



## The feasibility of Dynamic Wireless Power Transfer on highways



Denis Naberezhnykh – Head of ULEV and ITS Technology  
ITS World Congress Bordeaux, 8<sup>th</sup> October 2015

# Our Vision



*To be the world leader in creating the future of transport and mobility, using evidence-based solutions and innovative thinking*

## Fast facts

- One of the largest independent transport centres in the world
- International reputation for first class consultancy, research excellence and project delivery
- A team of over 400 highly qualified transport specialists



Clients in 145  
Countries



Over 800 Projects  
delivered in 2014



Over 4,000 TRL  
Reports available to  
download



TRL Software sold in over  
60 Countries and 250 cities  
world-wide



# Trends in road vehicle electrification

- No revolution in on-board battery storage



- EV range will double by 2020 (as will battery capacity)



- Novel, more flexible vehicle usage and ownership leading to higher vehicle utilisation



Batteries unlikely to provide range comparable with ICE vehicles in the near future

Range anxiety could be replaced with "charging anxiety"

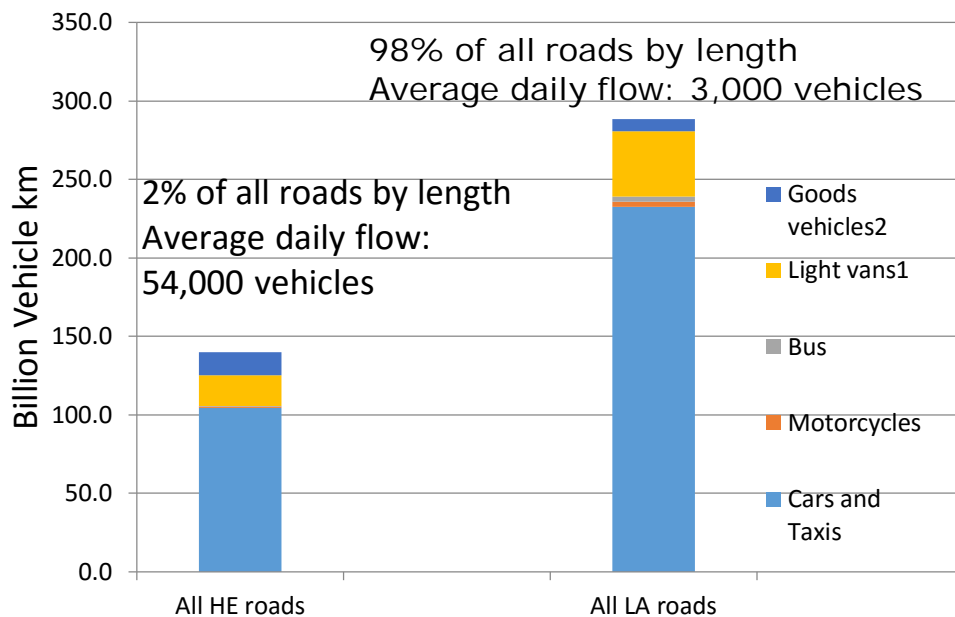
Increased demand in opportunistic charging

