

# Compressed or Liquefied Natural Gas; Opportunities to reduce HGV emissions

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# What is the LowCVP?



The Low Carbon Vehicle Partnership's mission is:

***"To accelerate a sustainable shift to low carbon vehicles and fuels in the UK and thereby stimulate opportunities for UK businesses"***



The LowCVP is an independent, not-for-profit stakeholder partnership funded through government grants, member contributions and project sponsorship.

The LowCVP is the only organisation in the UK – or Europe – which brings stakeholders together to facilitate the development of better policy and accelerate the shift to low carbon vehicles and fuels across all road transport.

# LowCVP delivers its mission by:

- ❑ **Building understanding** and consensus regarding the optimal pathways to low carbon road transport.
- ❑ **Influencing** Government and other decision makers on **future policy directions** and optimal policy mechanisms.
- ❑ Supporting collaborative initiatives that **develop the market** for low carbon vehicles and fuels.



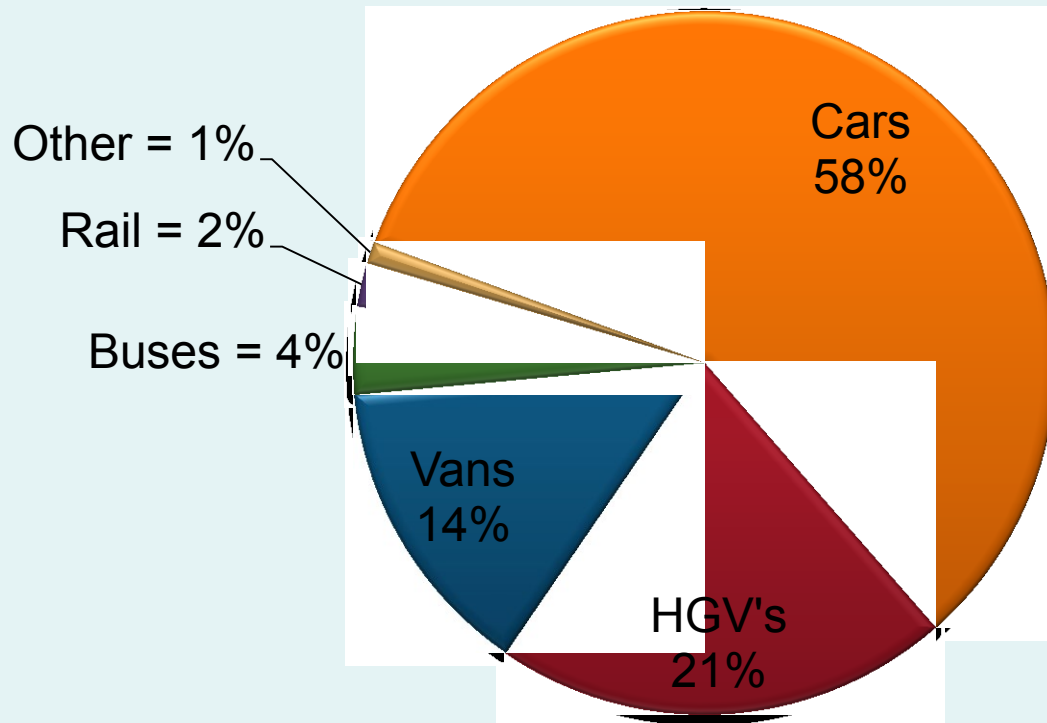
*“The LowCVP has been active and effective in the discussions leading to a change in policy on bus support. Revisions to the Bus Service Operators’ Grant will help promote the adoption of low carbon buses. The new Green Bus Fund will be even more significant and the LowCVP has been prominent in its development.”*

