Int. J. Sci. R. Tech., 2026 3(3)
A Multidisciplinary peer-reviewed Journal
www.ijsrtjournal.com [ISSN: 2394-7063]

Original Article

Portable Charging Van

Nehe Abhishek*, Darkunde Sanket, Kale Rohit, Jejurkar Harshal, A. R. Gavhane

Automobile Diploma Engineering, Pd. Dr. V. Vikhe Patil Institute of Technology & Engineering (Polytechnic) College, Loni

ABSTRACT

The project titled "Portable Charging Van " showcases a pioneering solution in the realm of sustainable transportation. In this innovative endeavor, a solar car has been meticulously designed, leveraging the abundant energy of the sun for both propulsion and extending support to other electric vehicles. The solar car is equipped with a 6V solar panel, charging a 4.5V battery, and driven by four 4V motors, controlled seamlessly by a standard RC transmitter and receiver. A key highlight of this project is the incorporation of a wireless charging system at the car's rear, capable of wirelessly transferring power to other electric vehicles in need. This functionality is particularly useful when encountering stranded or discharged electric cars on the road. In such situations, the solar car get call by the needy vehicle, navigates to its location, and initiates wireless charging, effectively reviving the stranded vehicle and enabling it to resume its journey.

Keywords: Portable Charging Van

INTRODUCTION

With the rise of electric vehicles (EVs) and the growing need for accessible power in remote or off-grid areas, a Portable Charging Van powered by Solar Panels offers a flexible and eco-friendly solution. This project integrates solar energy harvesting, battery storage, and mobile charging infrastructure into a single van, making it possible to deliver power wherever it's needed.

Fig. No. 1 Portable Solar Charging Van

The van's roof-mounted solarpanels capture sunlight and store energy in high- capacity batteries, which can then be used to charge EVs, e-bikes, phones, and other electronic devices. By combining renewable energy with mobility, the system reduces dependence on grid electricity and helps tackle issues like range anxiety, emergency charging, and power shortages in rural or disaster-hit areas.

This project demonstrates how solar- powered mobile charging units can complement fixed charging stations, providing a sustainable, cost-effective, and

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

practical approach to meeting modern energy demands.

OBJECTIVES

- To design a portable charging van that uses solar energy to power EVs and electronic devices.
- To integrate solar panels, battery storage, and inverters into a van for reliable off-grid charging.
- To reduce range anxiety by providing emergency mobile charging for EVs.
- To promote renewable energy use and cut dependence on grid electricity.
- To create a sustainable, cost-effective solution for charging in rural, remote, or disaster-affected areas.
- To demonstrate how mobile solar charging can complement fixed charging stations and expand energy access.

Concept:

- Turn a regular van into a mobile solar- powered charging station. Roof-mounted solar panels capture sunlight and store energy in a battery bank, which can then be used to charge EVs, e-bikes, phones, and other devices on the go.
- It's designed to be flexible and eco- friendly, going wherever power is needed — whether it's for EV roadside help, rural electrification, outdoor events, or disaster relief. By combining mobility with renewable energy, the van reduces dependence on grid electricity and provides a practical, sustainable solution to charging challenges.

