

Zero Emission Bus Workshop

Glasgow

7th October 2021

In partnership with:

McGill's Buses

Pelican

Zenobe Energy

Presentations to start at 10.15



National Policy Outlook

ZEB Workshop Glasgow

7th October 2021

Document prepared by Zemo Partnership

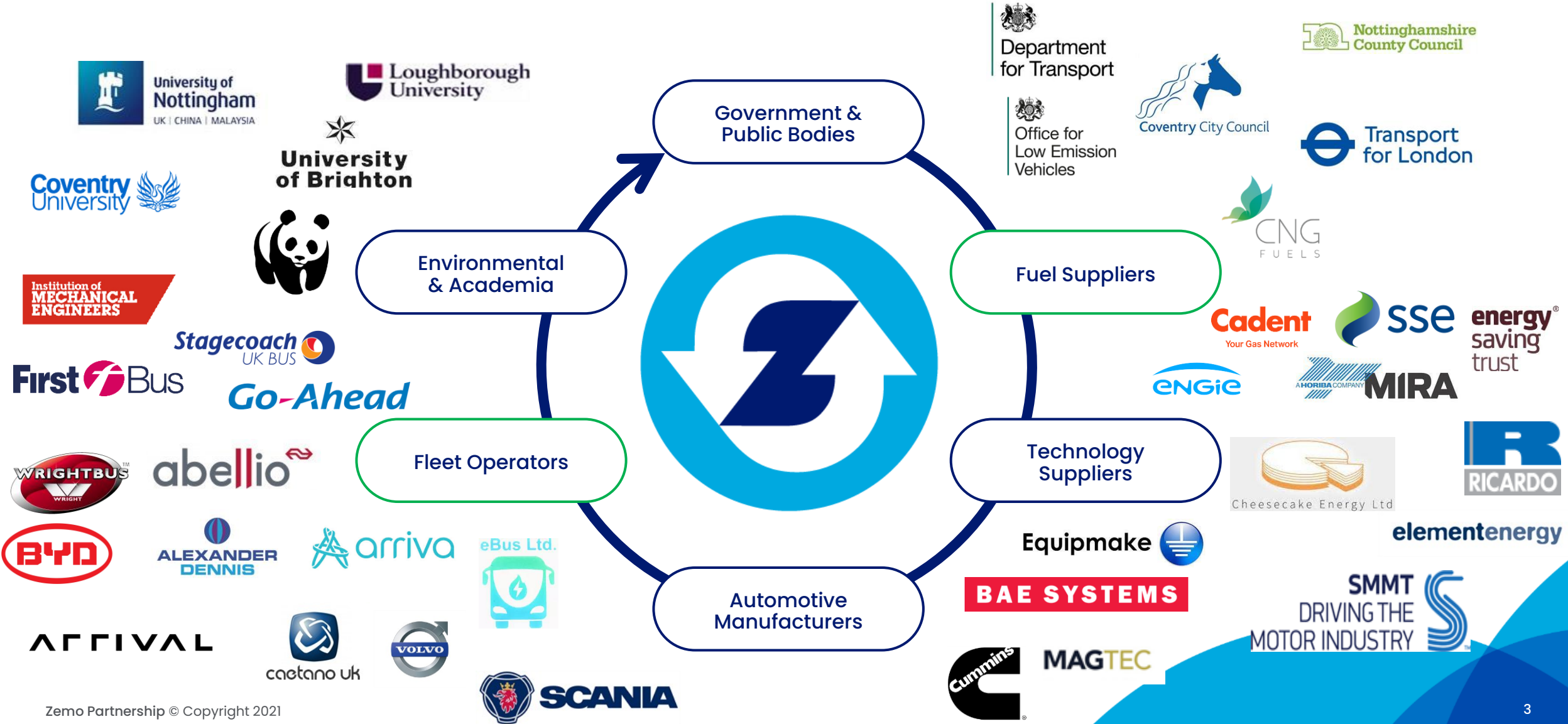


**Zemo
Partnership**

Accelerating Transport to Zero Emissions

www.zemo.org.uk

Zemo Partnership is a public-private partnership between **government and industry** to help shape and improve existing policy to accelerate the shift to a net-zero transport system in the UK.



Our work





Working Groups are at the heart of our member action on buses, passenger cars, fuels, commercial vehicles and energy infrastructure.



Buses & Coaches

Action programmes to speed the introduction of zero emission buses in the UK by working with passenger transport companies and local authorities



Daniel.Hayes@zemo.org.uk



Cars

Working with manufacturers, fleet operators, environment and consumer groups to accelerate the adoption of zero emission cars.

Alexander.Thomson@zemo.org.uk



Fuels

We explore measures to increase the adoption of sustainable low carbon fuels such as biofuels and renewable hydrogen.

Gloria.Esposito@zemo.org.uk



Commercial Vehicles

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

Brian.Robinson@zemo.org.uk



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.

Jonathan.Murray@zemo.org.uk



Collaborative Initiatives

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

James.McGeachie@zemo.org.uk

Decade of funding development



Zemo Partnership have been working with DfT and Transport Scotland to develop bus testing and incentives schemes for over a decade

- OEMs must certify vehicles over UKBC test to qualify for gov't grant funding – published on Zemo website
- DfT Green Bus Fund & Scottish Green Bus Fund Round 1-4 (2009 – 2015)
 - LCEB definition of 30% lower GHG emissions vs Euro III diesel bus
 - 1,240 buses – £90m / 241 buses – £11m
- Low Emission Bus Scheme & Scottish Green Bus Fund Round 5-8 (2015-2019)
 - 15% better GHG emissions than Euro V diesel and has Euro VI engine or better
 - 450 buses & infrastructure – £41m / 450 buses – £7.2m
- Ultra Low Emission Bus Scheme & Scottish ULEBS 1 & 2 (2019- present)
 - 30% better GHG emissions than Euro VI and has Euro VI engine or better
 - 270 buses & infrastructure – £48m / 295 buses – £50.6m
- Vehicles eligible for BSOG LCEB 6p/km in England & BSOG LCV in Scotland
- CPT members commitment to purchase only Ultra Low Emission Buses by 2025

A detailed technical document titled 'Zero Emission Bus Certificate - 2020/2021 DRAFT V6'. It contains multiple tables and sections detailing vehicle specifications, declared fuel properties, and emissions and energy consumption results from approved test facilities. The document is structured with various sub-sections and data points, including sections for 'Emissions and Energy consumption results from approved test facility - Average 4 tests' and 'Zero Emissions (Z.E.) Range: Energy consumption and charging efficiency'.