Adrian Wickens, Volvo Bus Product Planning Manager

# HGV is 2<sup>nd</sup> largest contributor to transport CO<sub>2</sub>

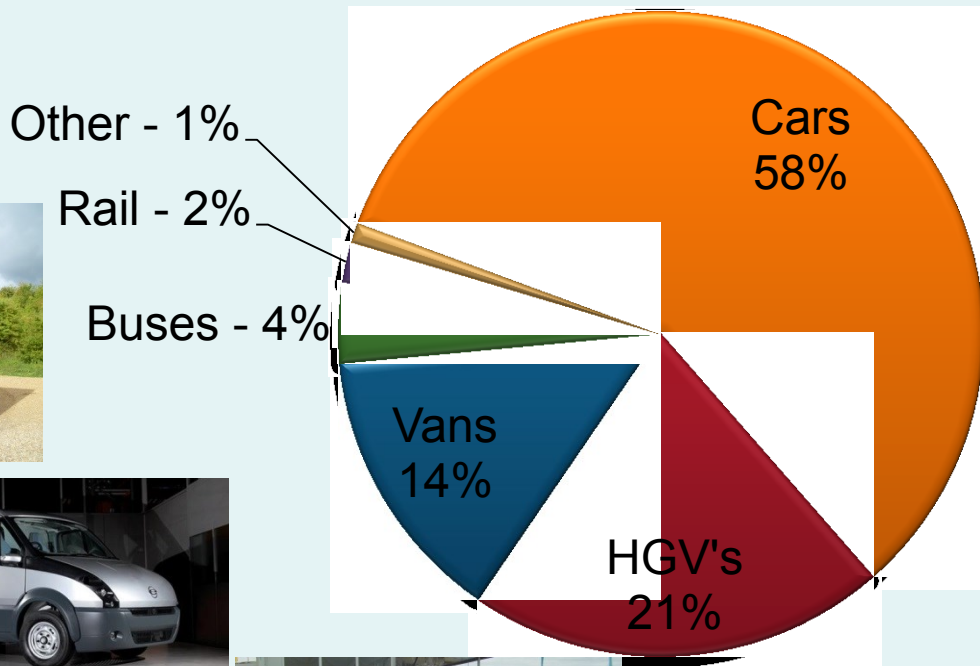
CCC transport factsheet 2013

Surface transport CO<sub>2</sub> (2011) = 111MtCO<sub>2</sub>



# A wide range of innovative vehicle technology options to reduce carbon are emerging on the market

*Core progress made through improvements in vehicle efficiency and with low blend Biofuels*

