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Self-Generating Electric Vehicle

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ABSTRACT: Electric vehicle technology is one of the rapidly developing technologies in the world. The main reason behind that is the scarcity of fossil fuels which leads to an increase in their cost and also due to their various harmful effects on the environment. World is now shifting towards a clean and environment-friendly source of transport i.e., EV's (Electric vehicles). But these EVs also have some problems, one of those is battery charging due to the lack of charging stations available and lack of electricity in some regions. This problem can be solved if EV's generate their own electricity. This paper suggests use of solar panels that generates electricity round the clock, to charge the battery in the still condition and use of small set of wind turbines installed in 4 corners of the EV are used to charge the batteries in running mode. Solar panels are installed on the roof and exterior body of the vehicle which are thermoradative panels. These systems will make the EV's Self-generating. This solar and wind-powered EVs can be called as hybrid EV's.

KEYWORDS: hybrid EV, Solar panels are installed on the roof, small set of wind turbines, Self-generating EV's, Thermoradative panels.

I. INTRODUCTION

Inspite of increased fuel cost, less maintenance and many more advantages, even today, peoples are not switching to electric vehicles due to problems in the charging system in the EVs. It can be charged through external ports only. That increases requirement of larger infrastructure of charging stations and larger backup for battery.

Use of hybrid renewable EV technology will provide multiple ways of charging. That improves reliability of power supply to the vehicle. Suggested technology uses renewable energy sources i.e., solar and winds through solar panels mounted on the exterior body and the roof of the EV, and 12 small wind turbines packed in the 4 sets each set consist of 3 small wind turbines. Each set is installed on the 4 corners of the EV. This combines charging technology will help to charge the battery in the running condition also. Thus, this will be self-sustained EV.

The fixed wind powered generation systems in use, so it generates electricity when the EV is in motion. But when the EV is not in motion the wind power system will not work. Therefore, there exists a solar power system which will generate the electricity when in the parking. Solar panels use the new technology i.e., antisolar panels which is able to generate electricity in both day and night time. Both the system will make the EV self-generating and the reason of having two generating system in one EV as these two systems will generate electricity in both the conditions of EV i.e., running and still. Ultimately increasing the range and also solving the problem of the charging.

The battery will not be handle these two systems, so the battery is divided into two sections i.e., battery 1 and battery 2. the solar and wind power system will charge the battery 2 and the battery 1 will be use the external source of charging or the battery 2 itself both the batteries will connected to the battery management system. The wind power system that is on the front will serve the purpose of cooling to the motor and the battery system.

II. RELATED WORK

Electric vehicles are one of the trending topics nowadays and the reasons behind that are simple, increasing pollution caused by the fuels and also their increasing cost. This majorly affects the transport sector which connects the world. So, the world needs another way of transport which has the low fuel cost and also the environment friendly. An electric vehicle or EV is the solution with both features. Due to increasing demand, many automobiles' companies are now investing in EVs. The government is also supporting EV's with new policies like FAME, Go electric campaign, National Electric Mobility Mission Plan, 2020. The economic times of India say that the Electric vehicle market in India is expected to hit 63 lakh units per annum mark by 2027. It shows that the EV is now the future of the automobile transport sector and hence the EVs are said to be the main part of another revolution.

Another trending topic is the use of renewable sources mainly solar energy for producing electricity. The concept of solar energy is not new converting the energy of the sun into electricity with the help of solar panels. Due to huge potential and increasing demand and also the fact that it is a renewable source of energy many industries have started investing in the solar energy sector. In terms of EVs Currently, some E-rickshaws run on solar energy with the help of solar panels on their roof for charging, and also some foreign companies are now coming up with their solar EVs which generate power in the daytime with the help of solar panels for charging while in parking.