LITRATURE REVIEW

- MatjazRozman, Augustine Ikpehai (2019) et. al. This paper presents a novel localization method for electric vehicles (EVs) charging through wireless power transmission (WPT). With the proposed technique, the wireless charging system can self-determine the most efficient coil to transmit power at the EV's position based on the sensors activated by its wheels. To ensure optimal charging, our approach involves measurement of the transfer efficiency of individual transmission coil to determine the most efficient one to be used. This not only improves the charging performance but also minimizes energy losses by autonomously activating only the coils with the highest transfer efficiencies.
- Jaime Garnica, Raul A. Chinga and Jenshan Lin (2020) et. al. Wireless power has been a topic of interest from the early 20th century until today. This paper traces the history of wireless power transmission starting with Nikola Tesla, continuing on to experiments with beaming power using microwaves. Examining the difference between near-field and far- field techniques, this paper continues into modern times explaining why near-field technique is more suitable for consumer electronic devices and exploring the near-field transmission of power via the magnetic field. Examples of short-range and midrange wireless power systems are explored.
- ShashankPrakash Naidu (2022) et. al. In this paper we are introducing an updated version of charging of batteries through renewable energy grids. The major sources of this charging by solar panels and wind turbine. A voltage regulator is used to produce a constant voltage at the output side. Buck-Boost converter is used to convert the low voltage DC[LVDC] to high voltage DC[HVDC]. A rectifier circuit is used only at the output of wind turbine which rectify the harmonics produced. This power is stored in the battery. The output of this battery can be used for any type of electrical components. However, we are using a switching mechanism used at the battery side which makes sure that output from the batteries will be continuous.
- Gautham Ram Chandra Mouli, Peter Van Duijsen, Francesca Grazian (2019) et. al. If electric vehicles have to be truly sustainable, it is essential to charge them from sustainable sources of electricity, such as solar or wind energy. In this paper, the design of solar powered e-bike charging station that provides AC, DC and wireless charging of e-bikes is investigated. The charging station has integrated battery storage that enables for both grid-connected and on grid operation. The DC charging uses the DC power from the photovoltaic panels directly for charging the e-bike battery without the use of an AC charging adapter.
- Seyed Ali Kashani, Alireza Soleimani, Ali Khosravi (2021) et. al. Within the past decade,

since impediments in nonrenewable fuel sources and the contamination they cause, utilizing green energies, such as those that are sunoriented, in tandem with electric vehicles, is a developing slant. Coordinating electric vehicle (EV) charging stations with sun-powered boards (PV) reduces the burden of EV charging on the control framework. This paper presents a state-of-the-art literature review on remote control transmission frameworks for charging the batteries of electric vehicles utilizing sun- based boards as a source of power generation. The goal of this research is to advance knowledge in the wireless power transfer (WPT) framework and explore more about solar-powered electric vehicle charging stations.

METHODOLOGY:

I) Design & Planning

- Select a suitable van and design the layout for solar panels, batteries, inverters, and charging ports.
- Calculate energy requirements and solar panel capacity needed.

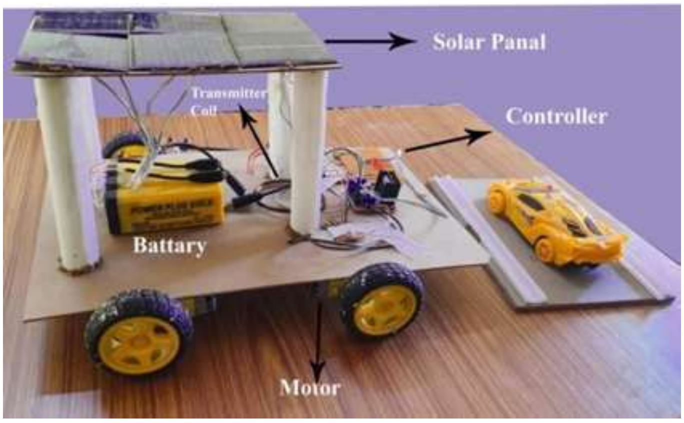

Fig. No.2 Design Portable Charging Van

II) Components:

- Solar Penal 6V
- RC Transmitter and Receiver
- BO Motor 60 RPM
- LED Bulb
- Magnet Wire
- Motor Wheel L298
- Battery 4.5V
- PCB
- Jack Pin Male and Female
- Remote
- IN4007 Diode
- Simple Wire, Jumper Wire Female to Female
- 1.5V Cell
- Resistor 100 ohm
- Resistor 1K Ohm
- Plastic Toy Car

Working:

- **Solar Energy Generation:** A 6V solar panel is mounted on the top of the car . When sunlight falls on the solar panel, it converts solar energy into electrical energy (DC current) using photovoltaic cells. This generated electricity is supplied to charge a 4.5V rechargeable battery through a diode (IN4007) to prevent reverse current flow.

- **Battery Charging and Storage:** The 4.5V battery stores the electrical energy generated by the solar panel. This stored energy is used to Drive the DC motors for movement Power the wireless charging transmitter circuit.

