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Solar EV Charging Stations on Highway

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Abstract: Solar energy and Electric vehicle (EV) are gaining wide importance from the past few years which lead to the concept of solar EV charging station. In Solar EV charging station, the solar panels are mounted along the guard rails in the highway. These solar panels are tucked with micro inverter beneath to maximize power point of each panel. The required/sufficient number of panels are installed for two types of charging i.e. Level 2 and DC fast charging. The charging station is built in the service road of the highway where in long ride goer can charge for a while parking at the side of the road. People adding an Electric vehicle to their home are finding it difficult for a long ride. Now for all such challenges we have solar charging stations on highway to make it easy. The solar charging station on highway is ecofriendly, feasible and help long riders to travel stress free.

Keywords: EV, Solar EV charging Station, Highway, Level 2 charging and DC fast charging.

I. INTRODUCTION

The demand and supply for Electric power can never be met due to various reasons like cost of generation, adequate space, transmission losses etc. To meet this need of power availability renewable energy has been introduced. One among this is solar energy which is gaining momentum in last few years. The biggest challenge in generating solar energy is the constraint of space required. These generating units are located outside urban area where large swathe of lands are available. However transmitting energy from generation place to the consumers or end users ends up in losing the power generated. Moreover since the introduction of Electric vehicles supplying energy to them outside the city limits while on the road has become next to impossible. Though the charging stations are available inside the city, the same is not available in the highway, there by mitigating the use of Electric vehicles for long distance. To encourage people in using Electric vehicles for long distance travelling and reduce CO₂ emission solar charging points is a must on the highways also. Hence I have developed a concept of introducing charging points on the highway regarding which my papers talk about in detail.