Developing incentives for Net-Zero

Focus is now on zero emission tailpipe and low carbon energy sources



- **Net-zero ambitions for 2045 in Scotland and 2050 for UK:**
 - “Majority of diesel buses in Scotland to be phased out by 2023”
 - “4,000 Zero Emission Buses in England by 2025” (12.5% total fleet)
 - London aiming for 9,000 ZEB by 2030 or 2034 at the latest
- **Zero Emission Bus Regional Areas & Scot ZEB Fund (2021 – present)**
 - 50% Greenhouse gas savings vs Euro VI diesel bus with no combustion engine on board
 - ZEBRA £120m (closed): £70m fast track – October 2021, £50m standard track – Feb 2022
 - £50m for Scot ZEB fund – currently open – deadline 5 November 2021
- **UK bus companies matching ambition of national governments**
 - 3/5 companies committing to fully ZEB fleet by 2035 at the latest – 12 year transition

Upcoming policy changes

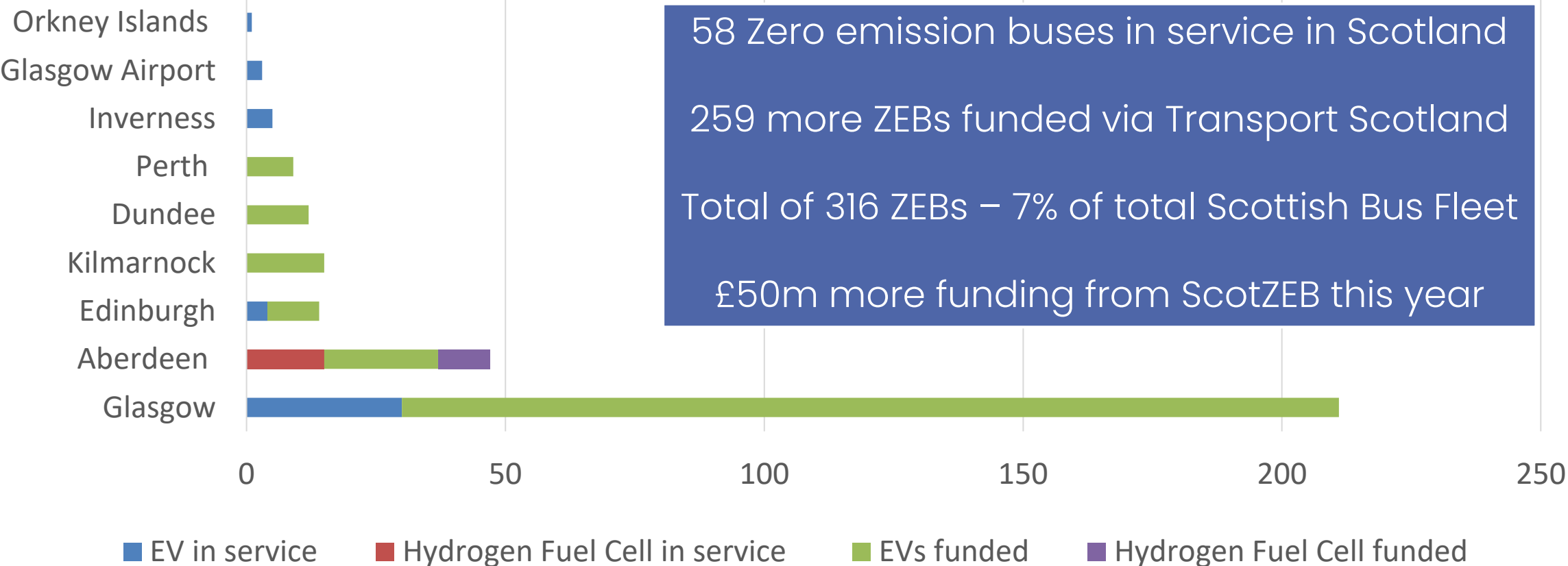
Key policy changes coming up affecting bus services



- DfT announced 22p/km ‘temporary’ uplift for Zero Emission buses from April 2022
- UK government set to announce consultation on the end of new non-zero emission buses
 - Zemo estimate phase out likely sometime between 2025-2030
- UK Government “call for evidence” on ZE coaches and minibuses
- BSOG consultation for England set for Winter 2021/22
- Some suggestion that Bus Service Improvement Plan (BSIPs) may be an alternative to future funding competitions in England.

