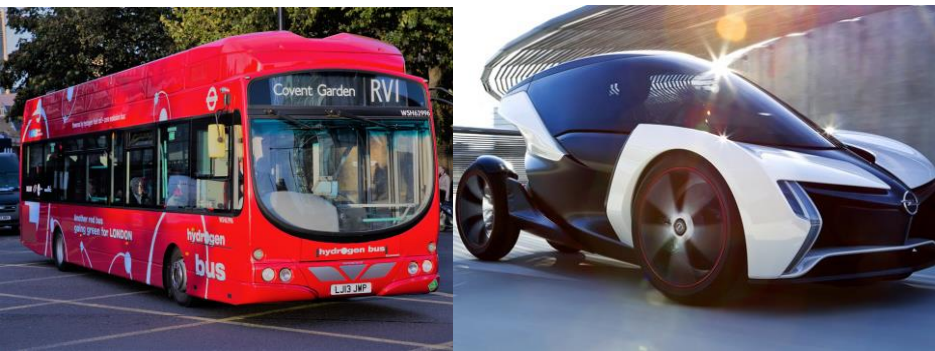


Joined-up-thinking: Lower Carbon, Cleaner Air

Wednesday, 4th October

Coach & Bus UK '17, NEC, Birmingham



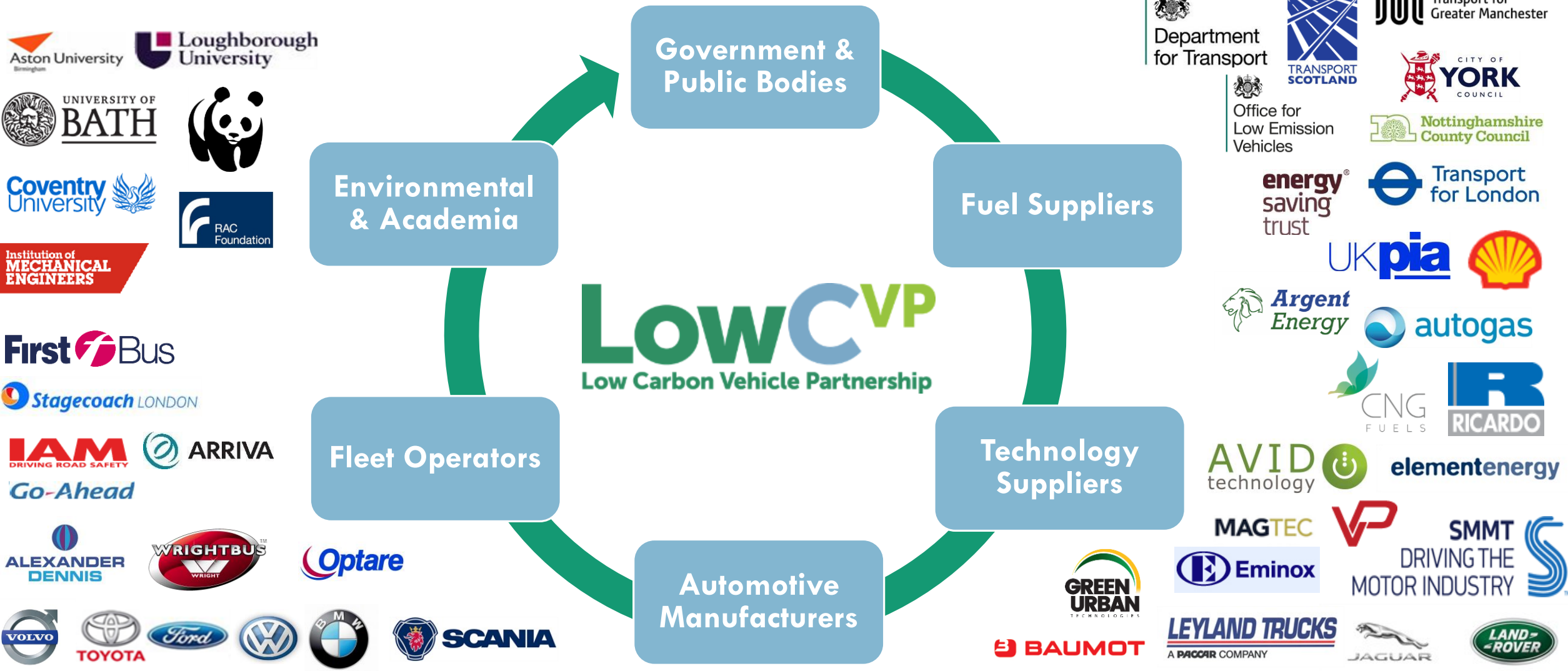
LowCVP
Low Carbon Vehicle Partnership
Connect | Collaborate | Influence



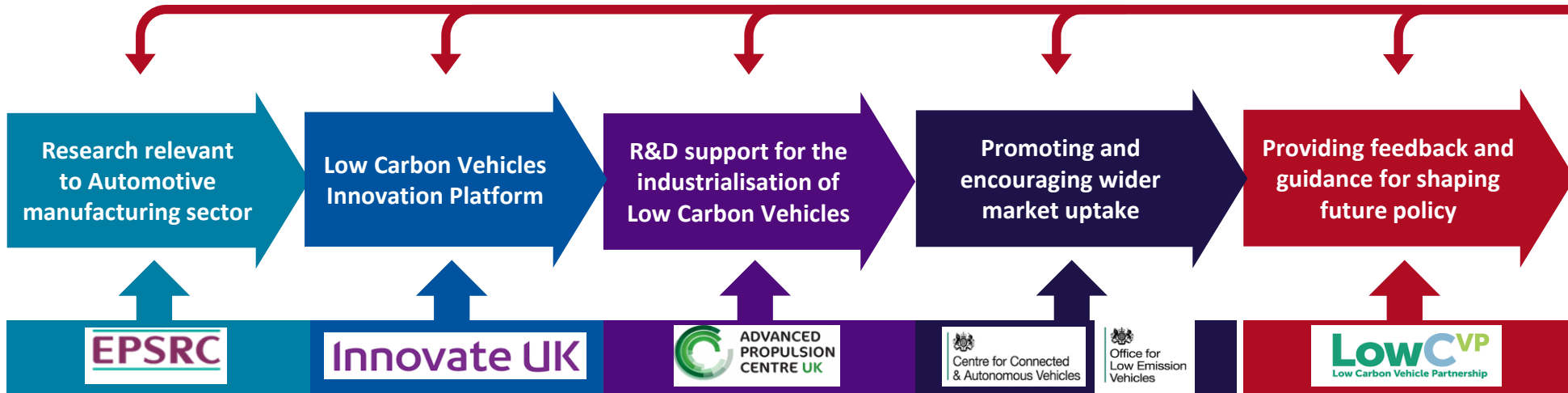
Low Carbon Vehicle Partnership, **Stand N13**

Daniel Hayes
Project Manager

LowCVP is a unique public-private membership organisation, tasked with “accelerating the shift to low carbon road transport” in the UK.