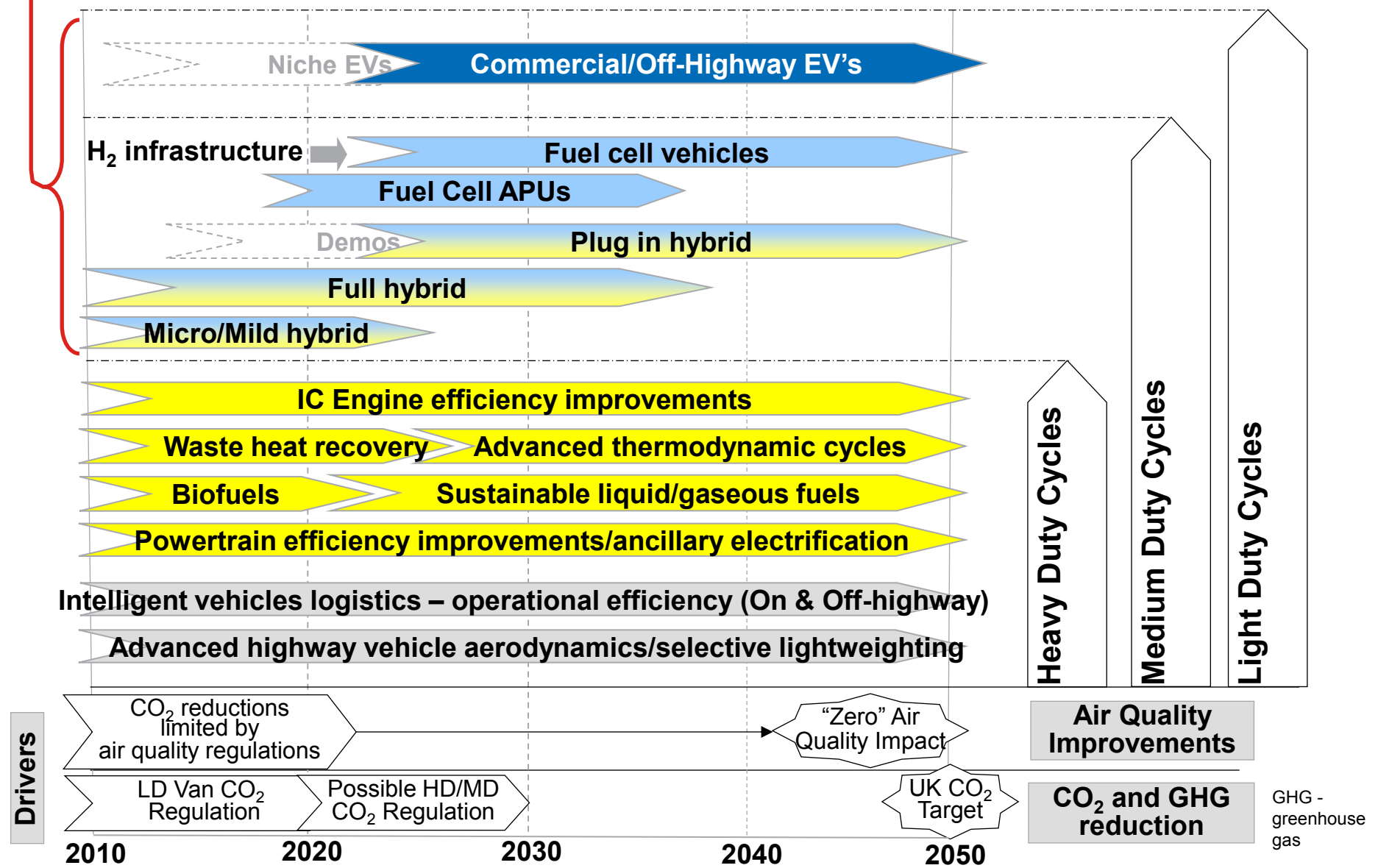


**LowC<sup>VP</sup>**  
low carbon vehicle partnership

# Low carbon Commercial Vehicle & Off-highway roadmap has parallel technology streams depending on duty cycle



**Breakthrough** in energy storage

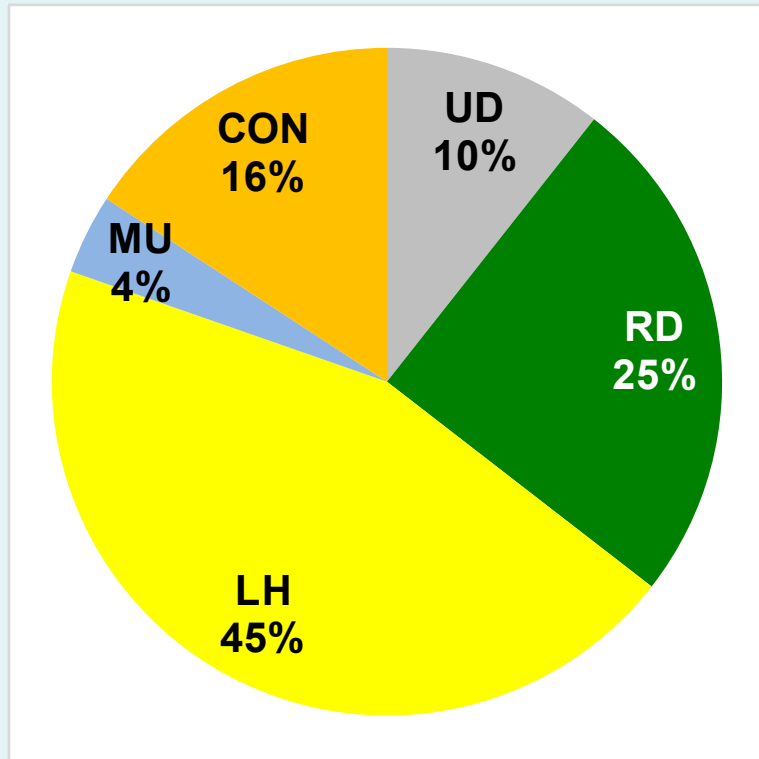


# Decarbonising Road Freight – the opportunities

- ❑ Research on behalf of DfT
- ❑ Joint report published 3<sup>rd</sup> Dec '12
- ❑ LowCVP/Transport KTN/SMMT
- ❑ Supported by Industry bodies
  - CiLT
  - FTA
  - RHA
- ❑ Available on LowCVP website



# Where does the HGV CO2 come from



## Ranking of duty cycles by CO<sub>2</sub> emissions share:

1. LH Long haul (44-46 %)
2. RD Regional Delivery (24-25 %)
3. CON Construction (15-16 %)
4. UD Urban Delivery (10-12 %)
5. MU Municipal Utility (4 %)

The ranges indicate the variation due to low, central and high distance estimates.