# Plug-in charging has its place

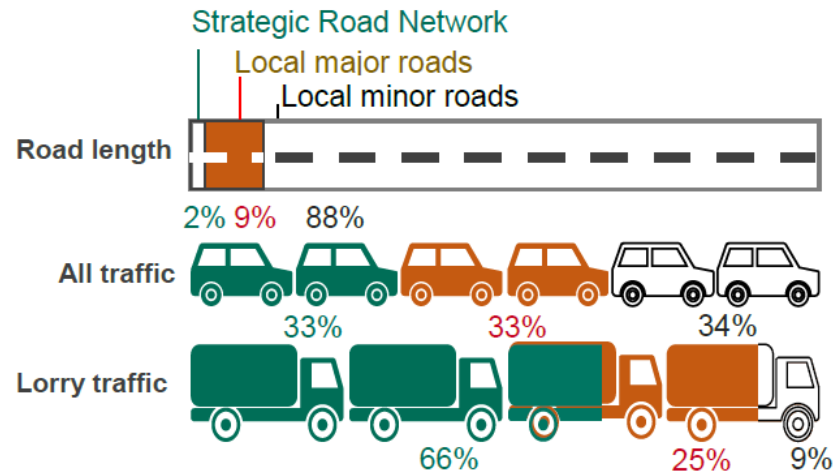


# How scalable is plug-in charging?

## Vehicle traffic by road type (UK)



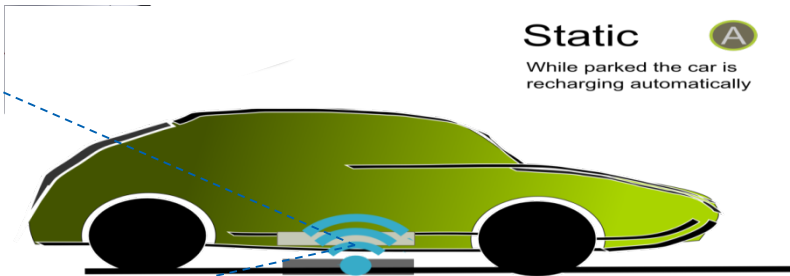
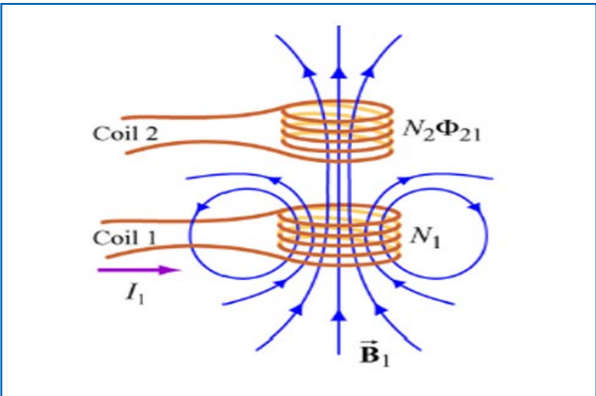
DfT Road Traffic Statistics 2015,  
Table TRA4115



Note: Percentages do not always add up to 100 due to rounding

DfT Strategic Road Network Statistics 2015

# What is Wireless Power Transfer (WPT)?



Source: SAET

## Position 1

Vehicle detection & recharging system in stand-by



## Position 2

Vehicle is charging by passing over the recharging pad and receiving transmitted power



Transmitted power depends upon:

- Speed
- Power unit
- Track length

## Position 3

Vehicle has been automatically recharged while driving.





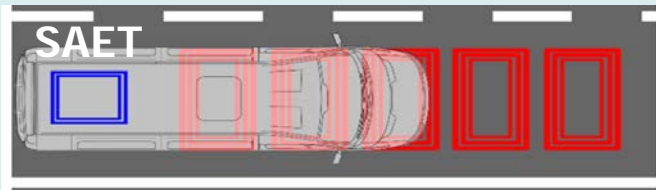
# FABRIC

<b>EC Call</b>	<b>GC.SST.2013-1.Feasibility analysis and technological development of on-road charging for long term electric vehicle range extension</b>			
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<b>Type of action</b>	<b>Project budget</b>	<b>EU Funding</b>	<b>Project Start</b>
<b>Research &amp; Innovation</b>	<b>€9 m</b>	<b>€6.5 m</b>	<b>January 1st, 2014</b>

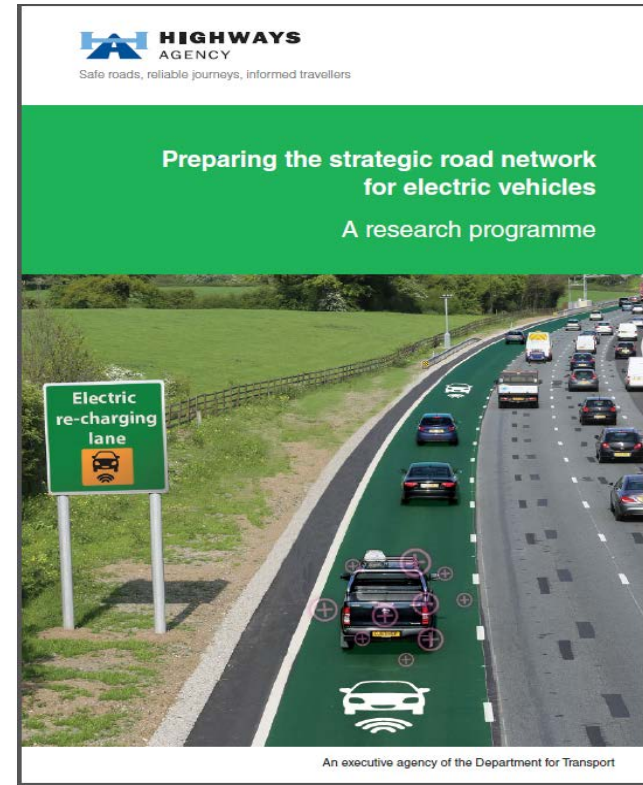
<b>Partners</b>	ICCS, CRF, SCANIA, VOLVO, VeDeCom (Renault), SAET, ERTICO, AMET, ATA, CEA, CIRCE, ENIDE, FKA, IREN, KTH, MECT, POLITO, QIE, SaNeF, TRL, TNO, TECNO, UNIGE-DITEN
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<b>Activities &amp; Status</b>	<ul style="list-style-type: none"> <li>- Three wireless charging solutions are being developed           <ul style="list-style-type: none"> <li>- VEDECOM in France using QUALCOMM static charging pads</li> <li>- POLITO in Italy</li> <li>- SAET in Italy</li> </ul> </li> </ul>
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# Background