Scottish Zero Emission Buses

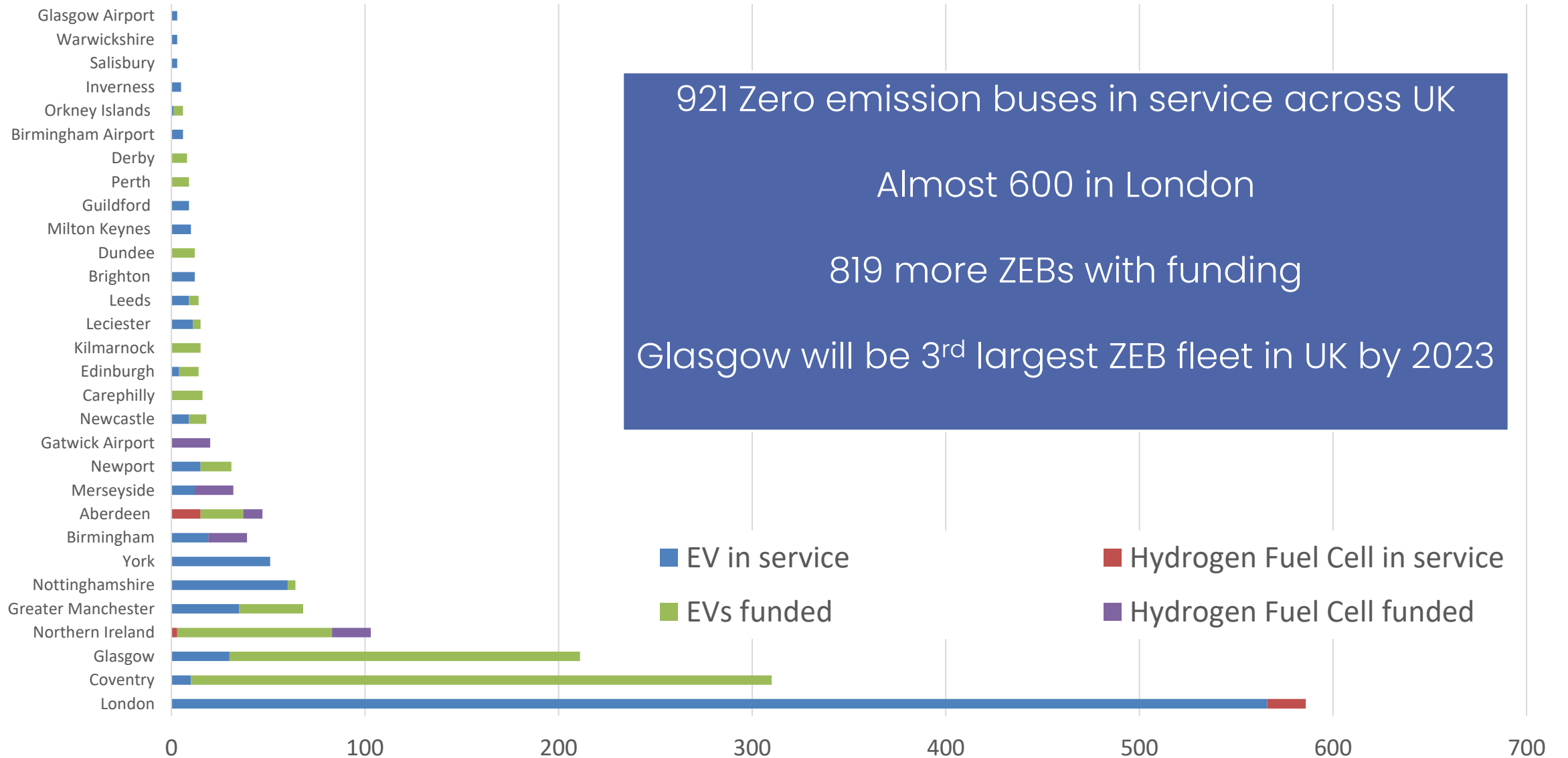
58 ZEB in service, 259 ZEBs with funding



