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Solar and Wind Powered Electric Vehicle

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ABSTRACT

This paper proposes a Hybrid Electric Vehicle (HEV) system which solves the major problems of fuel and pollution. The renewable energy is vital for today's world as in near future the non renewable sources that we are using are going to get exhausted.Wind power is clean and sustainable natural resources that has yet to be fully utilized in the automotive industry.Also the sun is probably the most important source of renewable energy available today. The hybrid system has been designed and installed to generate power which combines wind turbine and solar panel. The hybrid model system is renewable energy system, which helps conserve energy by reducing the use of fuel in vehicle. Hence developing a new method for the economical evaluation of Hybrid Systems for electricity production.The hybrid electric vehicle is a step in saving these non renewable sources of energy. The basic principle of solar vehicle is to use energy that is stored in a battery during and after charging it from a solar panel. Power generated by renewable energy sources has recently become one of the most promising solutions for the electrification of islands and remote rural areas. But high dependency on weather conditions and the unpredictable nature of these renewable energy sources are the main drawbacks. To overcome this weakness,Solar Energy combined with wind energy. The charged batteries are used to drive the motor which serves here as an engine and moves the vehicle in reverse or forward direction. This idea, in future, may help to protect our fuels from getting extinguished

KEYWORDS: *Hybrid Electric Vehicle, Solar Energy , Renewable energy , Wind energy , Hybrid Systems*

1. INTRODUCTION

This paper discusses about the usage of solar energy and wind energy to power up the vehicle. In order to achieve the required voltage, the Photo Voltaic (PV) Module may be connected either in parallel or series, but its costlier. Thus to make it cost effective, power converters and batteries are been used. The electrical charge is consolidated from the PV panel and wind turbine and directed to the output terminals to produce low voltage (Direct Current). An electric vehicle is pollution free and is efficient at low speed conditions mainly in high traffic areas. But battery charging is time consuming. The charge controllers direct this power acquired from the solar panel and wind turbines to the batteries. According to the state of the battery, the charging is done, so as to avoid overcharging and deep discharge. The voltage is then boosted up using the boost power converter, ultimately running the BLDC motor which is used as the drive motor for our vehicle application. In the course work, the characteristic features of the components: solar panel, wind turbine, charge controller, battery, interleaved converter, arduino processor and BLDC motor required for the vehicle application were studied in real time and also

were modelled individually and the complete hardware integration of the system into meet up the application's requirement..

2. ALTERNATE ENERGY

Due to scarcity of fossil fuel in future and its detrimental effect on the environment, an alternative energy has to be discovered

A. Reducing Carbon Dioxide Emissions

The most effective way to reduce carbon dioxide (CO2) emissions is to reduce fossil fuel consumption. Many strategies for reducing CO2 emissions from energy are crosscutting and apply to homes, businesses, industry, and transportation.

B. Importance of Renewable energy

Generating electricity from renewable energy rather than fossil fuels offers significant public health benefits. The air and water pollution emitted by coal and natural gas plants is linked to breathing problems, neurological damage, heart attacks, and cancer.

C.Solar Energy

Solar energy is radiant light and heat from the Sun harnessed using a range of ever-evolving technologies such as solar heating, photovoltaics, solar thermal energy, solar architecture and artificial photosynthesis. The large magnitude of solar energy available makes it a highly appealing source of electricity.

D.Wind Energy

Wind power is the use of air flow through wind turbines to mechanically power generators for electricity. Wind power, as an alternative to burning fossil fuels, is plentiful, renewable, widely distributed, clean, produces no greenhouse gas emissions during operation, and uses little land.

3. FIELD OF INVENTION

The fixed wind powered electricity generation systems in use, till now are dependent on wind direction and the force of the wind. But the wind is not available at all places and all time throughout the year. Therefore, there exists an immense need of a system for generating electricity from wind induced by moving vehicles which is available throughout the year at various places and with sufficient force of wind. Also solar powered electric vehicle is there but need to install it as an auxiliary fuel for fuel vehicle. Therefore need of inventing a hybrid renewable energy source as an auxiliary source for fuel vehicle. Therefore this invention provides a solution to the problem for generating electricity in this manner.

4. COMPONENTS OF PROPOSED SYSTEM

A. Motor

Motor and its Controller are the two most critical components for HSV. As the selected motor must be able to produce enough torque and power to pull the load. Three types of motors: AC motor, DC motor and Brushless DC motor were taken into consideration. According to calculations and references we concluded by choosing 1.3hp, 48V BLDC motor.

B. Motor controller

A motor controller is a component which is used to start and stop the motor also which is used control and varying the speed of the motor drive. The direction of motor rotation also possible to change using this controller during vehicle reverses movement/drive. 2.4 Braking system Braking system is a key feature in any vehicle. Two types of braking system namely disc brake and drum brake. In this work disc brake is mounted on the chassis for considering the safety precautions.

