

Policy levers for low carbon fuels

- REA Transport Fuels
- 3rd Dec 2019 – Osborne Clarke



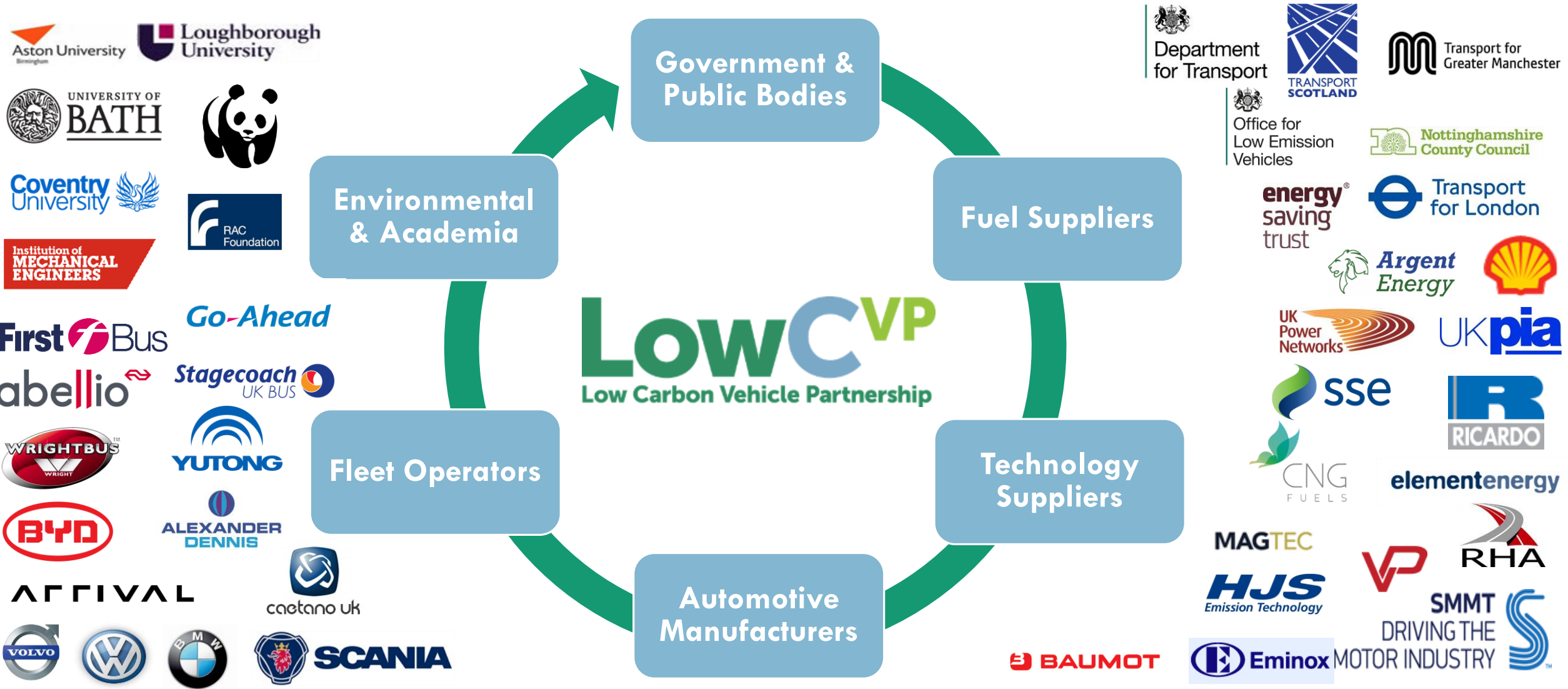
LowC^{VP}
Low Carbon Vehicle Partnership

Connect | Collaborate | Influence



Andy Eastlake
Managing Director

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



Working together – to build evidence, stimulate innovation, create robust policies and change the market to meet environmental objectives

Creating communities with shared goals

Understanding and evidence based research

Influencing policy and information

Accelerating the market



Two environmental challenges facing us all right now

Climate Change

NEWS

Home | **UK** | World | Business | Politics | Tech | Science | Health | Family & Education | Environment

Scotland | **Scotland Politics** | Scotland Business | Glasgow & West

Nicola Sturgeon declares 'climate emergency' at SNP conference

28 April 2019

SNP Conference

Vehicles in use don't make carbon – Fuels & Energy do



Urban Air quality

Pollution report reveals unsafe air quality at almost 70 sites

London, Leeds, Manchester are among the worst affected



Fuels in use don't make urban Emissions – Vehicles do

System Efficiency reduces both

▲ The mayor of London issued a high pollution alert for the capital on Tuesday. Photograph: Nick Ansell/PA

