

Survey on Wireless Charging and Placement of Stations for Electric Vehicles

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Outline

- Introduction
- Wireless Charging
- Parameters
- Conclusion

Transportation

- Demand for fuel for vehicles used for commuting
- Weather degradation



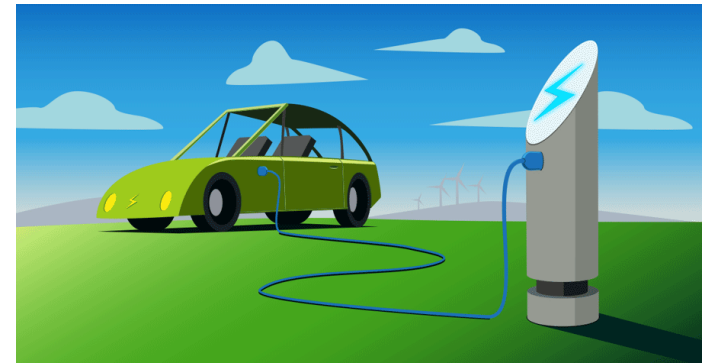
Electric Vehicle

- Zero level emissions, but emissions may be produced by the source of electrical power
- On the other hand
 - Long distances
 - Frequently charging
 - Short or limited period and distance according to their battery capacities.



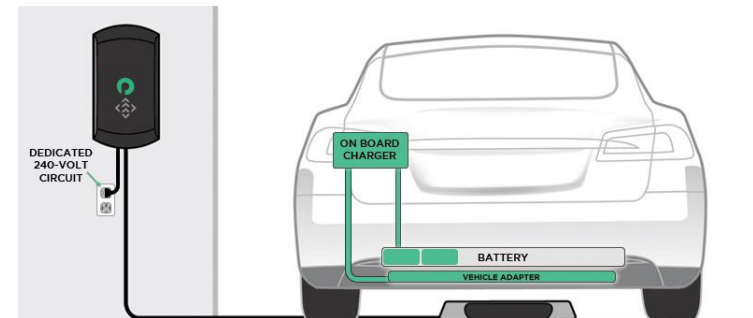
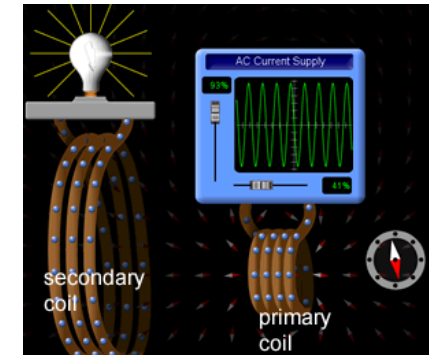
Charging Models

- Threshold-based charging model
- Parking Lots
- Daily Charging
- Bus Charging Techniques at garage during non-service time
- **Wireless Charging**



Wireless Charging

- Dynamic Charging
- Inductive Power Transfer [1]
- Power Supply
- Coils in Supply and Receiver
- The coils can be placed on roads



[1] Covic, G. A., & Boys, J. T. (2013). Inductive power transfer. *Proceedings of the IEEE*, 101(6), 1276-1289.

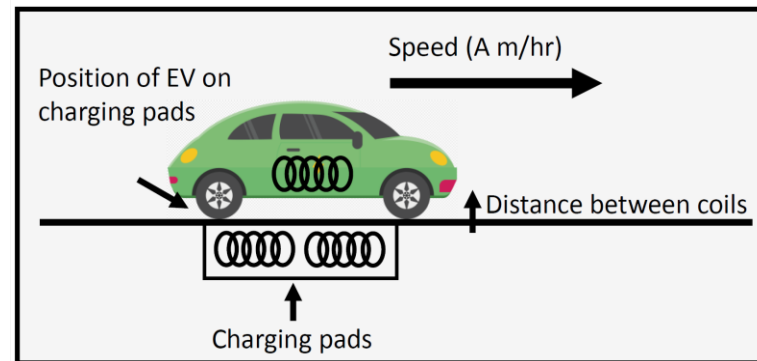


Objective

Survey on parameters which effects the Wireless Charging
Placement of Stations for Electric Vehicles

Factors for Wireless Charging Pads Placement

- Speed
- Positioning
- Distance between Coils
- Traffic
- The number of Stations and Coil
- Road Gradient
- Battery Size of Coil Position
- Day Time



