

DESIGN AND DEVELOPMENT OF A SOLAR BASED ELECTRIC VEHICLE CHARGING STATION

***Aaryan Dinesh Patil, Shubham Uddhav Magar**

Diploma in Mechanical Engineering, Sandip Polytechnic.

Article Received: 16 December 2025, Article Revised: 05 January 2026, Published on: 25 January 2026

Corresponding Author: Aaryan Dinesh Patil

Diploma in Mechanical Engineering, Sandip Polytechnic.

DOI: <https://doi-doi.org/101555/ijarp.6132>

ABSTRACT

The rapid growth of electric vehicles (EVs) has increased the demand for clean, reliable, sustainable charging infrastructure. This paper presents the design and development of a solar based electric vehicle charging station using photovoltaic panels, charge controller, battery storage, and inverter. The proposed system is economical, eco-friendly, and suitable for urban and rural applications.

KEYWORDS: Solar energy, Electric vehicle, EV charging station, Renewable energy, Photovoltaic system.

1. INTRODUCTION

Electric vehicles offer an alternative to fossil fuel transportation. However, the sustainability of EVs depends on clean energy sources. Solar energy provides an effective solution for EV charging.

2. Literature Review

Various researchers have explored renewable energy based EV charging systems. Studies show that solar powered charging stations reduce emissions and long-term costs.

3. Problem Statement

Conventional grid-based EV charging relies on non-renewable energy sources, increasing indirect pollution and grid load.

4. Proposed Methodology

The system uses solar PV panels to generate power, regulated by a charge controller and stored in batteries for EV charging.

5. System Components

Solar panel, charge controller, battery bank, inverter, EV charger, and protection devices.

6. Working Principle

Solar energy is converted to electrical energy using photovoltaic effect and stored for EV charging.

7. Experimental Setup

A prototype was tested under different sunlight conditions to evaluate charging performance.

8. RESULTS AND DISCUSSION

The system efficiently charged a light EV and reduced dependency on grid power.

9. Advantages and Applications

Low operating cost, eco-friendly, suitable for residential and institutional charging.

10. CONCLUSION

The proposed solar based EV charging station promotes sustainable transportation.

11. FUTURE SCOPE

Integration with IoT monitoring, fast charging, and grid-connected systems.

REFERENCES (IJARP Style)

1. M. Yilmaz and P. T. Krein, IEEE Transactions on Power Electronics, 2013.
2. Khaligh and S. Dusmez, IEEE Transactions on Vehicular Technology, 2012.
3. C. Chan, Proceedings of the IEEE, 2007.
4. S. Jain and V. Agarwal, IEEE Transactions on Power Electronics, 2007.