Policy opportunities

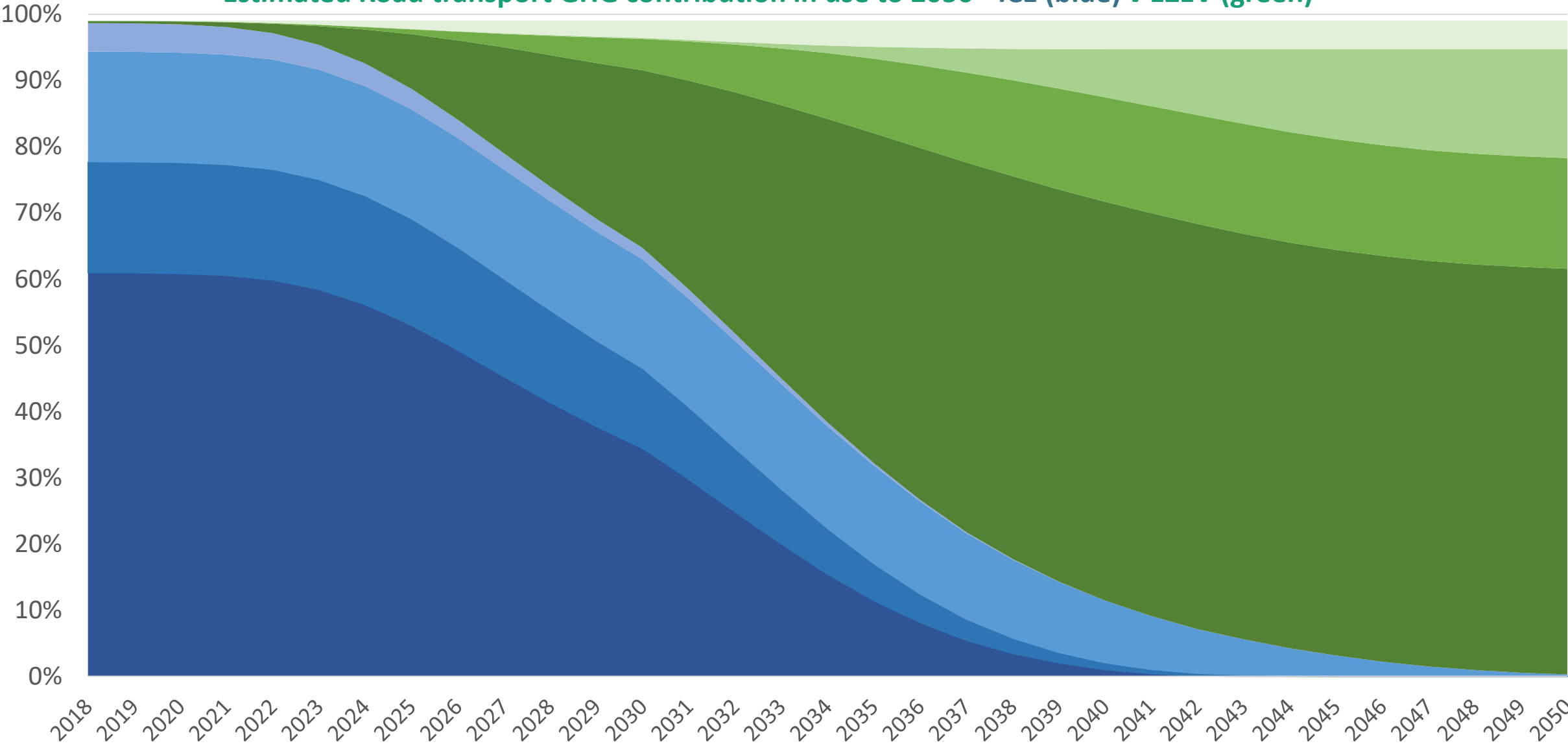
- Carbon reporting – company requirements and CSR agenda
- Operator information (LowCVP Fuels guide)
- Renewable fuel supply requirements – RTFO
- Voluntary Freight GHG reduction commitment (15% by 2025)
- The Alternative Fuel Labelling and Greenhouse Gas Emissions Regulations 2019
- Fuel Duty??
- Bus Service Operators Grant (BSOG)

Key is Policy clarity – Road to Zero (tailpipe), Net Zero (GHG) and Zero (tailpipe emissions) HGV options for the future

No doubt we're heading to zero, but when and what now?