Speed

- Various battery size: 30kW, 40kW, 100kW
- Travel distance: Average 151 mile with 40kW
- Plug-in electric vehicle charging systems deliver 3.3 kilowatts to 6.6 kilowatts
- Two cars with 120 km/h speed by receiving 20kW in 100 meter (No lost rate is reported)
- Cost required to build or install the system to be in operation





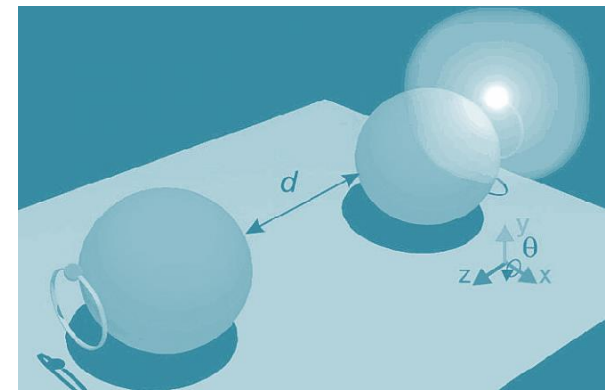
Positioning Vehicle

- 80% of the charging capacity if it is positioned close to the accurate place
- If this case is out of accuracy, the charging levels may be expected to be as low as 30%