Providing a platform for strategy, growth and sustainability in the automotive sector and UK transport market



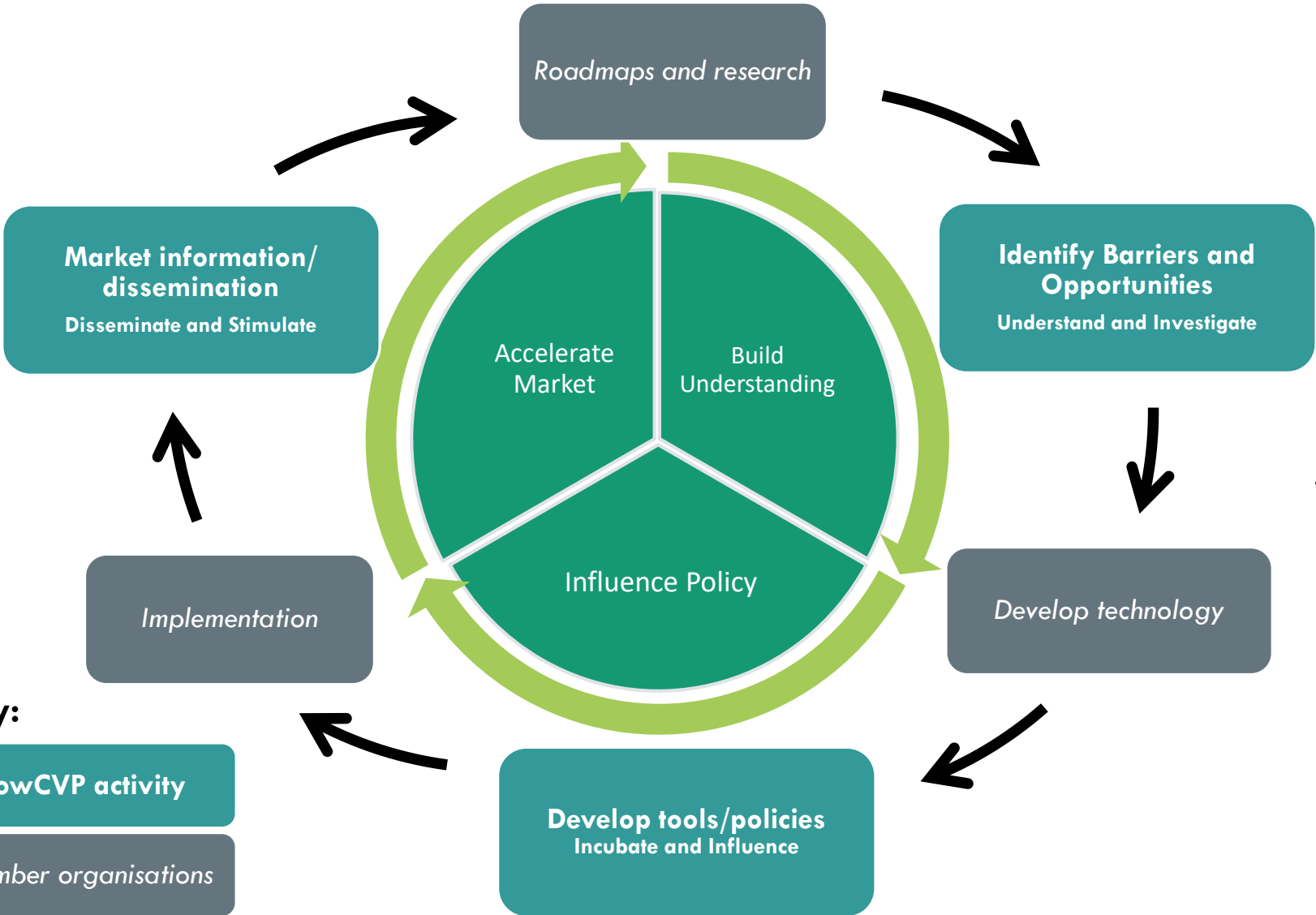
Early TRLs

Early/Mid TRLs

Mid/Late TRLs

Promoting British trade across the world facilitating inward investment and export.
Championing Innovation, Low & Zero Carbon Vehicles across industry and Government and users

LowCVP Activity & Influence Cycle - Robust Research, Policy and Information



Key:

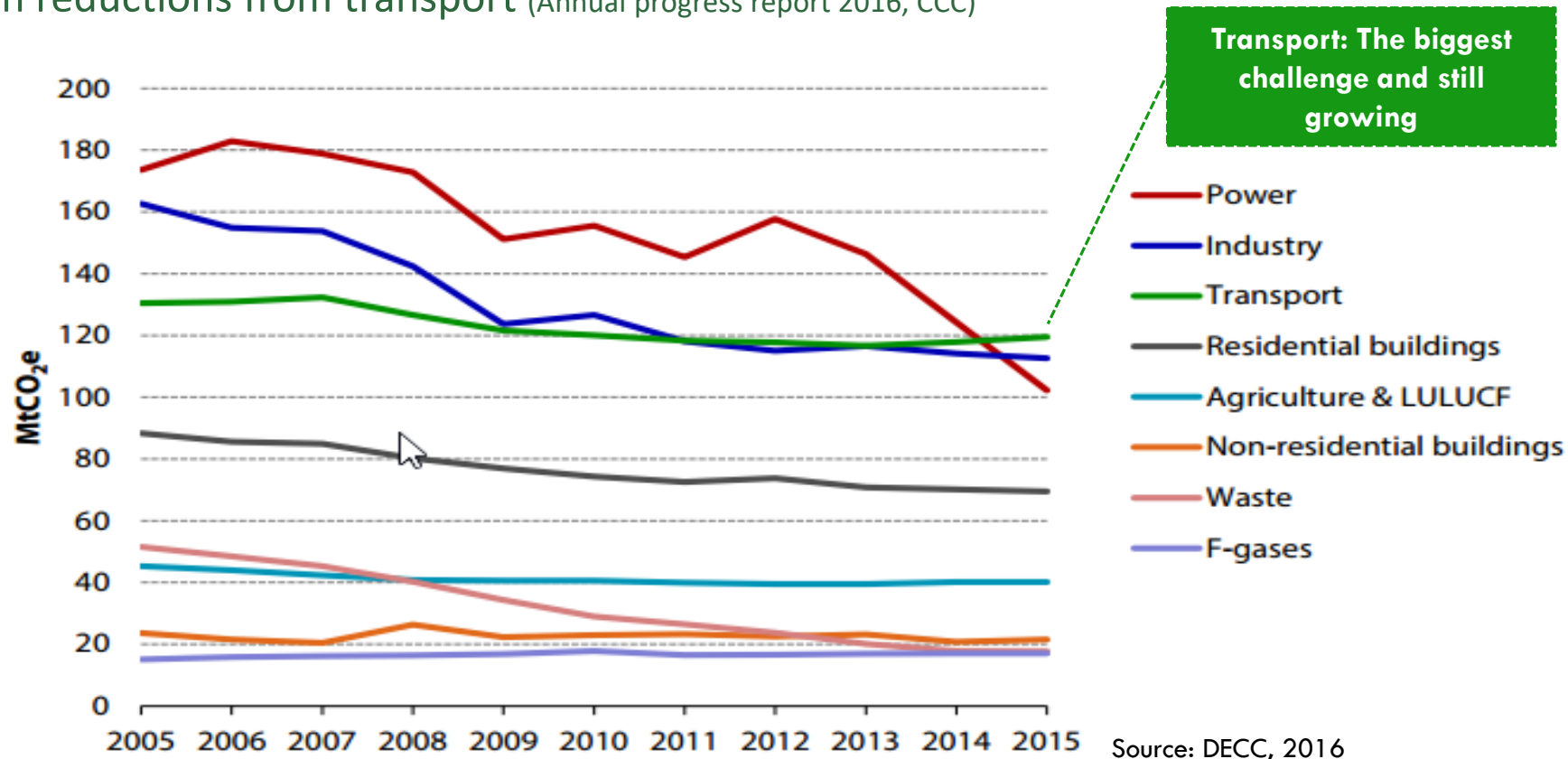
- LowCVP activity
- Member organisations

