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Solar Based E-Rickshaw

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Abstract: Fuel-based rickshaws, like auto rickshaws, are a common mode of transportation in India. But it requires fuel like petrol, CNG which will cause pollution in nature also the fuel is very costly and non - renewable. So our project Solar Rickshaw aims to provide a sustainable, eco-friendly transportation solution by replacing traditional rickshaw with solar-powered electric rickshaw .Our project address to need for affordable, green transportation with reduction in carbon emissions .Also it depends upon non-renewable energy sources. The solar e-rickshaw is an innovative, environmentally friendly transportation solution designed to reduce urban pollution and dependence on fossil fuels. By integrating solar panels with electric propulsion systems, solar e-rickshaws use renewable solar energy to power their motors, offering a sustainable alternative to traditional fuel-based rickshaws. This paper explores the design, functionality, and benefits of solar e-rickshaws, focusing on their potential to provide a cost-effective, low-maintenance, and eco-friendly mode of transportation, particularly in densely populated urban areas. Key components such as solar panels, energy storage (batteries), and electric motors are examined in terms of performance, efficiency, and feasibility.

Keywords: CNG, BLDC Motor, PV, MPPT.

I. INTRODUCTION

The increasing demand for an eco-friendly and sustainable transportation has led to the project solar electric rickshaws, It provide an efficient and clean alternative to conventional fuel-based rickshaws. The major components of this project are solar panel, battery, motor and MPPT Controller etc. During day solar panel absorb sun energy and Store into battery then we can use this energy to drive the rickshaw .Also here we place one charging point along with storage battery .

If sun energy is not available or during emergency case we can charge the battery and drive the rickshaw. So this project provides a rickshaw with lower operating costs, reduced greenhouse gas emissions, and decreased reliance on non-renewable energy sources .In this paper we are providing information about working principle, design considerations, efficiency, and challenges and vehicle performance.

II. LITERATURE REVIEW

With reference to several IEEE papers and books related to solar energy have explored various aspects of a vehicle which can be used for travelling and work on Sun energy .Because of those traditional sources of energy like a Petrol, CNG are non-renewable sources as well as after use they produce some poisoning by products causes environment pollution. We tried to make a rickshaw which uses renewable energy as a fuel .In this solar based E-rickshaw we using solar panels to utilize sun energy and this energy converted into chemical energy. And this converted controlled output is given to rickshaw as a fuel.

The review highlights the environmental advantages, including significant reductions in carbon emissions and air pollutants, compared to conventional rickshaws. Moreover, the economic benefits, such as lower operational and maintenance costs, are discussed. The paper also addresses the challenges associated with the widespread adoption of solar e-rickshaws, including high initial costs, limited sunlight availability, and infrastructure requirements. Future research directions focus on improving battery technologies, enhancing solar panel efficiency, and developing supportive government policies to promote the growth of solar e-rickshaws as a sustainable transportation solution.

