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Design and Development of a Solar-Powered Wireless Charging Station for Electric Vehicles

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Abstract

The transition to electric vehicles (EVs) is key to reducing greenhouse gas emissions and dependence on fossil fuels, yet the widespread adoption of EVs remains challenged by limited charging infrastructure, range anxiety, and reliance on non-renewable energy sources. This project focuses on the design and development of a solar-powered wireless charging station for electric vehicles, aiming to address these issues by integrating renewable energy and innovative charging technologies. The proposed system harnesses solar energy to provide a clean, sustainable power source, reducing the carbon footprint associated with EV charging. The wireless charging station is designed to be efficient, user-friendly, and adaptable to various environmental conditions. By utilizing photovoltaic panels, energy storage solutions, and resonant inductive coupling for wireless energy transfer, the system allows for convenient, contact-free charging. Key components include solar panels for power generation, a battery storage unit for energy management, a control system for optimizing power flow, and a wireless charging pad that interacts seamlessly with EVs equipped for inductive charging. The project explores optimal placement and orientation for solar panels to maximize energy capture, investigates power conversion efficiencies, and addresses safety protocols for wireless energy transfer. A prototype of the station will be developed, tested, and evaluated for energy efficiency, charging speed, and overall feasibility. This solar-powered wireless charging station has the potential to expand the EV charging infrastructure in a sustainable manner, supporting the shift towards greener urban transportation networks.

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