UK ZEB rollout



ZEBs in service across wide range of locations in the UK

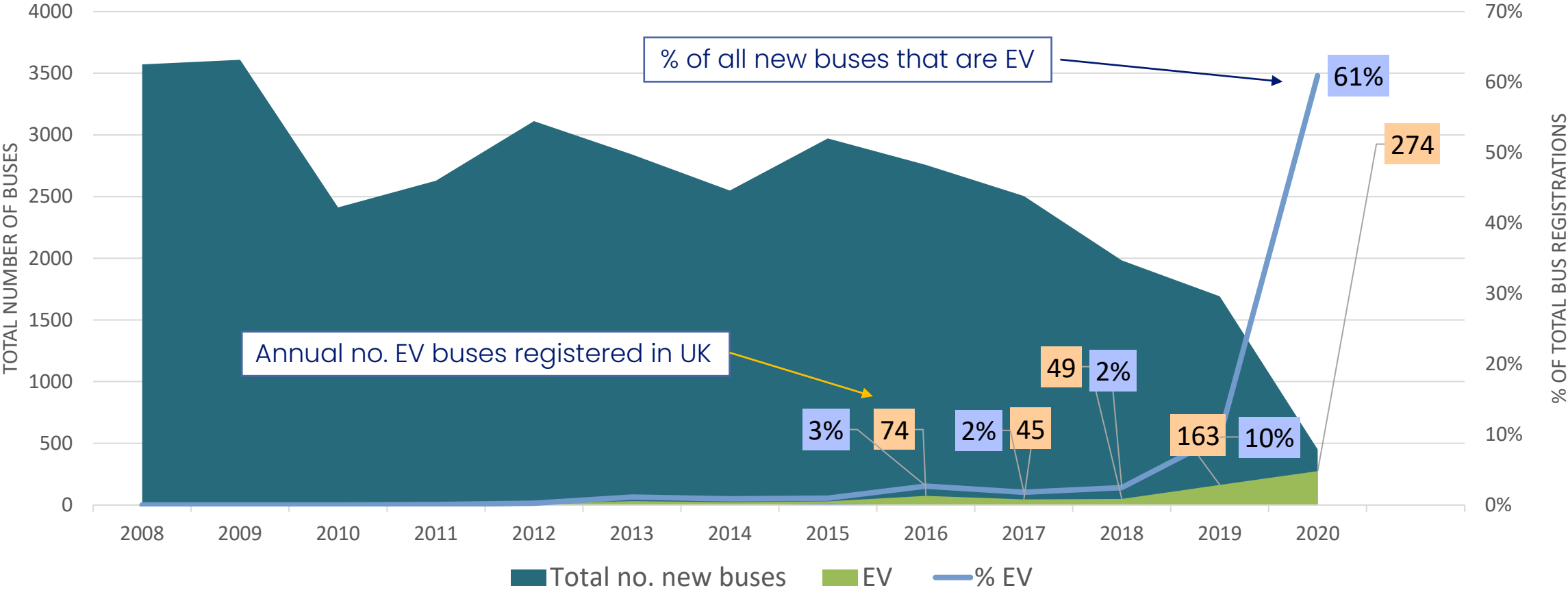


Zero Emission Bus Uptake

Average of 157 ZE per year, over last 3 years

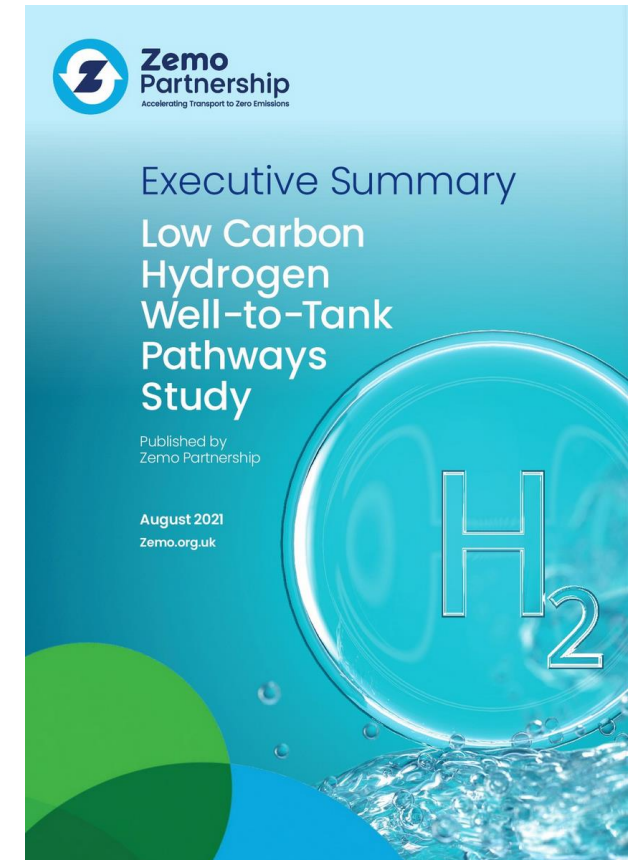


New bus registrations in the UK



Where Zemo are supporting

- Hydrogen pathways
 - WTT report published
- Renewable Fuel Assurance Scheme (RFAS)
 - Providing supplier specific carbon intensity data to operators
- Zero Emission Bus certification and accreditation
 - Defined a zero emission bus & accompanying test procedure
- Plug-in truck grant
 - Designed test for PiTG eligibility
- E10 checker
 - Check if your [vehicle is E10 compatible](#)
- Zero Emission Retrofit Accreditation Scheme (ZEVRA)
 - Workshops held with conversion specialists, local authorities, DVLA/DVSA/IVS
- Well-to-Wheel & Life Cycle Analysis of Zero Emission Technologies
 - Calculating impact of embedded carbon in batteries and fuel cells powertrains



Upcoming Events

Access to all events for Zemo members



- Fuels Working Group – 19th October
- Commercial Vehicle Working Group – 20th October
- Life Cycle Analysis workshop on EV batteries – 27th October
- Bus Working Group Meeting – 11th November

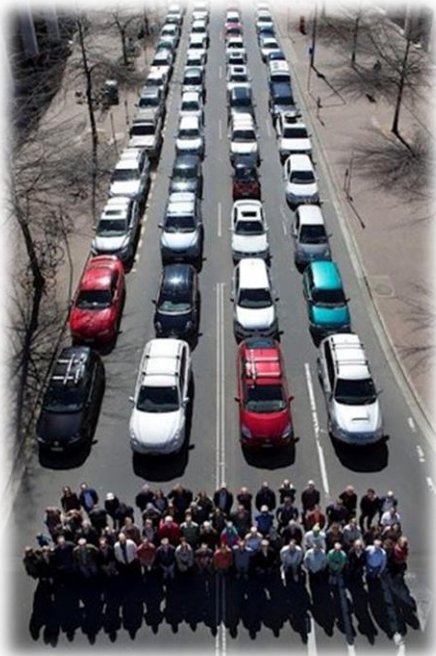
Sign up via www.zemo.org.uk

Achieving net zero ambitions?

Petrol & Diesel



Technology shift to more efficient zero emission technologies with low carbon energy



Modal Shift



Technology shift to EVs won't be enough for net-zero goals

- Both national and local policies will be needed to reduce congestion & encourage modal shift
- Incentivise public transport & active travel
- Discourage private car into city centre
- Behaviour change requires long term vision & planning
- Low Emission Zones can be developed to support modal shift to bus in long term



Zemo Partnership

Accelerating Transport to Zero Emissions

Thank you

Any questions? Please get in touch

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Project Manager

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Interested in joining the Partnership?

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Membership Coordinator

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McGill's Buses

Ralph Roberts, CEO



McGill's – Driving towards Net Zero



Ralph Roberts
CEO



How big is the problem for 'Bus'?

- The 5% issue

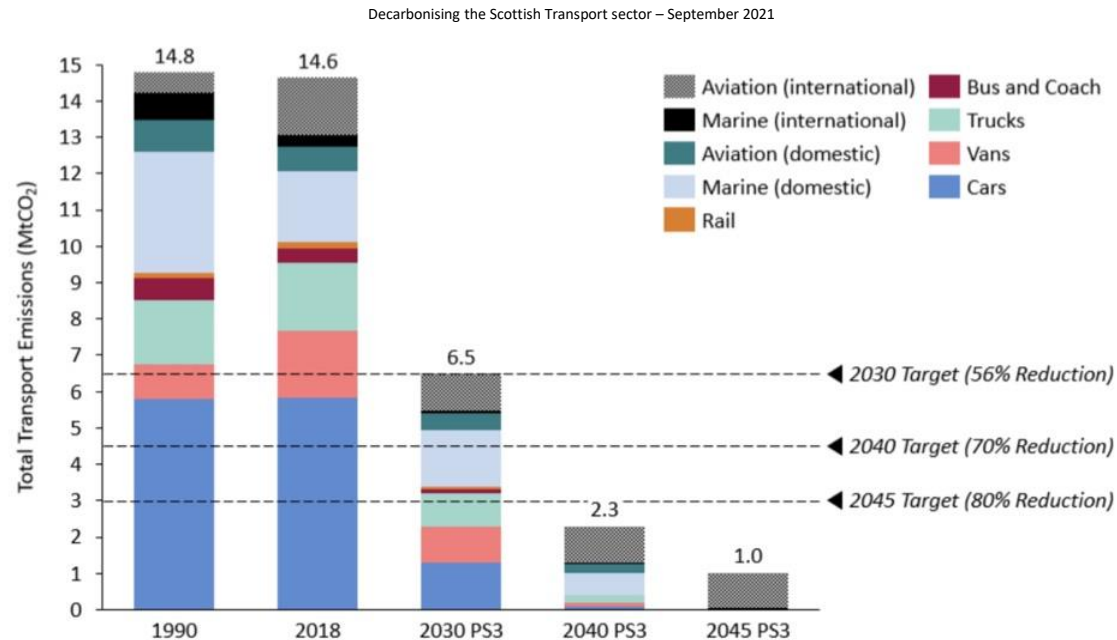


Figure 1: Progress made towards Scotland's transport emission in PS3 for 2030, 2040 and 2045.



Why act now?



- Early adoption can be risky
- Leave it to the big groups?
- Inherent unreliability of diesel
- Skills & Manpower
- Training
- **DO THE RIGHT THING!**



So, which direction to take?



- Electric
- Hydrogen
- Manufacturer
 - Driveline
- Choice of Partners



What have we achieved so far?



- Chose delivery partners (Pelican-Yutong, ADL, Zenobe, Scottish Gov)
- Purchased 68 Buses
- Purchased charging infrastructure
- Contracted Zenobe to supply batteries, supply & maintain infrastructure & warrant performance
- Started converting routes to full EV operation



What have we learned?



