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Low Emission Cities Workshop

Best practice measures for increasing the take up of low pollution and carbon vehicles in cities

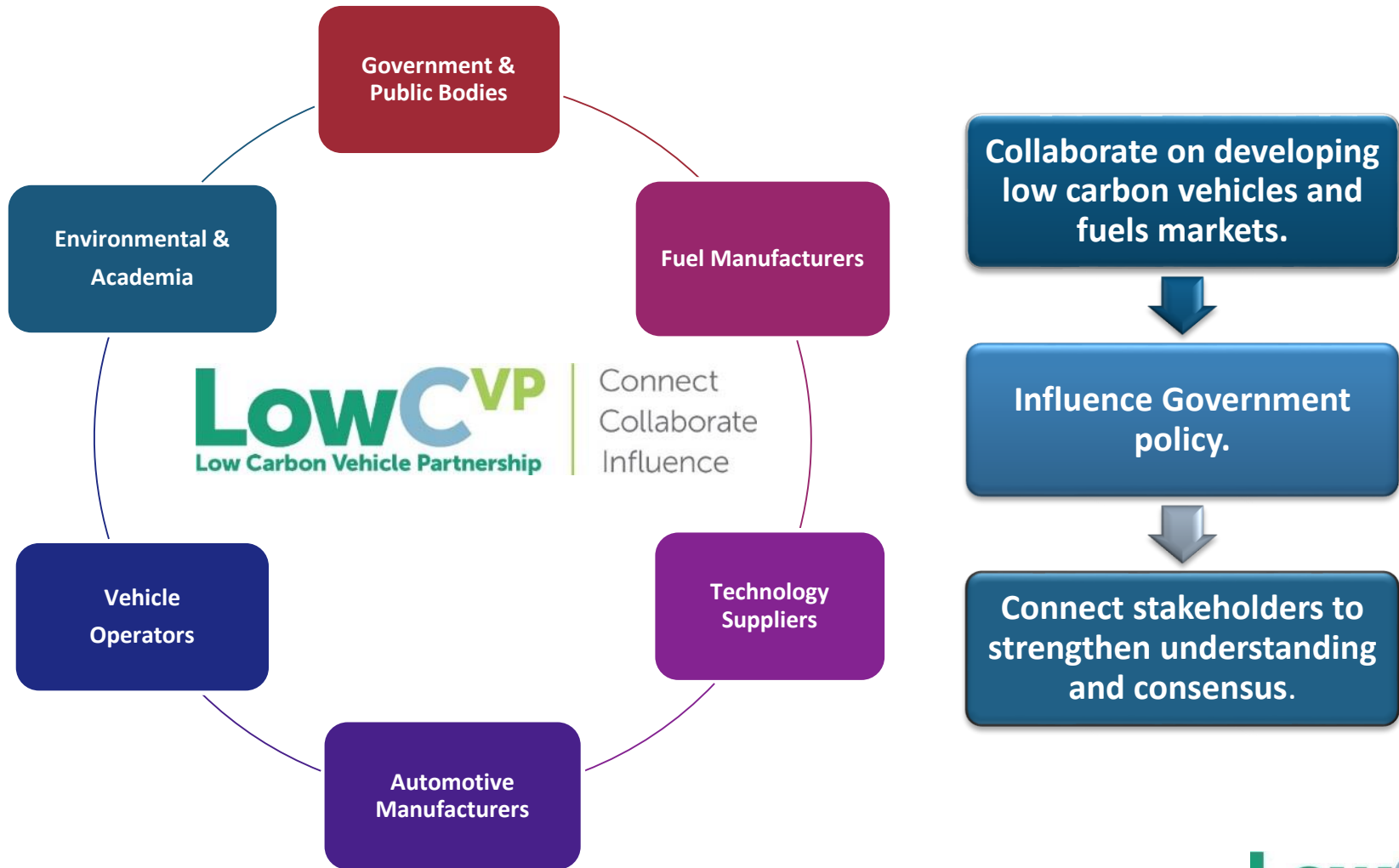
Wednesday, 18th November 2015, Sheffield