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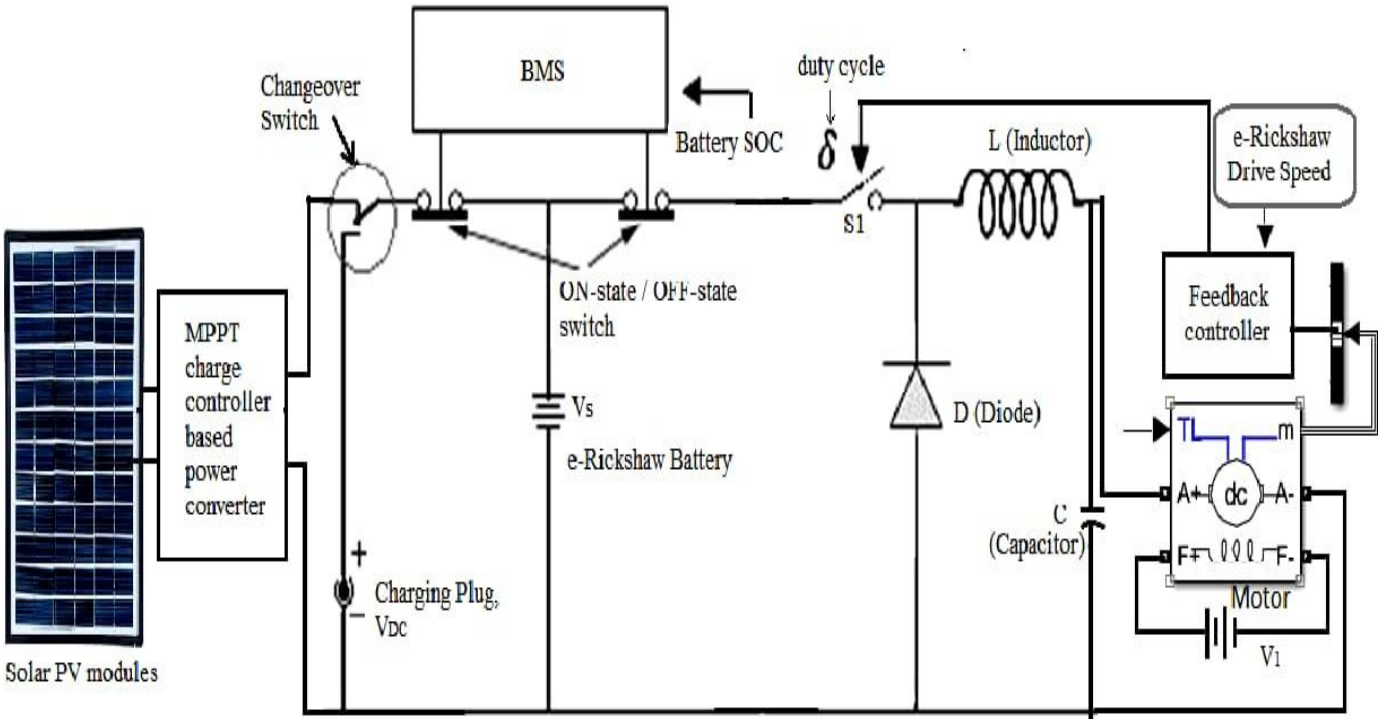
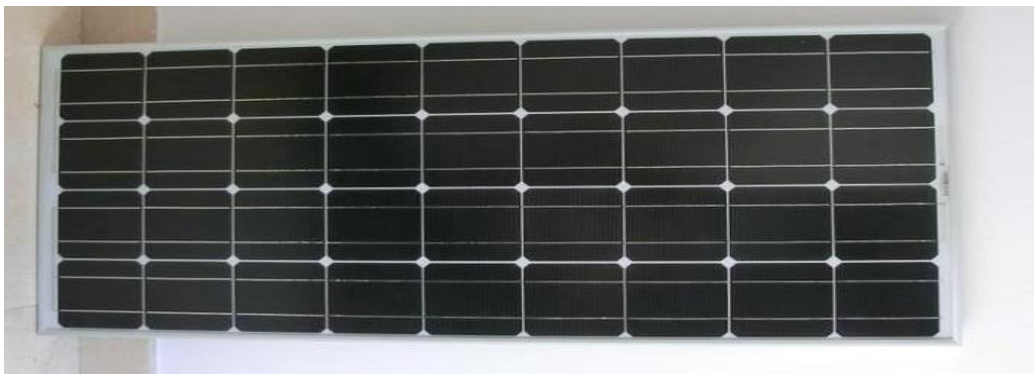
III. CIRCUIT DIAGRAM



IV. WORKING

Solar Based E-Rickshaw is a solar rickshaw with battery. It uses solar energy .To charge the battery and hence reduces uses of fuel also grid electricity .A solar e-rickshaw (electric rickshaw) is a three-wheeled electric vehicle powered by solar energy.
It is designed to reduce pollution, lower operational costs, and provide an eco-friendly alternative to traditional rickshaws, which often run on fossil fuels. The major components are as follows

1) **Solar panels-** convert sunlight into the electrical energy using (PV) cells. These cells absorb sunlight energy and generate and direct current. In this project we use three solar panels of rating 170W each. Those panel are placed on the roof of rickshaw. Whatever solar energy absorbed by the panel is transferred to bateery through MPPT controller.