- Nothing is impossible for a good team!
- Have a good Plan 'B'.....and 'C'
- Find the celebrations...and celebrate

*"Largest % of zero emission buses
of any fleet in UK"*

*"Operator of largest EV charging
Infrastructure in Scotland"*

*"Largest operator of EV buses
In Scotland"*

*"By Nov 1st 2021, will operate more EV buses
in Scotland than all other operators combined"*



Questions?





Yutong Bus

Ian Downie, Head of Yutong Bus UK



PELICAN

Engineering Group

100
PELICAN
— 1919 - 2019 —





World No.1 position with 16% of the global market in 2020

No.1 position in China with a total market share of 35% in 2020.

The largest production facility anywhere in the world

Average daily peak production of 230 vehicles

Built first electric bus in 1999

122,459 zero emission vehicles delivered

25.6 billion zero emission kms travelled

2020 China - Electric Bus Sales			
Rank	Brand	Sales	Share
1	YUTONG	15940	26.11%
2	BYD	9125	14.95%
3	CRRC	5503	9.01%
4	Zhongtong	4965	8.13%
5	Higer	3636	5.96%
6	Ankai	2799	4.59%
7	KINGLONG	2753	4.51%
8	FOTON	2663	4.36%
9	Skywell	2126	3.48%
10	Sunwin	2116	3.47%

Current UK Model Range

E10



E12



Double Deck due 2022



Airside Bus



TCe12



GT12 & GT13



TC9

McGill's Zero Emission Vehicle



July 2018



Sept 2021

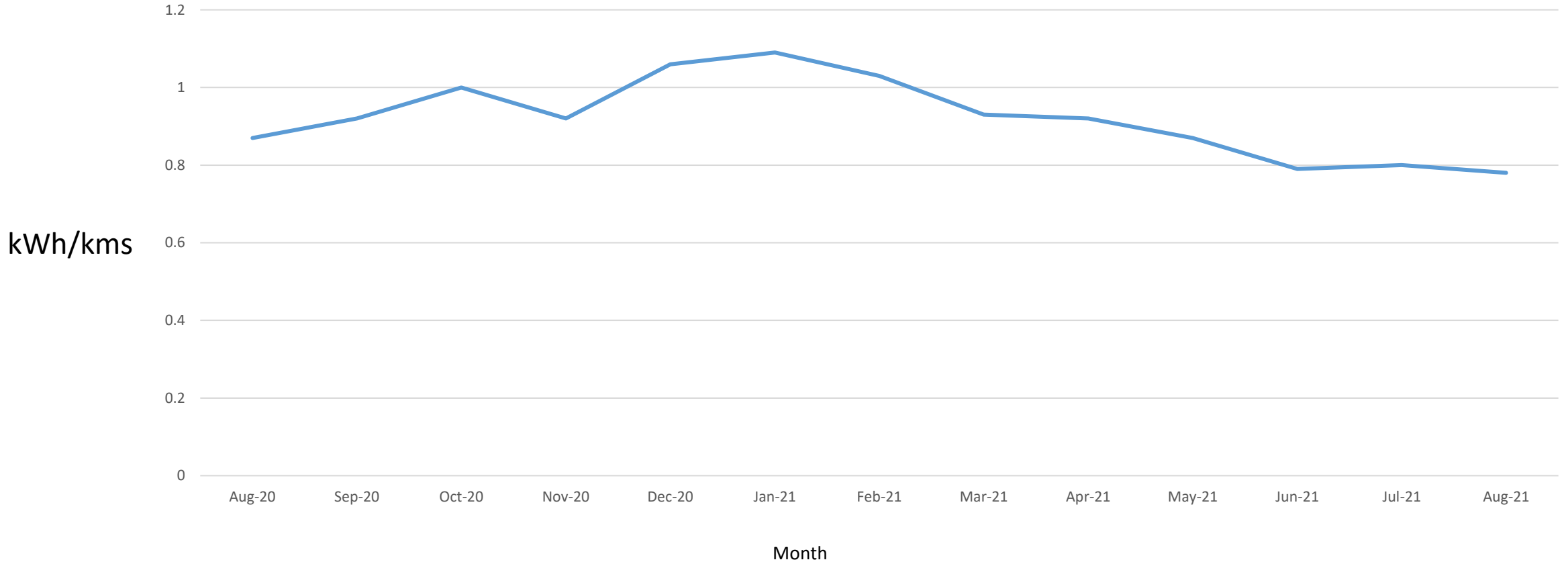
Specification Development
Charging
Batteries - LfP
Options

Air Conditioning

Electric air conditioning for enhanced customer experience
Never a diesel heater!



Yutong Energy Consumption



Between 337 kms to 463 kms in Year 1 (209 to 287 miles)

