



Solar E-Vehicles

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ABSTRACT

The demand and availability of energy is growing day by day in the whole world. Renewable energy resources will play an important role in the future as the conventional energy sources like coal and petroleum are limited and declining. In the present situation, energy crisis is an important very critical problem hence necessary to address. Basically, it is to verify the availability to increase the generation or to install additional generators. Alternatively, load management known as demand side management (DSM) strategy must be adopted. In the current scenario, the uses of fossil fuel for the domestic transport are rapidly increasing and indicate the threat in the near future. The adverse effects of the practice of such vehicles and means leads to the environment pollution and health issues related to the living habitats. In line with this the upcoming mode of transport is E-vehicles keeping concerned about the environment pollution. The drawback of this mode of transport is the use of electric energy for the propulsion and going to create additional burden on the existing power system setup and infrastructure. But the use of power electronics and controls in Electric vehicles (EVs) along with latest technologies is fostering and supporting the green transportation systems. E-Vehicle charger is the role player in reducing the dependence on fossil fuels and is the natural evolution of our energy infrastructure significantly. Consumer incentives are also important to make the purchase of an electric vehicle and home fast-charging station more affordable and attractive. To address this issue most of the developed countries have taken up an initiative to extract solar photovoltaic conversion systems to store and transfer to the grid. The present rate of use of E-vehicles is 70% compared to the earlier decade. From the perspective of solar energy basically, it is extracted as either heat or light energy. But the storage system is the bottle neck issue in this regard due to technical, economic barriers and challenges. The power electronics interfaces male E-vehicle battery to get charged from the grid if there is no source solar energy known as grid to vehicle (G2V). The other mode is to transfer the stored energy from the storage battery to grid (V2G) as and when grid finds the deficit of energy to meet its loads. Then the solar PV systems installed on the roof top of the vehicle generate the electricity and is used for their operation by the battery support. Therefore, the E-vehicles fitted with solar PV panels can even transfer electricity to the grid (V2G). Hence, the suitable design and implementation can prove the solar photovoltaic source as a promising source for such E vehicle application in the very near future. This creates an opportunity to the engineers and enterprises.

Keywords: *E-vehicles, solar energy*

INTRODUCTION

The main objectives of the concept “Solarenergy E-vehicles” environment. The conventional vehicles and potential for the use of alternative technologies in automobiles such as electric/hybrid vehicles need to be worked out or develop a plug-in hybrid electric vehicle by converting available conventional vehicle with a suitable motor and battery. It is also necessary to know why E-vehicle couldn't get enough consumer attraction. Need for E-vehicles marketing and production can be done and problems can be solved by applying suitable engineering solution techniques considering consumer requirements and cost constraints. Consumers should be aware of the CO₂ emissions caused by fossil fuel-based vehicles and the initiatives taken by government for promoting E-vehicles by giving subsidies. Electrical energy demand is increasing at an exponential rate which is very important for all the aspects of modern life. The exponential growth of the world population witnesses the same. Therefore, energy sources will play an important role. Present practices in this regard are having potential and priorities which attempt to reduce greenhouse gas emissions, improvement in the energy efficiency of domestic, offices and industries, energy marketing, energy management, energy conservation and energy security. These also try to find the practical and affordable alternate sources of energy, developing cleaner and more efficient transportation vehicles and systems, energy policy and energy strategy. Excessive extraction of fossil fuels or depletion and environmental degradation are the major issues that the current world is facing. To overcome these problems, recently renewable energy has been receiving increasing attention due to its environmental benefits. Competition of renewable fuels to the fossil fuels is important in the near future. The first

