



**Zemo  
Partnership**  
Accelerating Transport to Zero Emissions

# HGVs and the road to Net Zero

## Road Transport Expo

Document prepared by Zemo Partnership

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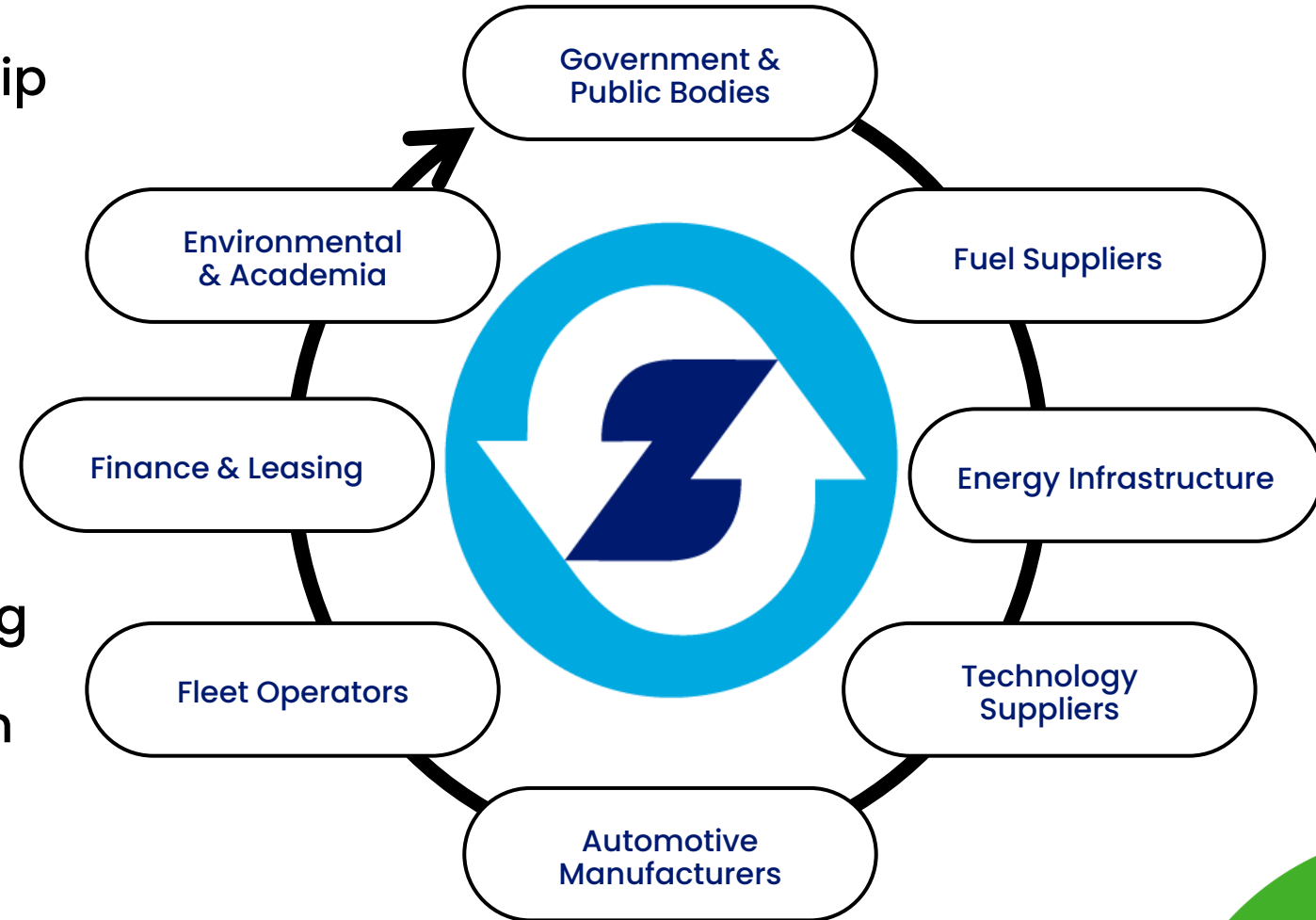
1<sup>st</sup> July 2022

# Zemo Partnership

Accelerating transport to zero emissions since 2003

An independent, non-profit partnership that brings together government, industry and a wide range of expert stakeholders in the field of zero-emission mobility.