Working Groups

- Commercial vehicles
- Buses
- Fuels
- Passenger cars
- Innovation

Decarbonising UK Transport: Transition to zero

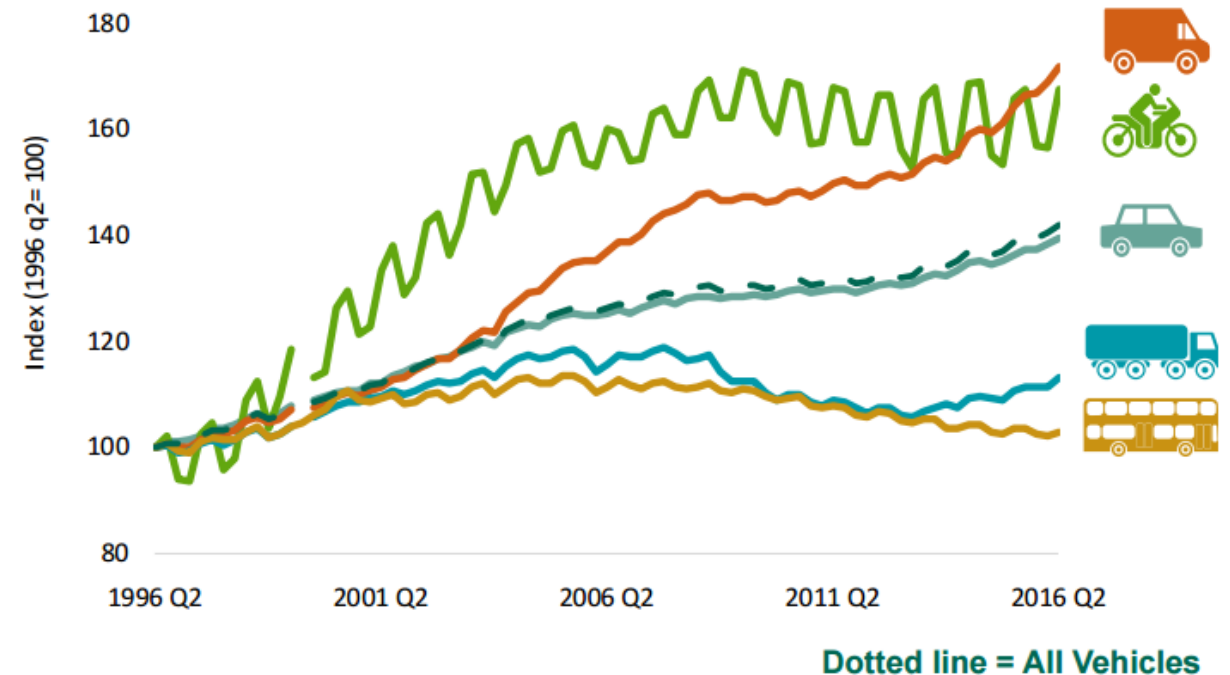
- Transport sector is now the largest source of greenhouse gas emissions in the UK and is growing!
- Government vision is that by 2050 almost all vehicles must be zero emission at the tailpipe...
- The Committee for Climate Change identified gap between current transport policies and the trajectory to deliver required carbon reductions from transport (Annual progress report 2016, CCC)



Demand-side emissions: Increasing numbers of vehicles

- Large growth in commercial vehicle sector due to cultural changes such as internet shopping.
- Increasing numbers of passenger cars – one car for every two people in the UK.
- Economic growth resulting in increasing vehicle ownership.
- No. of buses in decline post financial crisis..
- Number of bus journeys in steady decline as well...

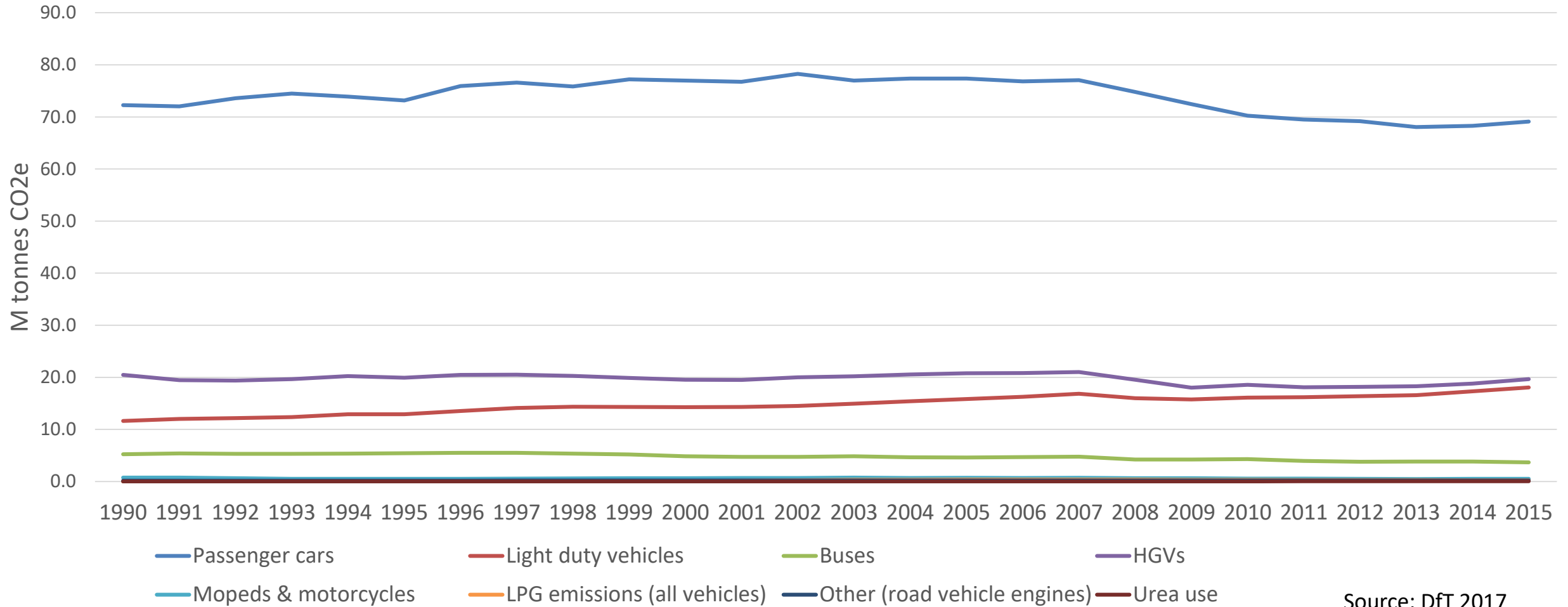
Figure 5: Licensed vehicles by type, GB: Q2 1996 - Q2 2016



Source: DfT 2017

Breakdown of road transport sector

Estimated emissions of Greenhouse Gases by source category, type of fuel and end-user category, UK 1990-2015