70% of fuel is used in Long Haul and Regional Delivery operation in Larger Trucks



# Recommended technologies & fuels

	Technology / fuel	Applicable duty cycles	Total UK HGV WTW CO <sub>2</sub> e saving potential*	Additional considerations
1	Dedicated natural gas engines	All	5-16% (methane) 61-65% (biomethane)	Significant particulate emission & noise reduction benefits. CO <sub>2</sub> reduction benefit substantially greater when running on biomethane.
2	Dual fuel engines	Long haul, regional delivery and construction	13% (methane) 33% (biomethane)	Some particulate emissions & noise reduction benefits when running on gas. Payback and CO <sub>2</sub> savings very dependent on gas substitution rates (higher for higher speed duty cycles). CO <sub>2</sub> reduction benefit substantially greater when running on biomethane.
3	Aerodynamic improvements	Long haul, regional delivery and construction	5-6%	Benefits dependent on correct fitting / adjustment / average duty cycle speeds. Does not suit some body types / operations.
4	Pure electric vehicles	Urban delivery	5%	Highest local air quality and noise reduction benefits. Lifecycle impacts of batteries need to be considered. Currently maximum available GVW is 12 tonnes.
5	Hybrid electric / hydraulic hybrid / flywheel hybrid vehicles	Urban delivery and municipal utility	3-4%	Air quality and noise reduction benefits particularly if able to run in electric only mode. Lifecycle impacts of batteries need to be considered. Flywheel hybrids are not yet commercially available, but are expected to offer a lighter weight and possibly lower cost alternative to battery-electric hybrids.
6	Low rolling resistance tyres / single wide tyres	All	1-5%	Lower rolling resistance tyres are available for all duty cycles. May have slightly shorter lifespan than standard tyres but CO <sub>2</sub> savings expected to outweigh any negative environmental impact.

# 6 – Opportunities

***No one technology or fuel will achieve reductions required, but three key areas are:***

## **Switching to gas - up to 65 % (biomethane) / 16% (methane) WTW savings**

- Large scale shift to use of gas for HGVs offers greatest carbon reduction potential.
- UK opportunity for technology export with two leading specialists in dual fuel technology
- All use of gas expected to achieve substantial improvements in air quality.
- Substantial investment needed – particularly in refuelling infrastructure.

## **Improving aerodynamic efficiency / reducing rolling resistance - up to 10 % savings**

- Long haul and regional delivery vehicles account for 70% of total HGV carbon emissions.
- General acceptance and use of some aerodynamic devices, but much more could be done.
- Lower costs and shorter payback periods than other options.
- Low rolling resistance and single wide tyres offer carbon savings while reducing overall costs.

## **Supporting take-up of hybrid / pure electric vehicles - up to 8 % WTW savings**

- Hybrid / pure electric vehicle technologies particularly suitable for urban delivery and municipal utility.
- Technologies have the potential to reduce lifecycle GHG emissions by 20-50%.
- Also provide additional benefits of lower noise and reduce/eliminate tailpipe pollutants.
- Hybrid technology can also be applied to gas vehicles

# Gas Vehicles

- ❑ Dedicated: Spark ignition engine.  
*All duty cycles particularly long haul/regional*
- ❑ Dual fuel: diesel and gas (retrofit)  
*Regional & long haul duty cycles*
- ❑ Fuel: Natural Gas (fossil fuel) or Biomethane (renewable)
- ❑ On board gas storage:
  - Compressed natural gas (CNG) 150mile range
  - Liquefied natural gas (LNG) – long distance
- ❑ Gas distribution: road tanker or gas grid
- ❑ Gas Refuelling: LNG or CNG station



