

# Design of Renewable Energy Powered Car

**Dr. S. Elangovan**

Prof. & Head, Dept. of EEE, Jansons Institute of Technology  
[elangopr@gmail.com](mailto:elangopr@gmail.com)

## Abstract

Based on the research and other findings, the hybrid vehicle will become popular and people will be interested on this. Our country can become independent of oil import. So this research is more important when considering the current investments by both government and the auto industry. It gives clear energy and no harm to the environment and no emissions. This hybrid vehicles technology will play an important role in future as they are the vehicles of tomorrow. Now we are more depending on Japanese or Korean models. Once this technology is developed and HEV sales will grow and more people will adopt this technology. Marketing and sales will not require more investment as they are eco-friendly and better than current existing models.

This article aims at the design of wind-solar hybrid energy systems. It highlights the economic attractiveness of hybrid vehicles and need for this in the future auto Industry.

**Key words:** Wind energy, Solar energy, Shock absorber, Hybrid vehicle, Battery & DC Motor.

## I. Introduction

### 1.1. Solar Energy

Sun has enormous potential of renewable energy. The worldwide power demand is  $10^{13}$  W. But, the Earth's surface is receiving almost  $10^{16}$  W of energy at an average sunny day. So, we receive more than sufficient power from Sun. So, technical utilization of solar energy is proved to be very useful. Utilization of solar energy is of great importance to India since it lies in a temperature climate of the region of the world where sunlight is abundant for a major part of the year. The recent applications of solar energy in India, are the energisation of pump sets for irrigation, drinking water supply and rural electrification covering street lights, community TV sets, medical refrigerators.

### 1.2. Wind Energy

The potential of wind energy as a source of power is large. The energy available in the winds over the earth is surface is estimated to be  $1.6 \times 10^7$  mW which is of the same order of magnitude as present energy consumption on the earth. In India, high wind speeds, are obtainable in coastal areas of Saurashtra, western Rajasthan and some parts of central India. They are non-polluting and it has no adverse influence on the environment.

The first power source is photo-voltaic solar cell. These cells convert sun light directly into DC power without any emissions. The second power source is wind energy i.e., the kinetic energy of air in motion. The third one is shock absorber which is connected to suspension. It converts kinetic energy into another form of energy.

## II. Methodology

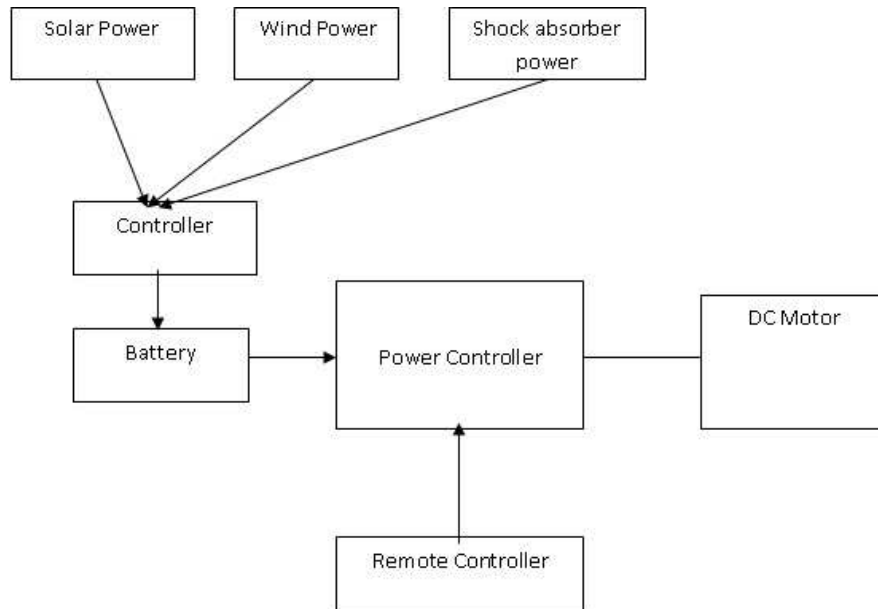
### 2.1. Hybrid Solar Energy

On-Grid solar PV system is used for usage of solar power in house and factory utilities. Stand alone PV system is including photovoltaic panels. It depends on the necessity of user and the number may vary. This stand alone PV system is not connected with grid. It can be called as off-grid operation. It is charged during day time and power is stored in battery. This stored energy is used as per our requirements. It is placed on the top of the car or automobile appliances. In the system, batteries charge controller, one or more PV panels, electrical switches and off-grid inverter is used. This charge controller is also called as charge regulator. This arrangement of charge controller helps the battery to avoid overcharge and discharge but helps to control output voltage from solar panel. Then inverter is arranged to modify DC power as per our requirement.