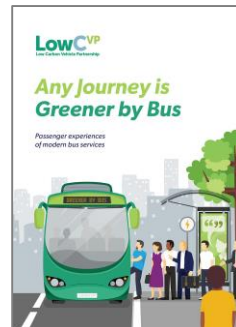
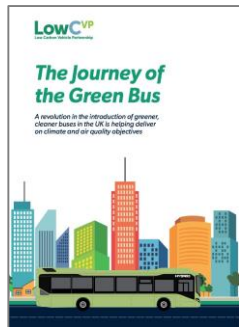
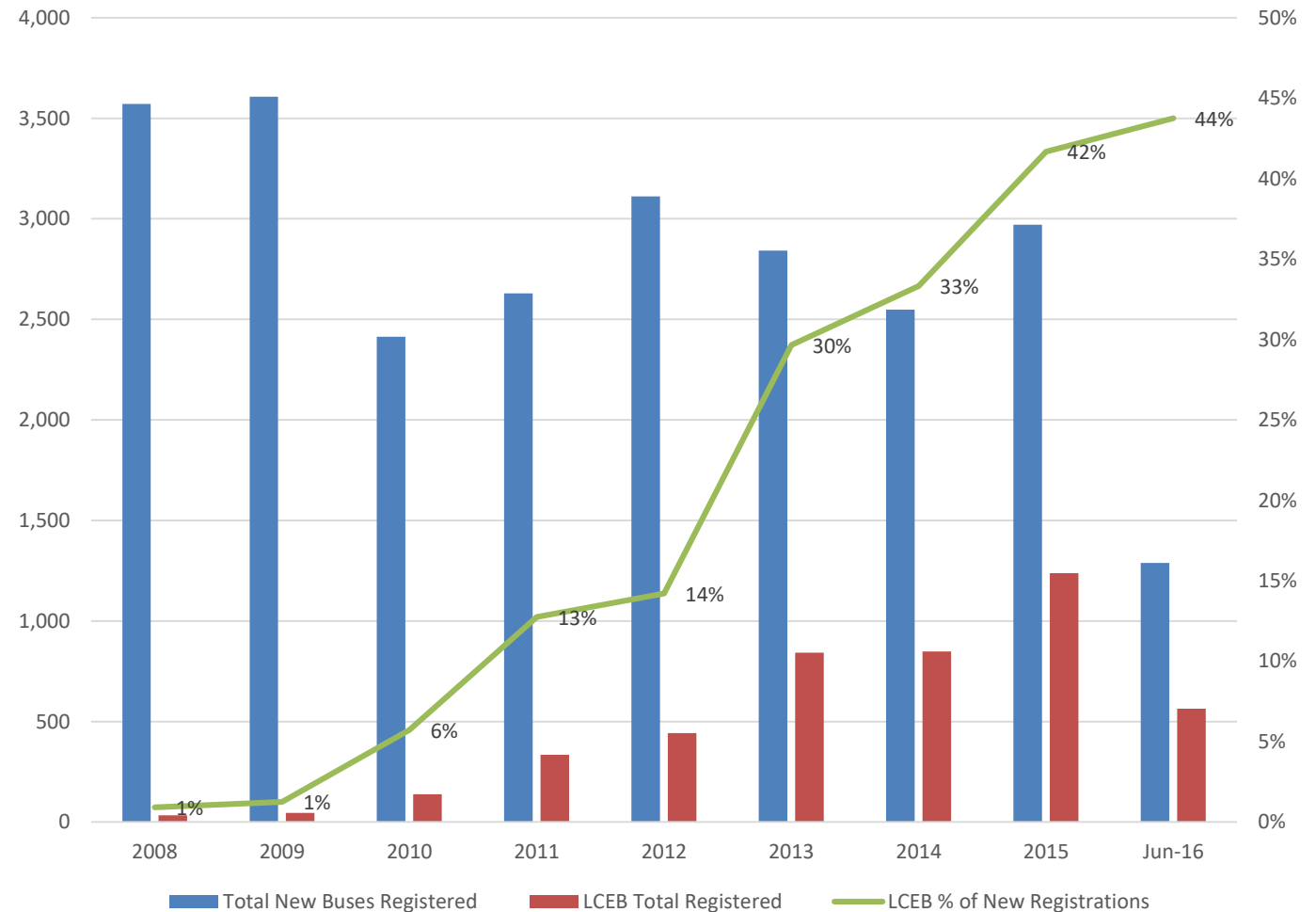


Source: DfT 2017

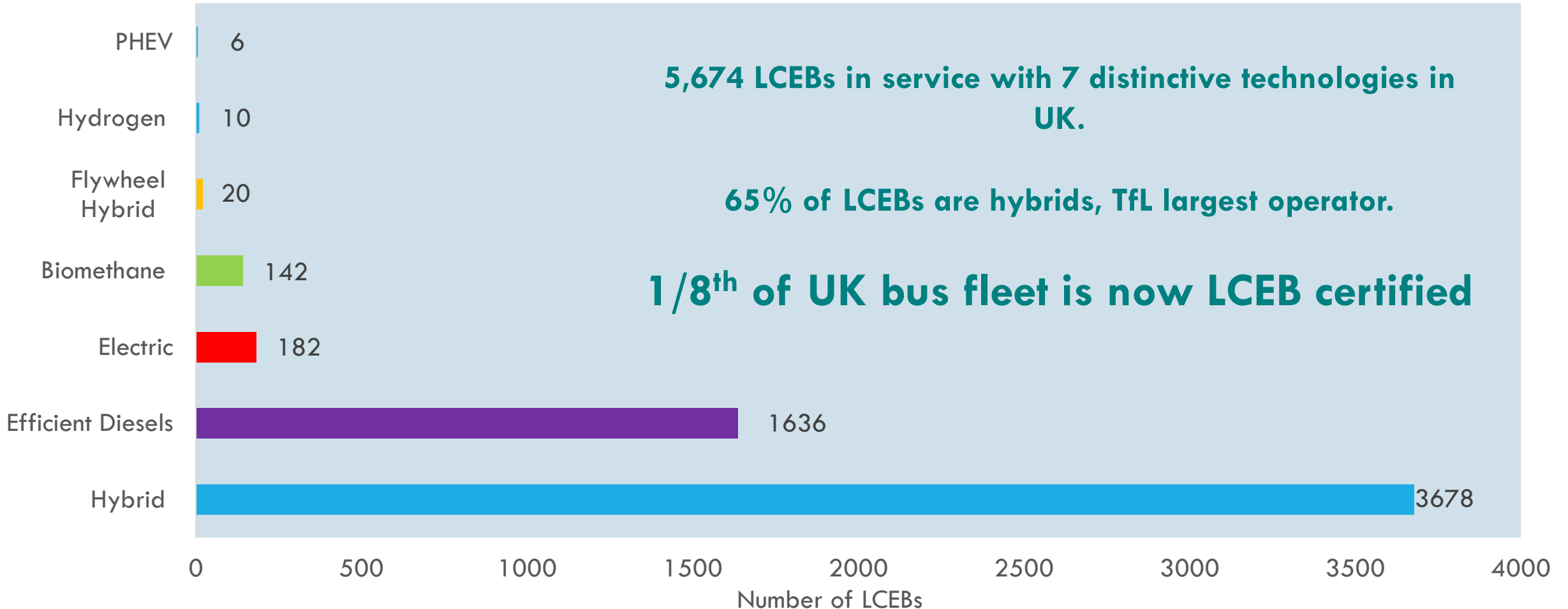
Success: Low Carbon Emission Bus Adoption

- In 1996, MLTB test created by TfL.
- In 2008, LowCVP incorporated MLTB test into Low Carbon Emission Bus Accreditation Scheme. **Well-to-Wheel assessment.**
- From 2009-15 Green Bus Fund uses LCEB accreditation to allocate **£90m** to new buses. BSOG LCEB 6p/km incentive created.
- By mid-2016, **44%** of all buses registered had LCEB status – compare this to ULEV uptake in the passenger car market at 1.6% in 2016!

