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DESIGN AND DEVELOPMENT OF REGENERATIVE SYSTEM IN ELECTRIC VEHICLE.

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Abstract — **This paper describes design of an on-board solar power charging system for charging of electric vehicle that solves the key downside of fuel and pollution. Use of solar powered chargers has emerged as an interesting opportunity with the help of government policies and with the help of renewable energy sources. In order to reduce pollution and reduce greenhouse effect there is a large scope of increase in electric vehicles all over the world. To run the electric vehicle the fuel required is the electricity which can be stored in batteries via the use of solar energy. The lack of infrastructure for solar charging stations has led the need to develop an on-board charging station. This can charge the vehicle while on the move which helps to reduce charging time and charge the electric vehicle where there is no charging station available. In this project we have developed a system for electric vehicle from renewable energy resources with Solar panel, MPPT kit, batteries and the performance of the proposed charging station was investigated.**

Keywords — **Solar Panel, MPPT kit, Battery, DC to DC converter, Electric Vehicle.**

I. INTRODUCTION

The increase in the use of Internal Combustion Engines for vehicles the questions like Pollution, depletion of fossil fuels, global environmental problems arose. This in turn led invention of Electric Vehicle which runs on electric motor and uses a Battery instead of fossil fuels as a fuel and can be charged via electricity.

The Batteries have a limit of charge holding capacity which makes it a problem for using an EV for long distances and also there are no major infrastructures like petroleum pumps for charging the vehicle. This made the inventions like Regenerative Braking System, charging the battery via dynamo, solar charging for making the reuse of energy that otherwise are just wasted.

Solar Charging a vehicle is a hot topic of discussion in this era. As it uses the abundant renewable solar energy to charge the battery with a very low price as compared to fossil fuels. The Solar Charging stations just like a petroleum station are nowadays common in places like America. The Stations are powered by Solar as well as grid connection for supplying the abundant Solar Energy for charging the batteries.

II. LITERATURE REVIEW

Abdul Rauf Bhatti1,4, Zainal Salam1,3,*,† , Mohd Junaidi Bin Abdul Aziz2 and Kong Pui Yee2, INTERNATIONAL JOURNAL OF ENERGY RESEARCH , Int. J. Energy Res. 2016; 40:439–461, Published online 23 December 2015 in Wiley Online Library " A critical review of electric vehicle charging using solar photovoltaic"

The application of renewable sources such as solar photovoltaic (PV) to charge electric vehicle (EV) is an interesting option that offers numerous technical and economic opportunities. By combining the emission-free EV with the low carbon PV power generation, the problems related to the greenhouse gases due to the internal combustion engines can be reduced. Over the years, numerous papers, including several review work, have been published on EV charging using the grid electricity. However, there seems to be an absence of a review paper on EV charging using the PV as one of the energy sources. With growing interest in this topic, this review summarizes and updates some of the important aspects of the PV-EV charging. For the benefit of a wider audience, it provides the

background on the EV fundamentals, batteries and a brief overview on the PV systems. Two types of PV-EV charging, namely the PV-grid and the PV-standalone, are comprehensively covered. Moreover, a case study is carried out in comparison to the grid-only charging to critically analyse the technical and the economical feasibilities of both types using Matlab simulation. At the end, recommendations and future directions are presented. It is envisaged that the material gathered in this paper will be a valuable source of information for the researchers working on this topic.

Mihir Pathare , Vimith Shetty, Diptarka Datta, Rajeev Valunjkar , Aniket Sawant, Shreenivas Pai ©2017 IEEE 2017 International Conference on Nascent Technologies in the Engineering Field (ICNTE-2017) "Designing and Implementation of Maximum Power Point Tracking(MPPT) Solar Charge Controller"

Solar-energy utilization is growing in demand since the past decade due to the increase in energy needs and depletion of non-renewable sources. But the problem with solar energy is that it's not constant; it keeps on fluctuating depending upon the weather conditions such as, solar irradiation, temperature, thus a battery is always connected between the load and the solar panel so as to act as a secondary source. Since, brighter the sunlight, more voltage the solar cells would produce and excessive voltage could damage the batteries. MPPT is a method for extracting maximum power from PV module and also to protect the battery from overcharging. MPPT charge controller serves two main purpose battery protection and energy metering. This paper provides details of maximum power point tracking solar charge controller device and dc energy-meter.

Koichi Go, Takahiro Hirano, Tatsuya Miyoshi, and Daisuke Sato, Published 03/28/2017 Copyright © 2017 SAE International "Development Solar Charging System of Vehicle"

Fuel consumption and CO2 emission regulations for vehicles, such as the Zero Emission Vehicle (ZEV) Regulation, motivate renewable energy technologies in the automotive industry. Therefore, the automotive industry is focused on adopting solar charging systems. Some vehicles have adopted solar energy to power the ventilation system, but these vehicles do not use solar energy to power the drivetrain. One important issue facing the design of solar charging systems is the low power generated by solar panels. Compared to solar panels for residential use, solar panels for vehicles can't generate as much power because of size and weight limitations. Also, the power generated by solar panels can be extremely affected depending on differences in solar radiation among the cells. Therefore, Toyota has developed a solar charging system that can use solar energy for driving the Prius PHV. This system can efficiently charge the hybrid battery with the low power generated by the solar panel. The power generated can charge the hybrid battery while the vehicle is parked. Power can also be supplied from the hybrid battery to the auxiliary battery system during driving. The solar power contributes to the improvement of the electric driving range and the fuel consumption. This paper shows a solar charging system applied to a plug-in hybrid vehicle, a system configuration, operating modes, improving the standby power consumption of the system, and structure of solar panel.