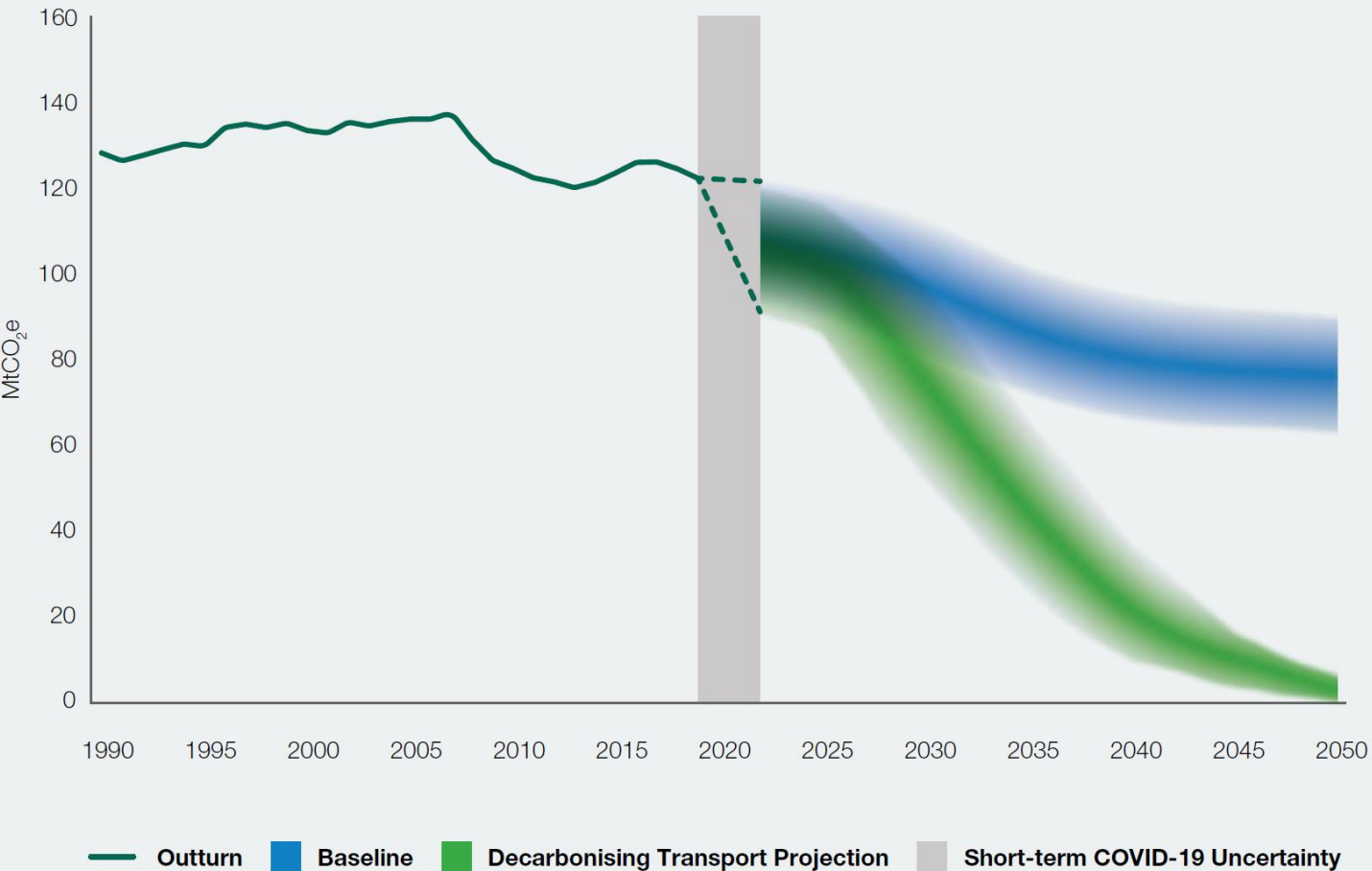
The Partnership plays a key role in helping the UK Government to shape and deliver its zero carbon transport strategy, with the objective of ensuring that the UK takes a leading role in the global shift towards low & zero carbon transport.



# Transport Decarbonisation Plan – July 2021



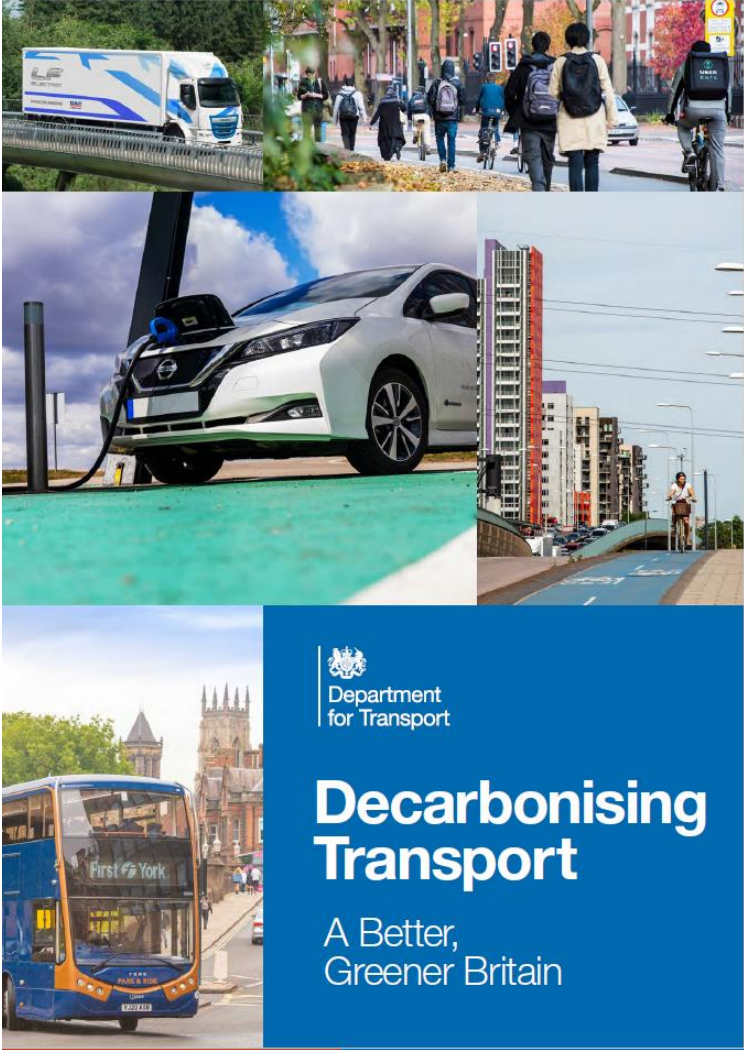
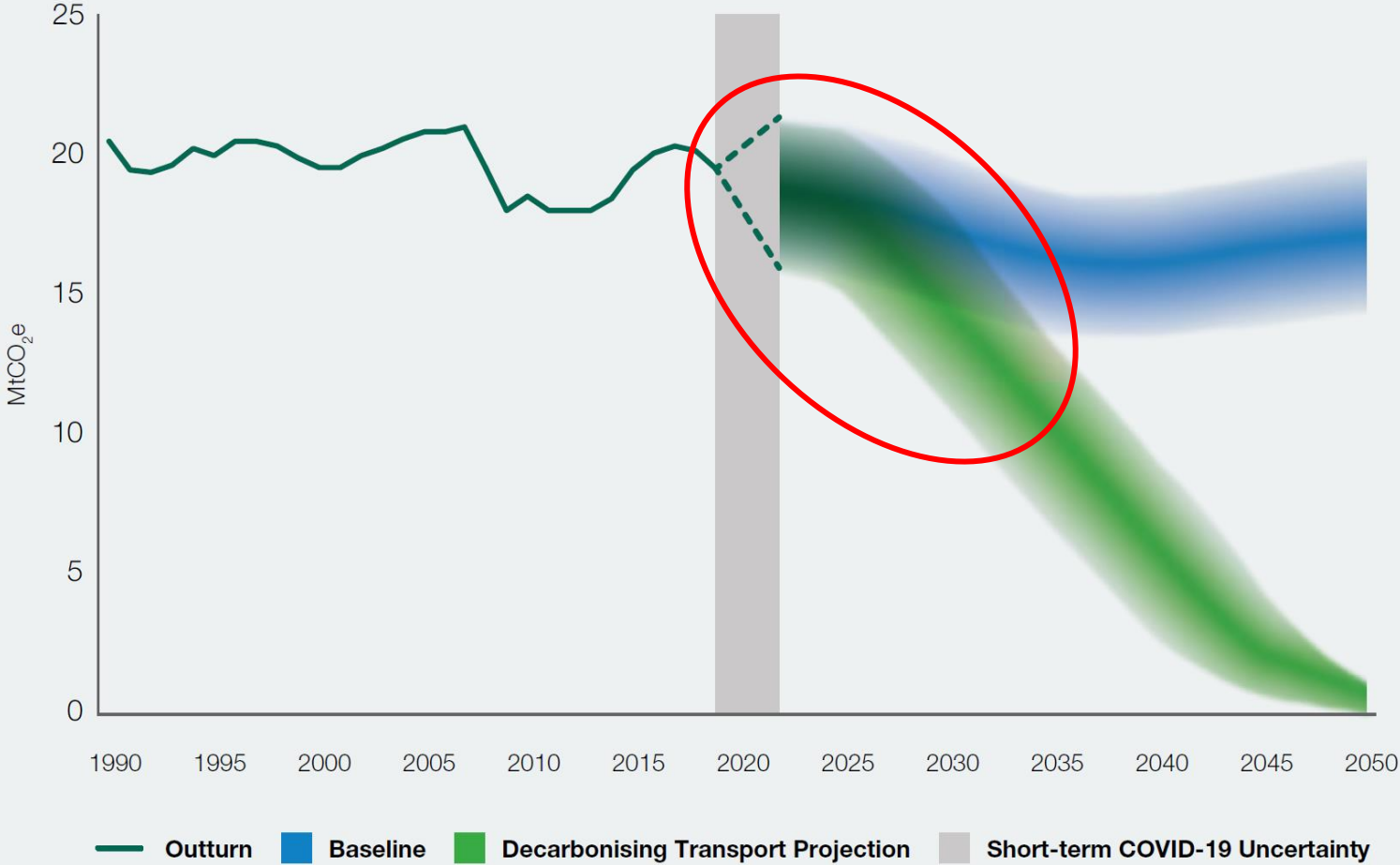
Figure 2: Decarbonising Transport domestic transport GHG emission projections, versus the baseline\*