Completed in the UK

The principal part of the vehicle is completed in Yutong

Pelican then completes the sourcing and fitment of high value items in the UK -

Seats and fabric

Passenger information systems

Destination systems

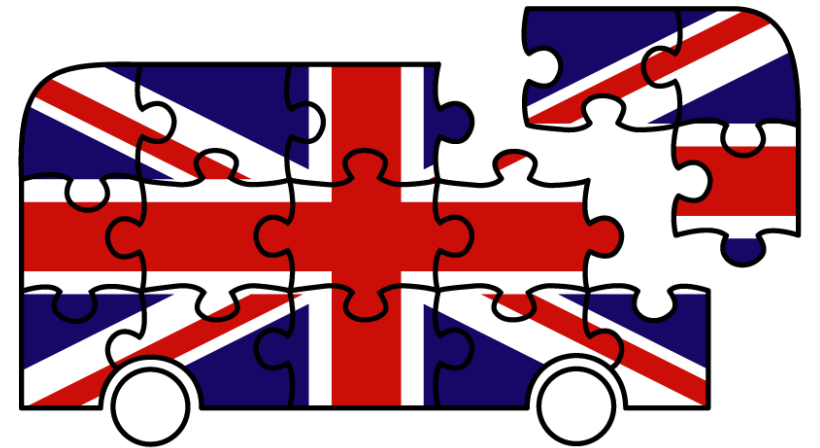
CCTV

Fire suppression systems

Commissioning of the batteries

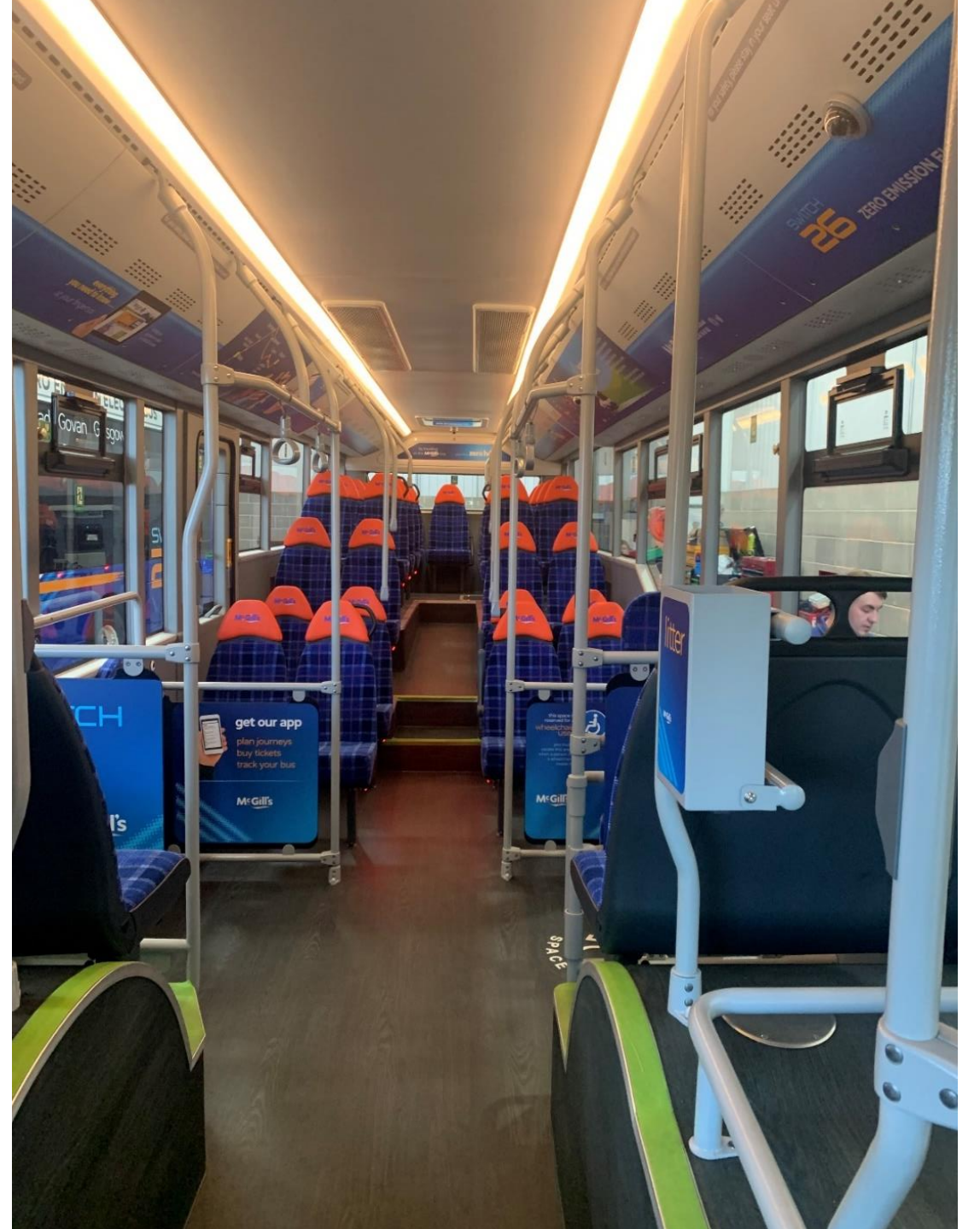
Upskilling of local staff through training on the vehicles