- **Vehicle Movement Control:** The car uses BO Gear Motors (60 RPM) connected to wheels. These motors are controlled by the L298 Motor Driver. An RC transmitter and receiver system is used to control Forward movement Reverse movement Left turn Right turn When the user presses a button on the RC remote The transmitter sends a signal. The receiver receives the signal. The motor driver activates the respective motors. The car moves accordingly.

- **Wireless Power Transmission: -** The main innovative feature of this project is Wireless Charging System.

  Working Principle: The system uses inductive coupling (Wireless Power Transfer - WPT). A transmitter coil is placed at the rear of the solar car. When powered, it generates a high-frequency alternating magnetic field. If another electric vehicle (receiver car) with a receiver coil comes near it: The magnetic field induces voltage in the receiver coil. The induced AC voltage is converted into DC. The battery of the stranded vehicle starts charging wirelessly.

- **Emergency Charging Operation:** A stranded EV calls for assistance. The solar car moves near the discharged vehicle. The wireless transmitter is activated. Power is transferred through magnetic induction. The discharged vehicle receives enough charge to resume journey.

- **Supporting Components Working: -** Diode (IN4007) → Prevents reverse current flow, Resistors → Limit current and protect LED/transistor, Transistor (2N2222A) → Used for switching in wireless circuit, PCB → Provides mechanical support and electrical connections, LED → Indicates power ON or charging status.

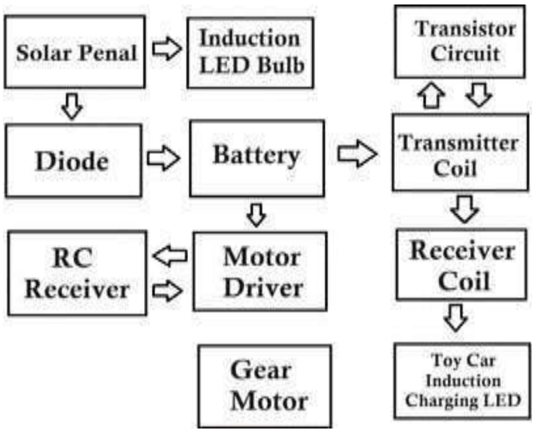

Fig. No. 3 Block Diagram

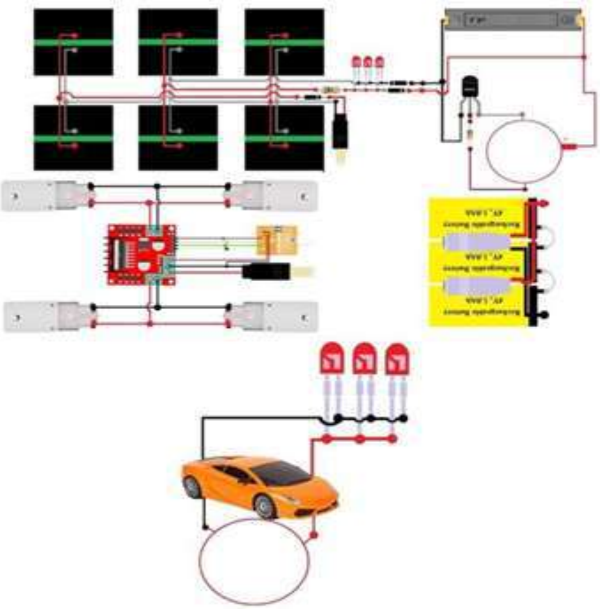

Fig. No. 4 Circuit Diagram

Advantage & Disadvantage

Advantages:

- Mobility: Can travel anywhere, providing power on-demand.
- Renewable Energy: Uses solar power, reducing dependence on grid electricity and fossil fuels.