# Transport Decarbonisation Plan – July 2021



Figure 13: Decarbonising Transport HGV GHG projections, versus the baseline\*



# We will support efficiency improvements and emission reductions in the existing fleet



Government will continue to use a range of measures to cut emissions from the existing HGV fleet in advance of zero emission alternatives becoming mainstream.

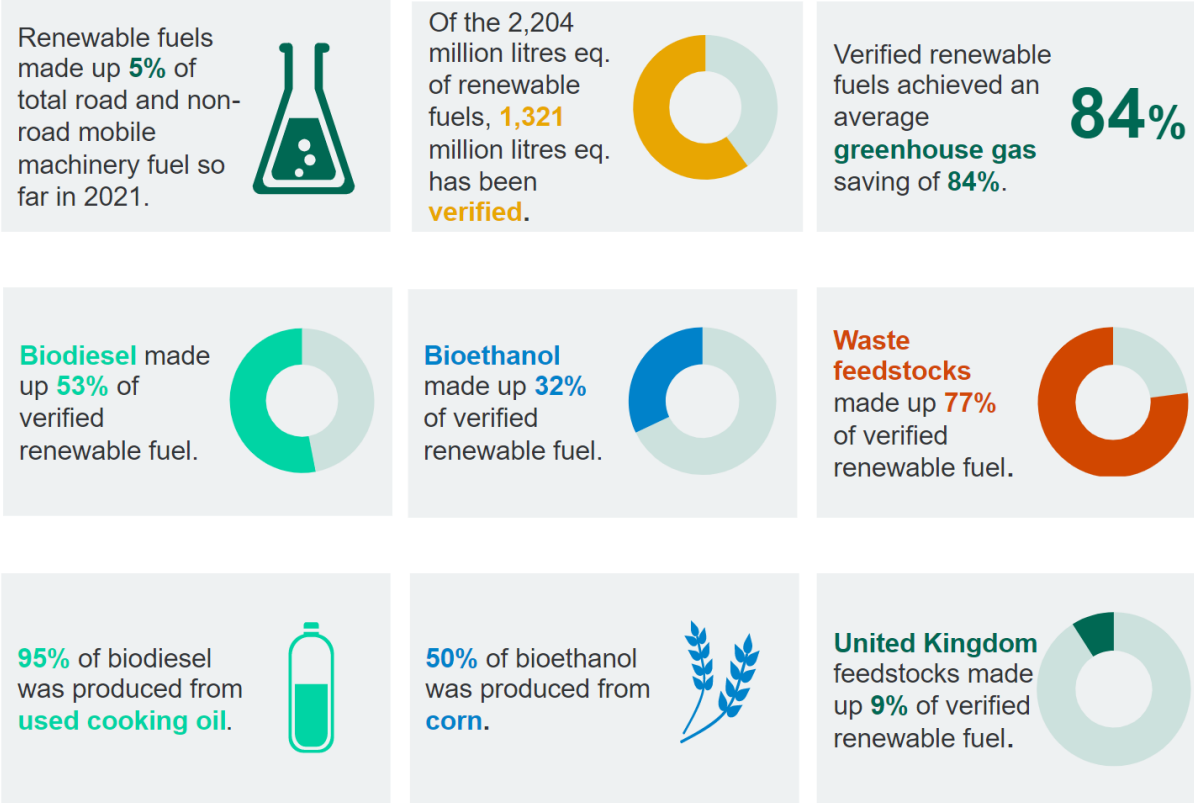
- We will use the Energy Saving Trust's online Freight Portal, to showcase the commercial benefits of improved fuel and logistical efficiencies, including information on available technologies, training and advice which operators can adopt to save time and money while reducing their emissions.<sup>147</sup>
- We will build on the initial work of Zemo Partnership and others in identifying zero emission solutions for transport refrigeration units and auxiliary power units, producing an action plan for their identifying the technologies available, barriers to introduction, and opportunities.
- The Renewable Transport Fuel Obligation will continue to support the use of sustainable low carbon fuels in road vehicles. To increase emissions savings, we will explore the potential to increase the biocontent in fuels for use in compatible vehicles, for example through the use of higher blends of biofuels or drop-in fuels. More details can be found in the section on 'Maximising the benefits of sustainable low carbon fuels'.
- Government has committed to maintaining the fuel duty differential up to 2032, subject to review in 2024, to encourage the use of biomethane and other gaseous fuels that create carbon savings compared to fossil fuels.<sup>148</sup>