Overview of Low Emission Vehicles

Andy Eastlake, Managing Director, Low Carbon Vehicle Partnership



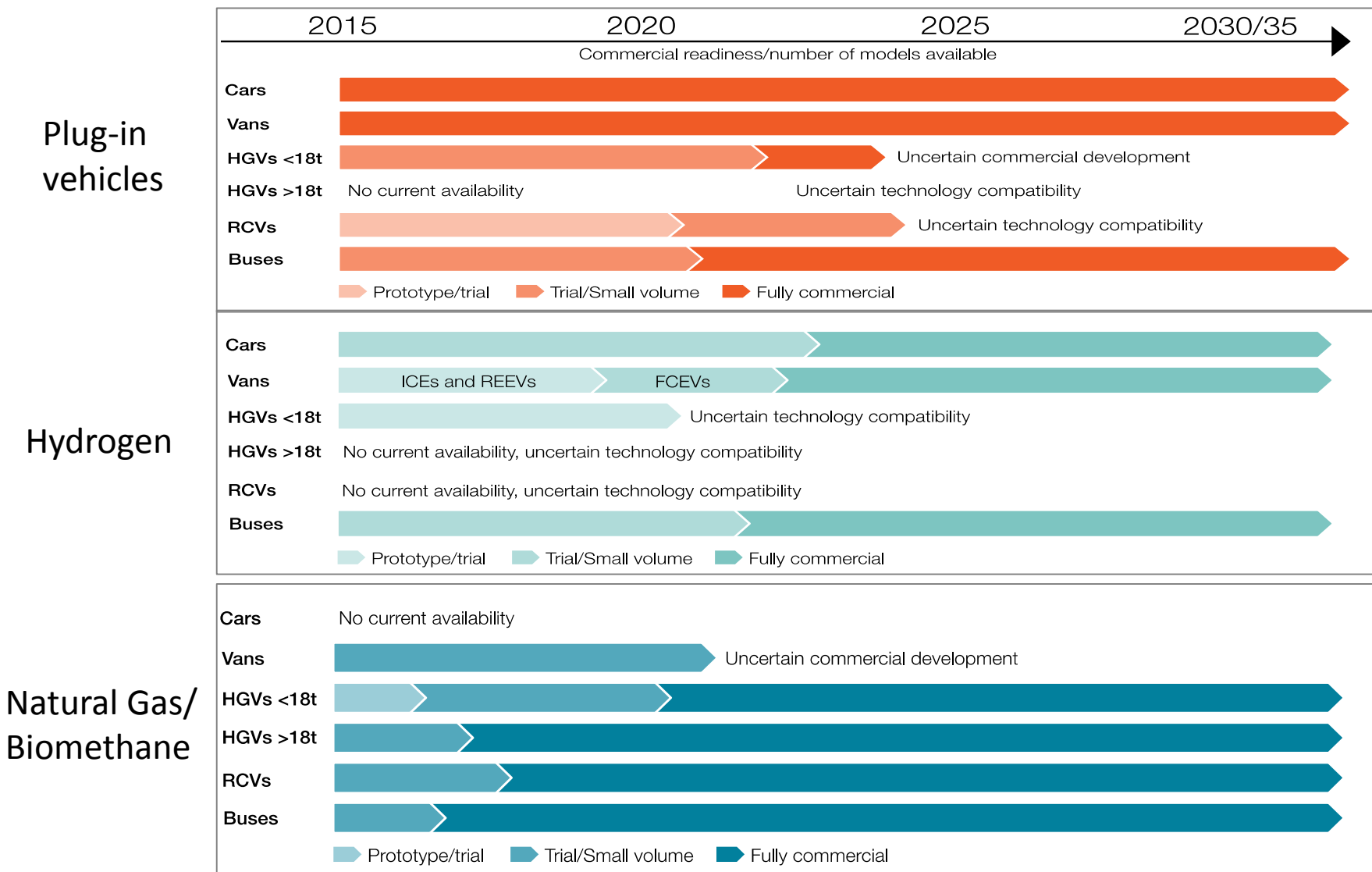
LowCVP is a unique stakeholder organisation, our mission is to accelerate a sustainable shift to low carbon vehicles and fuels



What is a low emission vehicle?