- Highways England published a research programme in 2014
- Prepare the SRN for future EV take up and facilitate their adoption
- Contribute to reducing GHG emissions and air pollution
- Focus is on identifying a wireless power transfer solution that could be installed under the road surface





**Feasibility study:**  
Powering electric vehicles on  
England's major roads



<http://www.highways.gov.uk/knowledge/publications/1902/>

Press release

## Off road trials for “electric highways” technology

From: [Highways England](#) and [Andrew Jones MP](#)

First published: 11 August 2015

Part of: [Road network and traffic](#)

Off road trials of the technology needed to power electric and hybrid vehicles on England’s major roads are due to take place later this year.



The trials are the first of their kind and will test how the technology would work safely and effectively on the country’s motorways and major A roads, allowing drivers of ultra-low emission vehicles to travel long distances without needing to stop and charge the car’s battery.

The trials follow the completion of the [feasibility study](#) commissioned by Highways England into ‘dynamic wireless power transfer’ technologies.

# Project team led by TRL



# Feasibility study results

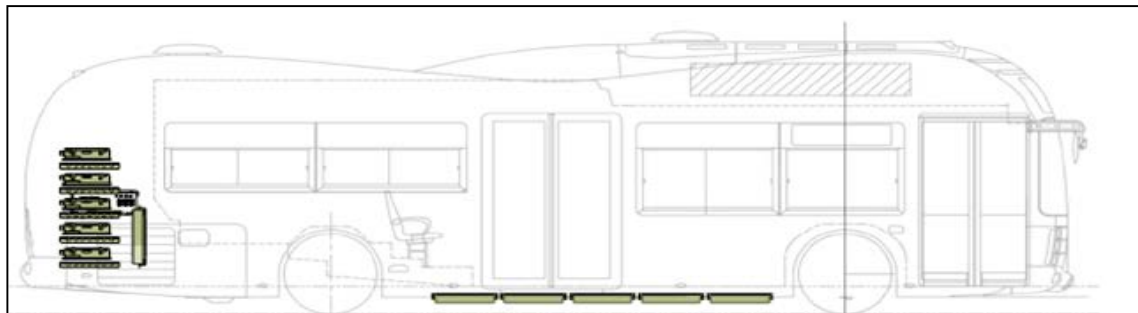
- Does the technology already exist?



<b>Power:</b>	140kW to 200kW
<b>Efficiency:</b>	80%-90%
<b>Air gap:</b>	Up to 30cm

Images: Scania

# Feasibility study results



<b>Power:</b>	Up to 200kW
<b>Efficiency:</b>	75%
<b>Air gap:</b>	Up to 27cm

Images: DW OLEV and KAIST

ITS World Congress Bordeaux





# Feasibility study results

- How much will it cost?

NPV (over 20 years, from 2010)	£17M per km	Construction, operation and electricity costs
Installation and grid connection	£3.9M per km	Road works and provision of appropriate power supply
Operation	£1.2M per km	Maintenance and back office operation
Electricity cost	£12M per km	Electricity over 20 years
Environmental benefit (20 yrs)	% reduction	Monetised saving
CO <sub>2</sub>	45%	~£2M per km
No <sub>x</sub> and PM	35% and 40%	Between £100k to £1M per km

# Could this be the future?



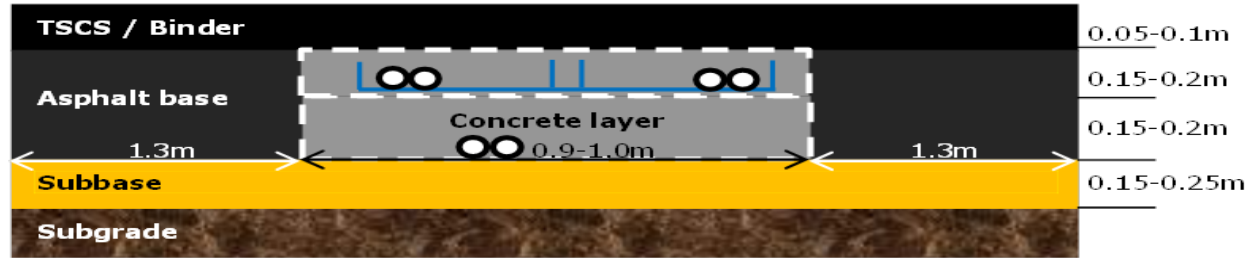
# Thank you

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# Feasibility study results

- Can it be installed in the road?



DW OLEV / KAIST DWPT system



Modieslab – Netherlands

# Feasibility study results

- Can the system be connected to the electric grid?

