



# **Advances in Electrical Vehicle Wireless Power Transfer (EVWPT) and the need for standardization**

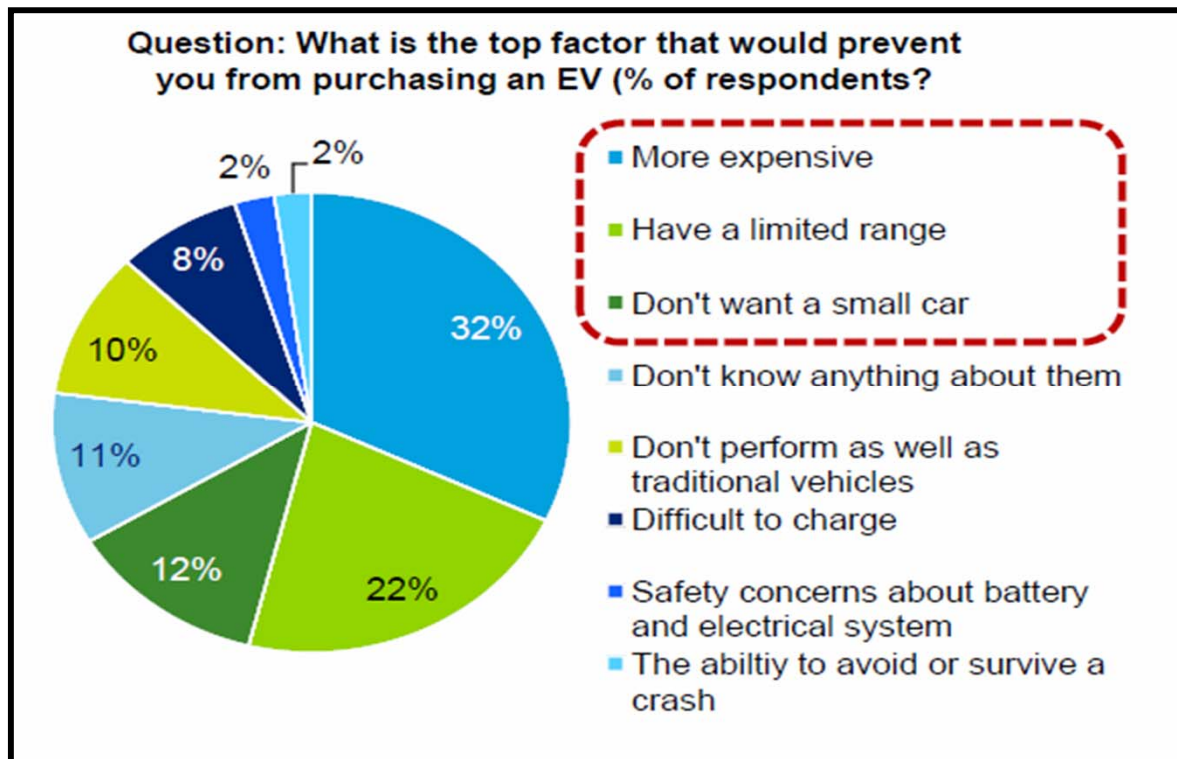
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# Motivation for EVWPT

Understanding the key barriers for EV consumer acceptance



Source: Deloitte 2010

## Motivation for EVWPT

- Unique to Battery-Electric Vehicles is a critical **trade-off** between:
  - *Mass*
  - *Cost*
  - *Range*
- **EV acceptance** is a function of these factors.
- Wireless Power Transfer (WPT) is a means to **increase the range** of an electric vehicle without substantial impact on the weight or cost.