- Emergency Charging: Helps EV users who run out of battery on the road.
- Eco-Friendly: Low carbon footprint, supports sustainable energy goals.
- Versatile Use: Charges EVs, e-bikes, phones, laptops, and even small equipment.
- Remote Area Support: Perfect for rural regions, construction sites, events, and disaster relief.
- Cost-Effective: Saves money long- term by using free solar energy.
- Reduces Range Anxiety: Gives EV owners confidence for long trips

Disadvantages

- Weather Dependence: Solar charging efficiency drops on cloudy or rainy days.
- Limited Energy Storage: Battery capacity is finite, so it can't charge many vehicles before needing recharge.
- High Initial Cost: Solar panels, batteries, and inverters require significant upfront investment.
- Space & Weight Constraints: Van size limits number of panels and battery capacity.
- Charging Speed: Slower compared to fixed fast-charging stations, especially for EVs.
- Maintenance: Batteries degrade over time and need replacement; electrical systems require regular checks.
- Energy Loss: Conversion from solar to battery to output involves losses, reducing overall efficiency

FUTURE SCOPE:

- Higher Efficiency Solar Panels: Use of advanced PV cells (monocrystalline, bifacial) for more energy generation.
- Larger Battery Capacity: Integration of high-density batteries to store more energy and serve multiple vehicles.
- Fast-Charging Technology: Adding DC fast-charging capability for quicker EV charging.
- Hybrid Power Sources: Combining solar with wind turbines or fuel cells for uninterrupted power.
- Smart Grid Integration: Enabling van-to-grid (V2G) energy sharing and real-time monitoring via IoT.
- AI Optimization: Using AI to predict energy demand, weather patterns, and optimize charging schedules.
- Fleet Expansion: Deploying multiple vans for city-wide mobile charging networks.
- Commercial Applications: Scaling up for logistics, delivery fleets, and public EV charging services.

CONLUSIONS

- The project successfully combines solar energy generation, battery storage, wireless power transfer, and remote-controlled mobility into a single innovative system.
- It provides a practical solution for emergency charging of stranded electric vehicles, reducing range anxiety and improving EV reliability.
- The use of renewable solar energy makes the system environmentally friendly and supports sustainable transportation.
- Wireless power transfer ensures a safe, contactless, and convenient charging method without physical cable connections.
- The integration of motor driver control and RC system demonstrates efficient movement and operational control.
- This project highlights the potential for developing smart, mobile EV charging support systems for future smart cities.
- Overall, the system represents a step forward toward clean energy-based, intelligent transportation solutions.

REFERENCE

1. A.R.Bhatti and Z.Salam, \Photovoltaic (PV) Charging of Electric Vehicle (EV)", in Conference: Electrical Engineering Research Colloquium (EERC-2013), At Faculty of Electrical Engineering, University Teknologi Malaysia (UTM), Malaysia, Volume: 1, 2013
2. D. P. Birnie III, \Solar-to-vehicle (S2V) systems for powering commuters of the future" Journal of Power Sources, 186(2), 2009, pp. 539-542
3. S. Lee, P. Shenoy, D. Irwin and S. Iyengar, \Shared Solar-powered EV Charging Stations: Feasibility and Bene_ts", 7th IEEE International Green and Sustainable Computing Conferfence, 2016.

4. Yilmaz M, Krien PT. Review of battery charger topologies, charging power levels, and infrastructure for plugin electric and hybrid vehicles, IEEE Trans Power Electron. 2013;28(5):2151-2169
5. Faucett WA," Electric Vehicle conductive charging system {part 1: general requirements", Genet Test Mol Biomarkers. 2010;14(5);585
6. Ahamed A, SaadAlam M, Chabaan R, "A comprehensive review of wireless charging technologies for electric vehicles", IEEE Transactions on Transportation Electrification 2017:1-1
7. Qiu C, Chau KT, Liu C, et al. "Overview of wireless power transfer for electric vehicle charging",2013 World Electric Vehicle Symposium and Exhibition (EVS27), 2013;7:1-9
8. Mak H-Y, Rong Y, Shen Z-JM. "Infrastructure planning for electric vehicles with battery swapping". Management Science, SSRN Electron J. 2012.

HOW TO CITE: Nehe Abhishek*, Darkunde Sanket, Kale Rohit, Jejurkar Harshal, A. R. Gavhane, Portable Charging Van, Int. J. Sci. R. Tech., 2026, 3 (3), 321-326. https://doi.org/10.5281/zenodo.19029662