LCEBs as a percentage of New Bus registrations (2008- June 2016)

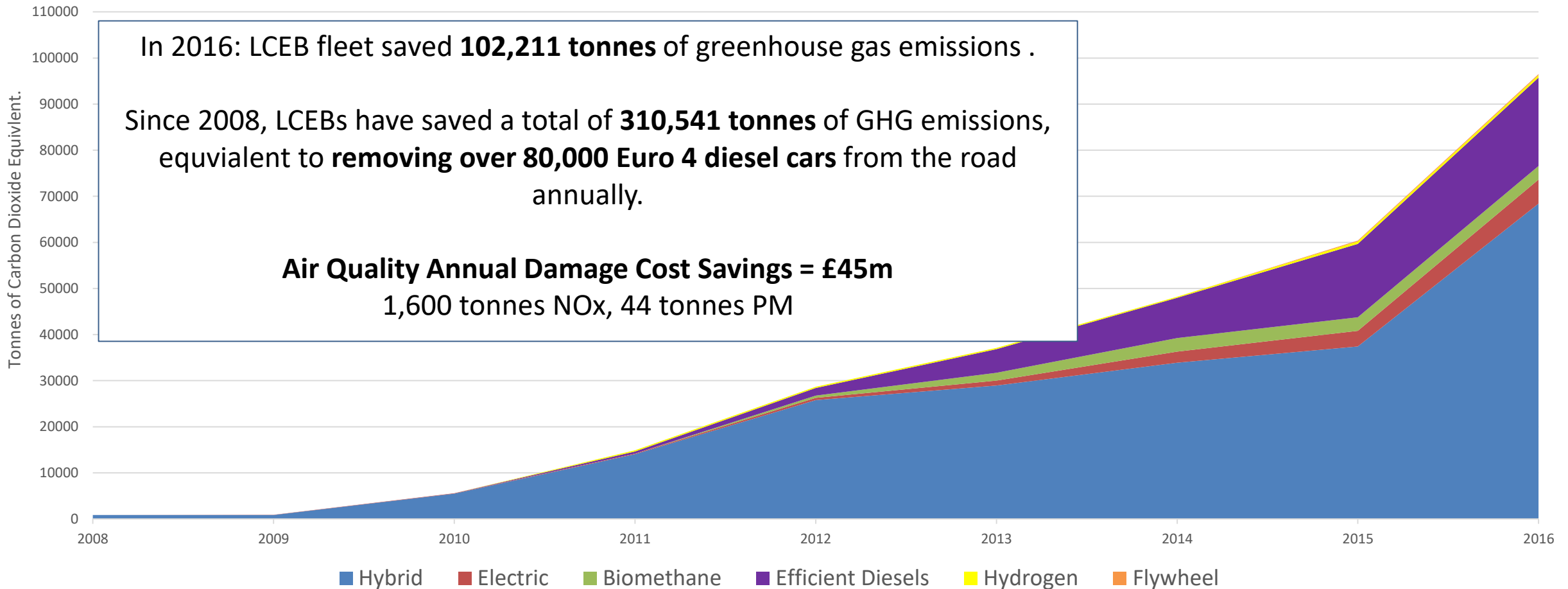


Breakdown of Low Carbon Emission Bus Technologies in-service in UK



Impact of Low Carbon Emission Buses

Estimated Annual Well-To-Wheel CO₂e saved by LCEBs technologies (tonnes CO₂e)



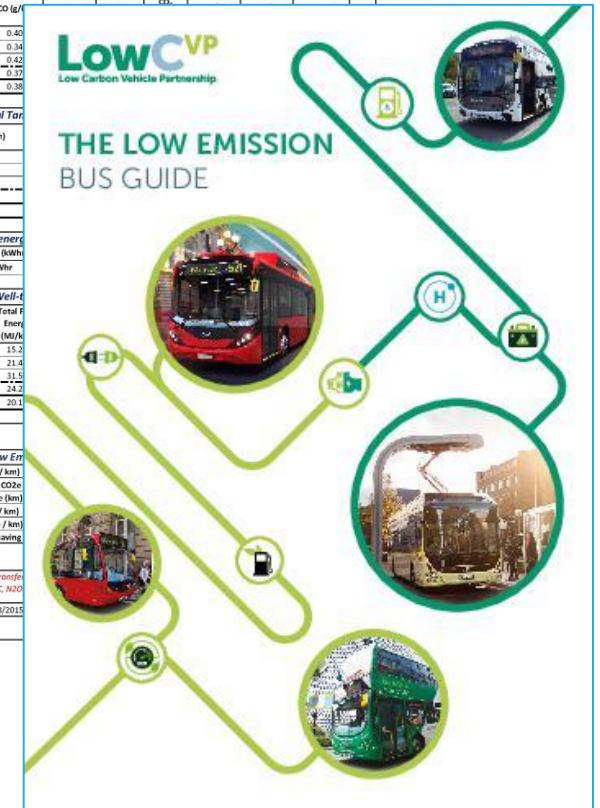
Evolution: Low Emission Bus Scheme (include AQ requirement!)

- In 2015, Low Emission Bus Scheme formed based on lessons learnt. (15% WTW GHG saving, Euro VI)
- Vehicles tested over LUB cycle – certificates published on LowCVP website for transparency and comparison.
- Low Emission Bus Guide created to inform operators and local authorities on best practice case studies
- To date, £41m allocated to new buses (479) and supporting infrastructure.
- In 2017, further iterations of LEB test to make testing more representative (Euro VI baseline, ancillary loads).
- c£48m for next round of funding, 2018-2020.