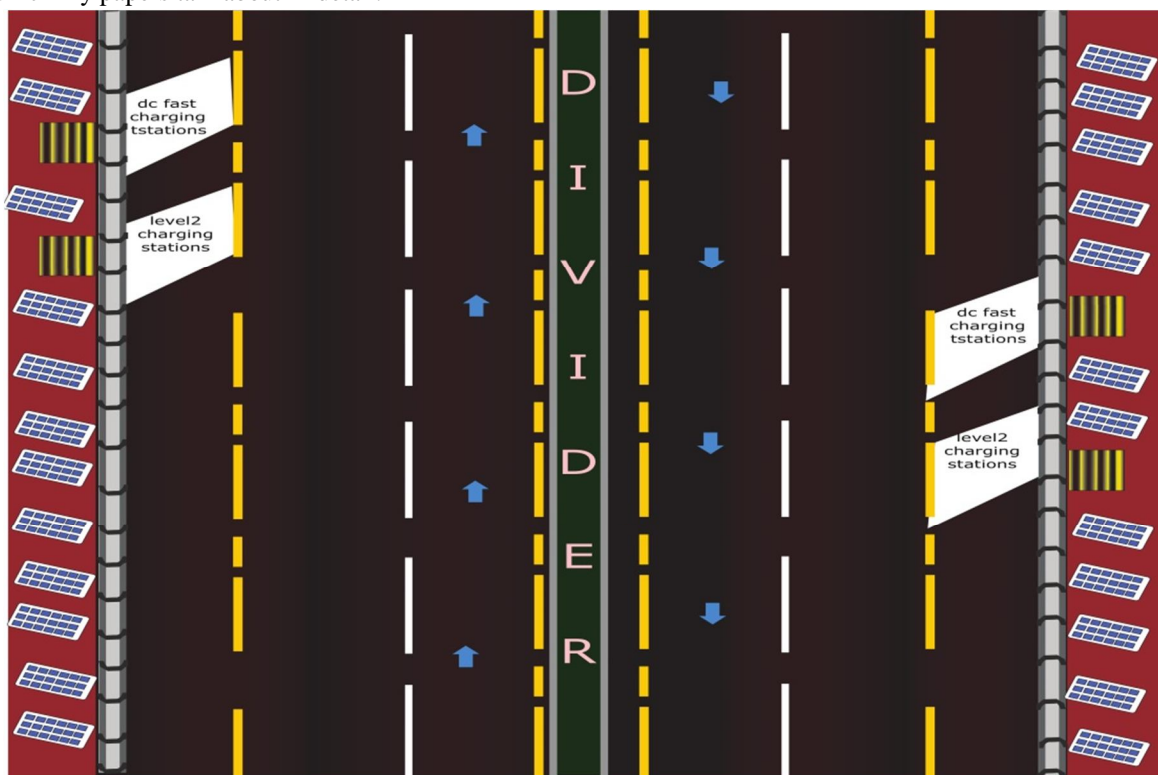


Fig 1. Division of road on the highway for installation of EV Charging Station

A. Working Principle

The solar charging stations on the highway can be set up by installing solar panels in service road along the guard rails. The solar panel structure orientation is exactly equal to the azimuth angle of the region. The inverters are used to get AC output from the solar panels. Later the ac or dc output is provided to level 2 & DC fast charging station respectively.

B. In Level 2: Charging station

The solar panels produce DC power and Charge the battery with the help of charge controller. The excess amount of energy is sent to grid tied inverter and exported to the grid. The stored energy from battery can be converted into AC power with the help of inverter and charge the Electric Vehicle. When there is less output or no output from solar panel, the Electric vehicle can be charged by importing the ac power from Grid.

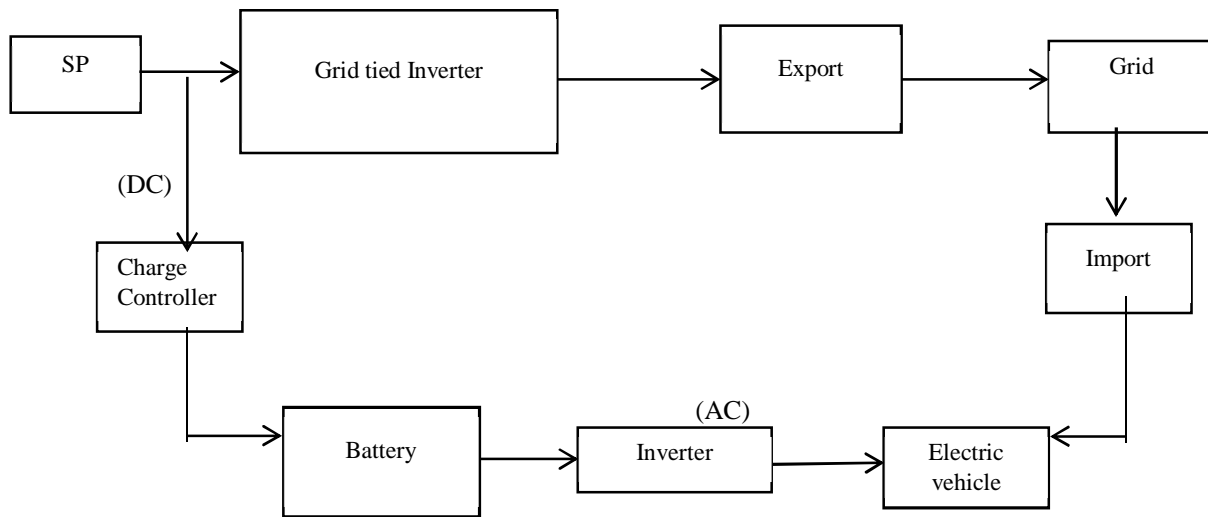


Fig 2. Block diagram of Level 2 Charging Station

C. DC fast charging

The solar panels that are set up on the highway along the guard rails is connected to DC/DC converter. The output of DC/DC converter is given to MPPT Charge controller. The Charge controller charges the battery and the excess is exported to grid using inverter. The battery can also be charged using inverter.

