# Green Energy-Driven Transportation & Wireless EV Charging

## Abstract

This project integrates wireless EV charging with renewable energy to enable in-motion charging, eliminating long stops at charging stations. The system uses electromagnetic induction from road-integrated coils for light vehicles and overhead pantograph wires for heavy transport. Solar energy storage reduces grid dependency, ensuring a sustainable and scalable transportation model.

## Introduction

Traditional EV charging stations cause delays and range anxiety due to long waiting times. This project offers an innovative solution using wireless dynamic charging roads and overhead charging for heavy vehicles, promoting green energy-driven transport.

## Objective

✔ Implement wireless charging lanes to power EVs in motion.
✔ Use overhead pantograph systems for heavy vehicles.
✔ Optimize charging efficiency using ferrite-enhanced materials.
✔ Improve scalability and cost-effectiveness with modular coil designs.

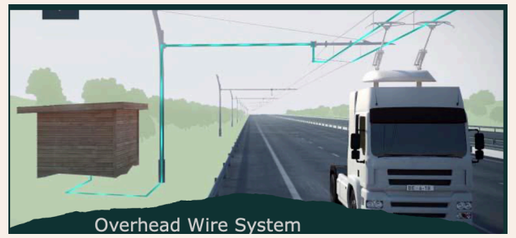
## Methodology

1️⃣ Research & Problem Identification
2️⃣ System Design & Prototyping
3️⃣ Testing & Optimization
4️⃣ Implementation & Future Enhancements

## Problem Statement

- Charging Delays: Stationary EV charging causes inefficiencies.
- Heavy Vehicle Battery Limitations: Trucks and buses need continuous charging solutions.
- Sustainability Issues: High grid dependence increases carbon footprint.

## Result




- Wireless Charging Efficiency: 85% power transfer efficiency.
- Optimized Charging Speeds: Best performance at 20-30 km/h.
- Energy Sustainability: Solar panels and grid backup ensure uninterrupted power.
- Heavy Vehicle Charging: Pantograph system enables long-distance travel.

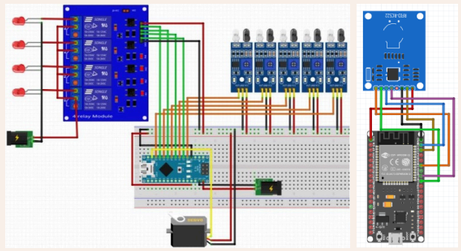
## Software Used

✅ Arduino IDE – Programming & Control
✅ ESP32 & IoT Dashboards – Data monitoring
✅ Matlab/Simulink – System Simulation

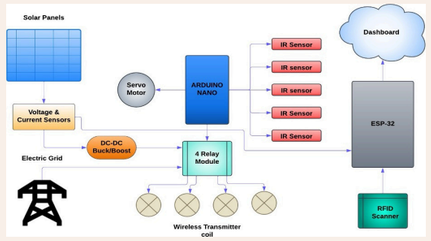
## Conclusion

This project successfully demonstrates a scalable, sustainable EV charging solution by combining wireless charging, solar energy, and overhead charging systems. Future enhancements include AI-driven power management, faster charging speeds, and smart city integration.

## Circuit Diagram



## Block Diagram




## References

- IEEE Papers on Wireless EV Charging & Renewable Energy
- Research on Smart Grids & V2G Communication
- Real-world Pantograph & Inductive Charging Applications