LowCVP Approved Test facility MILLBROOK

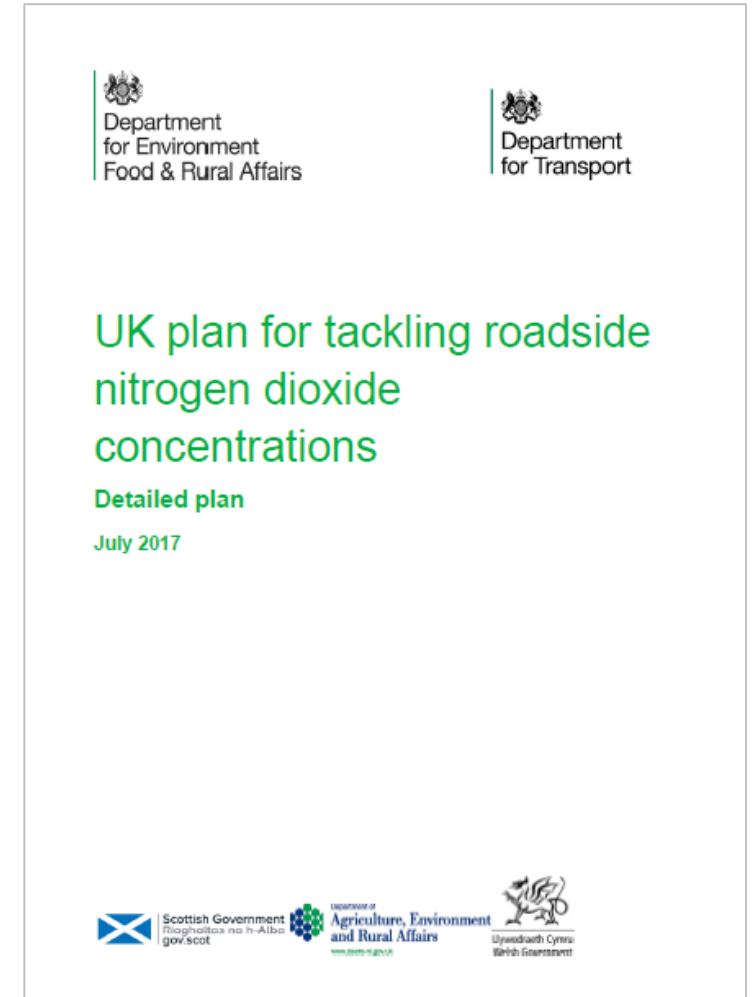
Low Emission Bus Scheme Certificate

Customer: Scania Great Britain		Customer Address: Delaware Drive, Tongwell, Milton Keynes		Test Purpose: LEB testing	
Vehicle Manufacturer: ScaniaADL		Unladen weight (kg): 11975.0	DYNAMOMETER SETTINGS		
Vehicle Type & Number: Scania KUB YP14 TGD		Gross Weight (kg): 18000.0	INERTIA: 13257 kg		
Engine: OC09 101/280 hp		Passenger Capacity: 70	P ¹ : 190.39 N		
Transmission: Auto		Capacity within GVW: OK	P ² : -9.3900 Nkm/h ²		
Euro VI certificate V/A		Manufacturer Certified	P ³ : 0.43004 Nkm/h ³		
Net Heating Energy (MJ/kg): 47.89		Fuel Provider: GBA Crouchland Biomethane	P ⁴ : -0.001944 Nkm/h ⁴		
Well-to Tank Factor: (g CO ₂ e/MJ) 11.11		WTT evidence: Biomethane	Mint Green Calculations		
Tank-to-Wheel Factor: (g CO ₂ e/kg) 5.49		Fuel Type: Biomethane			
Emissions and Energy consumption results from approved test facility - Average 3 tests					
Test Phase	HC (g/km)	CO (g/km)	CO ₂ (g/km)	CH ₄ (g/km)	Fuel
Rural	0.099	0.40	1.7		
Outer London	0.160	0.34	2.5		
Inner London	0.388	0.42	3.6		
METP	0.223	0.37	2.9		
LUB Average	0.167	0.38	2.3		
Total Tar					
Test Phase	CO ₂ (g/km)				
Rural	1.7				
Outer London	2.5				
Inner London	3.6				
METP	2.9				
LUB Total Average	2.3				
Electric energy					
Total measured energy consumed on vehicle (kWh)					
Measured grid energy during charging kWh					
Test Phase	Fuel/energy used (kg/km)	Total Fuel Energy (MJ/k)			
Rural	0.318	15.2			
Outer London	0.447	21.4			
Inner London	0.659	31.5			
METP	0.506	24.9			
LUB Total Average	0.421	20.1			
Well-to-Wheel					
Test Phase	Fuel/energy used (kg/km)	Total Fuel Energy (MJ/k)			
Rural	0.318	15.2			
Outer London	0.447	21.4			
Inner London	0.659	31.5			
METP	0.506	24.9			
LUB Total Average	0.421	20.1			
Data Generated by: [Signature]					
On behalf of Test facility					
Low Emission Bus Scheme					
GHG Well-to-Wheel (g CO ₂ e / km)					
Euro V Average Diesel Equivalent (g CO ₂ e / km)					
Zero Emission operating range (km)					
WTW GHG saving* (g CO ₂ e / km)					
% WTW GHG saving* (g CO ₂ e / km)					
Approved as Low Emission Bus? [15% saving]					
**** Data to input to LEB green fund calculator					
** TTW - Tank-to-Wheel					
COMMENTS: * compound measured via Fourier Transform Infrared Spectroscopy (FTIR) ALL HC ASSUMED TO BE METHANE FOR GHG CALC. N2O					
Test Numbers: MLD02015003 (R/23/2015)					
Certificate approved by: [Signature]					
On behalf of Bus manufacturer					



Joined-up-thinking: Lower Carbon and Cleaner Air

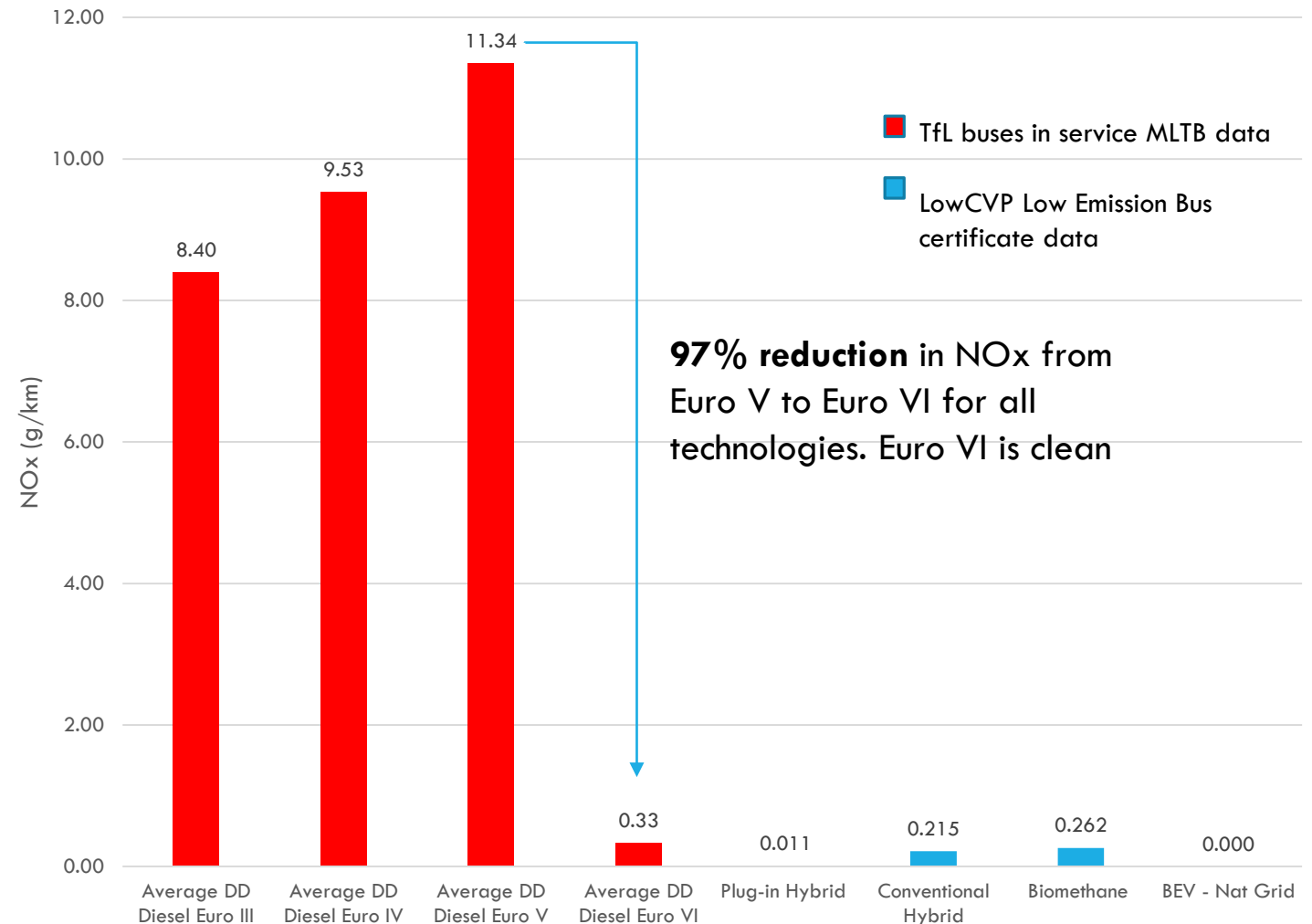
- Diesel vehicles encouraged due to fuel efficiency in relation to greenhouse gas emissions...however Euro standard test limits not being met in 'real world'.
- Introduction of Euro VI for HDVs and WLTP for cars and LCVs require test of 'Real Driving Emissions' (RDE) to improve correlation.
- The need to improve air quality has increased focus with a need to comply with EU limits for NO₂ by 2020.
- DEFRA released an action plan to help local authorities tackle emissions locally. Clean Air Zones expected for around 20 towns and cities along with 6 already announced. Local Authority plans are to be submitted by March 2018.
- Lesson learnt: Government policy to now tackle AQ and GHG emissions simultaneously; *Improving one cannot result in a worsening of the other!*



Low Emission Bus Testing: All Euro VI technologies are clean!