- No official definition but would aim to achieve low to very low air pollution (NO_x,PM) and CO₂ emissions.
- Portfolio of fuel and technology options – no silver bullet!
- **Alternative fuels – natural gas, LPG, hydrogen, sustainable biofuels**
- **Advanced powertrain technologies – battery electric (BEV), plug-in hybrids(PHEV), hydrogen fuel cell(FCEV) - ULEVs**
- **Internal combustion engines which meet latest Euro Standards (Euro 6/VI)**
- **Retrofit technologies – exhaust after treatment, conversions, fuel saving**
- Focus typically on reducing tail-pipe CO₂ emissions but we should consider ‘well-to-wheel’ GHG emissions (fuel production + exhaust).
- There are multiple standards for different vehicle types
 - European Emission Standards for LDV and HDVs
 - EU New Car and Van CO₂ Regulations
 - National standards for funding eligibility: Plug-in car grant <75 CO₂g/km
Low Emission Bus Grant: >15% Well-to-Wheel GHG emission savings compared to a Euro 5 diesel bus and achieve Euro VI engine standard.
- Consistent low emission vehicle definitions and standards recommended

Availability and market projections of a selection of technologies and fuels



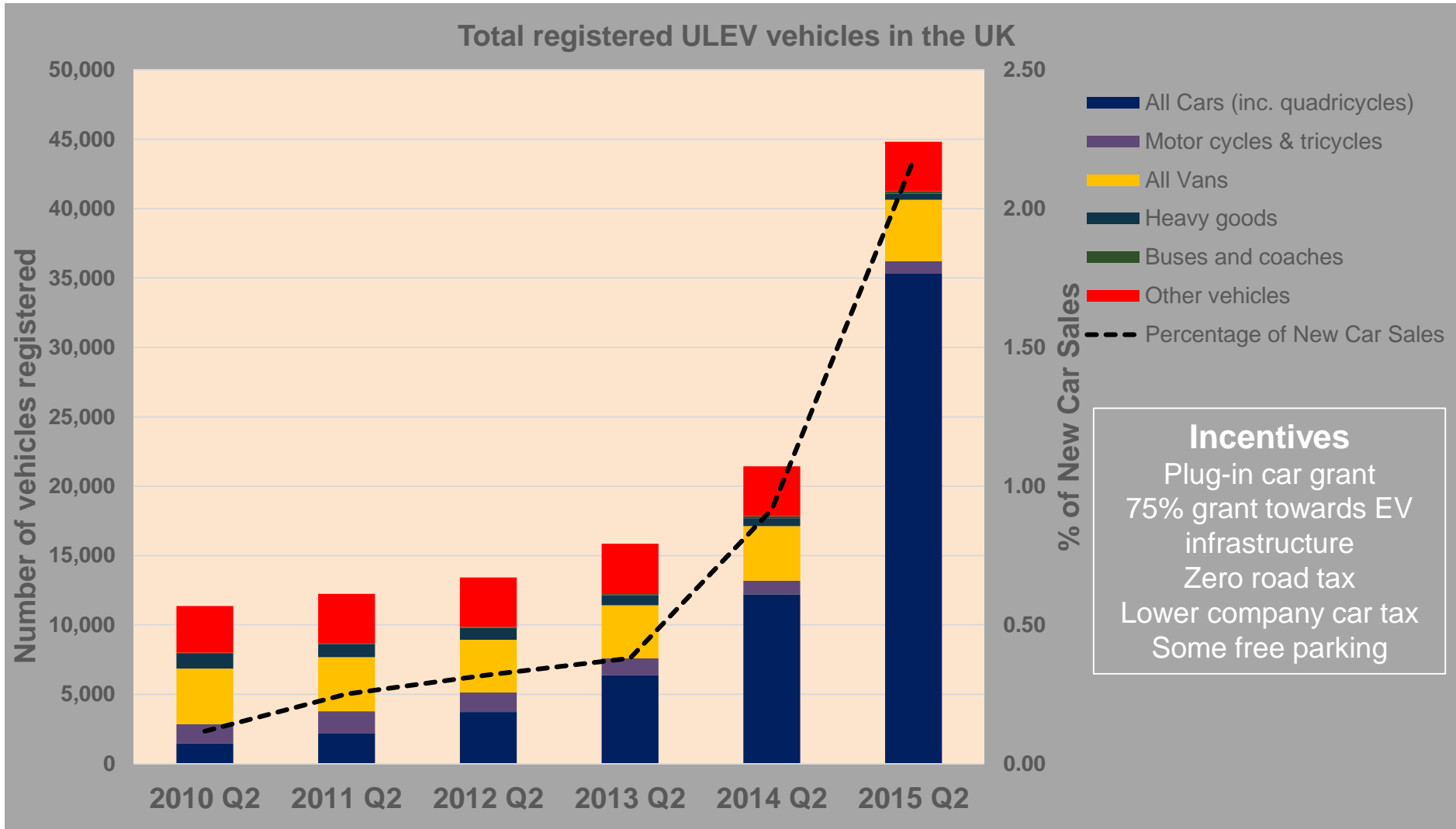
FCEV: Fuel Cell Electric Vehicle **HGV:** Heavy Goods Vehicles **ICE:** Internal Combustion Engine **RCV:** Refuse Collection Vehicle **RE-EV:** Range Extended EV