# Coca Cola Enterprise Ltd Biomethane Truck Trial

## Aim

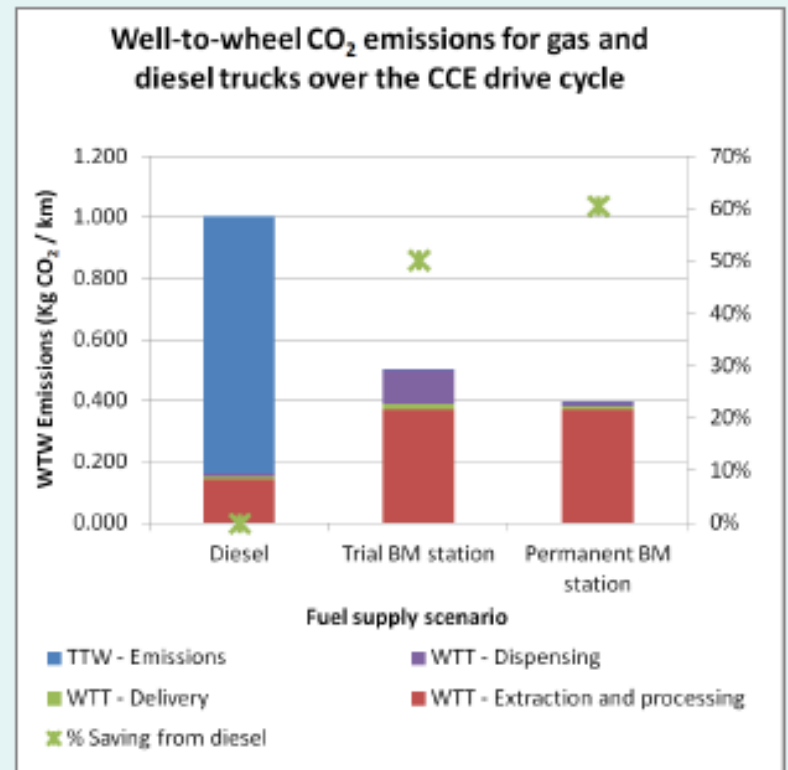
- To compare the performance of a diesel and biomethane truck for Coca-Cola deliveries across London, 2011

## Results

- Reduced PM emissions by 97%
- Lifecycle CO<sub>2</sub> reduced by 60%
- Reduced fuel costs by 12%

## Progress to date

- Invested in 14 biomethane HGVs
- Served Olympic Games in London
- Biomethane refuelling station London



## CO2 Emission Reduction – Dedicated Gas

	TTW CO2 benefit	WTW CO2 benefit
Natural Gas	1%	up to 21%
Biomethane	1%	61 - 146%

WTW carbon savings strongly influenced by WTT pathway

Gas Source Pathway	gCO2 eq/MJ	
Liquid manure (AD)	- 140	} Biomethane is carbon negative
Municipal waste (AD)	- 39	
Dry manure (AD)	- 35	
Landfill	- 33	
LNG import	20	
UK gas grid North Sea	7	
Diesel	15	

# Evidence base and support is growing

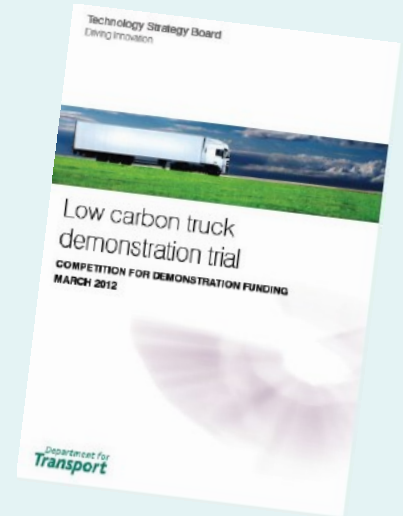
## ❑ TSB/DfT Low Carbon Truck Demonstration Trial

- Includes a range of vehicles/operators
- On road and track/dyno testing for emissions and CO2

## ❑ Infrastructure growing

## ❑ Vehicle range and OEM support growing

## ❑ Reports on Costs, Emissions, Fuel savings



# Further evidence is required for Gas & Biomethane

- ❑ Pathways of gas from source to Vehicle
  - Source (Fossil/Bio) (domestic/foreign)
  - Energy required (Compression/liquefaction)
  - Transportation
  - Leakage/losses
  
- ❑ Availability of Biomethane, now and future v Source options
  
- ❑ Economics of gas supply and infrastructure
  
- ❑ Robust comparison with Liquid Biofuels potential on a level playing field (iLUC, Transportation, Fiscal measures, etc)
  
- ❑ Comparison of real world emissions with Euro 6 Diesel

# Gas HGV's a key opportunity to reduce emissions

- ❑ Long haul heavy HGV's pose one of the most difficult carbon challenges – Bio derived fuels appear a good solution
- ❑ Methane is the lowest Carbon of HC fuels, is available now and with existing nationwide distribution system
- ❑ Bio-derived 'drop in' replacement option available now in volume
- ❑ OEM supported trajectory for technology and expansion
- ❑ Substantial trial and operation experience already in place and growing
- ❑ Strong evidence for Air Quality benefits over current Diesel
- ❑ International market well developed
  
- ❑ Broad support across UK stakeholders!



# Thank You!



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