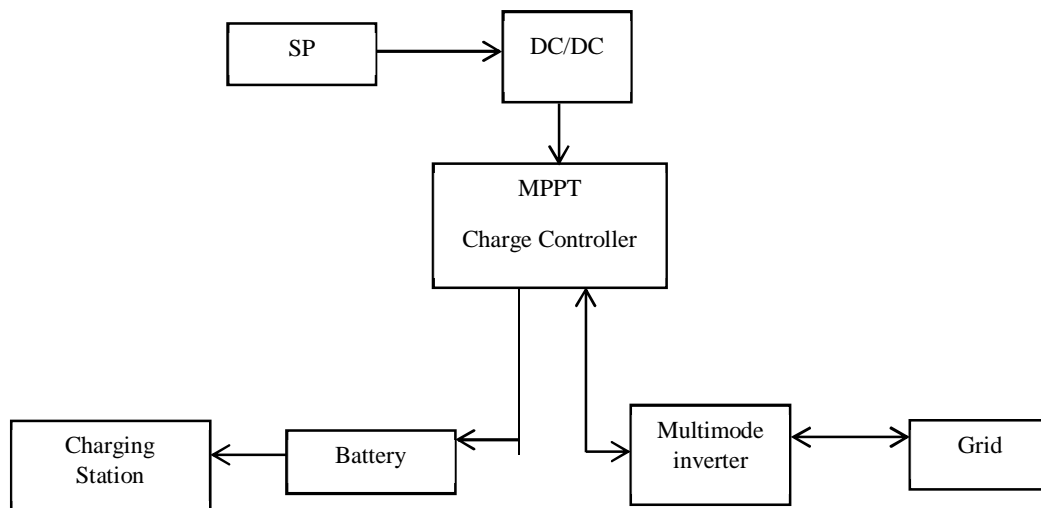


Fig 3. Block diagram of DC fast charging

D. Operation

During Day time, the sun rays are used to produce DC power from solar panels. These panels are connected to power conditioning units to provide ac power or they can be used to charge batteries for later usage. The AC output from power conditioning units is supplied to charging station. From the charging station the Electric vehicles can be charged from level 2 types or DC fast charging. The user needs to park in the charging area to get his vehicle charged and proceed on his journey.

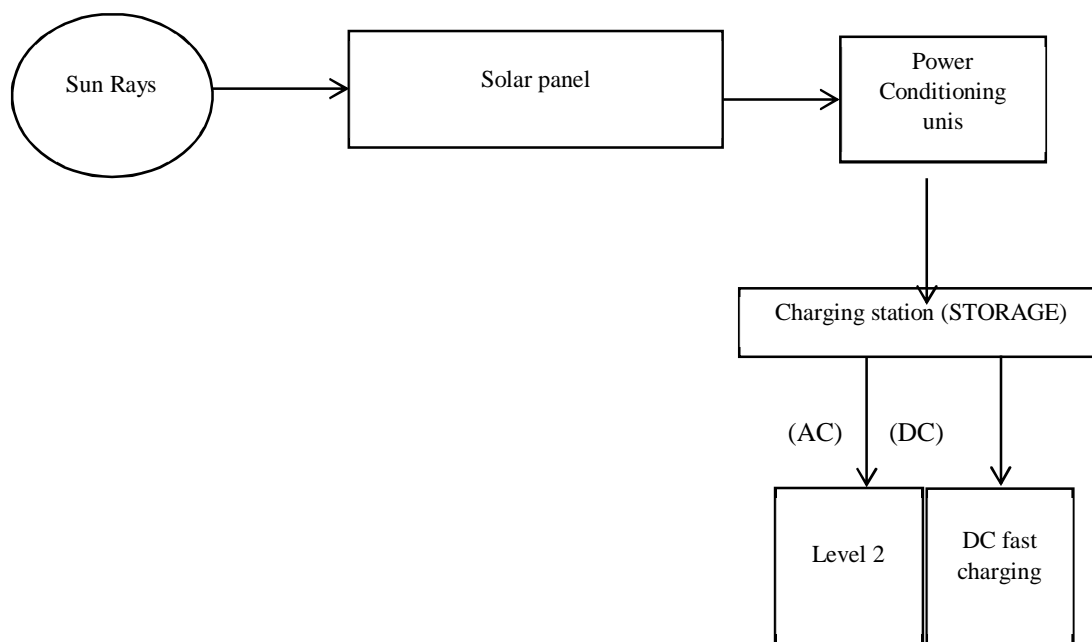


Fig 4. Block diagram of operation of EV charging station

II. CONCLUSION AND ADVANTAGES

The Electric vehicles run on electricity as a result there is no burning of petrol and diesel hence reducing the amount of emission. Electric vehicles as a low maintenance cost as no fuel is used. The installation of Electric vehicle charging station on the highway attracts a large number of crowds as they would not face any problem with charging the battery of the vehicles over a long distance run.

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