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IMPLEMENTATION OF HYBRID TECHNOLOGY IN ELECTRIC CARS USING WIND AND SOLAR AS ENERGY SOURCES

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Abstract: The conventional electric car finds the difficulty of charging it after few kilometers but the wind and solar powered car helps to eliminate this drawback as this car has the facility to be charged on board due to wind and solar energy. Taking into account air resistance, the design of the car is such that maximum aspects are taken into consideration. The sun and the wind energy are utilized to charge battery and generate the energy to run the car smoothly. Super capacitor helps for ripple free torque during motion. The wind and solar powered car has high efficiency and is a maintenance free car. The car works on the concept of charging and discharging of the battery on board. When the car runs, the motor consumes power from battery and after certain kilometers it needs to be recharged. In this car power is generated from wind turbines and the solar plates and are directed to the battery for the charging. The battery is recharged on board and the car doesn't need to be standby for charging.

Keywords: *Hybrid technology, PV modules, GFPD(Ground-Fault Protection Device), Carborator fan, Sensor, Dynamo or Generator.*

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I INTRODUCTION

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

The main object of the present invention is to provide a method and a system for generating electricity using easily available wind induced by moving vehicles and solar energy in transit or in operation. The other objective is to provide a solution for reducing pollution created by fuel vehicle by use of freely available renewable energy source i.e. solar and wind energy.

Here the hybrid car is specially designed so that the energy limitation can be easily overcome by using the hybrid technology.

As the battery running are beneficial for the society and more often this type of technology is fruitful for the environment. so to overcome the energy limitation we have installed wind with solar energy and that is called the regeneration of

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.SOLAR ENERGY

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

C.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.

II SYSTEM DESIGN AND COMPONENTS

The basic theory of the Solar Charging Station is to harvest the solar energy and convert it to AC electricity that can be used to charge electric bikes and electric motorcycles. The Solar Charging Stations utilize solar PV modules to convert solar energy to DC voltage. The DC energy can be stored to a battery bank by charge controller. An inverter is employed to convert the DC voltage from the battery bank to 110 volt AC at 60 Hz frequency for charging the electric vehicles. Two separate charging stations are built in order to efficiently monitor the system performance separately.

The following sections describe the functions, specifications of each component and the design considerations.

I. PV modules

Three 265 watts modules are used. The total maximum power output is 795 watts. It is known that the output voltage of a PV module is influenced by the ambient temperature. The range of the voltage output due to the extreme temperature should be within the specification of the charge controller. The temperature data from ASHRAE handbook is normally used along with open-circuit voltage (Voc) and the temperature coefficient of Voc (TCVoc) to calculate the range of the output voltage from the PV module.

a) The range of DC output voltage from PV modules:

From the electrical specifications of SolarWorld Sunmodule Plus SW 265 mono at STC (Standard Test Conditions):

Open-circuit voltage Voc = 39.0 V

Temperature coefficient of Voc = – 0.30% / ºC

The low temperature history at Hill AFB, Ogden [2]: ASHRAE Extreme Annual Mean Minimum Design Dry Bulb Temperature = – 16 ºC

Tmin = – 16 ºC – 25 ºC = – 41 ºC

V1 = Voc x { 1 + [(– 41 ºC) x (– 0.30% / ºC)]}

= 39 x 1.1312 = 43.8 V

There are three PV modules in series per string, therefore the maximum output voltage from PV modules after temperature correction will be 131.4 V that is within the input voltage specification of MidNite Solar's The KID charge controller.

3 modules in series Æ Vmax = 43.8 x 3 = 131.4 V

(b) The maximum output current from PV modules

Short-circuit current Isc = 9.31A

Temperature coefficient of Isc = 0.04 % / ºC

ASHRAE 2% High Temperature = 34 ºC

Tmax = 34 ºC – 25 ºC = 9 ºC

Imax = I1 = Isc x { 1 + [9 ºC) x (0.04% / ºC)]} = 9.31 A x 1.0036 = 9.34 A

2. Ground-Fault Protection Device (GFPD)

For the electrical industry, ground fault is the undesirable condition of current flowing through the grounding conductor. The cause of this undesirable current flow is an unintentional electrical connection between a current-carrying conductor in the PV system and the equipment grounding conductor (EGC) [3]. NEC Article 690.5 specifies the ground-fault protection requirements for grounded DC photovoltaic arrays. Ground fault protection is also required for ungrounded PV systems; these requirements are detailed in 690.35(C). The specified purpose of a ground-fault protection device (GFPD) as part of a PV power system is to reduce the risk of fire associated with a ground fault. The ground fault is a kind of shorted circuit, the fault current can be very high that could create a significant fire hazard as bare metal is heated by the current flow. In addition, the ground fault causes a safety hazard [3]. The ground fault protection device (GFPD) is connected between grounded conductor and system ground. If the current flows through GFPD is larger than the rated current (for example, 1 amp), the protection device will trip and disconnect the DC ungrounded conductor, i.e. the wire between PV positive and charge controller that is connected through the GFPD. As shown in Figure 2, the GFPD is protecting the ungrounded conductor between DC disconnect and charge controller.

