WIRELESS POWER TRANSFER ON ROAD FOR ELECTRIC VEHICLES

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Keywords:

Wireless Power Transfer (WPT), Resonant Inductive Coupling, Power Transfer Efficiency (PTE), Dynamic Charging.

Introduction:

Wireless Power Transfer (WPT) is a technology that enables the transfer of electrical energy without physical connectors. It is based on electromagnetic principles where power is transmitted through magnetic fields between transmitter and receiver coils.

As highlighted in the report, conventional EV charging systems suffer from limitations such as long charging time, dependence on charging stations, and range anxiety. To overcome these challenges, this project proposes a dynamic wireless charging system where electric vehicles can receive power directly from the road.

In this system, transmitter coils embedded beneath the road generate a high-frequency electromagnetic field. Receiver coils mounted on the vehicle capture this energy and convert it into usable electrical power. This method improves convenience, reduces charging interruptions, and supports sustainable transportation.

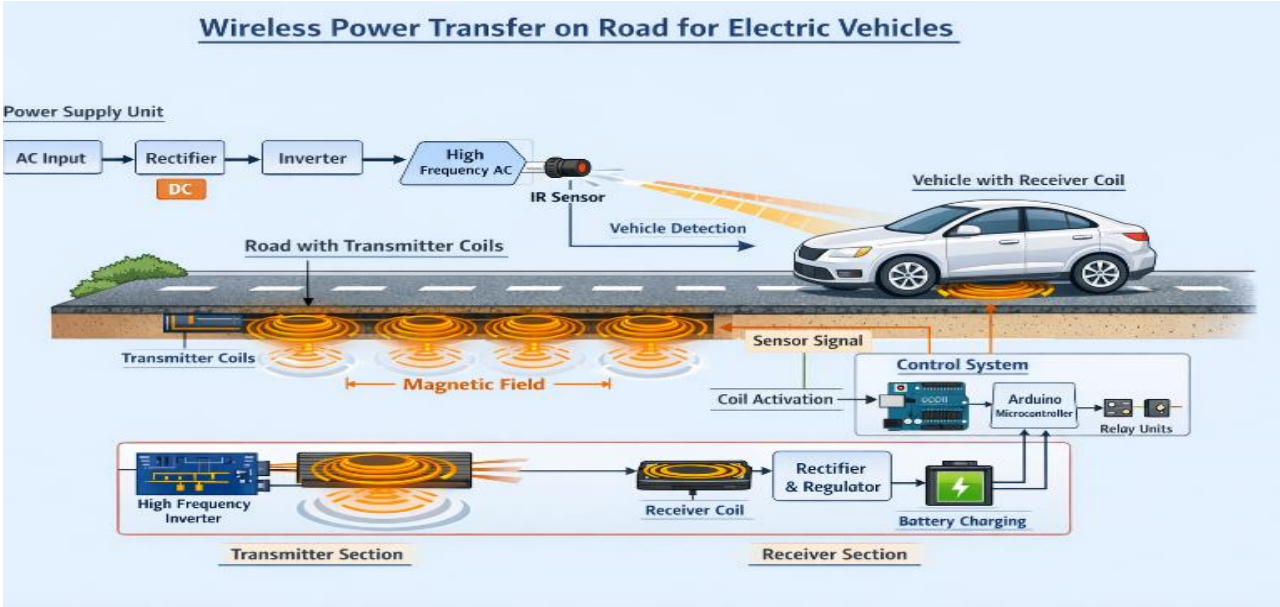

Figure 1: Wireless Power Transfer on Road for Electric Vehicles

Objectives:

1. To design a wireless power transfer system for EV charging.
2. To enable dynamic charging while the vehicle is moving.
3. To reduce range anxiety and charging downtime.
4. To improve Power Transfer Efficiency.

Methodology:

1. Power Conversion Stage
- AC supply is converted to DC
- DC converted to high-frequency AC using inverter

2. Transmitter Section
- Coils embedded under road
- Generates alternating magnetic field

3. Detection System
- IR sensors detect vehicle position
- Each sensor corresponds to a coil

4. Control System
- Microcontroller processes sensor data
- Activates corresponding relay and coil
- Prevents power loss by selective activation

5. Receiver Section
- Coil mounted on vehicle
- Receives magnetic field and induces voltage

6. Output Stage
- Rectifier converts AC to DC
- Filter and regulator provide stable output for charging.

Result and Conclusion:

The system successfully demonstrates wireless power transfer using inductive coupling, enabling efficient energy transmission from the road to the vehicle without physical contact. The output is stable and suitable for charging applications. The project confirms that dynamic wireless charging is feasible and offers improved efficiency, safety, and convenience compared to conventional methods.

References:

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Future Scope:

The future scope of this project includes:

1. Integration with renewable energy sources such as solar-powered roads can further enhance the sustainability of the system.
2. The use of artificial intelligence (AI) and smart control systems can improve efficiency by enabling automatic alignment detection and adaptive power management.
3. Development of high-efficiency coils and advanced power electronic circuits can significantly increase power transfer efficiency and reduce energy losses.