law of thermodynamics, also known as the law of conservation of energy, states that energy can neither be created nor destroyed it can only be changed from one form to another. Solar energy is the energy from the sun one who is the huge source of energy in the form of heat and light resulting from nuclear fusion at its core. The nuclear reaction releases energy that travels outward to the surface of the sun. The earth absorbs about 3,850,000 exajoules of solar energy every year and primary energy out of that is light energy. Among heat and light few of the systems utilize the heat energy for heating and rest others convert or transform the light into electrical energy. In the present situation energy crisis is an important very critical problem hence necessary to address. Basically, it is to verify the availability to increase the generation or to install additional generators. Alternatively, a systematic demand side management schemes such as demand control and shift or curtailment (DSM) methods must be adopted. In the current scenario the uses of fossil fuel for the domestic transport is rapidly increasing and indicate the threat in the near future. The adverse effects of the practice of such vehicles and means leads to the environment pollution and health issues related to the living habitats. In line with this the upcoming mode of transport is E-vehicles keeping concerned about the environment. The drawback of this mode of transport is the use

of electric energy for the propulsion and going to create additional burden on the existing power system setup and infrastructure. The advent of power electronics made the E-vehicle (EVs) application wise and green among the other transportation systems.

Depending upon the below Literature Survey of different papers we have decided to move forward to take this project in practical means. For this purpose we have aimed to construct a solar electric vehicle. To save renewable energy ex petrol or diesel.

LITERATURE REVIEW

Electric vehicles are increasingly seen as a means of reducing carbon emissions for transport operations. The first mass produced fully electric vehicle was the Nissan Leaf. The number of Leafs sold passed 50,000 on the 14th February 2013 and the total mileage covered by Leafs has exceeded 161 million miles (260 million km).

- The sales of battery electric vehicles such as the Leaf are exceeding those of the Toyota Prius, the first mass produced hybrid vehicle, at an equivalent stage of its market life.
- Vehicle to Grid technology, allowing electric vehicles to act as a power source, is seen as a major selling point for electric vehicle technology. The use of vehicle batteries in this way means that during overnight charging the vehicles can be used as localized buffers to smooth the load on the power supply grid.
- A further advantage offered by battery electric vehicles is the removal of emissions from the point of operations, offering improved air quality in congested cities.
- Most of the vehicles are running on the gasoline fuels. These vehicles exhaust hazardous gases. This increases the environmental pollution in the world. In recent years to reduce the pollution researchers have given the solution of EV's or hybrid vehicles and many countries adopted this as one of the best solutions to reduce pollution. The popularity is due to battery and silent operation. The present challenge is the optimization of best battery and charging.

E-VEHICLES AND WORKING

The block diagrams of proposed E-vehicle having solar charging and facility to interface with local grid for the charging and discharging is presented in the following section.

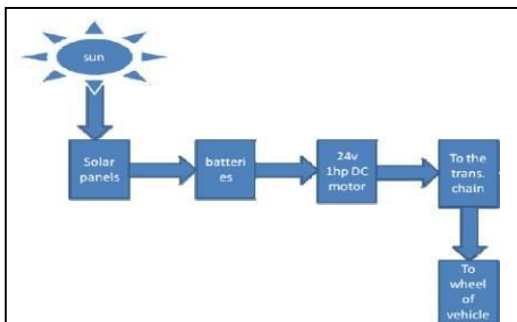


Figure 3: Block diagram solar E-vehicle.

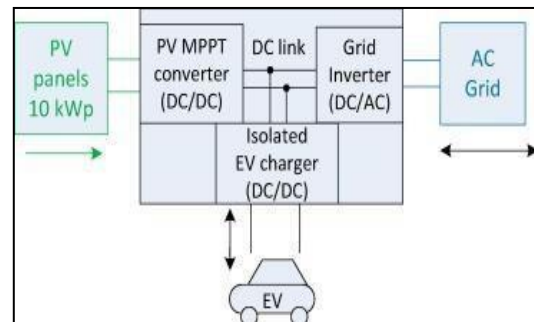


Figure 4: Functional block diagram.