Combustion fuels will need to decarbonise

Estimated Road transport GHG contribution in use to 2050 - ICE (blue) v EZEV (green)



ULEVs, ULCFs and transport solutions

Clean and Efficient vehicles + Low carbon fuels/energy = Low Carbon Transport

Certified ULEVs, Representative Testing, Emissions and Energy use

Ultra Low Carbon Fuel assurance scheme, Well-to-Tank factors

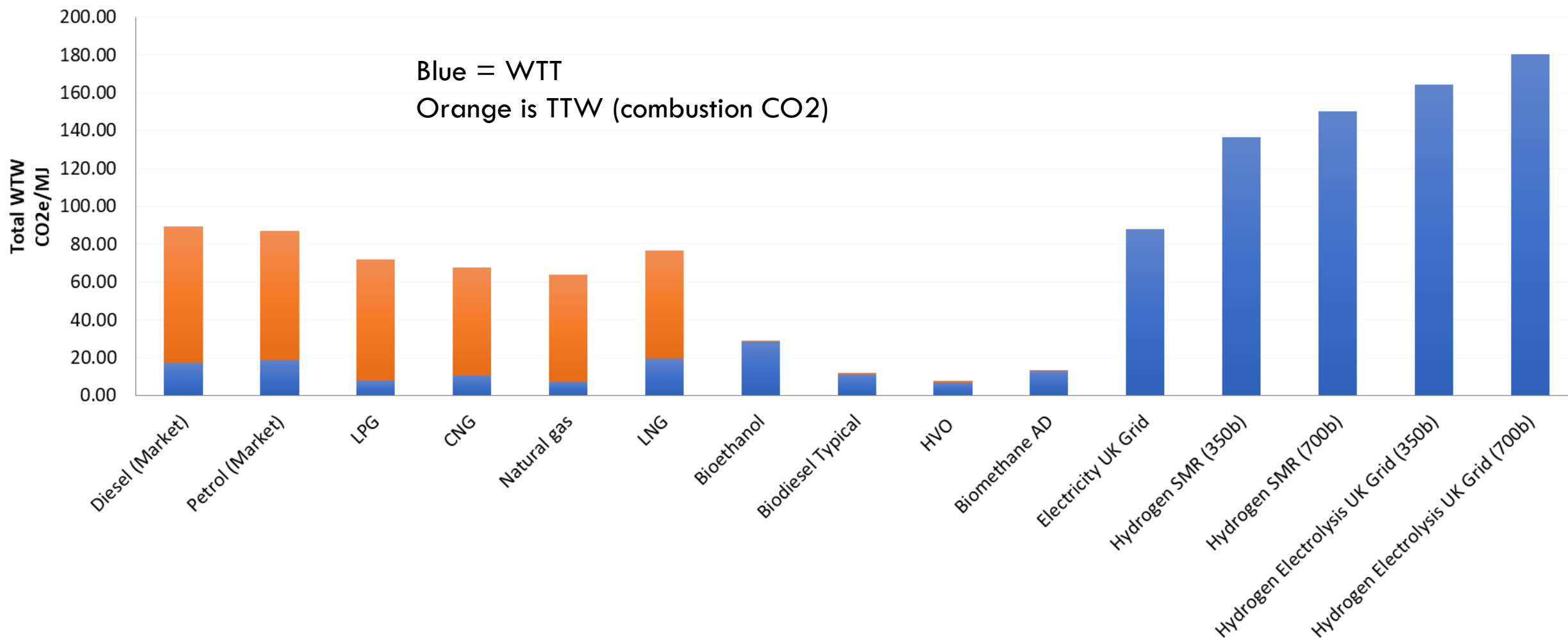
LowC^{VP} Low Carbon Vehicle Partnership		Approved Test Facility		MILLBROOK	
Ultra Low Emission Bus Scheme Certificate					
Customer: Alexander Dennis Ltd.					
Customer Address: Dennis Way, Salford, Surrey, GU1 1AF					
Test Purpose: ULEV Testing					
Vehicle Manufacturer: Alexander Dennis Ltd.					
Vehicle Type & Number: ADL E400n 0445					
Engine: CumminsISB Euro VI Hybrid					
Transmission: Automatic					
Euro VI certificate VIN: Manufacturer Certified					
Declared fuel, properties and source plus carbon conversion factors					
Net Heating Value: Diesel 38.0 MJ/Litre					
Well-to-Tank Factor: Diesel 16.42 g CO ₂ /MJ					
Well-to-Tank Factor: Electricity 143.60 g CO ₂ /MJ					
Emissions and Energy consumption results from approved test facility - Average 3 tests					
Test Phase HC (g/km) CO (g/km) NOx (g/km) PM (g/km) CO ₂ (g/km) CH ₄ (g/km) N ₂ O (g/km) Fuel Consumption (l/100km) Fuel used over phase/cycle (litres)					
Outer London 0.002 0.017 0.120 N/A 664.7 0.000 0.003 25.35 1.808					
Inner London 0.002 0.013 0.129 N/A 524.3 0.000 0.008 34.90 0.869					
Rural 0.000 0.010 0.124 N/A 150.8 0.000 0.017 21.50 1.134					
UK Average 0.001 0.012 0.123 N/A 445.1 0.000 0.008 27.25 1.268					
UNEC Average 0.001 0.016 0.184 0.0029 667.5 0.000 0.000 25.18 4.101					
Zero Emissions (Z.E.) Range: Energy consumption and charging efficiency					
Total measured energy consumed on vehicle (kWh) N/A					
Measured grid energy during charging (kWh)* N/A					
Total Tank-to-Wheel GHG CO₂ equivalent					
Test Phase CO ₂ (g/km) CH ₄ (g/km x 25) ^a N ₂ O (g/km x 298) ^a Fuel TTW** GHG (CO ₂ Equivalent g/km)					
Outer London 664.7 0.000 0.000 664.7					
Inner London 524.3 0.000 0.000 524.3					
Rural 150.8 0.000 0.000 150.8					
UK Average 445.1 0.000 0.000 445.1					
UNEC Average 667.5 0.000 0.000 667.5					
Calculated total Well-to-Wheel GHG CO₂ equivalent emissions over test					
Test Phase Fuel Energy (MJ/km) Fuel WTT** GHG Emissions (g CO ₂ /km) Electrical Energy (MJ/km) Electricity WTT** GHG Emissions (g CO ₂ /km) Measured Fuel TTW** GHG Emissions (g CO ₂ /km) Total WTTW*** GHG Emissions (g CO ₂ /km)					
Outer London 12.56 193.7 N/A 193.7 664.7 858.4					
Inner London 12.56 193.7 N/A 193.7 524.3 718.0					
Rural 12.56 193.7 N/A 193.7 150.8 344.5					
UK Average 12.56 193.7 N/A 193.7 445.1 638.7					
UNEC Average 12.56 193.7 N/A 193.7 667.5 860.2					
Data Generated by (On behalf of) Test Facility: <i>[Signature]</i> Date: 18.04.2018 Date Approved by: <i>[Signature]</i> Date: 18.04.2018					
Ultra Low Emission Bus Certificate Summary					
GHG Well-to-Tank 624.7 g CO ₂ /km					
Euro VI Average Diesel Equivalent 229.5 g CO ₂ /km					
WTTW GHG saving (compared with Euro VI diesel equivalent) 395.2 g CO ₂ /km					
% WTTW GHG saving (compared with Euro VI diesel equivalent) 72.7%					
% WTTW GHG saving (compared with Euro VI diesel equivalent) 72.7%					
WTTW CO₂ per passenger km (at Max Pass Capacity) 8.5 g CO ₂ /pass km					
Approved as Ultra Low Emission Bus (DfT saving or more) YES					
Comments: Intentional results marked in red are below detection limits.					
Test Numbers: M00017910 (12 April 2018), M00017911 (12 April 2018), M00017912 (12 April 2018)					
Certificate Approved by: <i>[Signature]</i> Date: 18/04/2018					