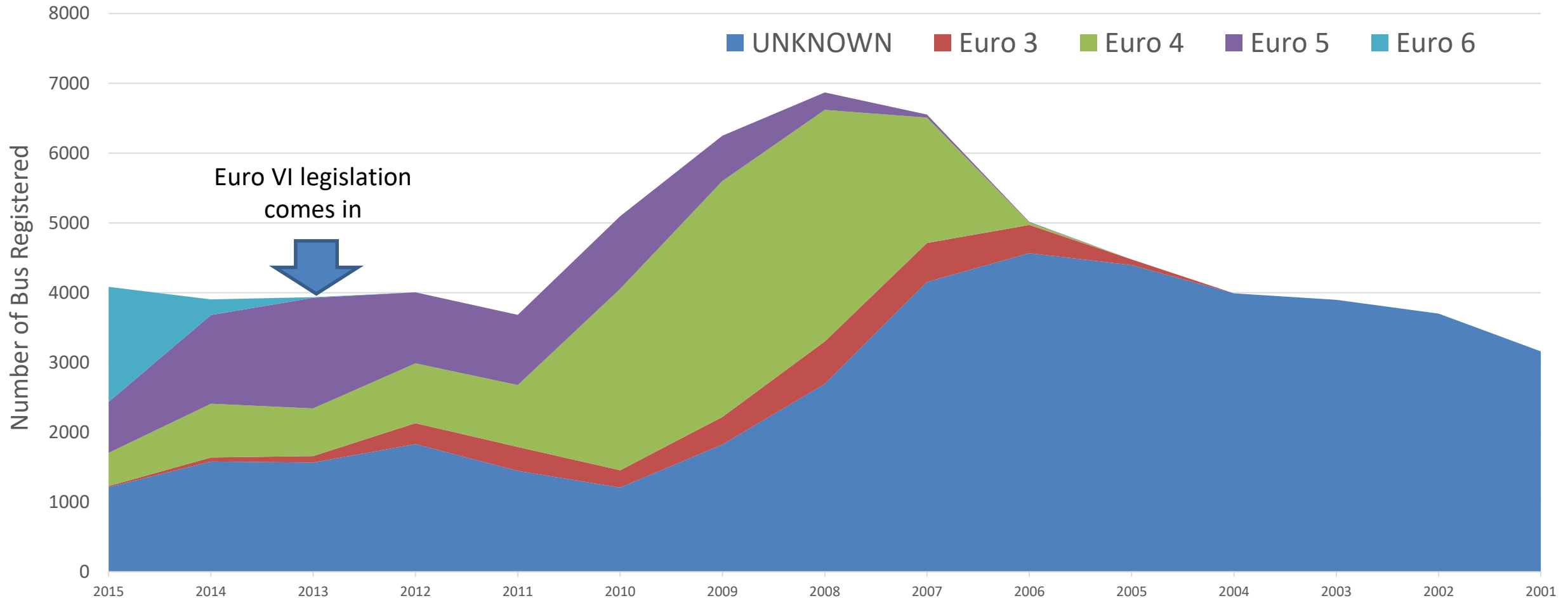
- *It's a myth!* Common consensus that all diesels are dirty – Euro VI bus test data shows otherwise.
- **National CAZ framework mandates Euro VI/6 for all diesel vehicles.**
- Short timelines to comply with EU limits mean that retrofit programme of buses is most cost effective way of reducing NOx
- **CAZ to become zero emission zones in future – early as 2025 in London.**

NOx emissions from Buses: Euro Standard emission comparison



New registrations by Euro Standard

New Bus & Coach registrations by Euro Standard, 2001-2015 (SMMT, 2016)



Clean Bus Technology Fund & Clean Vehicle Retrofit Accreditation Scheme

How to support bus industry to meet Euro VI CAZ criteria?

- LowCVP evaluated CBTF/CVTF 2013-2015 – report published
- Defra have released **£30m Clean Bus Technology Fund** 2017- 2019 to support retrofit technologies to reduce NOx.
- Further £10m in 2019-20. Expected to support total 2,000 buses to Euro VI equivalent.
- LowCVP **Clean Vehicle Retrofit Accreditation Scheme** for suppliers of retrofit technologies to prove ability to reach Euro VI equivalence.
- Energy Savings Trust overseeing certification scheme.
- CVRAS includes Coach and HGV test cycles to enable technology to be proven for other vehicles.

