Solar Wireless Electric Vehicle Charging System

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CHAPTER 1 ABSTRACT

This paper details the planning and design of a solar-powered charging for electric vehicles, a solution to the dual problems of expensive gasoline and harmful emissions. The number of countries with electric vehicles on the road is steadily rising. In addition to helping the environment, electric vehicles have proven useful in cutting down on transportation costs by substituting expensive fuel with much more affordable power. Here, we create a novel and effective answer to this problem by designing an electric vehicle charging infrastructure. There is no need to stop for charging because the EV can do so while it is in motion; the system is powered by solar energy; and there is no need for an additional power source. For its construction, the system employs a solar panel, battery, transformer, regulator circuitry, copper coils, and LCD display. This technology follows the ideology that charging electric vehicles can be done without having to pull over to a charging station. So, the technology proves the viability of a road-integrated, solar-powered wireless charging system for EVs.

CHAPTER-2

INTRODUCTION

The mix of solar energy and main supply and it be very helpful to the user. The battery be very hard to design in an EVs because of the high power and energy density. There have be many types of batteries used in instruments be lithium-ion batteries be the best solution for electric-powered vehicles. In the transportation systems, lately there is other of the most effective topic be the WP. and it be consists of High frequency power output, Magnetic induction principles the Solar panel and a little other issue be the protection consideration.

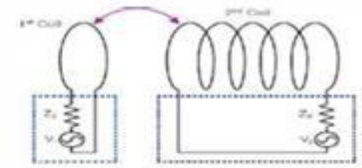

Figure.1 Magnetic Induction

Due to limited sources being available, it's important for us to come up with alternative methods for creating energy. WPT is a way to charge that is convenient and saves money. It has been estimated that 20 30% of the losses occur because of wires. As a result, Wireless Power Transmission is trying to decrease these losses and lower the pollution levels that come from the resources we currently use.

The sun strength Satellites are built with the concept of catching sunlight in areas for use in the world are expected to be in operation by 2025-2030. The SPS designs are mainly founded on WPT.

Now the modern paramount utility is the charging of gas now not rockets, electric cars, and many others. The fundamental operating principle of Inductive WPT Charging is that the inductor has components. One component acts as a number one winding and the alternative acts as a secondary winding .

CHAPTER-3 PROPOSED METHODOLOGIES

BLOCK DIAGRAM:

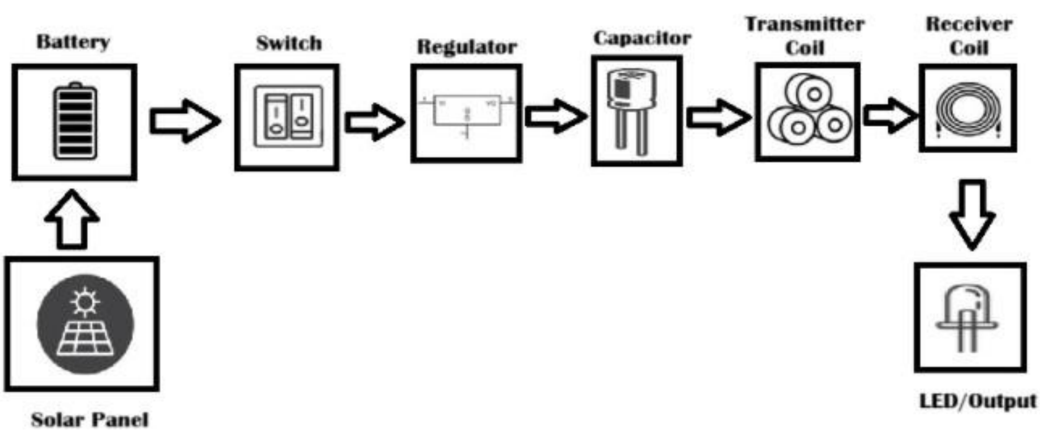

Figure :2

EXPLANATION:

System Overview:

This diagram illustrates a Solar Wireless Electric Vehicle Charging System. It consists of several key components working in tandem to enable wireless charging of electric vehicles using solar power.