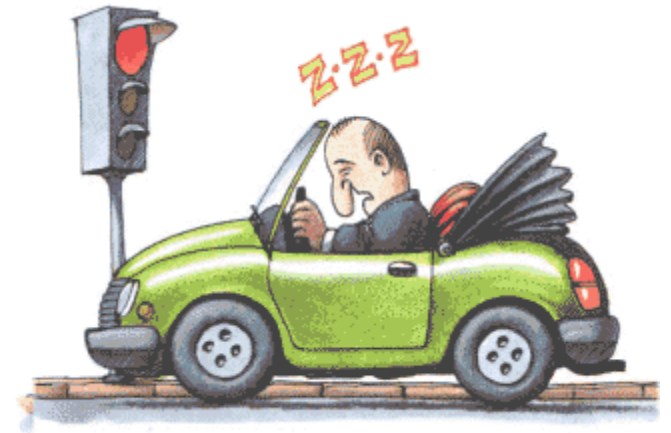
Distance between Coils

- Distance between the transmitter and receiver coil



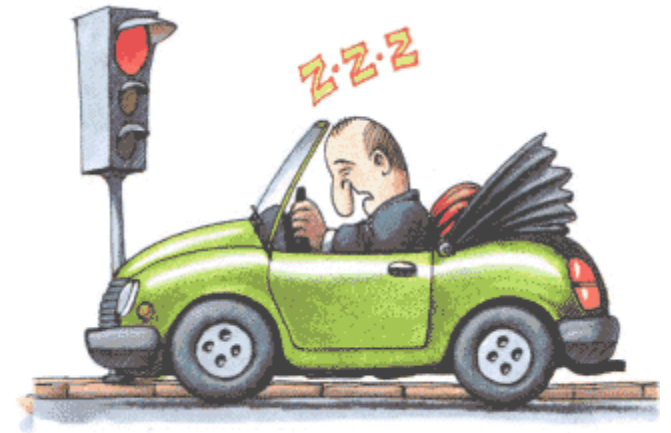
Traffic

- The number of vehicles
- The time to spend on the charging sections



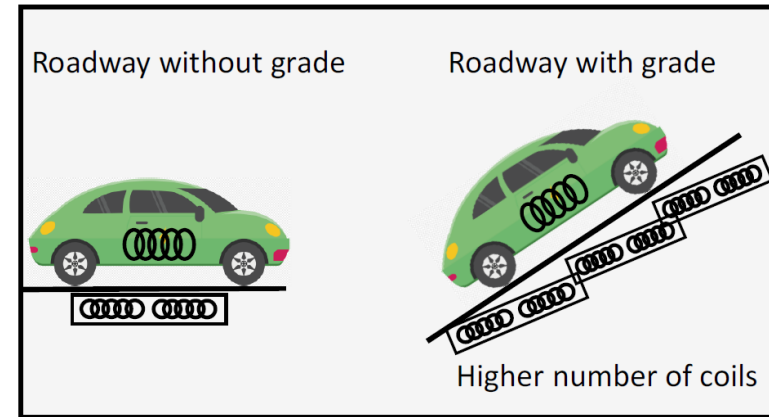
Traffic

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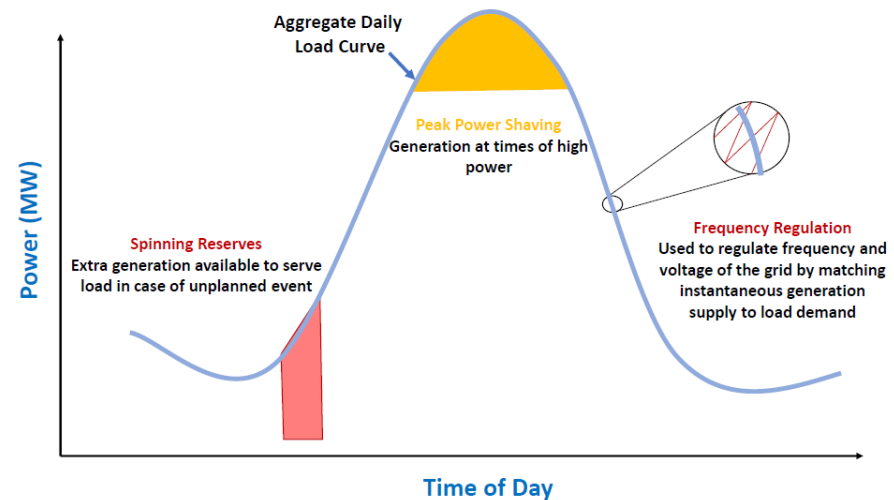
Road Gradient

- The distance between coils
- The number of coils



Day Time

- Based on a scenario like daytime, the roads in the cities may experience more traffic
- candidates for wireless charging pads
- a load factor of power supply must be planned to provide enough power at different times of the day.



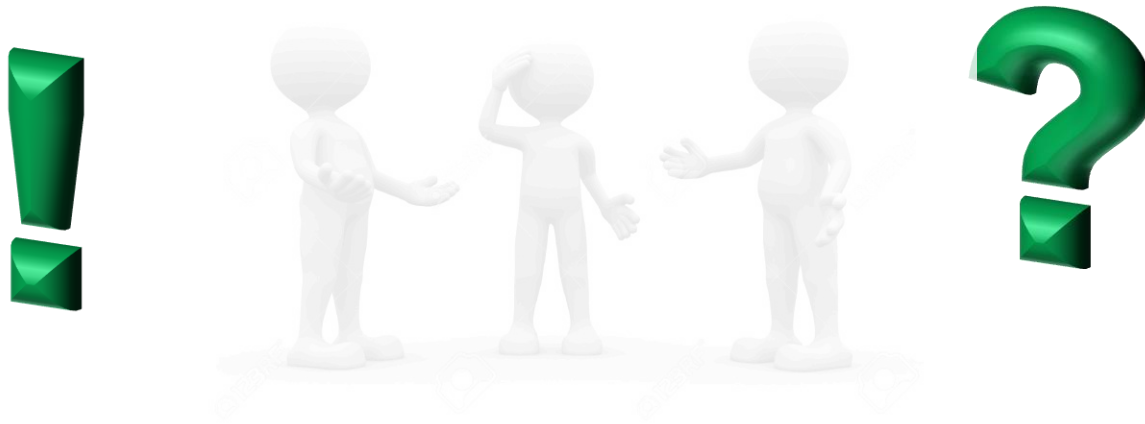
The Picture is from P. G. Electric, "Transportation electrification plan," March 15 2017. [Online]. Available: <https://www.portlandgeneral.com/-/media/public/residential/electric-vehicles-charging-stations/documents/pge-ev-plan.pdf?la=en>

Conclusion

The brief survey paper helps to new researchers understand the wireless charging in Electric Vehicles.

The parameters which affect the wireless charging and wireless charging placements are summarized.

The most important parameters for electric vehicle wireless charging are speed, traffic, the distance between charging sections and coils, the number of coils, the position of the coils on EV, battery sizes, the road condition, and the time for charging.



Thank You

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