Proof of Sustainability (PoS) for Biofuels and Bioliquids		V4.1	
For biofuels and bioliquids according to the Renewable Energy Directive (RED) and the Fuel Quality Directive (FQD), both amended through Directive (EU) 2015/1513			
Unique Number of Sustainability Declaration:		EU-ISCC-Cert-DE110-75180075	
Place and date of dispatch:		GL55 6UR - 10/07/2018	
Date of issuance:		11/07/2018	
Supplier		Recipient	
Name: Northwick Electricity Ltd		Name: Air Liquide UK Ltd	
Address: Westington Hill Stanley's Quarry, Chipping Campden, United Kingdom, GL55 6UR		Address: Westington Hill Stanley's Quarry, Chipping Campden, United Kingdom, GL55 6UR	
Certification System: ISCC EU		Contract Number: 161213 P0067 BPA_Northwick	
Certificate Number: EU-ISCC-Cert-DE110-75180075			
1. General Information			
Type of Product: Biogas / Biomethane			
Type of Raw Material: Food waste			
Additional Information (voluntary):			
Country of Origin (of the raw material): UK			
Quantity: 5.033 m ³		<input checked="" type="checkbox"/> metric tons	
Energy content (MJ): 251.652 MJ			
2. Sustainability criteria of the biomass according to Article 17 RED:			
The material complies with the sustainability criteria according to Art. 17 (3), (4) and (5) RED ¹⁾ <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			
The sustainability criteria according to Art. 17 (3), (4) and (5) RED were not taken into account ²⁾ <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
3. Greenhouse Gas (GHG) Information			
Total default value according to RED applied <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
E = E _{oc} + E _i + E _p + E _{ld} + E _u - E _{scs} - E _{ccs} - E _{ccr} - E _{ee} = 6			
GHG emission saving ³⁾ : 92.8% (for biofuels 83.8 gCO ₂ eq/MJ) 92.2% (for electricity production 77 gCO ₂ eq/MJ)			
92.8% (for electricity production 91 gCO ₂ eq/MJ) 92.9% (for cogeneration 85 gCO ₂ eq/MJ)			
The installation where the final bioliquid or biogas was produced started physical production of bioliquid or biogas after 5 October 2015 <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			
This form is valid without signature. By issuing this PoS, the issuing party guarantees that all information made on this Proof of Sustainability are correct, in compliance with the requirements of ISCC and the RED, and that the bioliquid or biogas has not already been used to fulfil a national quota obligation.			