Components and Function Solar Panel:

- Captures sunlight and converts it into direct current (DC) electricity.
- This DC power is the initial energy source for the entire system.
- Excess solar energy can be stored in batteries, providing a reliable power source even during periods of low sunlight or nighttime.

Figure :2.1

Battery:

- Stores the DC power generated by the solar panel for later use.
- This ensures a continuous power supply even when sunlight is not available.

Figure :2.2

Regulator:

- Regulates the output voltage of the transformer to a stable level.
- This ensures that the transmitted power is within the desired range for safe and efficient charging.

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- It provides the desired output voltage regardless of any change in the input voltage or load conditions.

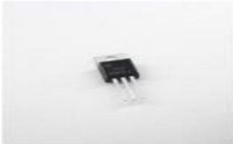


Figure :2.3

Transmitter Coils:

- Converts the regulated DC power into an alternating magnetic field.
- This magnetic field is transmitted wirelessly through the air.

Figure :2.4

Receiver Coil:

- Receives the transmitted magnetic field and converts it back into electrical energy.

LCD Display: Provides visual feedback on the charging status, including voltage levels and charging progress.

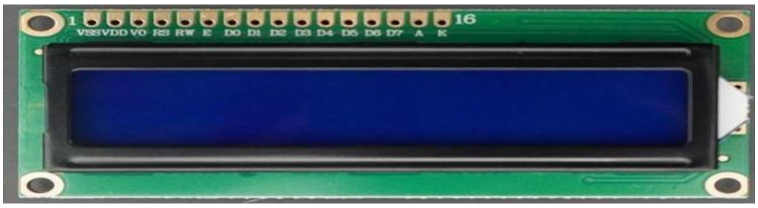


Figure :2.5

Key Features of the System

Solar-Powered: Utilizes clean and renewable solar energy for charging.

Wireless: Eliminates the need for physical charging cables, providing convenience and safety.

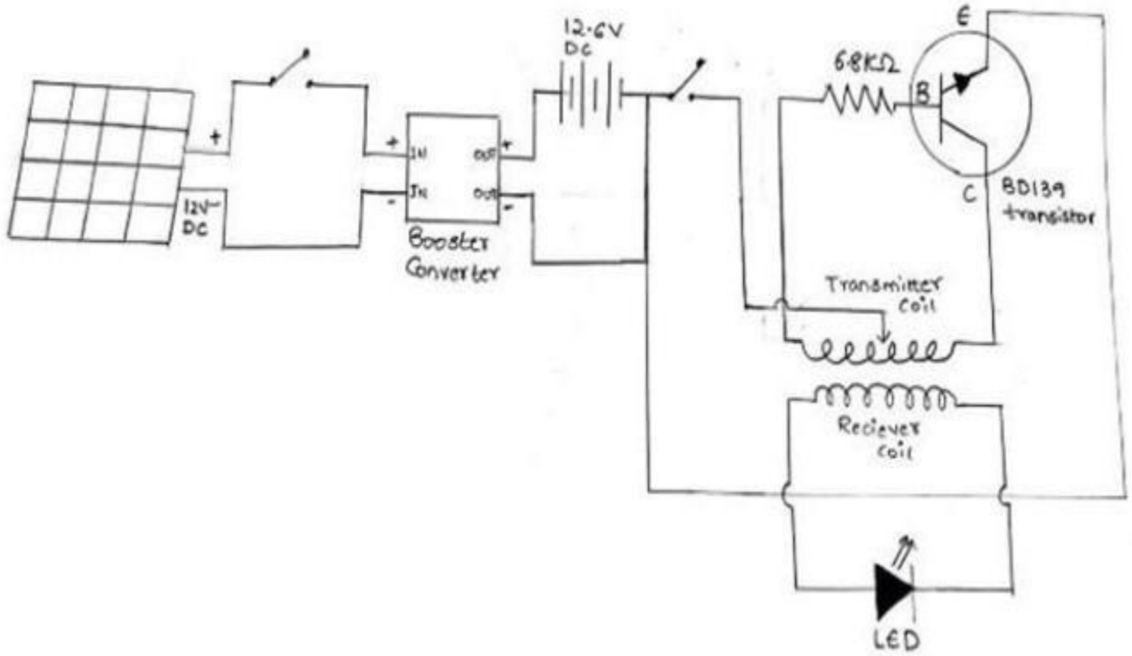
Efficient: Optimizes power transmission and conversion for minimal energy loss.