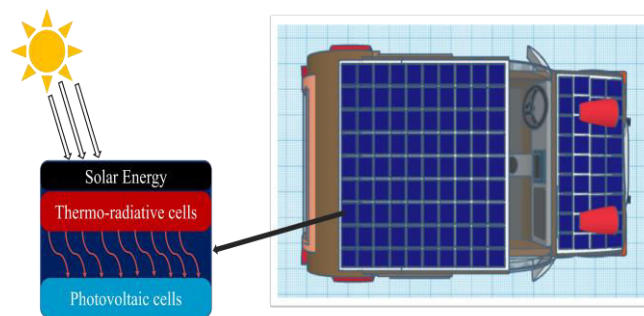
Wind energy is another renewable and clean source of energy available. We have seen the wind power plants which are used to produce the electricity from the wind through huge wind turbines. But the use of wind energy in EVs for charging is one of the new technologies that is implementing. Some of the foreign companies are now coming up with their wind-powered EVs which have huge wind turbines on the roof which used to produce electricity for the EVs while running, but the problem with that of increased weight, consume lots of space.

III. METHODOLOGY

A. Solar Generator:-

This hybrid EV uses solar energy through the roof and front side of the EV which is made of solar panels provided with cooling system. But the difference between solar energybased EV and suggested hybrid EV is that in addition, the solar PV,panel has thermal radiative cell that generates power by radiating heat to its surroundings. When pointed at the sky during night thermal radiative cell emits infrared light (heat) because it is warmer than outer space and generates electricity.

With the absorbed photons from the sun the photovoltaic cell generates electricity. A Thermo radiative cell generates electrical current as it radiates infrared light (heat) toward the extreme cold of deep space. Due to this it works in night time also and produce sufficient energy for charging i.e., 50% of day time.

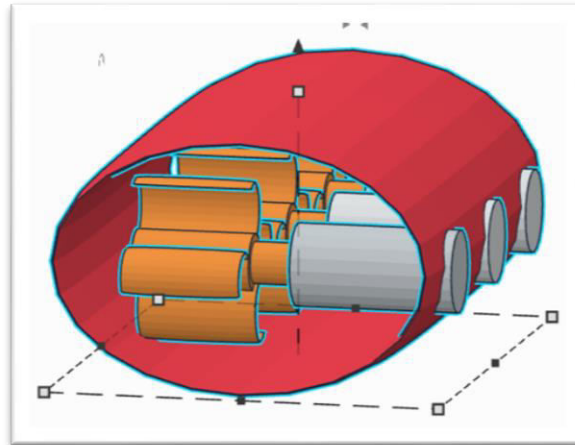


Arrangement of the solar panels on the EV

B. Use of wind Turbine:-

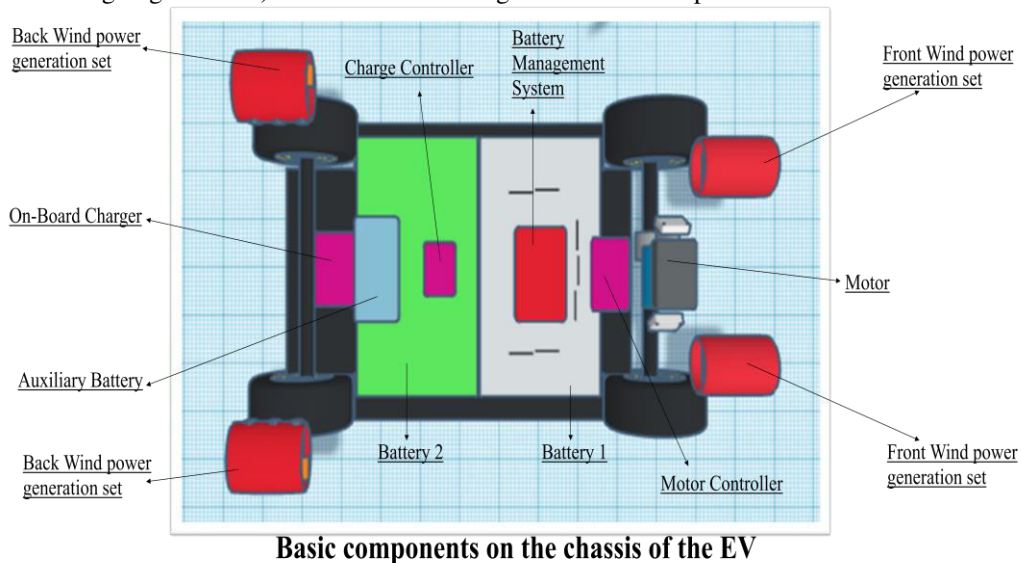
This hybrid EV Generates power through wind when in running mode this can be understood more clearly by the example like we have a small wind turbine connected with the generator in our hand and we start running as fast as possible so now while running we are cutting the airflow and same as with the wind turbine as we holding it in our hand. so, it will start to rotate and generate some amount of power, we can connect one LED also so that it will glow. Using the same principle in EV while running will cut the airflow and the connected wind turbines will produce power for the charging of the battery. This hybrid EV makes the use of 4 sets of wind power generation system installed on