# Categorization of EVWPT

## Location-based categorization:

Stationary WPT:	vehicle is parked, no driver is in the vehicle
Quasi-dynamic WPT:	vehicle stopped, driver is in the vehicle
Dynamic WPT:	vehicle is in motion

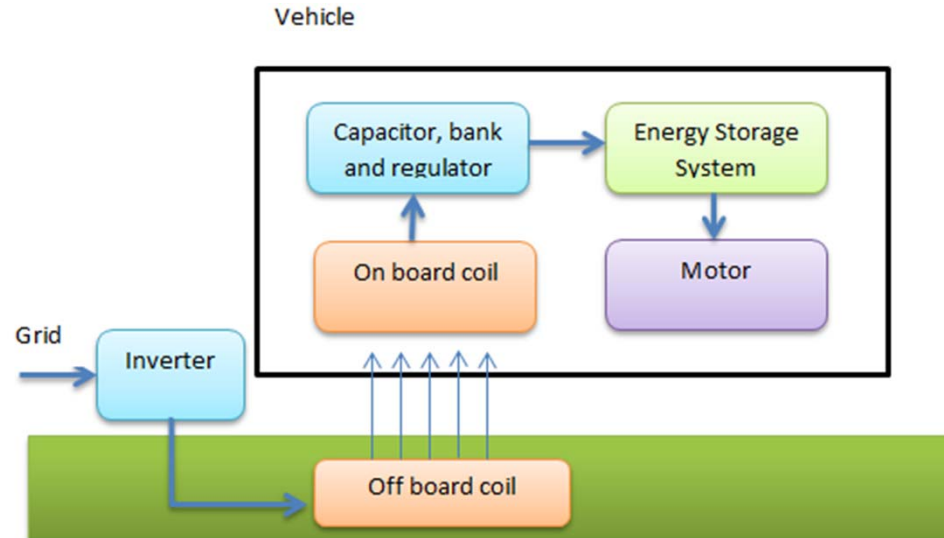


SAE  
J2954

## J2954 WPT power classes:

Light Duty Home:	3.6 kW
Light Duty Fast Charge:	19.2 kW
High Duty:	200-250kW

# Proprietary design vs. standardization needs



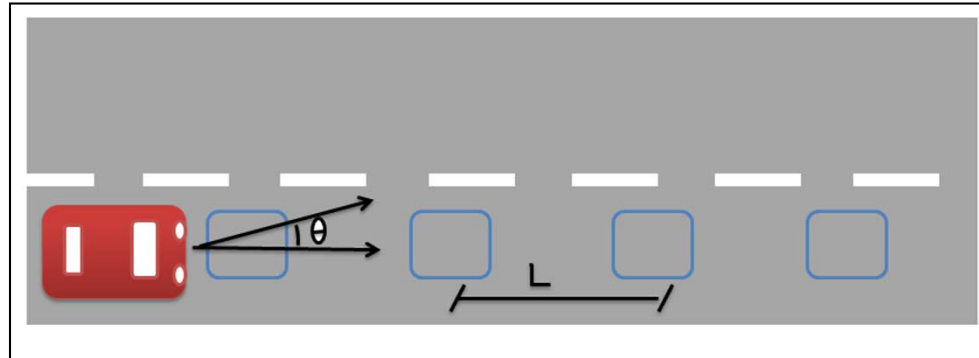
## Proprietary:

Coil design, power electronics, inverter system design

## To be standardized:

communication standards, system performance, system safety, operating frequency, mounting locations, alignment techniques