C. Battery

Three types of battery namely lead acid battery, Nickel metal hydride battery and Li-ion battery were examined. Li-ion battery is widely used in the application of hybrid vehicle. In this work Li-ion batteries each of 34 Ah are preferred to store the energy and which is used to drive the motor. Li-ion batteries of 20Amps are used as they will last for about 800 full charge cycles before any replacement required.

D. Solar panel

According to the design calculation and torque requirements, 200 watts solar panel has been selected in this work. Four panels of 50 watts capacity each were used. All the materials were effectively utilised to avoid energy losses.

E. Wind Energy

Wind Powered vehicles are subject to relatively low forward resistance and are thus capable of speeds exceeding the winds. Some rotor-powered examples have demonstrated ground speeds over double that of the wind – both directly into and directly

downwind the wind – by transferring power between the rotor.

F. Solar charge controller

Solar charge controller controls the voltage received from the panel to the battery. It is generally used to convert non-linear energy form into linear energy form. It is used to prevent the short circuiting of the components.

G. Wind charge controller

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5. METHODOLOGY

This paper deals with how energy can be stored by moving or standstill vehicle which has a fuel kit using wind and solar energy.

Battery Electric vehicle consist of an electric motor which is powered by battery connected to it. Electric motor is used for the movement in this type of vehicle. It does not produce emission. In traffic, BEV delivers high torque to the wheels and smoother acceleration than Internal combustion engine. It is noiseless while operating motor. But on other side there are some disadvantages like, high production cost, limited top speed, more recharge time required.

Battery is mounted on back side which acts as a energy storing device. The fan are mounted on the front side of the vehicle.Motor is attached at backside of fan. Truncted cone is installed infront of fan to increase the efficiency of fan. Solar panel is mounted on the upper side of battery.The figure1 details about the proposed hybrid system for the solar and wind power.

This hybrid system utilizes both solar and wind power for power generation and alternately have a control of the energy supplied to battery with the help of converters. This system helps to maintain a stable and reliable power supply with desired rating to charge the battery and power the load. Maximum power tracking is done with the help of perturb and observe method for both solar and wind power source. Two branches which are connected in parallel to supply to load and to battery. Both the power sources are controlled by MPPT and voltage source converters. In solar, the MPPT is achieved by varying the controller and regulating the converters. The solar irradiance is efficient under standard conditions of temperature 25°C and irradiance of 600W//m2-1000W/m.. The wind energy system has a generator and a turbine for converting the mechanical power to electrical energy. This system includes a variable speed wind turbine and a permanent magnet synchronous generator.

Maximum speed is obtained under maximum rotor speed by the MPP. For a supervisory control system, to set the dc and to maintain the power sources and storage system. The control system charges and discharges the battery in accordance with setting the voltage at specified range.

When one of the sources is voltage controlled other will be current source.The paper focus in development and design of a hybrid system utilizing the solar and wind energy sources with the help of a microcontroller. This model is mainly adopted for domestic purposeapplications. Photovoltaic cells help to convert the solar energy into electrical energy or heat energy. This system is mainly of two types one is line dependent and line independent.

The line dependent system is not in need of batteries for storing energy. It directly supplies the energy to the demand with the help of an inverter. This line system is also used at times of low sun beam. The line independent system, as the absence of line electricity batteries or accumulators are required for supplying energy at times of demand. The dc output needs to be converted to ac for supplying to electrical appliances. The wind energy is based on the capacity for producing power.

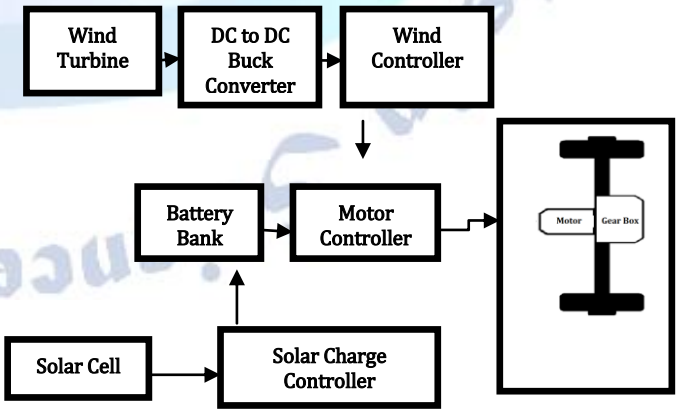

Fig1. Proposed Topology of Solar and Wind Powered Electric Vehicle

Advantages

This concept of hybrid system is useful as it has two power sources for vehicle. When there is insufficient

fuel and battery has a sufficient charge then vehicle will operate on battery and vice versa.

It helps to reduce the use of fuel which is more profitable for future. Also it will help in reducing pollution as there is less consumption of petrol.

Disadvantages

While operating on battery vehicle will not run at samespeed as it drive with the fuel powered system.Also the time required to charge the battery by solar and wind energy will be little more.

6. CONCLUSION

After making the final completion of project it is found that project is in working condition.It is found that prototype captured the solar energy through solar panel and wind energy through fan induced on it.There are huge potential for producing electricity from renewable sources. This paper gives a clear idea that vehicle powered with the help of solar energy and wind energy is more effective than fuel vehicle.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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