Low Emission Bus with Ultra Low Carbon Fuel									
Customer: Dennis (Great Britain) Ltd									
Customer Address: Dennis Way, Salford, Surrey, GU1 1AF									
Test Purpose: ULEV Testing									
Vehicle Manufacturer: Alexander Dennis Ltd									
Vehicle Type & Number: ADL E400n 0445									
Engine: CumminsISB Euro VI Hybrid									
Transmission: Automatic									
Euro VI certificate VIN: Manufacturer Certified									
Declared fuel, properties and source plus carbon conversion factors									
Net Heating Value: Diesel 38.0 MJ/Litre									
Well-to-Tank Factor: Diesel 16.42 g CO ₂ /MJ									
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Certificate Approved by: <i>[Signature]</i> Date: 18/04/2018									

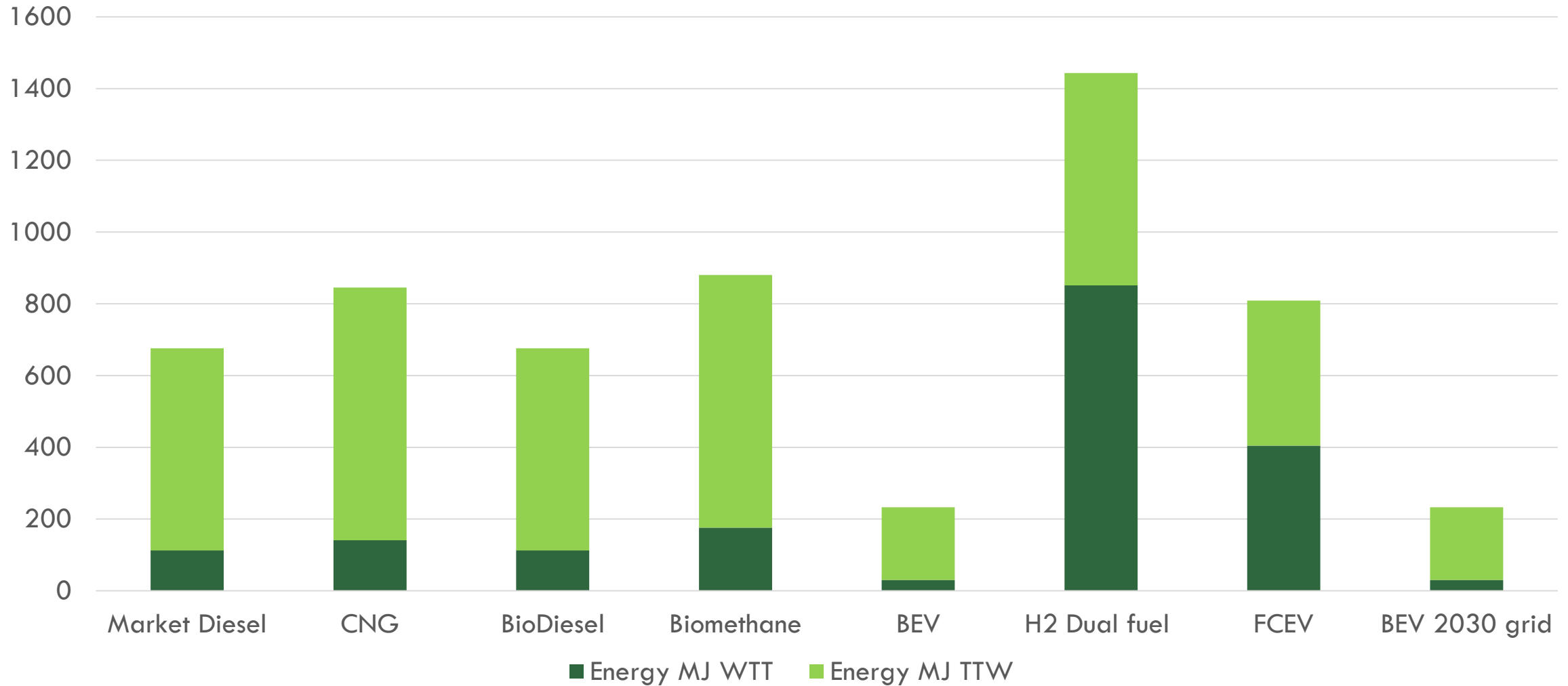
CO₂ of Fuels (WTT and TTW) per unit Energy (MJ)

