown that power generated using a hybrid of solar and wind energy generation techniques is more efficient than using either of them in countries like India. India has been actively promoting use of renewable energy sources. Thus SolWin energy generation helps us to generate more power in regions where the weather changes every few months. The SolWin also uses unique technology in both solar and windmill sections. It uses a dual axis solar tracker and a savonius wind turbine for greater efficiency.

Index Terms- Solar, Savonius, Hybrid.

1. INTRODUCTION

As India is progressing its power needs are increasing day by day. There is tremendous scope for India to use renewable energy sources on a large scale. In India there are 300 clear sunny days that is capable of generating 5000 trillion units per year according to a leading electrical magazine. By 2022 India plans to generate 20,000 MW by solar alone. There is also lucrative opportunity of using wind to generate power as India has a very long coastline and large plateaus to install windmill and generate huge amounts of power. SolWin energy generation aims at generating power on a domestic scale for residential and commercial complexes using the hybrid model. This model will increase the efficiency by at least 30-40%. There are laws in India which state that there will be subsidy for products that promote manufacturing and generation of electricity by using renewable energy sources.

2. DUAL AXIS SOLAR TRACKER

SolWin uses dual axis solar tracking to optimize the output efficiency throughout the day. The tracking is done with the help of a microcontroller. The photo sensors mounted on the solar panel are used to give signals to the microcontroller so that tracking can be done smoothly. This technique increases the efficiency by 30% as compared to stationary mounted solar panels.

3. SAVONIUS WIND TURBINE

The wind turbines that are used in SolWin are vertically mounted turbines also known as savonius turbine. The rpm of the turbines is given by the following equation:

$$R.P.M = V * 60/Dx[]$$

Eq. (1)

Where, V = wind speed in ft/second

D = diameter of rotor in feet.

The savonius are used for the reason that solar can be mounted along with it in the same arrangement thus giving form to SolWin energy generation.

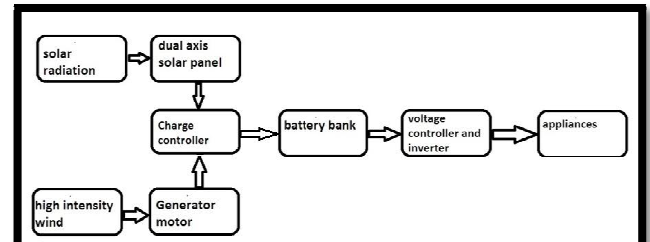


Fig. 1. Combined working of SolWin

The SolWin is beneficial as it helps generating power even when both sun and wind are not available at the same time. The outputs of solar and wind turbines are added in the adder section and then given to the charge controller. The charge controller will keep the excess voltage or voltage spikes under a threshold level and also keep the current stable so that the battery bank used is unharmed. The solar panel is kept over the frame of the windmill thus using lesser area and conveniently. Both the sections independently but as they are used in the same arrangement we call it a hybrid model. The wind turbine rotates the generator by using a pulley set up and the generator gives output power of about 150 watts where the r.p.m of the turbine has to be 130-150.

4. COMPARISONS

This section shows comparisons between stationary mounted panels and dual axis tracking. This section also shows that how SolWin is more efficient than using either solar or windmill to generate power.

4.1 Comparison between stationary and dual axis tracking solar panel

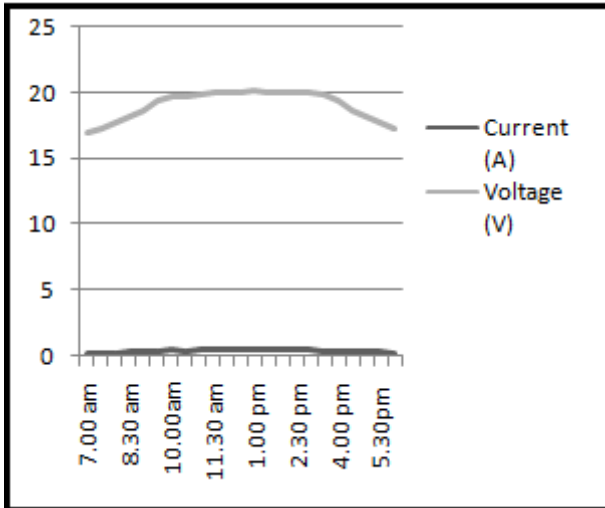


Fig. 2. Stationary mounted panel voltage and current graph

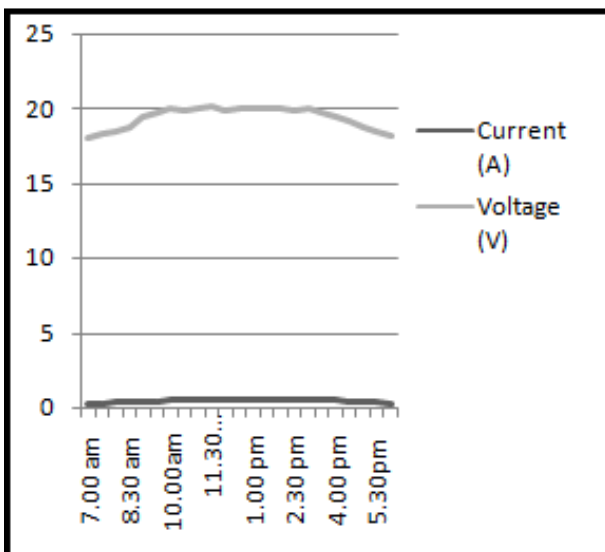


Fig. 3. Dual axis tracking voltage and current reading

The graphs clearly show that the dual axis tracking gives more efficient output for a longer time throughout the day thus increasing the overall efficiency.

Thus by combining these two techniques we can generate power even when either sun or wind is not available at the same time. The effective turbines and dual axis tracking system will enhance the SolWin system. SolWin increases the power

generating efficiency by 30-40% as compared to using either of the solar or windmill to generate power.

5. APPLICATIONS

- The SolWin project can be used at residential areas and commercial complexes on the terrace area.
- It can be used in rural areas with open spaces around.
- Places where weather is not constant, considering the sunlight and wind

6. CONCLUSION

After evaluating the results under various scenarios it has been observed that the SolWin is a better option as it works even if one of the energy sources is available. This project is favorable even when the area used is concerned. The project is useful in rural as well urban areas though the cost effectiveness has to be worked upon.

7. ACKNOWLEDGEMENTS

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