30% UK Value Content



Completed in the UK by

PELICAN 







SG71 MXM

Production capacity
Production flexibility
Delivery accuracy

Production



TCe12 Electric Zero Emission Coach/Interurban Bus

Option of 281kWh or 350kWh Battery

50 Seats

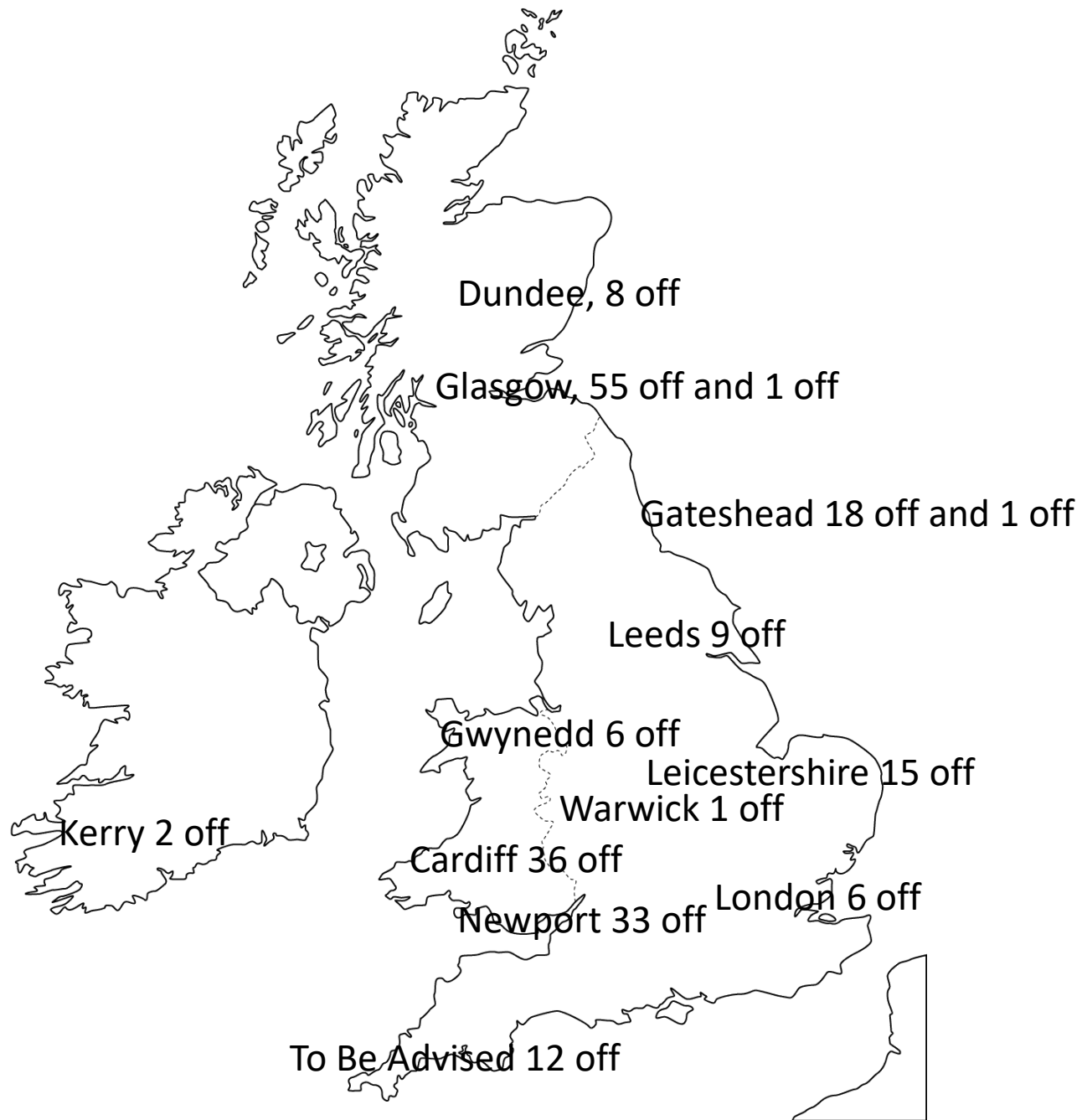
PSVAR Compliant

Range Approx. 240 to 280 Miles

Identical Driveline to E10/E12

The only ULEB certified zero emission coach/Interurban bus in the UK







Ian Downie

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The Customer Comes First

Zenobe Energy

Arron Dowie,
Director of Business Development
&
Richard Kapelko, Project Manager



Rethinking Energy

Arron Dowie
Business Development Director

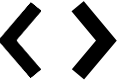
ZENOBE

Oct. 2021
Private and Confidential

This



We're **rethinking energy** by making clean power accessible



Why?

Our purpose is to make clean power accessible.

How?

By deploying battery storage in innovative ways to the Power and Transport sectors.

What?

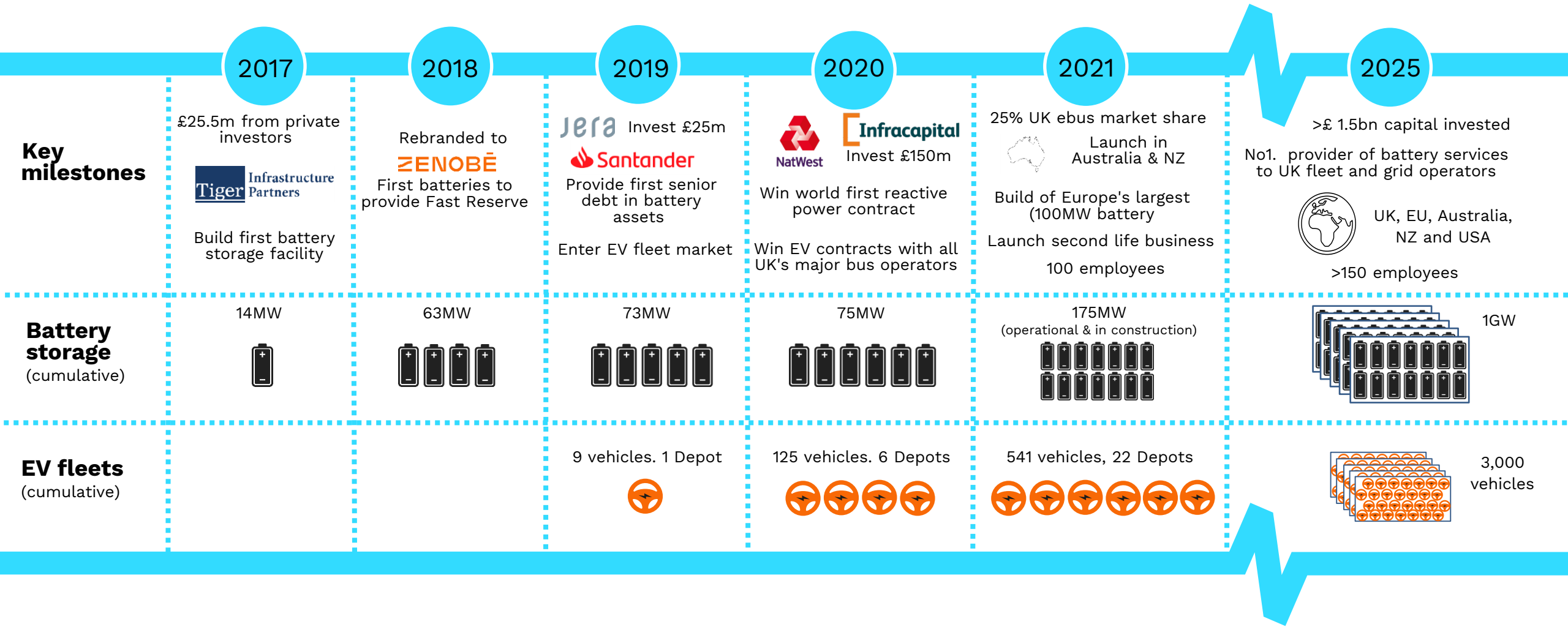
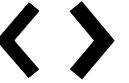
We design, finance, build and operate battery-based services.

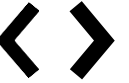
Values?

Sustainable. Pioneering. Solutions. Partnership.