Comparison of total GHG emissions for UK road transport fuels & energy vectors

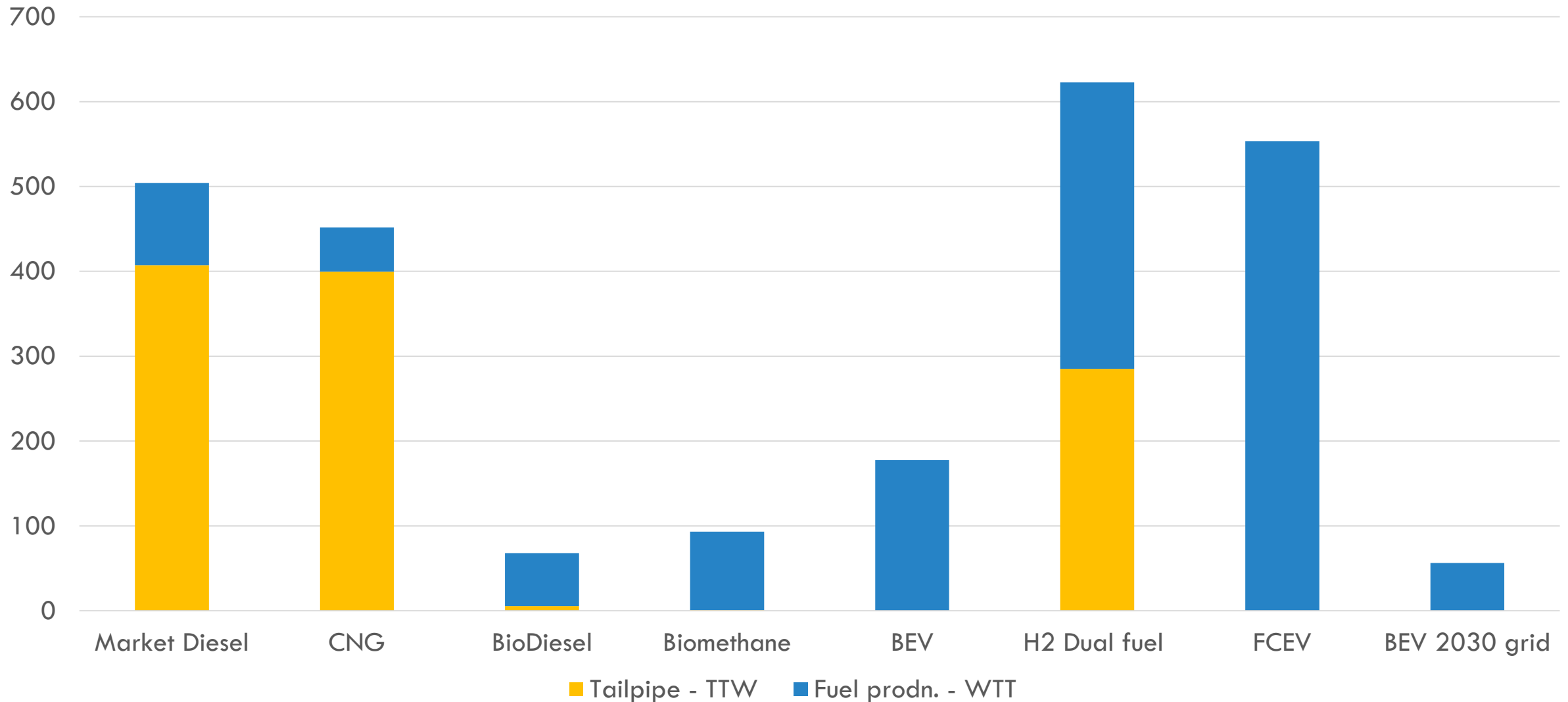


7.5t Truck in use – Typical energy consumption

Illustrative Energy consumption MJ/100km for 7.5t Truck by powertrain/fuel combination



7.5t Truck – typical WTW CO₂ g/km for variety of options



Trucks – example of “joined up” approach

- LowCVP cover aspects across the whole innovation spectrum from designing the programmes for funding to producing reports to promote low carbon in the market and develop market support policy
- The independent assessment and support to government with a view across all carbon impacts (Life Cycle approach) will be critical in delivering the Road to Net Zero for 2050
- Understanding of Vehicles (use patterns and technology), Fuels (production, delivery and storage), Production impacts and future mobility systems is critical

LowCVP TRUCK RELATED PROJECTS

- Setting up LEFT trial
- Testing/guidance
- Fuels parameters
- LCA assessment

Government Truck Trials - current

Aug 2016– £20M Low Emission Freight and logistics Trial (LEFT)