**Low carbon liquid and gaseous fuels – predominantly biofuels deployed in road transport – deliver about a third of all domestic transport carbon savings under current carbon budgets.<sup>183</sup> Our overall strategy is to deploy low carbon fuels across the transport sector in a way that achieves maximum greenhouse gas savings.**

In the short term, low carbon fuels will continue to be an available and flexible resource to deliver immediate emissions savings in all road vehicles. The medium-term need is expected to shift to long-haul HGVs in the road sector with increasing demand also from aviation and maritime which are likely to need the largest proportion of low carbon liquid or gaseous fuel in the longer term.

# Decarbonising the fuel in the fleet

Figure 3: Highlights - 2021



Fleet Operator & Supplier Information			
Customer name	Zemo Logistics	Customer address	Enfield Lock Industrial Estate
Renewable Fuel Supplier	Super Green Fuels	Renewable fuel supplier identifier	SP/P4/21
Category of renewable fuel supplier	Trader	Declaration period	3 months – Jan to Mar 2021
Declaration number	SP/Q1/21/01	Date declaration issued	30/3/21

Renewable Fuel Description		Greenhouse Gas Emission Performance	
Renewable Fuel	Compressed Biomethane	GHG emission intensity of renewable fuel supply chain	10 gCO <sub>2</sub> e/MJ
Renewable fuel blend supplied	100%	GHG emissions savings	85%
Volume of renewable fuel sold	100,000,000 kg		
Production process	Aerobic digestion		
Country of production	Germany and Spain		
Distribution to refuelling station	UK and EU gas grid - mass balanced		

Feedstock Sustainability	
Renewable fuel feedstocks	Manure Husks Grass cuttings Food waste
Country(s) of origin	Spain, France, Germany
Traceability from feedstock origin	Feedstock physically maintained through the supply chain
Supply Chain Voluntary Sustainability Scheme Certification(s)	Yes - ISCC

GHG Emission Savings Compared to Fossil Fuel	
A+	>101
A	91-100
B	81-90
C	71-80
D	61-70
E	51-60
F	41-50
G	31-40
H	21-30
I	11-20
J	0-10
K	0-10

Fossil and pump diesel

Further information	
GHG emissions relate to Scope 3 emissions in corporate GHG emission reporting (Greenhouse Gas Protocol) GHG emission savings of more than 100% means that the renewable fuel is carbon negative.	
Renewable Fuel Supplier has corporate GHG emission reduction plan – Yes	
Zemo renewable supplier approval date:	March 2021
RFAS website:	www.zemo.org.uk

Zemo Partnership approval: *G. Zepente*

Compressed Biomethane delivered 86% GHG saving in 2021

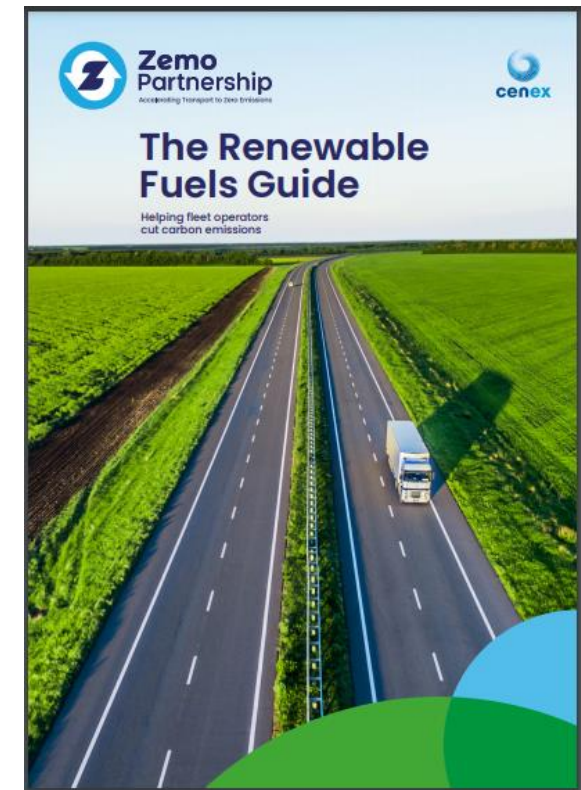
# Options for action now

Use less Fuel/Energy – (Operations, Aero, Tyres etc)

Lower emission vehicles (new Euro VI, Hybrids, Battery)