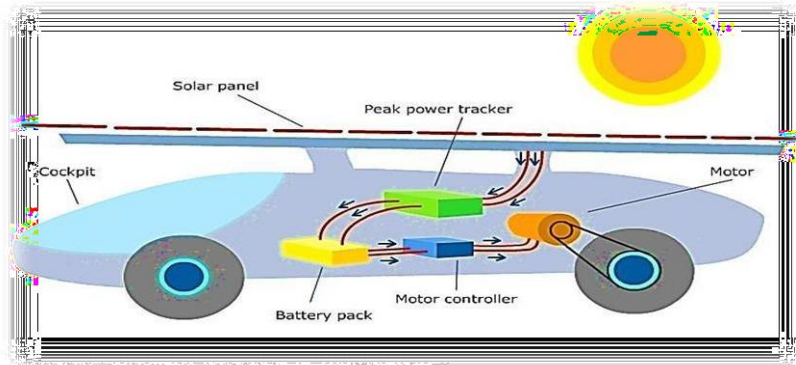
Fig. 3 shows a general diagram of an E-vehicle having a solar charging option. Due to the unavailability of sun during night hours of a day it demands large storage battery as per the capacity of the vehicle. The modification on the said model is to provide a charging option not only from solar but also from the electric grid as shown in Fig. 4. Sun is the secondary source of energy for the vehicle. Energy from the sun is collected by the solar panels and is stored into the batteries. For a sample case study, a vehicle utilizes a 24V DC series motor and a storage battery. The rear wheel of the vehicle is connected to the motor through a chain sprocket. Before the study of the model the battery is assumed to be fully charged and during the transit of the vehicle the charging is done. It is very important for the batteries to charge and discharge to keep their life cycle good. Solar-powered vehicles utilize various components, and a list of components is shown in Table 1 for a solar-powered four-wheeler.

Table 1: List of components used for four-wheeler.

| Components used | Range | Quantity |
|---------------------------------------|-------------------------------------------------|-----------|
| Batteries (heavy inverter batteries) | 24V 190Ah | 2*12V |
| Solar module | 140Wp(Watt Peak) | 1 |
| Connecting Cables | Motor connection:-25Sq.m m high voltage cables. | 10 meters |
| | Solar module to charge controller unit:-1Sq.mm | 1 meter |
| | Charge controller to battery unit:-2Sq.mm | 1 meter |
| Motor | High torque DC motor 1Hp=746W | 1 |

WORKING PRINCIPLE

The electronic charge controller and the solar panel help to charge and control the energy in the battery for the vehicles operation with suitable protection of depth of discharge and over charge etc. A 140 Wp solar module is used with output ranging from 24V to 25V DC at standard test conditions (STC) is present in the sample case example. The batteries are initially fully charged before the usage of vehicle. The solar panel installed charge after converting light into electricity. The features incorporated keep the condition of the set up good as the availability of solar insolation matters the most as per the geographical position of the vehicle. Generally, in India, between 9:30 am to 3:30pm with proper mounting of solar panels best electricity extraction can be achieved. The motor mounted in the vehicle can perform its intended movements as per the control with the battery power. Fig. 5 shows a sample E-vehicle.



ADVANTAGES

- **No Fuel Costs:**
- **Renewable Energy Source**
- **Reduces Electricity Bills**
- **Low Maintenance Costs**
- **Technology Development**

Applications

- Also in this sense, solar energy could be used for car propulsion in different ways in indirect way, to produce bio-fuels (for conventional vehicles) or hydrogen (for fuel-cell vehicles, or vehicles with ICE fuelled with hydrogen or a mix of methane and hydrogen)

RESULTS

Solar cars have been developing since the last twenty years and are powered by energy from the sun. Although they are not a practical or economic form of transportation at present, in the future they may play a part in reducing our reliance on burning fossil fuels such as petrol and diesel.

CONCLUSION

The present mix mode of transportation is having adverse emissions to the atmosphere and the current practice to reduce the impacts of these emissions is of greater importance. The practice of electric vehicles (EV) in this regard added greater value and provided large scope to the development and research. The associated government policies and benefits to both the manufacturers and user need to be revisited to enhance the E-vehicle market. But the popularity of silent and ecofriendly electric vehicles is increasing now a day's creating bundle of opportunities for the enterprises and users.

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