- 13 projects, 316 vehicles,
 - Hydrogen, Natural Gas, Biomethane, Electricity, LPG,
 - Electric, Range extended Electric, Dedicated Gas, Dual Fuel engines, Aero and lightweight Trailers, KERS
- 2t to 44t vehicles
- Refrigeration units, Energy storage
- Monitoring of the vehicles in use
- Comprehensive emission testing

<https://left.tri.co.uk/>

Innovate UK
Office for Low Emission Vehicles

Department for Transport



LEFT programme – Data gathering

Vehicles all monitored in service – results to follow
NEW – Comprehensive Emission Testing Programme
All project vehicle types tested
On Track with PEMS or in emission laboratory
Using representative cycles

City Centre, Urban, Rural, Long Haul

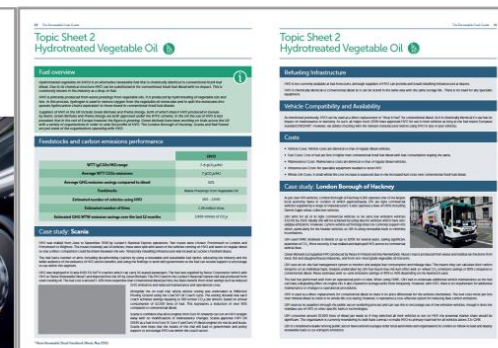
2t Delivery Van



6.5t Delivery Van



Renewable Fuels Guide



Workshop on Embedding Life Cycle CO₂e Assessment into Automotive Manufacturing and Future Vehicle Policy

LC Event [Add to Calendar](#)

MEMBER DISCOUNT

Date: 28 Nov 2019 - 28 Nov 2019
Time: 10:00 - 16:00
Website: lca_workshop.eventbrite.com/?aff=LowCVP
Contact: Gloria Esposito
Location: IMechE
Full Address: One Birdcage Walk, London, SW1H 9JJ

Description:
Please Note: Due to high demand, the format of the day's activities are being altered slightly. There will now be a morning session open to all, followed by a dedicated workshop in the afternoon for invited participants. Please register your interest in attending below.
Achieving the Government's 2050 net zero carbon target requires the UK to take deep cuts in road transport greenhouse gas emissions over the next two decades. The advancement of zero tail-pipe

Renewable Fuels Guide – coming soon



The Renewable Fuels Guide

Helping fleet operators cut carbon emissions



Disclaimer
Although we have named specific vehicles in this guide, Cenex and LowCVP do not endorse any particular makes and models. Cost and emissions data are illustrative only. Fleet should undertake or commission their own analysis to determine likely financial and environmental performance. All facts and figures are correct at the time of writing (September 2019).

Topic Sheet 3 - Biomethane

Fuel overview



Biomethane is chemically identical to natural gas when used as a renewable and can be easily substituted as a biofuel for natural gas vehicles both CNG and LNG. When used as renewable vehicle fuel in the UK, biomethane is made from a variety of organic waste materials via the process of anaerobic digestion. It requires upgrading to a quality suitable for use in gas vehicles then typically injected into the National Gas Grid for distribution. The RTFO scheme allows biomethane producers to inject biomethane into the grid and an equivalent mass of methane to be extracted from the grid at a refuelling station. Biomethane can be dispensed as compressed biomethane gas (CBG) or liquid biomethane (LBM).

UK suppliers of biomethane include CNG Fuels, Air Liquide and Gas Alliance.

GHG Emissions Performance

The table below shows the GHG emissions performance of the primary feedstocks used for producing biomethane supplied in the UK⁶. Data has been sourced from Government's RTFO statistics and interviews with biofuel suppliers. When a high proportion of biomethane is produced from manure it can achieve a negative GHG emission intensity. This is because methane is released to the atmosphere when manure is stored in the open environment. Methane is twenty five times (by mass) more powerful as a greenhouse gas than carbon dioxide. By using manure as feedstock, methane can be captured giving rise to a carbon neutral or negative biofuel. Currently the RTFO does not report negative renewable fuels, however this is likely to materialise over the next twelve months.

	Biomethane Range
WTW GHG emission intensity	5 - 15 gCO ₂ e/MJ
WTW GHG emission savings	82% - 94%
Average GHG emission savings	88%
Primary sustainable feedstocks	Food waste, manure, agricultural residues

Current Deployment

Biomethane is relatively widely used in the UK with increasing take up by the freight sector. As the accompanying case studies highlight, it is used by John Lewis Partnership, London Borough of Camden and Kuehne + Nagel. Other fleets include Asda, Howard Tenens, DHL, Ocado, Hermes, DPD, London Borough of Islington, Veolia, and Lawsons building merchants. It is estimated that approximately 400 HDVs operate on biomethane in the UK. Biomethane has been popular in the bus sector due to specific incentives via B50G requirements to mandate the use of biomethane in gas buses. There are 363 biomethane buses in operation in cities such as Nottingham, Bristol and Reading. Based on current gas vehicles running biomethane, it is estimated that approximately 15,000 tonnes of GHG emissions have been saved over the last 12 months.