Renewable fuels/energy

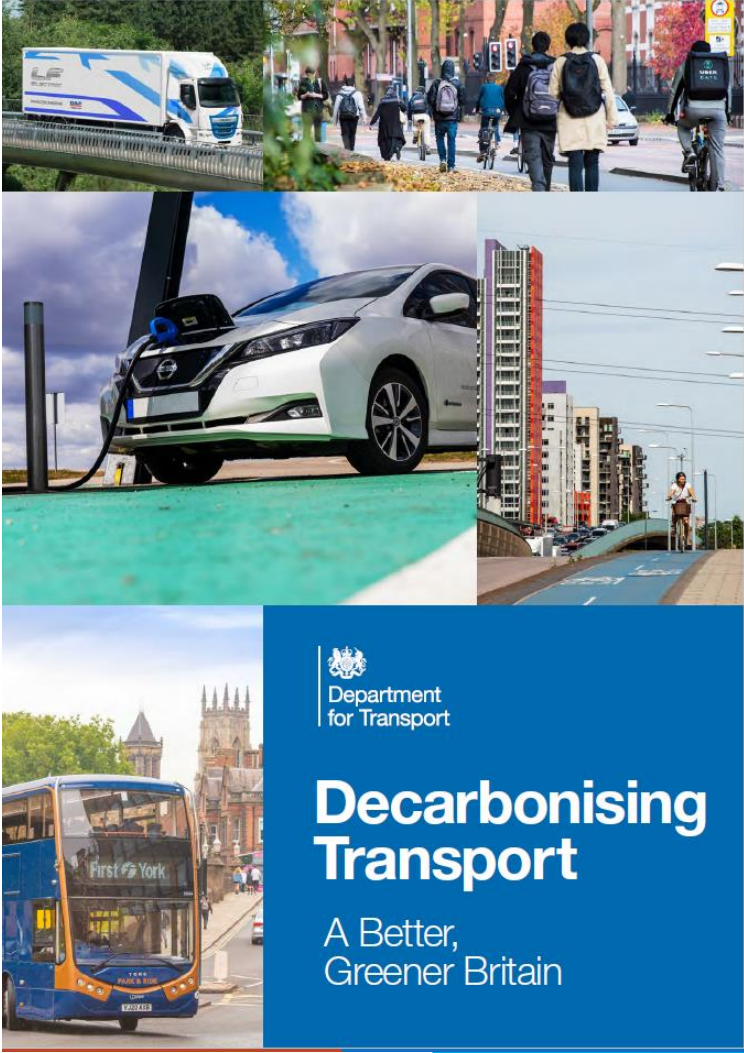
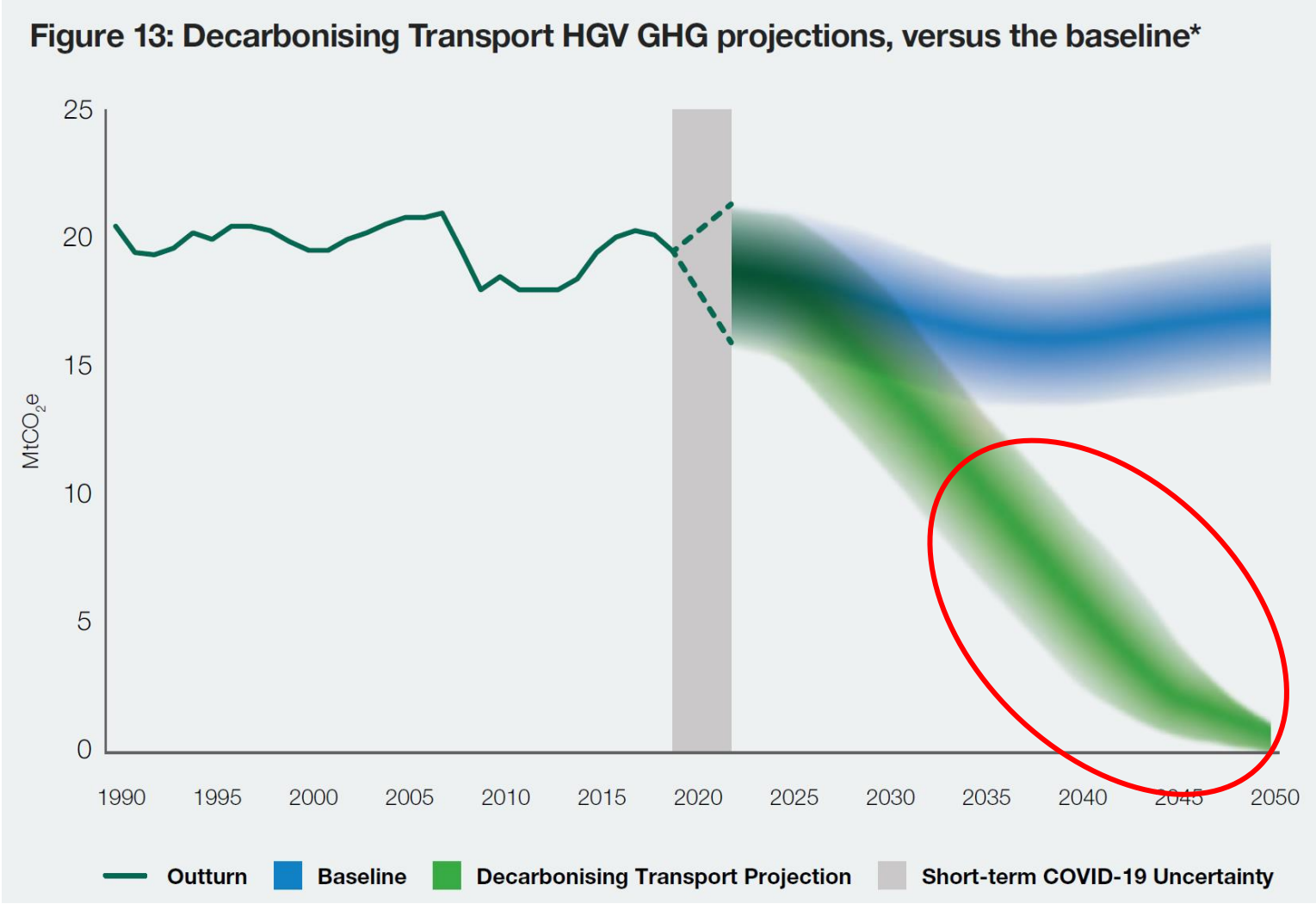
Trial new vehicles



# Transport Decarbonisation Plan – July 2021



Figure 13: Decarbonising Transport HGV GHG projections, versus the baseline\*





# Emission and climate change

P25 – Zero tailpipe emission on road is the plan.



There is **strong public support for action to remove transport's emissions**. Ending transport's damaging contribution to climate change will create better places for us to live and work in, with quieter and less congested streets. Changing the way, we travel has the power to improve the health and wellbeing of the nation.

This is also a huge industrial opportunity, a once in a generation chance to increase economic growth and future prosperity – using **electricity, green hydrogen, sustainable low carbon fuels and pedal power** – to invest in new jobs across our country.

This plan expands our commitments to **reduce and remove the use of fossil fuels from road transport**, and to set achievable but ambitious phase out dates for every type of new fossil fuelled road vehicle. When complete, we will have addressed the single **biggest contributor to UK transport carbon emissions and eliminated all tailpipe emissions of other pollutants**.

‘There will still be particulate emissions associated with road, rail, tyre, and brake wear, and we are working to tackle those too, but the toxic by-products of burning hydrocarbon fuels will be eliminated from the roadside and rail.’