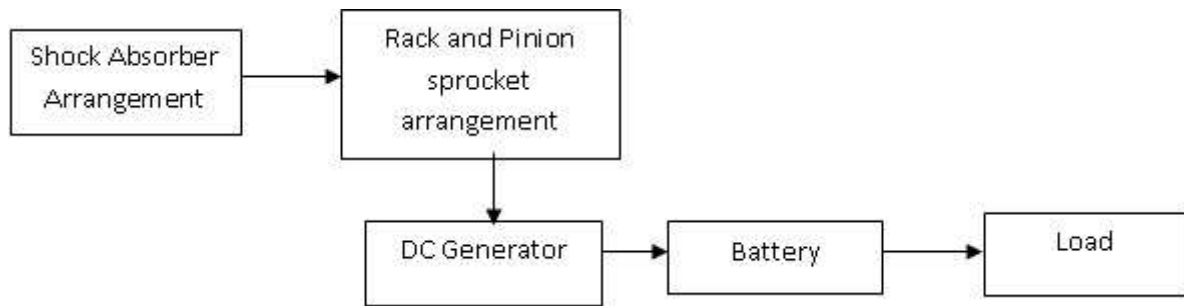
### 2.2. Hybrid Solar PV System

Hybrid solar PV system means solar PV system is combined with other power source for utilities.

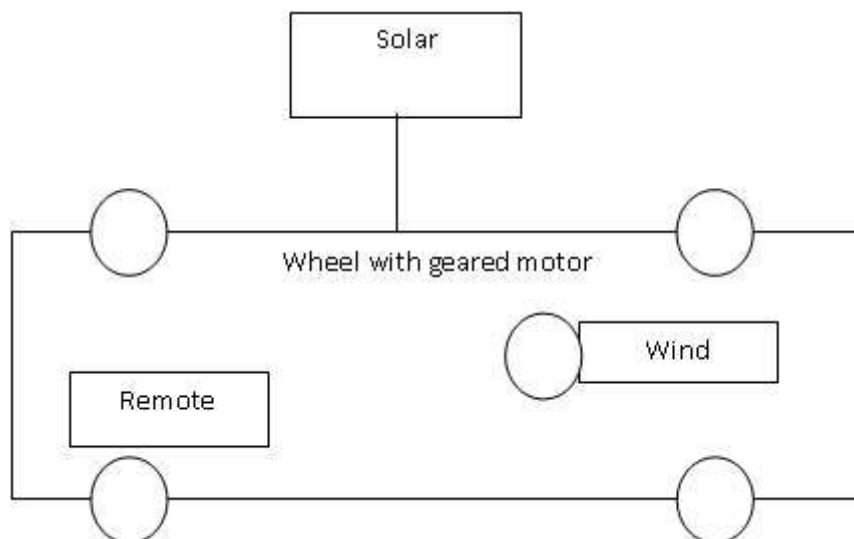
1. Photo voltaic diesel hybrid system.
2. Solar - wind hybrid system (PV-wind hybrid system).



*Block diagram of wind-solar hybrid car*



*Power generation by Shock Absorber*



*Line diagram of PV-wind hybrid car*

In this article, we discuss about PV-wind hybrid system. In this solar PV system and wind power generation are combined. Both differ in a day at different timings. Solar energy is available in day time and wind energy depends on the wind speed at different occasions. But we get power continuously to run the car or utilities.

In this combined system, fluctuation is very less when compared to separate system. The load is also more in the combined system.

The disadvantage is, it is difficult and installation is tedious, compared to normal design. It greatly depends on the nature and power generation varies to some extent.

The advantages are it is less costly, economical and no pollution at all. The developed countries like U.K, implemented a policy to go petrol less car by the year 2030. This research will greatly help our country to adopt this new technology as we are one of the major producers of automobiles and export to various countries.

When we use wind energy the average speed must be minimum 20 km in one hour (20 kmph).