Refuelling Infrastructure

Both public access and depot-based refuelling are available for CBG and LBM. For more information refer to the next chapter on biomethane infrastructure.

Vehicle Compatibility and Availability

Gas heavy duty vehicles can run interchangeably on natural gas and biomethane with no impact on fuel consumption or warranty considerations. The engines are either dedicated spark ignition (LNG or CNG) or High-Pressure Direct Injection dual fuel (Volvo – LNG only).

Both CBG and LBM vehicles are available as rigid and artic HGV's up to 44t GVW. Example vehicles include the Iveco Stralis NP, Iveco Eurocargo, two, three and four axle rigid plus 4x2 artic with 280, 340 and 410hp engines, Mercedes Benz Econic, Volvo FH and Volvo FM.

Topic Sheet 3 - Biomethane

Costs

Vehicle Costs: Gas HGVs can cost around 25% more than a conventional diesel equivalent when purchased outright. A number of companies offer gas vehicles on a lease contract.

Fuel Costs: Biomethane is cheaper than diesel on a pence per mile basis, partly driven by the fuel duty. Treasury has committed to maintaining the fuel duty differential between natural gas and diesel through to 2032. This rate difference is 50% lower than conventional diesel. Fleets which have high annual mileages, such as long haul logistics companies, achieve the greatest cost and carbon savings.

Maintenance Costs: Maintenance costs of gas vehicles are 20%-25% more diesel vehicles.

Infrastructure Costs: Costs vary depending on whether fleets use public access or depot refuelling. The capital costs of depot refuelling station can be recovered through lower fuel operating costs. Alternatively, some providers will provide infrastructure and recover costs through the fuel price directly (wet lease).

Case Study: John Lewis Partnership

Sustainability is at the core of John Lewis Partnership's (JLP) operation. It has implemented ambitious measures to reduce their carbon emissions, with a target of a zero carbon fleet by 2045.

The commercial vehicle fleet consists of 1,600 vans, 400 light trucks, and 600 heavy duty trucks. JLP is reducing road transport carbon emissions by driving fewer miles, improving fuel efficiency and switching to alternative fuels.

In 2010 JLP and Imperial College London reviewed 30 alternative fuels and technologies. Using criteria covering sustainability, availability and the long-term business case, JLP concluded that biomethane was the best option for its heavy fleet. The process of introducing biomethane began with a trial of one demonstration vehicle. JLP rolled the fuel out gradually over the past eight years and now uses it in 85 Scania P 340 trucks. It has committed to changing the whole fleet of 600 trucks to dedicated gas HDVs fuelled by biomethane by 2028.

The gas trucks cost around 25% more than diesel vehicles to purchase. This is offset by fuel savings, as they are paying around 30-40% less for biomethane than diesel on a pence per mile basis. This means they recover the investment in no more than two years. Over the lifetime of a vehicle the total cost is about 24% lower than an equivalent diesel truck, though payback depends on factors such as fuel price and miles driven.

Vehicles are refuelled with RTFO-approved, and ISCC-certified, methane at the CNG Fuels stations at Leyland and Northampton. The biomethane sourced, which is produced from feedstocks including food waste and manure, can reduce well-to-wheel greenhouse gas emissions by 84%, compared to mineral diesel.

Other fleets using Leyland include Hermes, Argos and HPH Group. CNG Fuels also operate a refuelling station at Crewe and Northampton, and will be opening new sites at Warrington, Erdington, Knowsley, Larkhall and Bellshill between late 2019 and summer 2020.

In total CNG Fuels supplies an annualised amount of more than 10 million kilograms of biomethane. This figure is growing rapidly as existing customers order additional gas trucks and new customers order their first gas trucks. CNG Fuels expects annual growth rates of dispensed volume of biomethane of up to 150%, powering up to 300 vehicles by early 2020.

The carbon intensity of biomethane varies depending on where on the gas grid the stations are connected, with the lowest intensity for stations connected to the high pressure grid. All existing CNG Fuels stations and the majority of their planned stations are on high pressure grid.

The vehicles and refuelling infrastructure have been extremely reliable, helping JLP gas trucks cover over 10 million miles. The organisation now works to encourage other businesses to switch to biomethane by participating in programmes such as TRL's LoCITY to disseminate the benefits to other freight and logistics operators.



Thank you. Any questions?



Andy Eastlake C Eng FIMechE

Managing Director

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Interested in joining the Partnership?

Collaborating to develop the vehicles, energy and supporting infrastructure for future mobility