# Focus on Freight

## Delivering a zero emission freight and logistics sector

We are consulting on phase out dates for the sale of all new non-zero emission HGVs

We will demonstrate zero emission HGV technology on UK roads this year

We will stimulate demand for zero emission trucks through financial and non-financial incentives

We will support efficiency improvements and emission reductions in the existing fleet

We will support and encourage modal shift of freight from road to more sustainable alternatives, such as rail, cargo bike and inland waterways

We will take forward measures to transform 'last mile' deliveries

## Phase out dates for new non-zero emission Light Goods Vehicles (LGVs) and Heavy Goods Vehicles (HGVs):



**LGVs (under 3.5t)**  
all new vehicles required to have significant zero emissions capability

zero

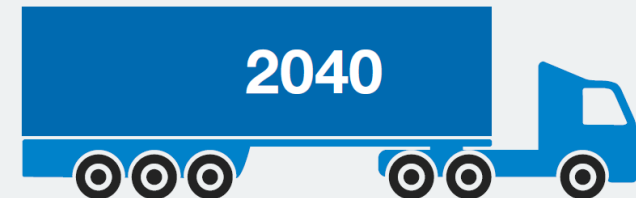
and 100% zero emissions at the tailpipe **from 2035**

2035



**HGVs (above 3.5t and up to and including 26t)** End the sale of new non-zero emission HGVs in this category **by 2035**, or earlier if a faster transition seems feasible\*

**HGVs (above 26t)**  
End the sale of all new non-zero emission HGVs **by 2040**, or earlier if a faster transition seems feasible\*

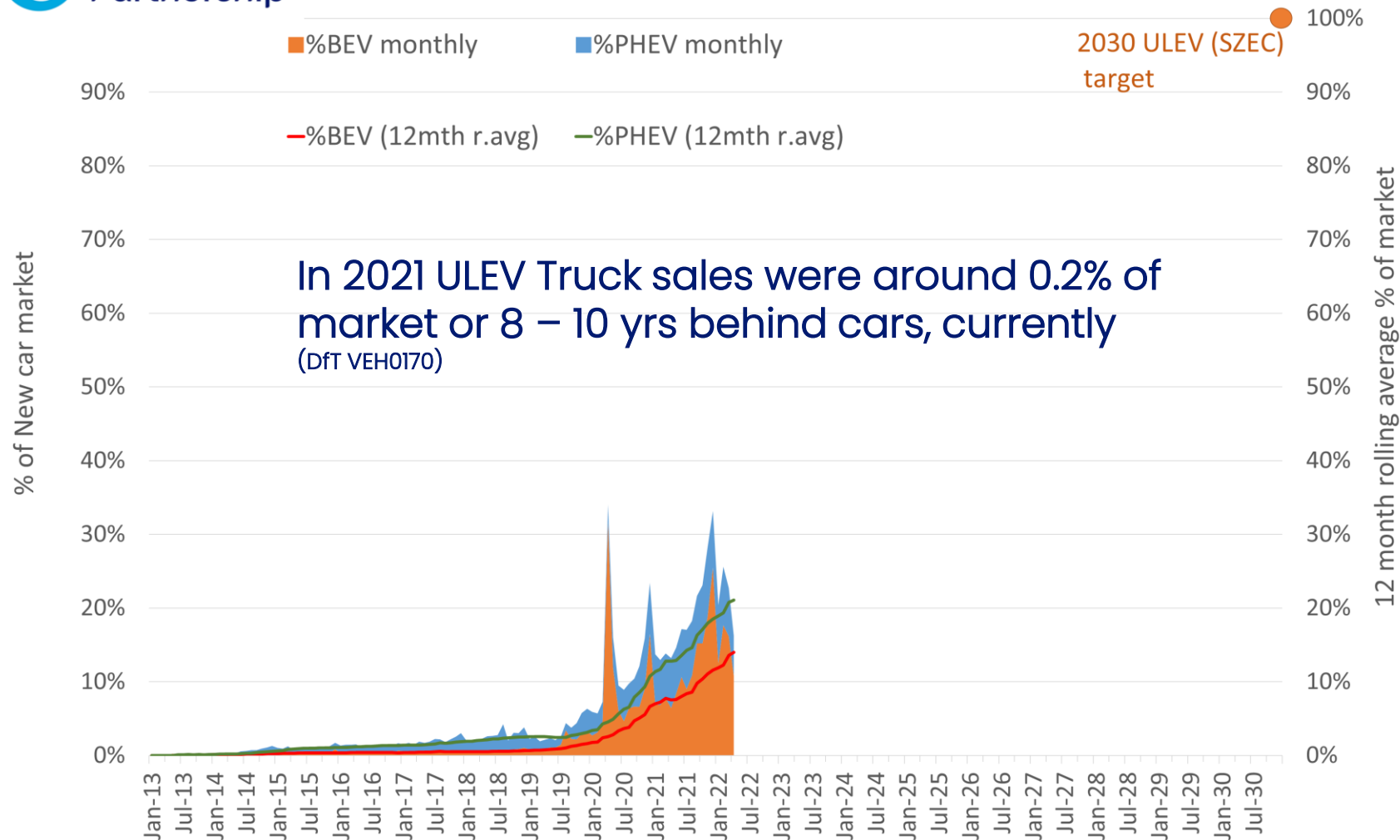


\*Subject to consultation

# ZEV's are coming, but GHG takes time!



Plug-in car market share growth (SMMT data, Zemo analysis)



21% of cars sold in 2022 YTD have a plug. Around 2.5% of cars now on the road have a plug.

5.4% of Vans sold in 2022 YTD have a plug. Around 0.6% of vans now on the road have a plug.