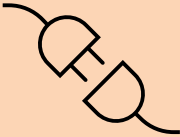



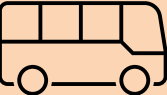














We make clean power accessible at increasing scale





Our bespoke, flexible **EV fleet solution** includes a comprehensive range of connected services

 Financing	 Planning	 Delivery	 Operation
 Charging infrastructure	 Route analyses	 Grid connection	 Software to automate and optimise
 Vehicle chassis	 Charging model	 Charging infra	 24 hour monitoring and support
 Vehicle battery as a managed service - replaced batteries given a second life	 Site design	 Civils	 Fleet monitoring and reporting
	 Electrical infra	 Network	 Performance guarantee
	 Energy supply	 On-site clean power generation and storage	



Our full turnkey offer is structured around **three contracts**

1. **Charging Service Agreement**



Up to 15 year agreement whereby Zenobē:

- Finances, develops, installs and operates the charging infrastructure
- Provides a battery at the depot (if needed)
- Guarantees every vehicle each day has enough charge
- Provides the energy supply

2. **Battery on the vehicle**



A 5 - 15 year agreement whereby Zenobē:

- Guarantees every vehicle each day has enough charge

3. **Master Rental Agreement**



A 5 - 15 year agreement whereby Zenobē:

- Leases or arranges hire purchase of the electric vehicle chassis

Our software ensures the smooth and efficient running of your fleet



- Zenobe has designed the system to work with as little user interaction as possible and we will work with customers to tailor the platform further for their needs
- Automation of reports on Charger and vehicle performance can be delivered to an email or set of emails as standard
- In order to maintain the highest possible operating standards at site, Zenobe employs 24/7 service staff to monitor the health of all assets on each of its sites. This team come at no additional cost and will work to support you in the management of your services; monitoring the sites as standard and alerting users of any issues that may arise during the day
- Zenobe works within constant development and product lifecycles, with feedback from customers regularly sought and built into future releases. We will provide customers with a dedicated Customer Success Manager who will work with you on set-up and handover of the system including any training required



INTRODUCTION

Richard Kapelko



Zenobe Delivery Project Manager

It's never that easy





Delivering : Electrification of three bus depots

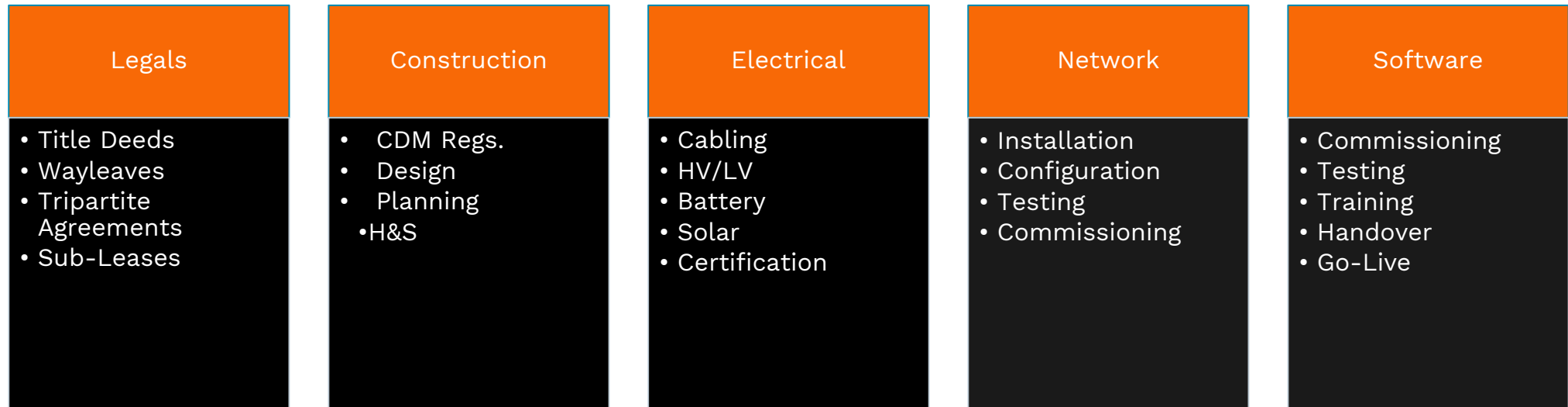
CHALLENGE	ZENOBĒ SOLUTION
<p>Multiple Simultaneous Builds</p> <p>McGill's needed to deploy 68 eBuses across three of their depots</p> <p>The three sites need to be electrified and live by October 2021 as the eBuses are to be showcased for COP26 in Glasgow</p>	<p>Time Efficient Build</p> <ul style="list-style-type: none"> Zenobē have experienced project managers that are well-versed in keeping to tight deadlines Zenobē already have 13 live depots, many of which were built at the same time. This has given us the skill to manage simultaneous builds
<p>Maximising Grant Funding</p> <p>McGill's secured grant funding through SULEB 1 & 2</p> <p>This pays for 75% of the infrastructure and 75% of the difference between a diesel and eBuses</p> <p>McGill's required additional financing for the eBus and charging infrastructure</p>	<p>Match Funding with Innovative Financing</p> <ul style="list-style-type: none"> Zenobē financed the remaining CAPEX (c. £17m) to maximise the amount of eBuses McGill's could put into service All 68 bus batteries are financed off-balance sheet via Zenobē's battery managed service The charging infrastructure and chassis were financed with a HP structure
<p>Insufficient Onsite Power</p> <p>McGill's did not have sufficient grid capacity on any of the three sites to effectively charge the eBuses</p>	<p>Managing Power Procurement</p> <ul style="list-style-type: none"> Zenobē worked with multiple DNOs to ensure that enough power would be available to site at go-live Zenobē also work closely with iDNO's to lower the cost of the non-contestable works and speed up the process



CATEGORY	REQUIREMENTS
Depots	Jonhstone, Inchinnan & Dundee
Bus Type	55 x Yutong E12 12 x ADL/BYD E400EV 1 x ADL/BYD E200EV
Number of Chargers	34 x Pihong DC 120kW
Authorised Supply Capacity (ASC) Procured	1.5 MVA across all sites

ZENOBĒ SOLUTION SUMMARY	
Time efficient build	✓
Match Funding with Innovative Financing	✓
Managing power procurement	✓
Smart charging strategy	✓

Plan to Succeed and Not to Fail



Key to a Successful Project

- Constant Communication
- Planning Ahead
- Work with and not against
- Be Involved in your project
- Wanting the Change



Some things you can never plan for

- Supply Chain Delays
- Covid-19 Related Issues
- Brexit Related Issues
- Buried Services
- Unforeseen Buried Obstacles
- Complex Installs



Every Project has it's difficulties

- Communication
- Planning
- Change of Scope
- Scope Creep
- Legals





















Special Thanks to McGill's and Pelican Yutong



Ready to **rethink energy**? Get in touch

- ✓ Sustainable
- ✓ Pioneering
- ✓ Solutions
- ✓ Partnership

www.zenobe.com



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Bradley Fox – 07717 405 584

Nicholas Beatty (Founder) - 07810 864 264

Steven Meersman (Founder) - 07743 774 080

General – fleet@zenobe.com

Panel Session

Questions & Answers



End of presentations