Safe: Includes voltage sensing and regulation to prevent overheating and other hazards.

User-Friendly: Provides clear visual feedback on the charging process.

Overall, this system demonstrates an innovative approach to charging electric vehicles.

CIRCUIT DIAGRAM:



CHAPTER-4 PROBLEM STATEMENT

The increasing adoption of electric vehicles (EVs) offers a promising solution to reduce greenhouse gas emissions and dependence on fossil fuels. However, the current charging infrastructure, primarily reliant on wired charging stations, presents limitations such as physical connection requirements, potential wear and tear on charging ports, and limited accessibility. To address these challenges, this project aims to develop a solar-powered wireless EV charging system that offers a more convenient, efficient, and environmentally friendly solution. One or more electric motors, or traction motors, are used to propel an electric vehicle (EV). It is possible for an electric vehicle to be self-contained using a battery, solar panels, fuel cells, or an electric generator that converts gasoline to energy to be fueled by an off-vehicle collector system. There are many different types of electric vehicles, such as hybrid and all-electric cars, trucks, trains, ships, planes, and spacecraft. Electricity was a popular mode of vehicle propulsion during this historical period, which provided a level of comfort and operational convenience not possible in gasoline-powered vehicles at that time.

Key Challenges:

- **Efficiency:** Ensuring efficient power transfer over wireless distances to minimize energy loss and maximize charging speed.
- **Range:** Extending the effective charging range to accommodate various parking scenarios and vehicle positions.
- **Safety:** Implementing robust safety mechanisms to prevent electromagnetic interference and potential hazards.
- **Cost-effectiveness:** Designing a system that is economically viable and scalable for widespread deployment.

CHAPTER-5

WORKING MODEL

Wireless Power Transfer for Electric Vehicle Applications:

- Magnetic resonance wireless power transfer (WPT) is the technology that could release us from the confines of cables once and for all. Specifically, the WPT uses the same fundamental concept—called inductive power transfer—that has been studied and refined for at least three decades. In recent years, WPT technology has seen significant advancements. With a kilowatt's worth of power, the distance between the grid and the load grows from millimeters to hundreds of meters.
- As a result of these developments, the WPT is increasingly appealing for use in both static and dynamic EV charging applications.
- In this research, we surveyed the WPT field for technologies that could be used to charge EVs wirelessly. Challenges associated with recharging time, range, and cost can be readily overcome by implementing WPT in EVs.
- When it comes to selling EVs in large quantities, battery technology is now obsolete.

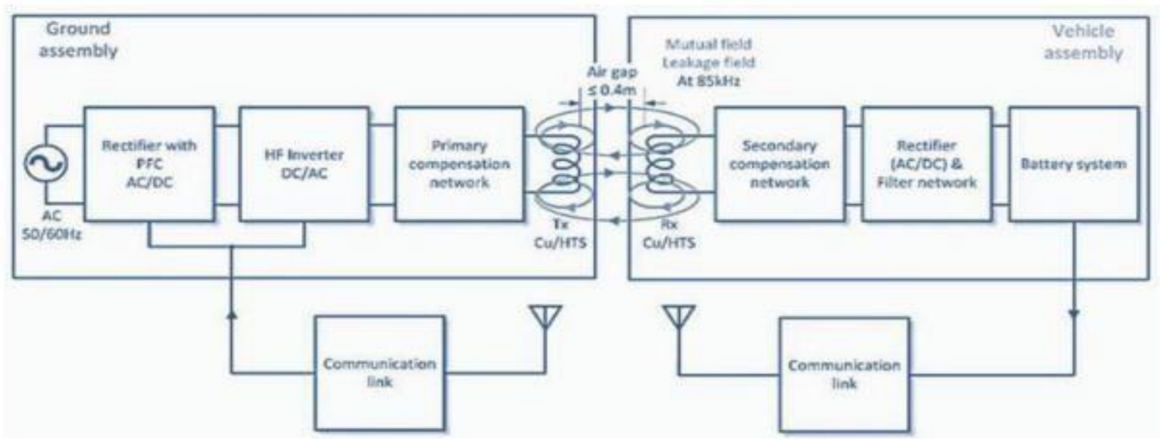


Figure 3: Wireless Power Charging in Electrical Vehicles

Comprehensive Development of Dynamic Wireless Power Transfer System for Electric Vehicle:

- This article details the full process of creating a dynamic wireless power transfer (WPT) system for charging an electric vehicle's battery (EV).
- The development procedure begins with an analysis of the dynamic WPT system's electrical requirements, continues with the design of the system's power stages, and ends with a validation test. In the design phase,the electrical size of the power stage components is depicted along with the structure of the coupling set, the layout of the coils, the configuration of the conversion stages, and the topology of the compensation networks.
- Within the verification phase, we discuss how a dynamic WPT system is set up and report the outcomes of experimental testing conducted with a roving pickup along the track.

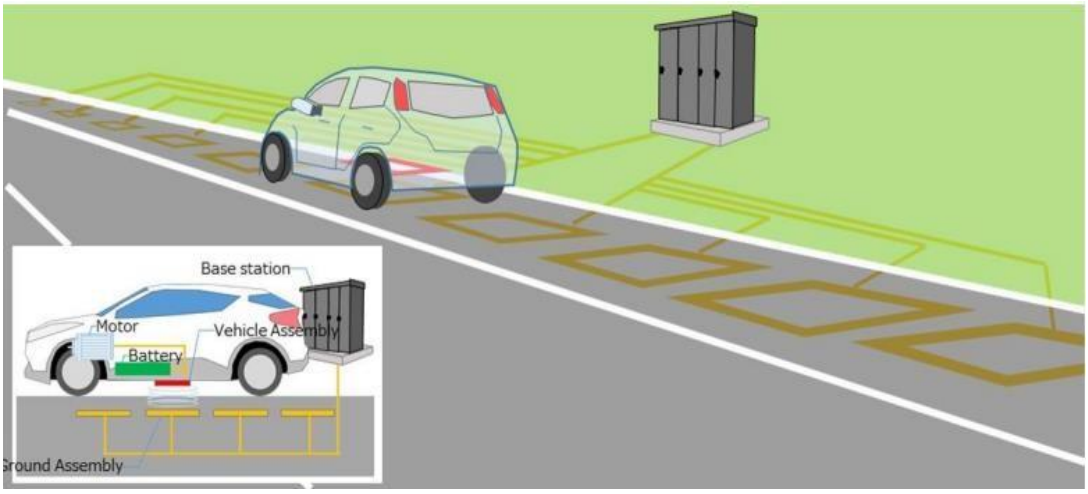


Figure 1.2: Base station along with ground station

CHAPTER-6 OUTPUT AND RESULT

OUTPUT:

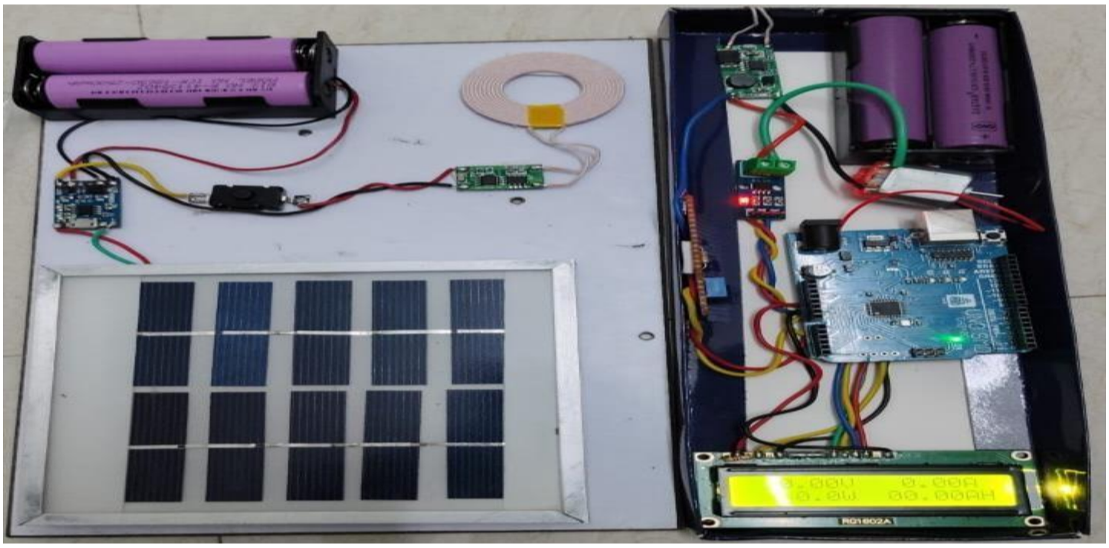


Figure 3

RESULT:

This project aimed to design and implement a solar-powered wireless electric vehicle charging system. The system utilizes solar energy to power a wireless power transfer system, enabling the charging of electric vehicles without physical cables. Key components include a solar panel, battery, power electronics, and transmitter and receiver coils. Experimental results demonstrated the feasibility and efficiency of the system, highlighting its potential to contribute to sustainable and convenient electric vehicle charging solutions.

CONCLUSION:

The increasing adoption of electric vehicles (EVs) necessitates the development of efficient and sustainable charging infrastructure. Traditional wired charging solutions, while functional, present limitations such as physical connection requirements, potential wear and tear on charging ports, and limited accessibility. To address these challenges, this project aims to develop a solar-powered wireless EV charging system.

The proposed system leverages the advantages of wireless power transfer (WPT) techniques, particularly magnetic resonance coupling (MRC), to enable efficient and contactless energy transfer between the charging station and the EV.

The key contributions of this project include:

- Efficient Power Transfer: The implementation of advanced WPT techniques and optimized system design to achieve high efficiency and extended charging range.
- Renewable Energy Integration: The seamless integration of solar power generation to reduce reliance on fossil fuels and promote sustainability.
- Intelligent Control: The development of intelligent control algorithms to optimize power flow, maximize charging efficiency, and ensure safe operation.
- Cost-Effective Solution: The exploration of cost-effective components and manufacturing processes to make the system economically viable.

FUTURE SCOPE:

1. Dynamic and Smart Charging:

Integration with smart grids and dynamic road charging systems can enable seamless, on-the-go charging and efficient energy management.

2. Sustainability and Off-Grid Solutions:

Solar wireless charging offers eco-friendly, off-grid options, especially for remote areas and urban smart infrastructure.

CHAPTER-7

LITERATURE SURVEY

- The literature review on recent research and development in the field of solar and wireless charging stations for electric vehicles. Bugatha Ram Vara Prasad et al. (2021) proposed a solar charging station for electric vehicles that utilizes a solar panel array and a power conditioning unit to convert the solar energy into electrical energy.
- The system includes an energy management system that regulates the charging process and optimizes the use of renewable energy sources.T.D. Nguyen et al. (2020) conducted a

feasibility study on bipolar pads for wireless power chargers.

- The study evaluated the performance and efficiency of bipolar pads for wireless charging, highlighting the potential benefits of this technology in reducing the reliance on physical connections.Bugatha Ram Vara Prasad and K. Aswini (2021) designed a bidirectional battery charger for electric vehicles that enables efficient charging and discharging of the vehicle's battery. The system includes a battery management system that regulates the charging process and ensures optimal performance.
- M. Singh et al. (2019) proposed a real-time coordination system for electric vehicles to support the grid at the distribution substation level. The system utilizes a communication intelligent algorithms to manage the charging and discharging of the vehicles, optimizing the use of renewable energy sources and reducing the reliance on the power grid. The literature review highlights the importance of renewable energy sources and wireless charging technologies in promoting sustainable and efficient charging solutions for electric vehicles.
- B. Revathi A. Ramesh, et.al [4] it is possible to extend the power transmission distance between the transmitter and the receiver coil by installing intermediate repeaters in the IPT system, accordingly. It is carefully determined where the repeater should be placed between the transmitter and the receiver. For producing the same amount of electricity, the efficiency of the two alternative setups varies greatly. If the repeater is placed closer to the transmitter than the receiver, the efficiency will improve. A gap of 10-15 cm between the road surface and the bottom of the electric vehicle is significant for larger vehicles such as trucks or buses, so certain techniques are required to increase the charging distance depending on the gaps. To achieve this, repeaters are inserted

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