# Large commercial vehicles

Zero emission today

- 0.3% of new HGV registrations classified as ultra low emission in 2021
  - <0.1% in 2020
- **BEV HGV market starting to emerge**
  - Traditional OEMs
  - New entrants
- **Bigger challenge to electrify**
  - Mass & use cycle
  - 44t HGV, 400mile range = ~1MWh, ~5t battery



# Large commercial vehicles

## Incentives & support



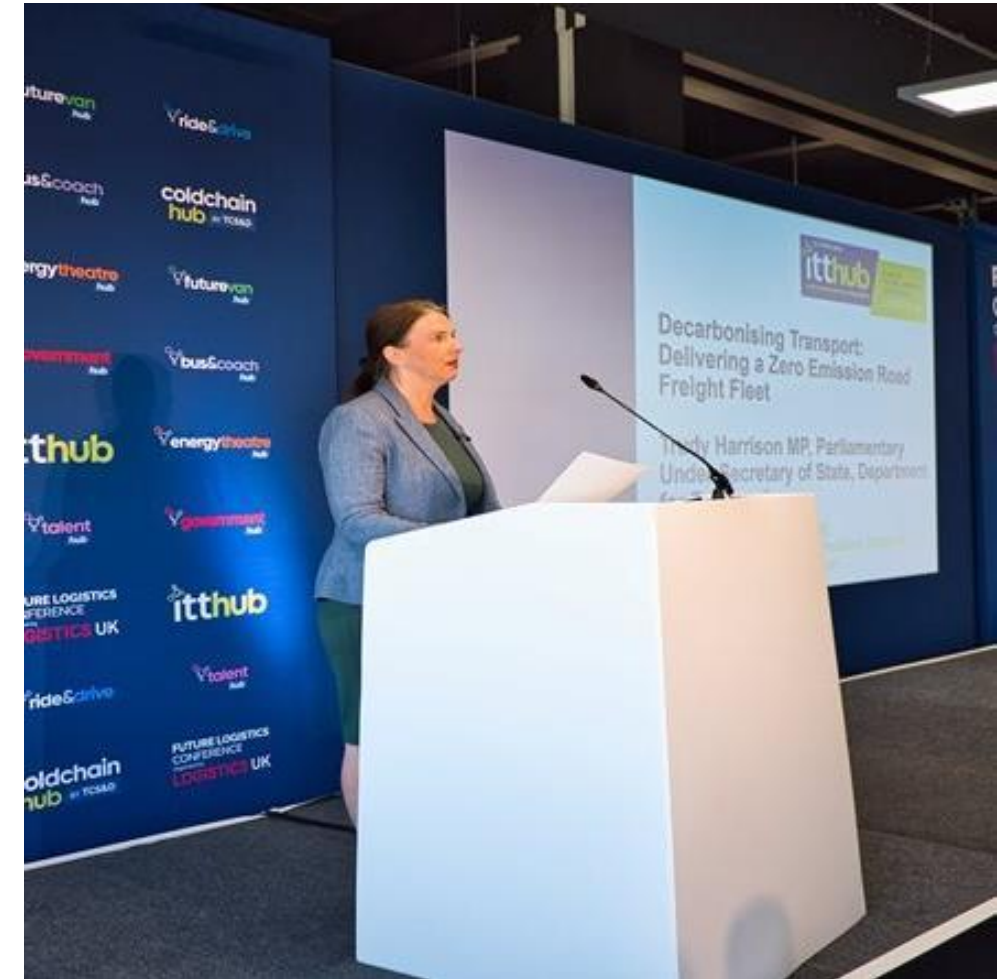
- **Plug-In Truck Grant (N3)**
  - Minimum zero emission range of 60 miles
  - 20% of purchase price
  - Up to a limit of £25,000
- **Limited number of grants available per year**
  - 100 grants at £25,000 (5 per organisation)
  - Then 250 grants at £16,000 (10 per organisation)
  - Thereafter £5,000
    - Maximum of 1000 grants in total per organisation per year
- **Grant availability extended to 2024-2025**



# Large commercial vehicles

## Zero Emission Road Freight (ZERF)

- **ZERF announcement (12<sup>th</sup> May '22)**
  - £200m over 3 years
  - Large scale demonstration of zero emission HGVs & associated infrastructure
  - Competition timing to be announced
    - Summer is the expectation
  - BEV & hydrogen fuel cell focus initially
- **Follow on from the £20m trials that took place last year**



# Zero Emission Road Freight Trials (ZERFT)



Planned major UK Govt funded programme to trial Zero emissions HGVs

Review the technology, the operation, the infrastructure and the energy as a “system”

## Hydrogen

Hydrogen fuel cell HGVs are fitted with an electric powertrain. Energy is stored on board the vehicles as hydrogen, which is converted to electricity in fuel cells. There are no tail pipe emissions - the only by-products are warm air and water vapour. The vehicle will also have a battery to produce additional power when needed, and to recuperate electrical energy from braking. Vehicles will need to refuel at hydrogen refuelling stations.

Conventional internal combustion engine powertrains can also be converted (or specifically developed) to operate with hydrogen as a fuel. However, these vehicles are generally less efficient than the equivalent fuel cell vehicles, and are not zero-emission as they emit pollutant emissions such as NO<sub>x</sub>.

Hydrogen fuel can be made using electricity to electrolyse water, or through reforming methane, sourced either from natural gas or biomass. Following methane reforming, the resulting carbon dioxide can be sequestered so that it is not released into the atmosphere, though this technology is in the early stages of implementation in the UK.

Long-haul hydrogen fuel cell HGVs have been trialled internationally, but are not yet being mass-produced, and there have not yet been any trucks built to UK specifications. However, fuel cell cars and buses have already been introduced in the UK, so the basic technology is well understood.



Hydrogen Fuel Cell HGV Components (indicative only)

## Electric Road Systems



Catenary infrastructure on A5 in Germany (Image source: Hessen Mobil)

Electric Road Systems (ERS) involve installing infrastructure that enables electrical energy to be delivered directly into a vehicle while it is in motion. The most developed and HGV-compatible ERS technology is conductive overhead catenaries. In this system, a catenary wire is suspended above the carriageway. A pantograph is mounted on top of the vehicle, designed to extend to meet the catenary when the vehicle is in position, enabling power to flow from the overhead wires into the vehicle powertrain. Vehicles feature a full electric drive and a pantograph system, similar to overhead rail electrification. ERS-enabled vehicles also need a backup system such as battery energy storage to travel between ERS-enabled roads, and for interruptions such as bridges/tunnels and other obstacles.