Saadullah Khan, Aqueel Ahmad, Furkan Ahmad, Mahdi Shafaati Shemami, Mohammad Saad Alam & Siddiq Khateeb. Published online: 22 Dec 2017 "A Comprehensive Review on Solar Powered Electric Vehicle Charging System"

Electric vehicles (EVs) are becoming increasingly popular in many countries of the world. EVs are proving more energy efficient and environmental friendly than ICEVs. But the lack of charging stations restricts the wide adoption of EVs in the world. As EV usage grows, more public spaces are installing EV charging stations. On the other hand, if EVs are charged via existing utility grid powered by fossil fuel-based generation system, then it affects the distribution system and could not be environmentally friendly. As solar has great potential to generate the electricity from PV panel, the charging of EVs from PV panels would be a great solution and also a sustainable step toward the environment. This paper presents a comprehensive analysis of solar PV-EV charging systems and deployment in the world. Analytical methods were proposed to obtain information about EV charging behavior, modes of charging station operation, and geolocation of charging station users. The methodology presented here was time- and cost-effective, and very helpful to the researchers and students in this field.

III.PROBLEM STATEMENT

The problem statement for EV solar panel charging is to develop a system that can efficiently and effectively charge electric vehicles (EVs) using solar energy. The system should be able to charge EVs in a timely manner, even in areas with limited sunlight. The system should also be affordable and easy to install.

The following are some of the challenges that need to be addressed in order to develop an effective EV solar panel charging system:

The amount of sunlight that is available varies depending on the time of day, the season, and the location. The system must be able to charge EVs even in areas with limited sunlight.

The efficiency of solar panels is affected by a number of factors, including the type of panel, the angle of the panel, and the amount of sunlight that is available. The system must use high-efficiency solar panels in order to maximize the amount of energy that is collected.

The cost of solar panels has been declining in recent years, but they are still more expensive than traditional charging methods. The system must be affordable in order to be widely adopted.

The installation of solar panels can be complex and time-consuming. The system must be easy to install in order to make it more accessible to consumers.The development of an effective EV solar panel charging system has the potential to significantly reduce the environmental impact of transportation. By using solar energy to charge EVs, we can reduce our reliance on fossil fuels and help to

combat climate change.

IV.OBJECTIVES

To develop a system that can efficiently and effectively charge electric vehicles (EVs) using solar energy.

To ensure that the system can charge EVs in a timely manner, even in areas with limited sunlight.

To make the system affordable and easy to install.

To reduce the environmental impact of transportation by using solar energy to charge EVs.

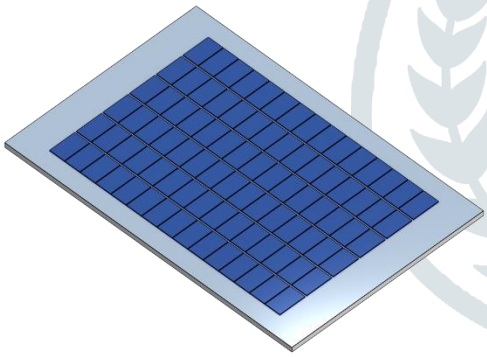
To help combat climate change.

These are just a few of the objectives that could be considered when developing an EV solar panel charging system.

V.METHODOLOGY

Firstly we will study the solar charging systems used for charging electric vehicles. We can use the following methods for achieving the proper utilization of the system.
THEORETICAL: Theoretically we will compare different types of charging system and select the optimum system.
ANALYTICAL: We will calculate the efficiency of the system and analyse it.
EXPERIMENTAL: After theoretical and analytical analysis and calculations we will implement it and experiment till we achieve our results.

VI.EXPERIMENTAL SETUP



VII.COMPONENTS

- **SOLAR PANELS**
- **CHARGE CONTROLLER**
- **BATTERY**
- **INVERTER**
- **MOUNTING SYSTEM**
- **WIRING**
- **SAFETY EQUIPMENT**

VIII.FUTURE SCOPE

The future scope of EV solar panel charging is very promising. As the cost of solar panels continues to decline and the efficiency of solar cells improves, EV solar panel charging will become more and more affordable and accessible. This will make it possible for more people to switch to electric vehicles, which will help to reduce our reliance on fossil fuels and combat climate change.

In addition to the environmental benefits, EV solar panel charging also has a number of economic benefits. For example, EV solar panel charging can help to reduce energy costs and improve grid reliability. It can also create jobs in the solar and EV industries.
As the world transitions to a clean energy future, EV solar panel charging is a key technology that will play a major role in reducing our reliance on fossil fuels and combating climate change.

IX.Design & Calculations

Flexible type Monocrystalline Solar Panel is the best for this kind of purpose as it is light weight as well as it absorbs more light in dim conditions also.

The calculations for Panel size selection are as follows,

Required voltage to charge battery = 55 v
Voltage produced by each cell = 0.6 v (ideal)
Number of cells = 102
Number of cells in series = 102
Number of cells in Parallel = 0
Dimensions of single cell = 80 mm x 47 mm

Charging time and charging percentage of battery using solar energy:

Battery:
Ah = 48 Ah
V = 48 V
Solar panel:
Vmp = 57
VImp = 1.25 Ah

Time = Battery amps / charging current= 48/1.25= 36 hrs.

For ideal condition, Battery takes 36 hrs to charge from 0% to 100%.

Therefore;
If 36 hrs 100%
4 hrs X%
Then X=400/36=11.1%.

Therefore, in 4 hrs, battery would charge 11.1%.

Similarly in 1 hour the battery will charge= 100/36 = 2.77%.

X.Conclusion

We have successfully designed and developed the on board solar charging system to charge the electric vehicle via solar energy. We have successfully used a setup of solar charging with the help of flexible type of monocrystalline solar panel, MPPT Kit and Batteries. We have concluded that if the system is amped up the charging time can be more reduced.

References

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