# Challenges of dynamic wireless power transfer



Synchronization of energizing coils, timing of power transfer

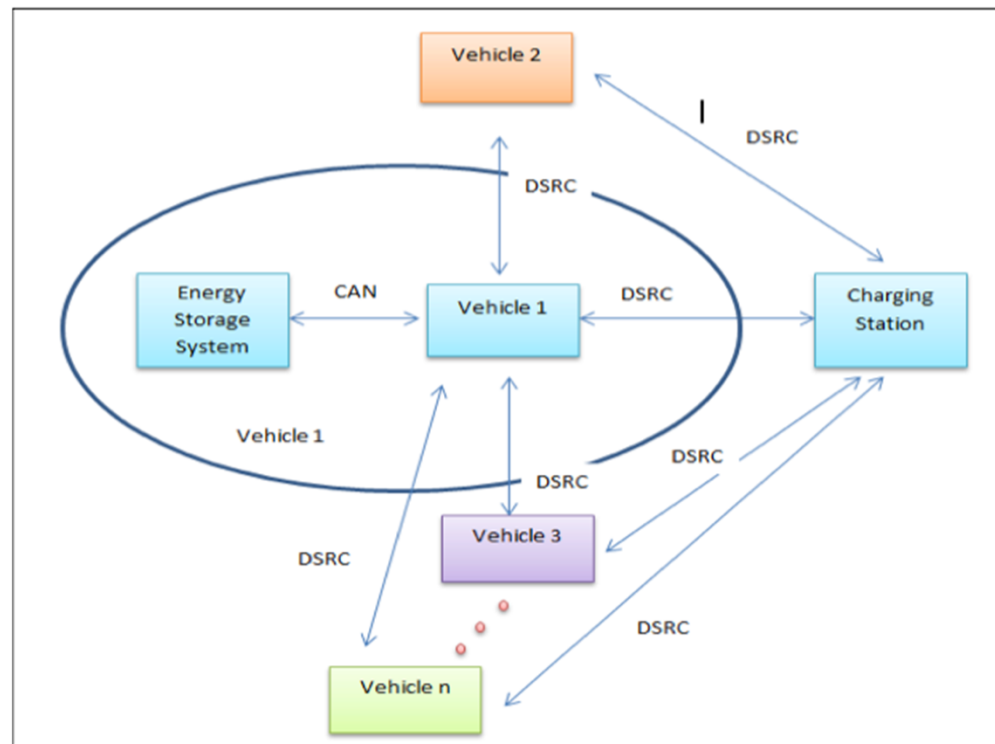
Acceptable power levels

Vehicle alignment

Allowable speed profiles

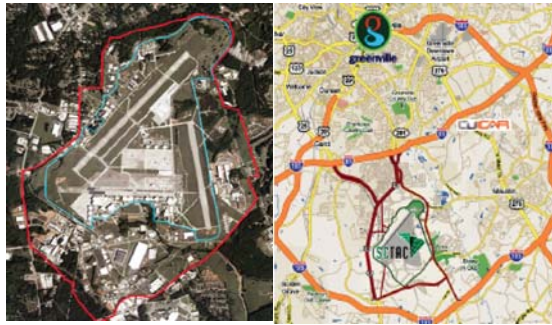
Multiple vehicles on charging lane

# Need for low-latency wireless communication for dynamic EVWPT



Dedicated Short Range Communication (DSRC, IEEE 802.11p) is a valid technology candidate for low-latency wireless communication

## Need for physical testbed for stationary and dynamic wireless charging



Test site for stationary and dynamic wireless charging is currently in development (joint initiative of CU-ICAR and SC-TAC\*)

\*see general facility information at [www.cuicar.com](http://www.cuicar.com) and [www.sc-tac.com](http://www.sc-tac.com)





# New IEEE pre-standardization initiative for dynamic wireless charging

IEEE Standards Organization has initiated a Electrical Vehicle Wireless Power Transfer Industry Connections Activity.

## **Motivation and goal:**

This IEEE Standards Association Industry Connection Activity is related to pre-standardization efforts in the domain of Electric Vehicle Wireless Power Transfer with a particular focus on **dynamic wireless charging** as these efforts address the range limitation of electric vehicles as well as the cost aspect of the vehicle energy storage and complement the current standardization activities of the SAE (J2954) which is centered on stationary charging.

Final approval by IEEE-SA Standards Board is expected for March 6, 2013.



# Potential commercialization opportunities for dynamic wireless charging

Personal Rapid Transport (PRT)

Rail systems

EV buses

Dedicated Highway Lanes (for electrified vehicles to enable long range driving)