A multitude of barriers preclude the near term uptake of plug-vehicles & alternative fuels

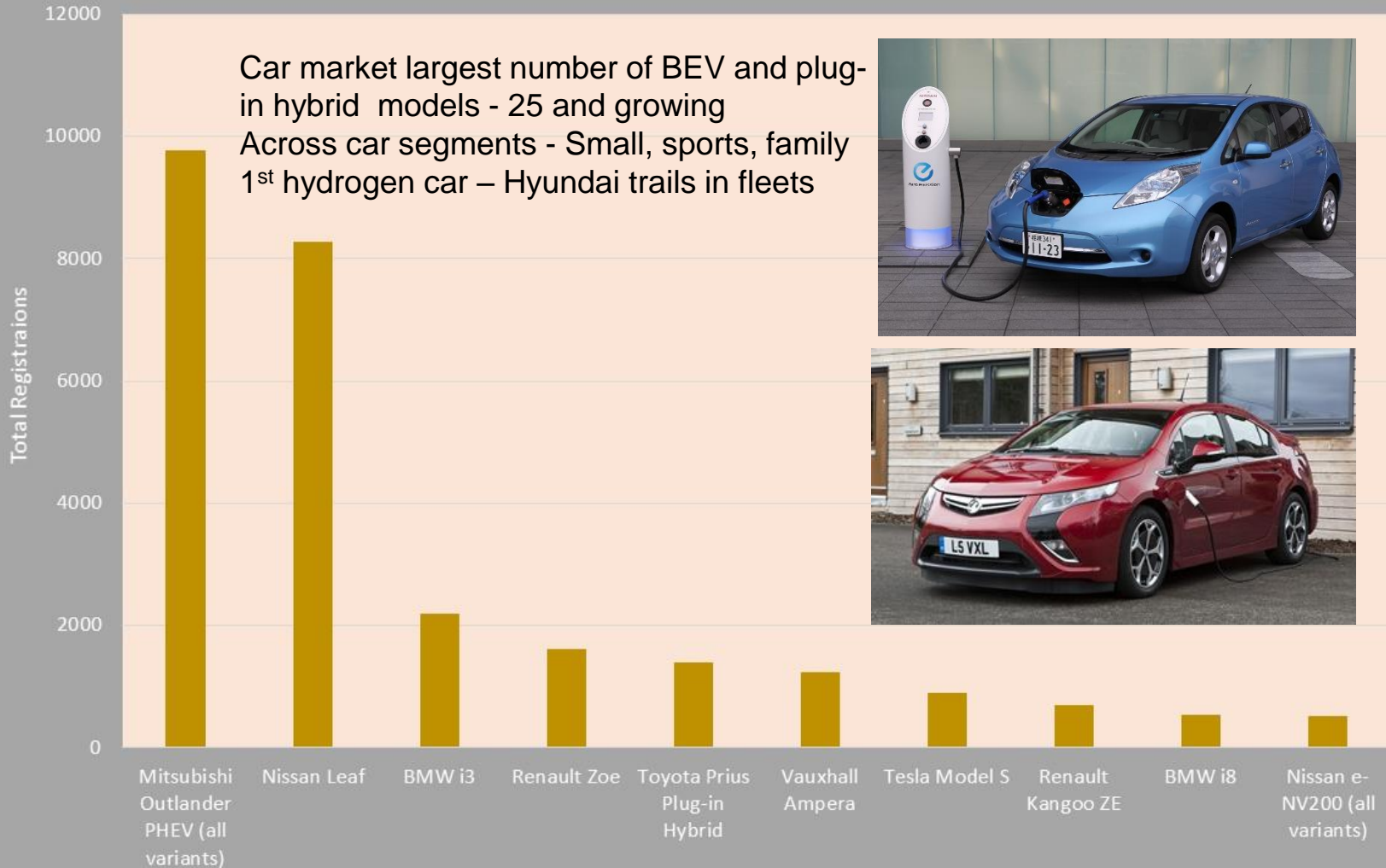
	Fleet Operators	Public
Electric /Plug-in hybrids	<ul style="list-style-type: none"> Higher capital cost Uncertainty in total cost ownership Battery life/replacement cost Payload penalty for vans Range limitation Resale value Lack of availability for low emissions vans with higher payloads Lack of information about financial benefits and suitability of different technologies Lack of data on real world performance 	<ul style="list-style-type: none"> Higher purchase cost Battery life Range anxiety Lack of public refuelling Recharge time Performance/reliability