2) **Batteries**- Battery Store energy for use when sunlight is insufficient such as during the night or cloudy weather .The charged battery provides power to the electric motor enabling the rickshaw to operate independently .For this project here we are using lithium ion battery which is generally between 72V with capacities ranging from 100AH

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3) **BLDC Motor-** Brushless DC Motor Convert electrical energy into mechanical energy to propel the rickshaw brushless direct current (BLDC) motor. Rating of this battery is between 1KW and 3KW depending on the desired speed and capacity of the rickshaw. Usually mounted at the rear axle to drive the wheels. BLDC motor is used because of BLDC motors can be controlled with feedback mechanisms to deliver precise torque and rotation speeds and has maximum torque.

4) **MPPT charge controller-** The maximum power point tracking (MPPT) controller this device must be used in solar power system to optimize the efficiency of solar panels. Function of MPPT is to maximize the energy extracted from a power source, such as a solar panel or wind turbine. MPPT is used to adjust the voltage to ensure that the system operates at peak power.

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5) **Motor controller**- Regulates the power send from the battery to the electric motor. The motor controller is responsible for adjusting the speed of the motor, managing regenerative breaking and ensuring the motor operates efficiently. That include of the controller over voltage protection, current limiting and regenerative breaking

V. ADVANTAGES

1) **Environment eco-friendly** – Renewable solar energy run on solar electric rickshaw reducing air pollution contributing to cleaner air.

2) **Energy independence** – Using solar energy makes operates less reliant on fluctuating fuel prices or electricity cost offering more control over and reducing economic changes.

3) **Increase driving range** – Battery operation during charging with solar panels, solar electric rickshaw can potentially cover longer distance without frequent charging stop.

4) **Quit operation** – Solar powered rickshaws operate quietly noise pollution reduce in urban areas that is like of electric vehicle.

5) **Sustainability & Innovation**- Solar electric rickshaws represent a stop towards more sustainable urban transportation solutions showcasing innovative technology lead to future advancements in green transportation.

VI. APPLICATION

1) Public transportation- Solar electric rickshaws short and long distance are eco-friendly of urban transportation.

2) Tourism industry – Solar electric rickshaw are increasingly used for eco-friendly tours in tourist hotspots, parks and other attraction

3) School and college campus E-vehicles- Many institutions and universities are used solar electric rickshaws for internal transportation they are quite and efficient of the large campuses

4) Agriculture and market transport- Farmers can electric solar rickshaws used to transport agriculture product from field to local or big markets in cost effective they are reducing their reliance on diesel or petrol vehicle.

VII. CONCLUSION

In Solar Based E-Rickshaw project we try to make a product which will utilize the natural sun energy and reduce the uses of oil & CNG.It is designed to reduce pollution, lower operational costs, and provide an eco-friendly alternative to traditional rickshaws, which often run on fossil fuels.. It has smooth start, superior in operation also sustain weight upto 200kg.

Solar e-rickshaw is especially effective in urban and peri-urban areas where short-distance transportation is common.

VII. ACKNOWLEDGMENT

We would like to express deepest gratitude to everyone who contributed to the successful development of the solar electric rickshaw project. This would not have been possible with the support, guidance form several individual and institution.

First and foremost, we extend our sincere thanks to (**Miss S.A.INAMDAR**) expertise and insightful guided us for this project. Share knowledge played crucial role in shipping our understanding of solar and electric vehicle technologies.

This technical assistance and infrastructure access made a significant impact on the projects progress. Your innovative ideas , problem solving skills and team work contributed to the successful completion of the initiative lastly we would like to acknowledge the continuous support of the guide and group members, who offered encouragement and understanding throughout the entire process.

This project represents a shared vision of sustainable transportation and we are deeply thankful to everyone who played a part in success.

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