the 4 corners of EV each set consist of 3 wind turbines and generator so total 12 wind turbines. These sets will supply power to the battery in a running mode according to the vehicle speed.



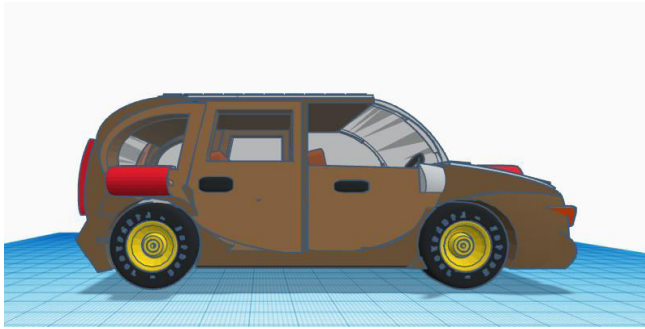
C. Working: -

This hybrid EV works on the simple mechanism that the EV is driven with the help of the motor supplied by the battery pack. When in parking, sunlight and the heat of light the anti-solar panels start their work of charging the EV through a controller. When EV is turned ON, battery starts supplying power to the motor via a motor controller. On the other hand, due to the airflow, the wind turbine on the corners of EV as indicates in the above figure will start rotating and the wind power set will start its work and supply power to the battery pack through a controller for charging. Thus, in running conditions wind energy be the major source of charging. Since both the system of solar and wind are working in the running mode run of EV the range will increase. But the amount of Extra range that the EV will give depends upon the running time of the EV and certain weather conditions. When the battery pack is fully charged the excess energy will be given to the auxiliary battery in the EV which is used to control the lighting and other auxiliary systems. This can be understood more clearly with the help of a 3D view of hybrid renewable EV made on the tinker-cad software (online designing software) and a connection diagram made on the proteus software.

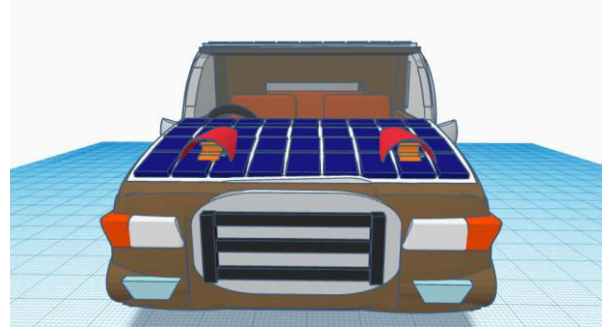


D. 3D view in Tinker-cad

Above are some Images of the Self –Generating EV designed with the help of Tinker-Cad 3D Modeling online software.