Natural gas/biomethane and dual fuel	<ul style="list-style-type: none"> Lack of refuelling stations Uncertainty in performance/reliability especially dual fuel Supply of biomethane Cost of infrastructure for small operators/LAs 	

National and local policy can facilitate reducing these barriers and stimulate demand for low emission vehicles.

Plug-in car market has increased rapidly since 2014, incentives played a key role



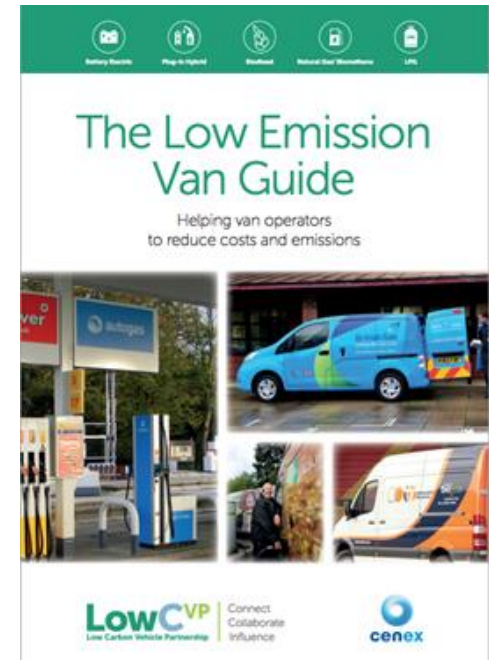
Top ten plug-in car models purchased 2015