### **III. Shock absorbers**

Generally the hybrid car gets power from both sources and runs efficiently. When we drive uneven roads, we can get power using shock absorbers also. Shock absorbers are provided as a part of the suspension system of motor vehicles. If we drive uneven roads, they will continue to vibrate for some time even after the bump has passed, when the vehicle wheel strikes a bump, the spring is compressed enough and only a vertical upward motion is transferred to the frame. When the wheel comes down from the bump, the spring expands very rapidly, to control this vibration; the shock absorber is used in the suspension system. When the wheel falls over a hole, the spring expands and is unable to take the full vehicle load. The shocks absorber takes a part of this load.

It is the difficult to predict and control the output of the wind generation, So the potential impacts on the electric grid varies. It is essential to manage the uncertainty, and an approach is needed to make wind power, a more reliable source. The wind power generation system becomes reliable when we combine with other energy store system to avoid fluctuation of wind power. The wind generation is depending upon the geographical condition and location. The wind speed is high in hilly areas and can produce more energy and these energies stored in batteries.

The hybrid energy system consists of two or more energy sources, a power conditioning equipment, a controller and energy storage system that is battery. The hybrid car utilizes wind and solar energy and power generated by shock absorber to move. The power is generated by these sources and is stored in the battery and the battery supplies electric power to the DC motor. The DC motor is responsible for rotation of the wheels.

### **IV. Components used:**

#### **4.1. Photovoltaic solar cell**

To use solar energy we use photo-voltaic solar cell. Photo voltaic energy is the energy obtained from Sun by conversion of electromagnetic energy into electric energy in a PV Cell. These cells convert sunlight directly into DC power. In general, silicon is used as semiconductor material.

#### **4.2. Basic principle of wind energy source**

Wind power is used to produce electric power with the help of multi blade turbine alternator combinations. It is the cheapest of all energies. But it requires high wind for a longer period in the same direction. It consists of stand, turbine, generator assembly, gear box, control system and yawing system. Turbines have generally three blades. The blades convert wind energy into mechanical energy. This mechanical energy is converted into electrical energy by means of generator. The blades are made of low weight and have high modules of elasticity. Yawing is done for keeping nacelle (metal box) to face the wind direction. The various advantages of Wind energy sources are: the initial and running costs are very low, Wind power is free from pollution, It is quick and easy to control

### **V. Advantages & Disadvantages of Hybrid Car**

#### **5.1. Advantages**

- Operating costs are low
- Saving costs (Purchasing electricity and fuel)
- It is pollution free and completely clean
- Wind and solar are freely available

- It generates electricity without polluting the environment
- It does not require more skilled operator

## 5.2. Disadvantages

- It is purely dependent on weather conditions
- Space required for installation
- Initial cost is high
- It must be maintained carefully
- Solar PV modules require more care

## VI. Mechanical Modelling:



## VII. Conclusion

Renewable energy is an indigenous resource available in considerable quantities to India. It is having a significant local, regional or national economic impact. The use of renewable energy could help to conserve foreign exchange and generate local employment if these technologies are designed, manufactured, assembled and installed locally. Nowadays the costs of transmitting electrical power or transporting conventional fuels are high. Renewable energy is cheap and best and can be produced as per our needs.

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## About the author:



Dr.S. Elangovan has 18 years of experience in Academic, Research and Administration in various premier engineering institutions. He received his Ph.D. degree under the faculty of electrical engineering. His research area includes power quality enhancement, Power electronics application to power system, multilevel inverter, converter topologies etc. He has published three engineering text books. He also published his research findings in six international journals, six international conferences and seven national conferences. With his experience, he has established several state-of-the-art laboratories. He is a recipient of Best Teacher award from Akshaya Institute of Management

Studies in 2013. He has received certificate from University of Dale Carnegie for attaining “High impact teaching skills” for the various pedagogical teaching learning process followed by him. WIPRO had selected him as a master trainer for their project Mission 10x. Dr. Elangovan, as an active volunteer of IEEE Madras Section had initiated the networking among the student members and professional members and had organized 100+ events/activities. He has served as the Secretary, IEEE MAS WIE (2008) and Vice Chair, IEEE MAS GOLD (2009 to 2014), Vice Chair, IEEE MAS GINI (2008-2010), Chair, IEEE MAS SAC (2014-2015), Chair, IEEE MAS YP AG (2014-2016) and Chair, SB Revamping Committee (2016-2017), Chair, IEEE MAS Student Project Funding (2016). Chair, IEEE MAS SB Revamping Committee (2016). He had also successfully organized the IEEE Madras Section Nagercoil Hub Congress (2015), Coimbatore Hub Congress (2016) and IEEE GeniOS’15, an Online Symposium in which over 1000 participated across the globe.