3. DC disconnect and AC disconnect

DC disconnect is used as PV power source disconnect to comply disconnecting means required by NEC 2011, Sections 690.13, 690.14(c), and 690.15 [4]. DC electricity

has continuous energy than the cyclic AC electricity and is therefore harder to cut of the running current in the conductor. A specialized DC rated disconnect is required for the DC side of PV system. I our system, Square D HU361RB, 3P, 600VDC, 30A disconnect is used as the DC disconnect. NEC 2011, Sections 690.13 indicates: PV power source disconnect, specifically referring to DC power portion of the system. In our system, the DC disconnect works as the PV power source disconnect. NEC 2011, Sections 690.14(c) requires PV system disconnect so that the system can be safely and easily shutdown and disconnected from building wiring. The AC disconnect in Figure 2 is utilized as the PV system disconnect. NEC 2011, Sections 690.15 also requires PV equipment disconnect so that all sources of power can be disconnected to service or remove individual components in the system. For inverter, the DC disconnect and the AC disconnect in our system work as the PV equipment disconnect.

4. DC overcurrent protection

DC circuit breakers are used to protect the wires from overcurrent. On the PV power source side, the circuit breaker with rating of 30A @ 150V DC is used. For the circuit between battery bank and inverter, a 200A @ 12V DC circuit breaker is installed.

5. Charge controller

The charge controller receives and regulates the input voltage from PV power source and stores the energy by charging the battery bank.

6. Battery bank

Four 12-volt Deka 8A27 valve-regulated AGM deep cycle solar battery are connected in parallel as the battery bank. Each battery has the capacity of 92 Ah (Amp-hour). This battery bank provides 4,416 watt-hour of energy storage.

7. Inverter

The Xantrex PROWatt SW2000 inverter is rated 2,000 W output power. It takes 12 V DC electricity from the battery bank and converts it to true sinusoidal 120 VAC, 60 Hz electricity.

8. Equipment Ground

Non-current-carrying conductive materials such as the metal enclosure or case of all the components of the PV system need to be properly grounded (connected to earth) to reduce the risk of electric shock.

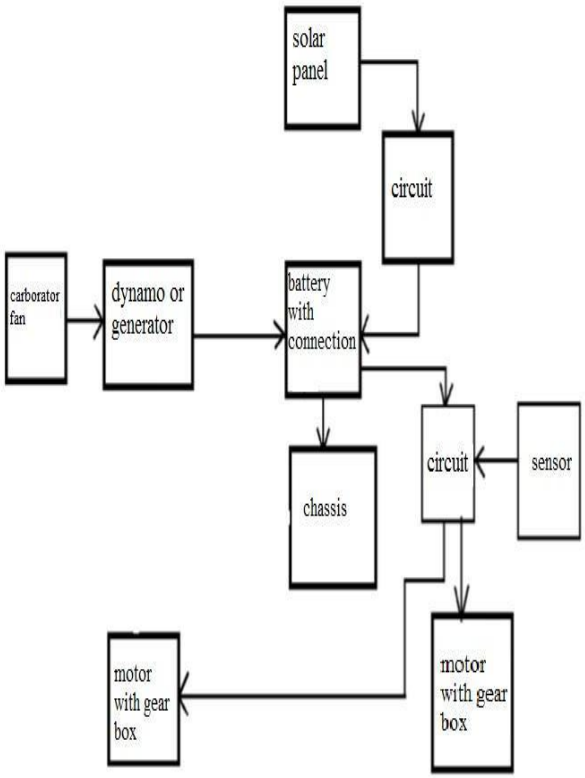
9. Electric Outlet

The electric outlet provides the receptacles for the charger of electric bikes. It is the only device installed outdoor. So it needs to be an outdoor electric outlet.