The low emission van market is in its very early stages of development

- 99% of UK vans are diesel, <1% new van sales are plug-in/alternative fuels
 - Plug-in vans limited availability, mainly small van segment
Models - 9 BEV, 1 REEV, 1 hydrogen ICE
 - Larger vans – LPG, natural gas/biomethane, sustainable biodiesel (B20)
 - LowCVP Low Emission Van Guide – outlines low emission fuels and technologies, business case, incentives, infrastructure, environmental and operational merits.
- More information LowCVP Low Emission Van Hub:

<http://www.lowcvp.org.uk/lev.htm>



Renault Kangoo (BEV)



Mitsubishi Outlander (REEV)



Autogas Conversion (LPG)

Low emission taxis market is focused on plug-in technology but opportunities exist for alternative fuels

- Plug-in black taxis (BEV & REEV) recently entered the market, very low volume
- Black taxis conversions are possible - LPG and natural gas/biomethane. Birmingham City Council LPG black taxi conversion project (Clean Vehicle Technology Fund) – lower cost option
- Petrol hybrids been very popular with city mini-cab firms; opportunities with PHEV



Mercedes Benz Vito Taxi

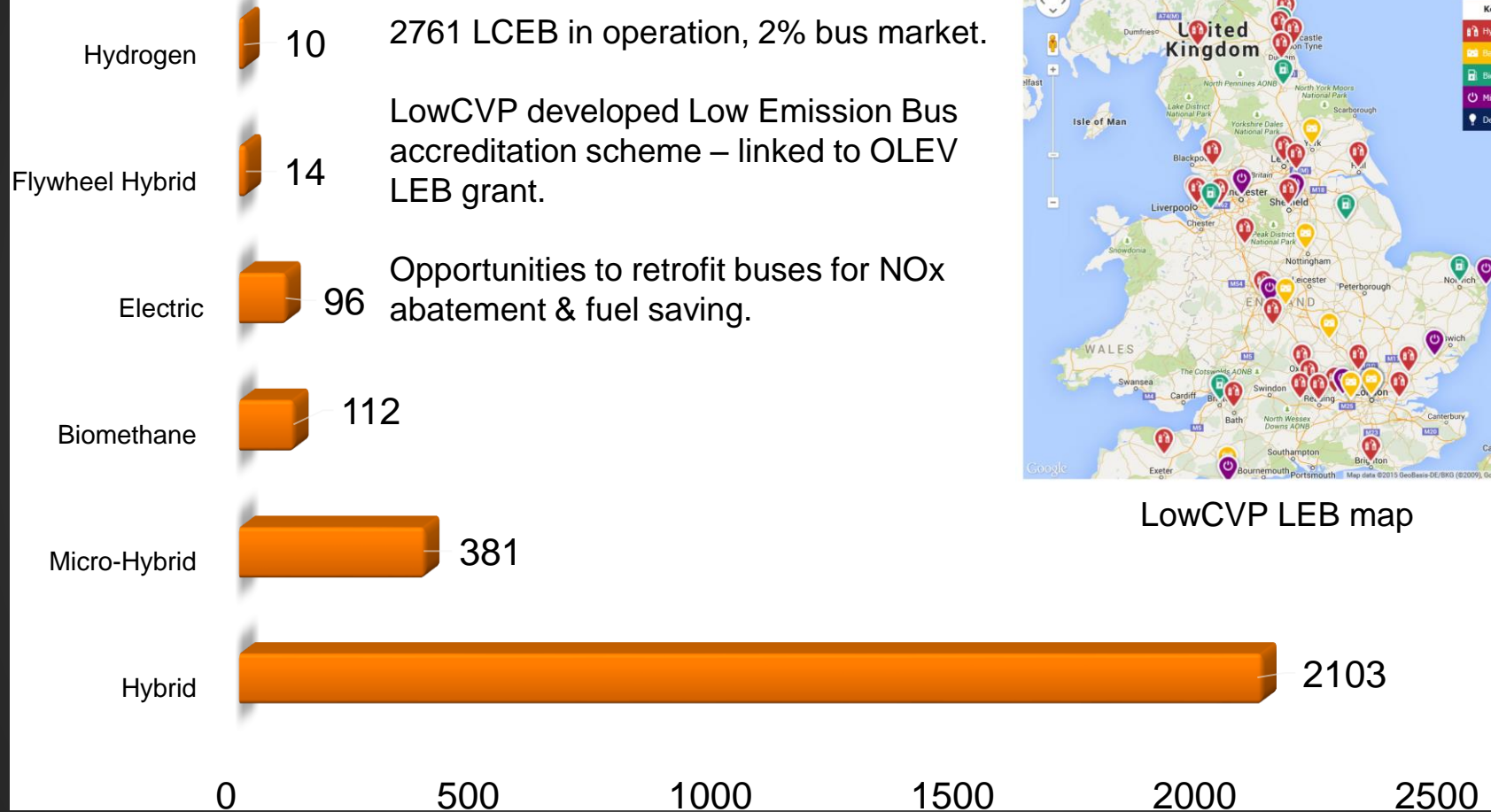


Fraser Nash Metrocab



Nissan e-NV200

The low emission bus market has experienced strong growth over the past three years, variety of technologies in use



2761 LCEB in operation, 2% bus market.

LowCVP developed Low Emission Bus accreditation scheme – linked to OLEV LEB grant.

Opportunities to retrofit buses for NOx abatement & fuel saving.



LowCVP LEB map

OEMs – ADL, Volvo, Scania, MAN, Optare, BYD

Exemplar low emission bus fleets



Transport for London

- Largest hybrid bus fleet >1700
- Biodiesel B20 (used cooking oil) >30 buses
- 17 battery electric buses, 1st double decker
- 3 plug-in hybrid bus with inductive charging
- 8 hydrogen fuel cell buses
- Bus retrofit programme – Selective Catalytic Reduction Technology, >90% NOx reduction

Reading Buses

- 34 gas buses run on biomethane (more from Reading later!)