ERS HGV Components (indicative only)

## Battery Electric Vehicles



Battery Electric HGV Components (indicative only)

- Power Electronics and Control Systems
- Electric Drive Train
- Batteries

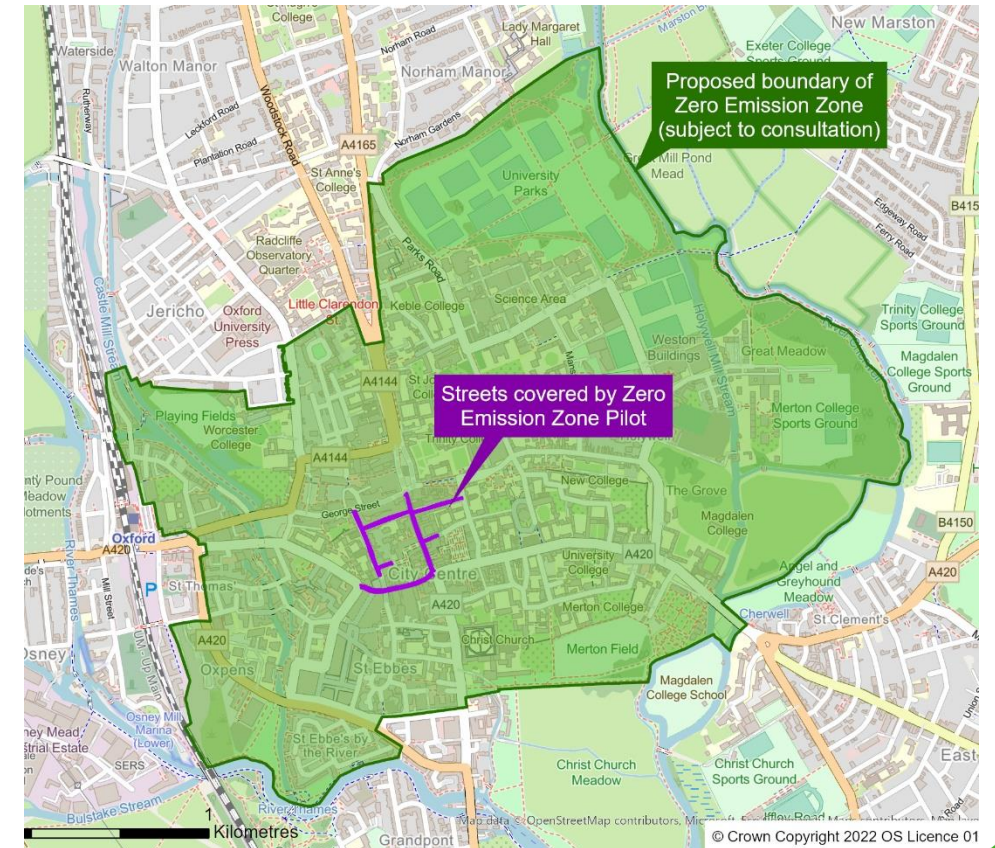


The basic vehicle architecture of a pure battery electric HGV is similar to the other options, but the vehicle must store all of its energy in batteries. Battery technology is a fundamental part of both hydrogen fuel cell and ERS solutions, and can be suitable for lighter vehicles with shorter routes. However, as a standalone solution for the largest long-haul HGVs, we do not think it is ready for a large-scale demonstration in the near future due to range limitations, the weight of batteries which reduces efficiency and carrying capacity, and technical and operational concerns regarding charging.

# Large commercial vehicles

## Local authority action

- Oxford is the first city in Britain to implement a zero emission zone
  - Pilot launched in Feb '22
  - Initially a small number of streets in the city centre
  - Daily charge per vehicle
- Zero emission vehicles are exempt from charge
- Ultra low emission vehicles are subject to a reduced charge compared to Euro 6 vehicles



(Data source: Oxfordshire County Council)



# Not just propulsion! Auxiliaries need Net Zero too



Transport Refrigeration Units emission evaluation for Transport Scotland – May 21

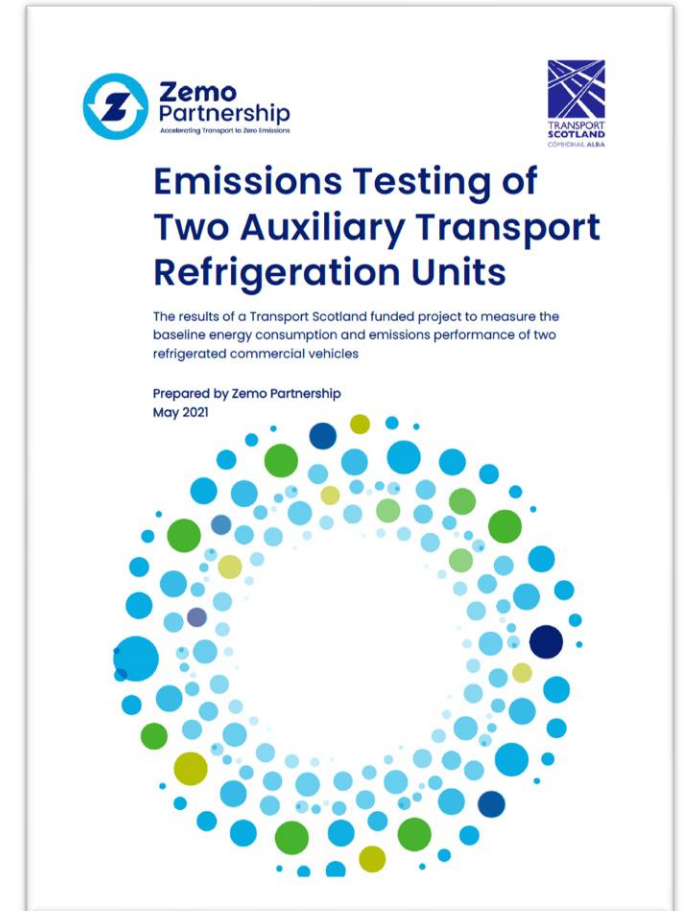
Building on TRU test procedure developed by LowCVP (Zemo)

Tested two typical TRUs under simulated operating conditions

Report now published

- Unabated TRUs are now contribute more AQ emissions than the Euro VI Trucks pulling them
- Significant impact of NO<sub>x</sub>, PM and PN emissions

Recommendations to test further current units and variety of new zero emission solutions and/or retrofits to be funded in 2022





# Zemo Partnership

Accelerating Transport to Zero Emissions

Thank you

Any questions? Please get in touch

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