## Update on Long Distance Zero Emission Coaches

SA SAA

**UKCOA Members Meeting** 

13<sup>th</sup> September 2022



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**Welcome** to the most experienced sustainable mobility partnership in the UK.

We bring government, industry and the widest range of expert stakeholders together to accelerate transport to zero emissions. We work tirelessly with our members to shape government policy, create influential initiatives and provide expert advice and guidance to those working to reduce transport emissions.



# We provide an independent platform for debate and cross-sector collaboration





## Just some of our 230+ Zemo members:





# From freight, fleet and fuels to bus operators and energy suppliers



## Zemo working groups:

# <image>



#### **Commercial Vehicles**

For manufacturers, freight transport operators, technology suppliers, technical experts and others interested in accelerating the transition to cleaner, greener road freight.

#### **Energy Infrastructure**

Formed to make suggestions to Government and industry to ensure that the GB energy system is ready for and able to facilitate and exploit the mass take up of electric vehicles.



#### **Collaborative Initiatives**

Joint working group projects where content crosses over, overseen by the members' council.

## Contents

- 1. Zero Emission Coach (ZEC) uptake in the UK
- 2. Funding
- 3. Technology challenges
- 4. What can be done today?
- 5. Zemo Partnership Voluntary Zero Emission Coach Certification (ZEC) Scheme
- 6. Questions?

## Zero Emission Coach (ZEC) uptake in the UK

#### Fledgling market in the UK

- Since 2019, just over 50 zero emission coaches have been ordered in the UK 18 of these are currently in-service.
- These coaches are being deployed in a variety of scenarios including on scheduled bus services, domestic tourism, and air-side shuttle work at airports.
- All of the vehicles ordered to date are the Yutong TCel2 battery-electric coach – the only zero emission coach currently available in the UK.
- Despite registrations beginning to grow, zero emission coaches remain a tiny minority of overall annual coach registrations.
- This compares to over 50% of all new bus registrations being zero emission in 2021 (Zemo Partnership estimate).
- In Europe, there has been limited uptake of electric coaches with some experience in France and Germany.





## Funding - what's missing?



#### Grants drive competition and technological development

#### Development of UK bus market highlights impact of grants on ZEB uptake



## Total of £656m investment in bus industry over 15 years – **Coach sector** is only sector not eligible for DfT grants.

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## Where are we now?

#### Scotland leading the way!

- Transport Scotland is continuing to support zero emission coaches with capital grants – having done so through SULEBS and Scottish Zero Emission Bus (ScotZEB) Challenge Fund Phase 1.
- Itatest round offered up to £180k for an EV coach and £230k for a hydrogen FCEV **coach**. Funding also supported cost of supporting infrastructure.
- 5-year warranty and Zemo Partnership certification required for qualification, and the vehicles must operate in Scotland for 5 years.
- Indicative guidance was recently published on **ScotZEB Phase 2**, with even broader support for zero emission coaches.
- Funding will support zero emission coaches (and infrastructure) operating in Scotland for:
  - Public service routes
  - Home to School transport
  - Community transport

- Transport to Health and Social Care
- Private Hire Coaches
- Tourist Coaches
- 'Green financing' and repowering may provide coach operators other avenues to electrify their fleets (both of which are also supported through ScotZEB 2).





Ultra Low Emission Bus Scheme Certific

Zemo Partnership

The Presence Presence				HOT CARE		Contraction of the second s			O'R INGT A DE STATING	
Well-to-Tank Factor: Diesel		17.02 g CO2		g CO2e/MJ	WTT evidence		UK GHG reporting factors 2020			
Well-to-Tank Factor: Electricity 84		0.04 g C02e/MJ		Ruel Type			UK Grid Electricity			
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Inner Urban	0.000	0.000	0.000	0.00	0.0	0.000	0.000	1.33	3.36	185,210
Rural	0.000	0.000	0.000	0.00	0.0	0.000	0.000	0.69	5.12	96,900
LBC Average	0.000	0.000	0.000	0.00000	0.0	0.000	0.000	1.07	9.67	148.816
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## Technology challenges.....and solutions!