10. Safety Practices

The PV system can generate a high DC and AC voltage during the operation. Proper personal protection equipment (PPE) such as helmet, safety goggles, electric gloves, and footwear, etc. should be used when the system is energized. Students will learn the importance of safety practices and operate in a safe condition.

III BLOCK DIAGRAM



IV HYBRID CARS

V WORKING

Here first of all the vehicle that is presently running on battery say for ola electric vehicle can be modified by installing various new circuits.

The solar panel will charge the battery on the day time. The circuit attached to the battery will protect the battery from damages the sunlight intensity is more in the summer the solar panel passes more amount of voltage than required by the battery and this leads to the battery damage so for stabilizing the voltage the circuit will be installed between the solar and the battery.

As there is no one in the electric car we can install the carborator fan and the fan will be attached to the generator and the vehicle is in moving position even in the night time when the solar panel will not work the battery will be charged through the wind energy that is from the fan with dynamo attached and the battery will be charged.

Clips are attached so that the user can change power source for charging the battery from solar to wind when required. And in another part the sensor based circuit is also installed this circuit will connected to the motors of the vehicle in the night time or at that when the driver forgets to apply brake in the traffic portion or when driver fall asleep while driving in the night time this sensor circuit will continuously bypass the invisible rays and the rays will detect the in front object of the vehicle if suddenly in front objects say for any vehicle has applied brake and the driver forgets to apply brake this sensor will automatically will calculate the distance and the both objects comes closer then the sensor will pass command to the circuit and the brakes will be applied automatically.

This system can save lot of life even it can avoid accidents. For increasing the loading capacity of the motor the gear section that is the gear box is also installed that will increase the loading capacity of the motor without consuming more voltage and power from the battery.

VI METHODOLOGY

The methodology is the systematic analysis of solar and wind powered electric car,so hence the methodology can be divided into two parts as follows,

1. CONVERSION OF WIND ENERGY INTO ELECTRIC ENERGY
2. CONVERSION OF SOLAR ENERGY INTO ELECTRIC ENERGY

1. CONVERSION OF WIND ENERGY INTO ELECTRIC ENERGY :

In this prototype the wind capturing device is a fan. Fan is mounted on the front side of the chesis with the truncated cone in front of it. Fan will get rotated by the wind blown by the blower which will get directed toward the fan due to cone where in actual it will be the wind around the vehicle when vehicle is in running condition. Rotating fan will convert the captured kinetic energy of wind into mechanical energy .The centre shat motor which is connected to battery will convert this mechanical energy into electric energy which is going to stored in the battery.

2. CONVERSION OF SOLAR ENERGY INTO ELECTRIC ENERGY:

Solar panel is situated on the top of battery in the prototype. Where in actual vehicle it will be mounted on the upper body of chessis of four wheeler. While the vehicle in running position or stand still and have a sufficient solar energy the solar panel will trap that energy and due to the photovoltaic effect of solar panel, it will convert this solar energy into electric energy which will get stored into the battery.

VII ADVANTAGES, DISADVANTAGES & APPLICATIONS

ADVANTAGES:

- Zero Carbon emission.
- Accidents are avoided due to automatic braking.
- Use of brushed motor.
- Vehicle speed has been increased.
- Can run in the city as well as on highways.

DISADVANTAGES:

- They are employed in cities and also in villages for the tranportation.
- Limited vehicle speed
- Limited distance covered
- Takes more time to charge the battery.
- Only can be used in city.

APPLICATIONS:

- They are employed in cities and also in villages for the tranportation.
- They are employed in small scale and also in large scale industries for carrying products of industries.
- China has the largest number of hybrid electric cars.
- They are also employed in play grounds for the supply of beverages and water.

VIII CONCLUSION

To provide a method and a system for generating electricity using easily available wind induced by moving vehicles and solar energy in operation.The other objective is to provide a solution for reducing pollution created by fuel vehicle by use of freely available renewable energy source i.e. solar and wind energy. Solar and wind energy gives an alternative method to power an electric car. There are huge potential for producing electricity from renewable sources. This gives awareness of vehicle powered with the help of solar energy and wind energy is more effective than fuel vehicle.A Lot of studies revealed the supply of fossil fuels such as coal, natural gas and oil are limited.Researches have also identified the impacts of using fossil fuel energy on global climate change. The demand for energy is increasing as the world population grows and the economic growth in many developing countries as well as the developed countries. The energy crisis can be anticipated in the near futures. Alternative energy or renewable energy opposed to fossil fuels ought to be actively explored earlier rather than late. Renewable energy such as solar energy can provide a long term solution and minimize climate change.

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