Clean Vehicle Technology Fund and Clean Bus Technology Fund Programmes

Evaluation Report

Prepared for the DEFRA/DfT Joint Air Quality Unit

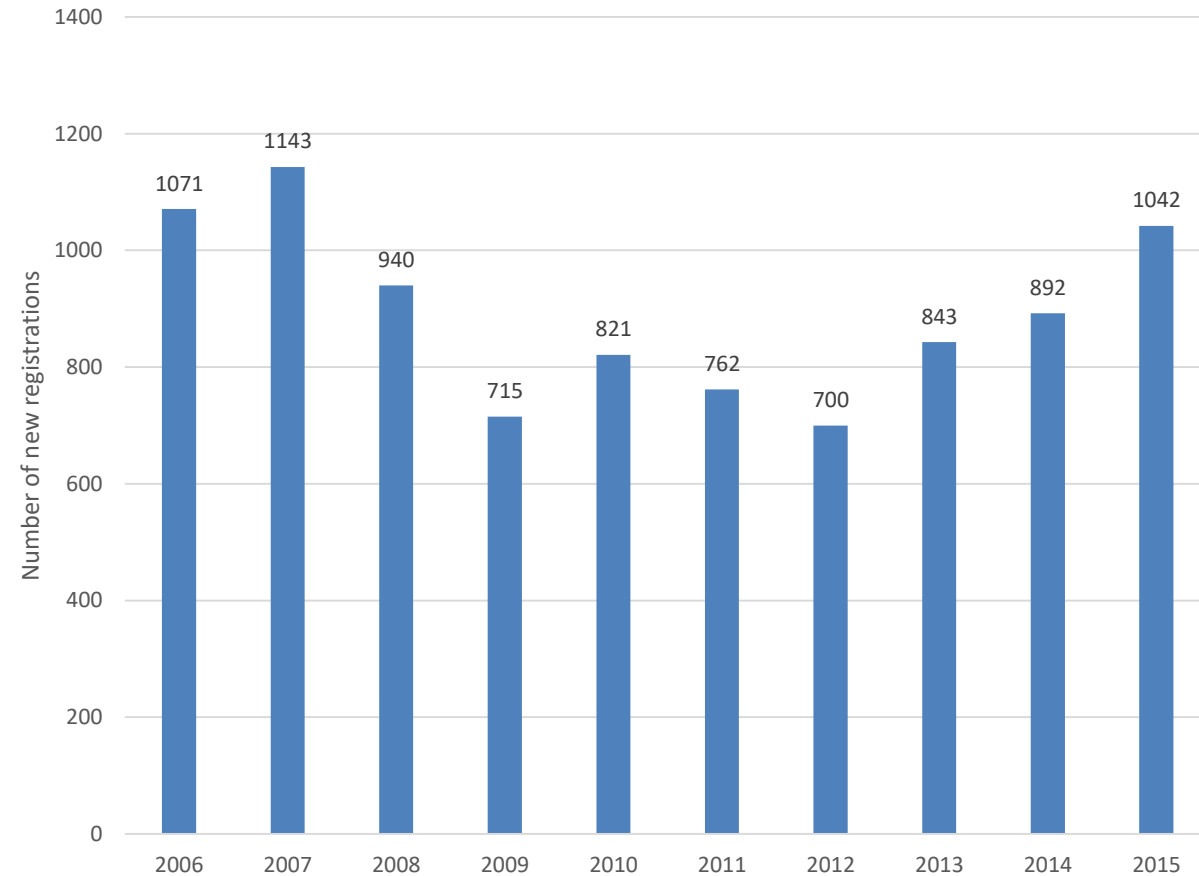
Report
August 2017



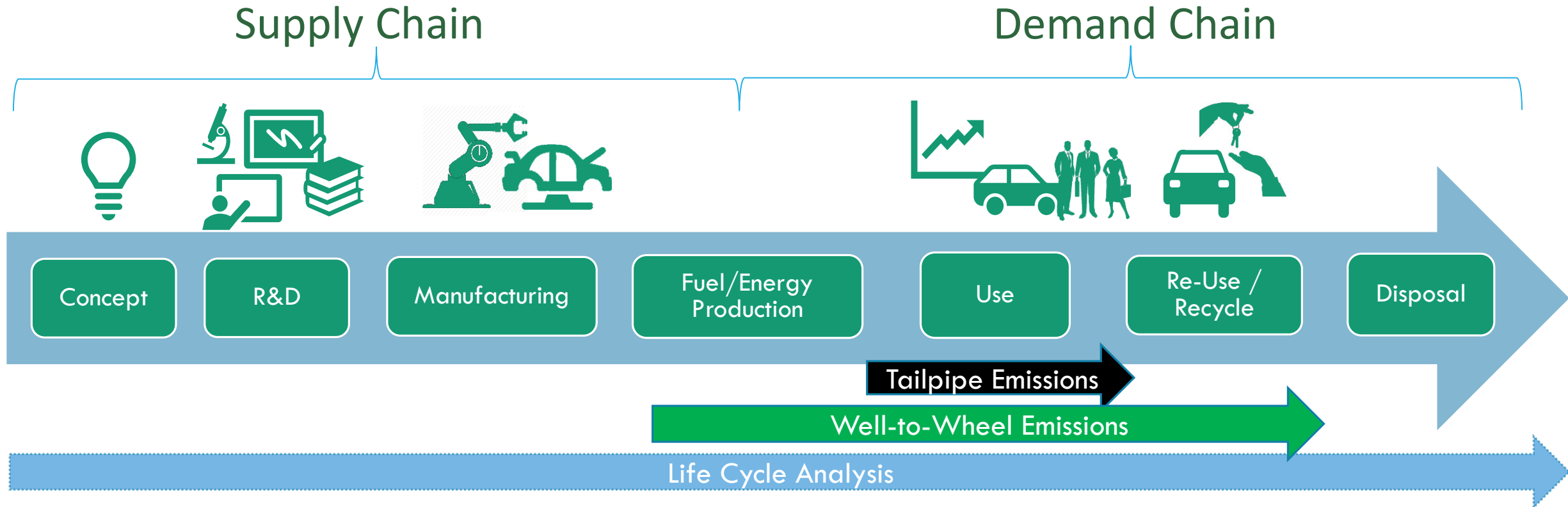
Evaluation of UK Coach Market: Opportunities for Decarbonisation?

- LowCVP taking snapshot of UK coach market for insight into carbon and AQ impacts.
- Identifying low carbon technologies and fuels being deployed e.g. Biodiesel, Hybrids.
- Creating case studies of various coach operations to provide better understanding of businesses
- Need to meet Euro VI is biggest push for coach operators – big impact on small businesses.
- Report will feed into policy decisions around support for retrofitting coaches
- Potential “Low Carbon Coach Scheme” in future

UK new coach registrations (2006-2015)



Joined-up-thinking: 'Cradle to Grave' approach



- Moving towards a 'Whole Life Cycle' approach for product origins, emissions and energy use.
- Supply chain emissions and practices can be shifted quickly, demand side can take much longer (cultural).
- *Demand chain needs innovation to ensure whole life carbon reductions (smart ticketing, MAAS).*

To conclude...

- **Bus industry has been at the forefront** of emissions testing and uptake of low carbon technologies and fuels.
- LowCVP looking to bring coaches into the fold... much more complex business model!
- **Euro VI is the minimum requirement for city operation**, moving towards zero emission long term.
- Introduction of Clean Air Zones is necessary - **but should be viewed as an opportunity!**
- Engage with your local authority and join-up-your-thinking!

LowCVP Activity & Benefits of Membership



Access to relevant resources, publications and reports

Low Emission Bus Guide, Transport Energy Task Force, Good Practice Guides, Transport and Infrastructure Roadmaps, L-category vehicle report.



Build and develop your professional network within the low carbon community

Innovation, Buses, Passenger Cars, Fuels and Commercial Vehicles working groups.



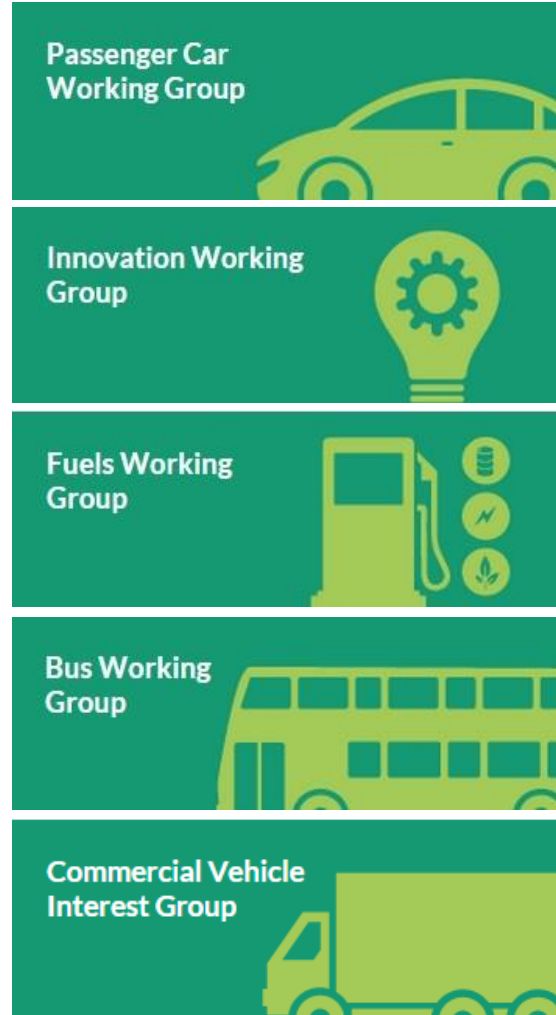
Participate in high profile members-only events and conferences

Parliamentary Reception, Annual Conference, Low Carbon Champion Awards.



Keep up-to-date with the latest industry news and government announcements

Monthly newsletter, press releases, industry insights, Twitter, YouTube and LinkedIn.



Thank you. Any questions?



Daniel Hayes

Project Manager

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Interested in joining the Partnership?

Szilvia Libor

Membership Coordinator

szilvia.libor@lowcvp.org.uk / 020 7304 6880