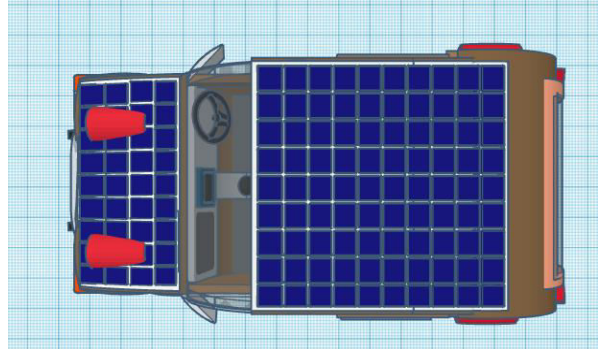
Side View



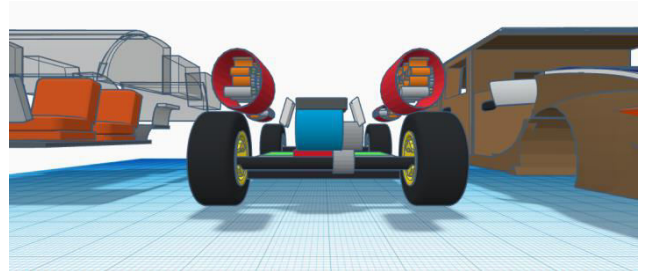
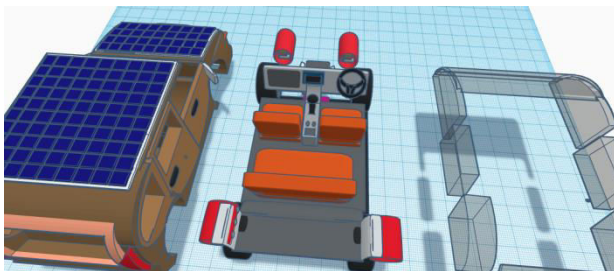
Front view



Back View



Top View



Separate Section View of interior body and outer body with front Chassis View

IV. EXPERIMENTAL RESULTS

Assumed Data for the Electric Vehicle:-

All the above data is being calculated by the reference of the present electric vehicle standards with features of the self-generating EV. The calculation is being made by the assumptions of the outputs of solar power and the wind power.

❖ **Performance:-**

- 1) Expected theoretical Range: - 500-600 km
- 2) Total power: - 105 kW (141 hp, 143 Ps)

❖ **Motor specifications**

1. Motor used: - PMSM (permanent magnet synchronous motor)

- 3) Total torque: - 353 Nm
- 4) Drive: - front

❖ **Battery**

1. Battery used: - lithium-ion battery
2. Voltage of single battery: - 24 V
3. Am-hour: - 72 Ah
4. No. of Battery used: -2
5. Each battery capacity: - 20.4 kWh
6. Total Battery Capacity: - 40.8 kWh

❖ **Charging system:-**

1. Normal Charging port: - 2
 - i. From normal household wall plug – 230V / 16A – charging time: - 13 hours
 - ii. from fast charging system at charging station - 50 kW DC – charging time: - 42 minutes
3. Wind charging system
 - i. Radius: - 12cm
 - ii. Diameter: - 24cm
 - iii. No. of Blades:- 3
 - iv. Wind speed: - 50 km/h or 60 km/h (normal speed limit in maharashtra)
 - v. Efficiency factor: - 80 to 90%
 - vi. Power of single wind turbine: - 50w to 100w (for 80% efficiency) , 70 w to 114 w (for 90% efficiency)
 - vii. Number of small wind generation set: - 12 (grouped in set of 3 so total 4 sets)
 - viii. Total generating power: - 1.2 kw to 1.4kw

2. Voltage: - 580 V
3. Current: - 130 A
4. Torque: - 353 Nm

❖ **Amount of range getting in 1 hour**

- 1) Solar: - 14 km
- 2) Wind: - 11.2 km to 13.17 km
- 3) 1- phase (3.7 kW) 230V / 16A: - 34.8 km
- 4) 3-phase(22kW) 230V / 29A Public charging: - 62 km
- 5) (50kW DC) Fast charging: - Expected range of 500-600 km

2. Solar charging system

- i. The solar panels of 1.5 kW (location: - Roof and front side)
- ii. Full charging time: - 21 hours
- iii. Add range while charging in running condition depend on the running time of the vehicle. For e.g., on general drive of 1 hour while add on range of 14 km.

❖ **Theoretical Dimensions and weight**

1. Length: - 4314 mm
2. Width with mirror: - 2048 mm
3. Height: -1620 mm
4. Curb weight (means without passengers and cargo): - 1600 kg
5. Payload: - 460 kg
6. Gross weight: - 2060 kg

V. CONCLUSION

We have implemented an Renewable energy technology in the Electric vehicle to make it self-generating EV. our simulation works properly and shows the use of solar energy and wind energy in our EV. The huge potential of producing electricity from renewable sources can be used in EVs. This paper gives a clear idea that the vehicle powered by solar energy and wind energy is more effective than fuel vehicles.

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