#### Matching the range and carrying capacity of diesel coaches

- Diesel coaches have the flexibility of both range and carrying capacity (luggage space and passenger capacity).
- Zero emission coaches face the challenge of matching that range without impeding on the carrying capacity of the coach.
- Today OEMs face a challenge in packaging the necessary number of battery packs and/or hydrogen storage tanks needed to meet range requirements, into existing space under the cabin (reduced luggage).
- Some changes to energy storage systems could help to solve packaging challenges:
  - 700 bar hydrogen storage tank system and refuelling, instead of 350 bar (as is common now). This will allow fewer tanks to be used for the same mass of hydrogen stored (higher density) – effectively doubles range at same storage capacity, but at higher cost.
  - Liquid hydrogen storage and refuelling, instead of gaseous storage of hydrogen. This will allow fewer tanks to be used for the same mass of hydrogen stored (higher density) – increases range but comes with significant need for cooling (-273°C).
  - **Opportunity / rapid charging** capability to allow fewer/ smaller batteries.



Indicative Range Estimates of Zero Emission Coach



## **Range improvements**



#### Ranges of ZEBs have increased year-on-year since inception

#### **Range of UK ZEBs since 2010** (includes new and repowered vehicles) Trendline exceeded 400km (250 miles) by the end of 2021 for Hydrogen (Single and Double Deck) Range (km) Trendline exceeded **300km (185 miles)** in early 2022 for Battery Electric (Single and Double Deck) Year Battery Electric Hydrogen

**ZEBs are now mainstream** having only too recently been seen as technology which wouldn't meet the needs of operators.

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## What can we do now to support the transition?

## Tackle the 'low hanging fruit'

- For operators, what is possible today for one vehicle / one service?
- Early adopters are already demonstrating that some services are suitable for zero emission coaches today.
- Zero emission coach operation is possible today. In practice this means scenarios such as:
  - Short distance scheduled services (up to 100 miles) with top-up charging
  - 'Back to base' educational transport
  - 'Back to base' day trip / domestic tourism work
- The focus should be on what services can be achieved today, not what can't be achieved.
- Following in the footsteps of buses early adopters focused on 'low hanging fruit' routes in urban areas where mileage was achievable with the technology available at the time.
- Operators and manufacturers went through a valuable period of knowledge building helping to develop zero emission buses, feeding mass adoption occurring today (over 1,500 in service).



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## **Zero Emission Coach Certification Scheme**

#### Zemo Partnership 'setting the standard'

- The Zero Emission Bus testing and certification scheme, developed and accredited by Zemo Partnership, supports UK national funding schemes.
- ZEB testing and accreditation is required to ensure public money supports proven technologies that will perform in-service. Certificates enable operators to understand the expected performance, determined through testing over a representative cycle (three phases, heating/cooling impact & passenger loading).
- To achieve accreditation and certification, vehicles must:
  - have no combustion engines on-board (including diesel heaters)
  - produce no regulated emissions from the tailpipe(s)
  - achieve a 50% well-to-wheel greenhouse gas saving compared to a conventional Euro VI diesel over the UK Bus Cycle.
- A major challenge in the transition to zero emission coach technologies is understanding the performance and capabilities of new zero emission models.
- This project seeks to support market understanding by creating an independent, voluntary certification scheme that demonstrates key details about ZE coaches, such as energy storage capacity, estimated range and energy consumption.



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Inner Urben	NA	NA	NA	NA	NA	NA	NA	3.36	1.33	185.95	
Rural	NA	NA	NA	NVA	NA	NA	NA	5.12	0.69	\$6.47	
LBC Average	NA	NA	NA	NA	NA	NA	NA	9.67	1.07	140.60	
UK BUS Average	N/A	NA	NA	NA	NA	NA	NIA	14,79	0.90	125.83	
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#### Zero Emission Bus Certificates

## Thank you

Any questions? Please get in touch

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Interested in joining the Partnership? Please contact: Members@Zemo.org.uk

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