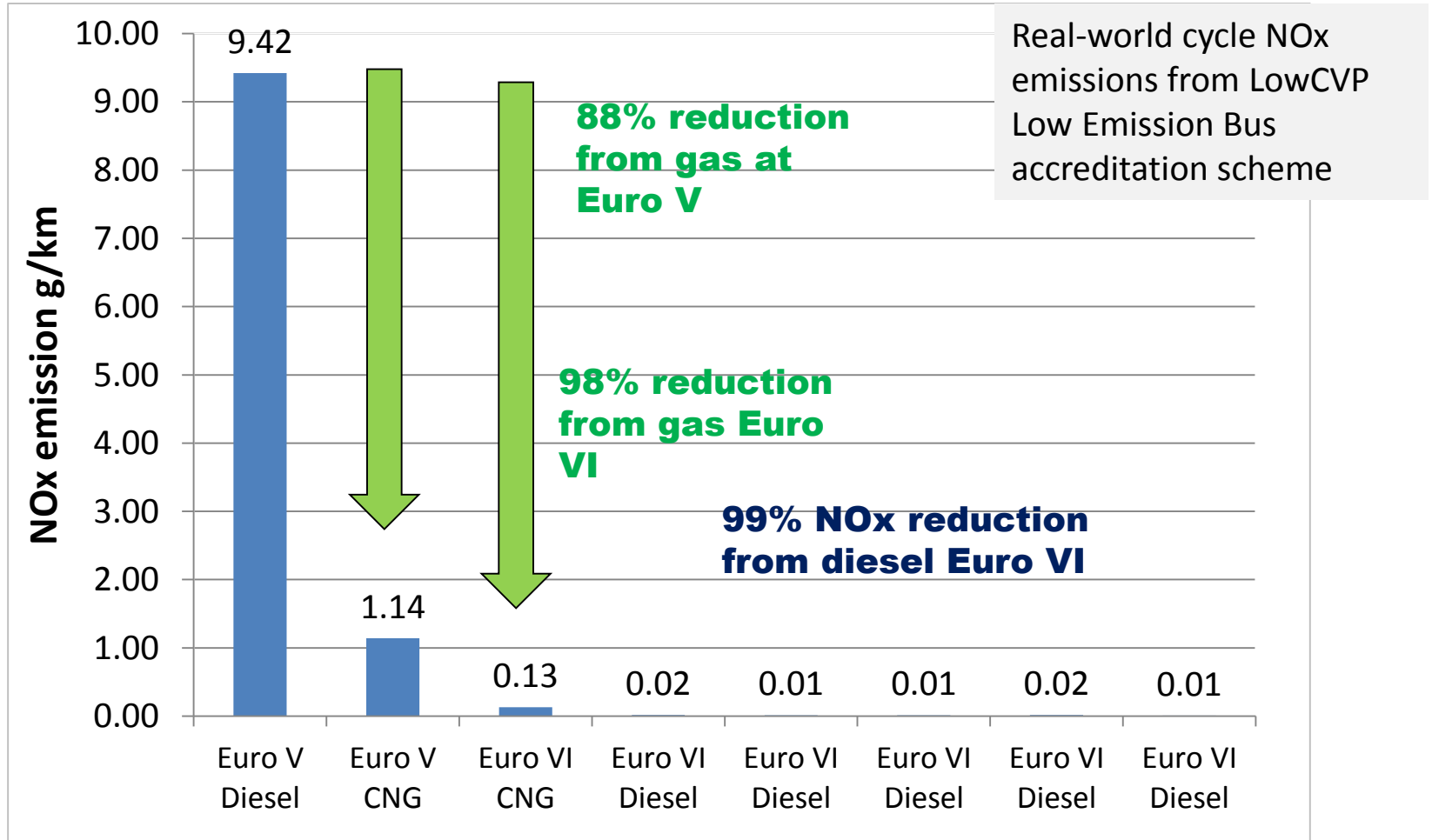


Nottingham City Council

- 45 battery electric buses
- Exploring conversion of diesel to electric
- Developing fast & standard charging



Independent vehicle emission testing shows very good NOx emissions performance of Euro VI buses



NOx emissions can be lower than the Euro VI car limits (0.08g/km)

Low emission truck market is in its very early stages, fuel and technology options dependant on vehicle duty cycle

- City duty cycles - hybrid, battery electric, and natural/gas biomethane (dedicated CNG/LNG trucks), sustainable biodiesel (used cooking oil)
OEMs – Scania, Volvo, Mercedes Benz, DAF, Iveco
- Long haul/motorway duty cycles – natural gas/biomethane dedicated and dual fuel (LNG/CNG), sustainable biodiesel
- Very low numbers of hybrid and BEV trucks, natural gas and dual fuel trucks – circa 500 in use
- Opportunities for retrofitting fuel saving technology
LowCVP Low Carbon Truck Accreditation Scheme
- Availability of sustainable liquid and gaseous biofuels is a key challenge and ensuring WTW GHG emissions are lower than diesel.
(DfT - Low Carbon Truck Trial <http://www.gasvehiclehub.org/>)



DAF Hybrid Truck



Mercedes Benz CNG Truck

THANK YOU FOR LISTENING

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<http://www.lowcvp.org.uk/lev.htm>

Low Emission Buses
<http://www.lowcvp.org.uk/initiatives/leb/Home.htm>