Welcome to

BCIMO'S

CLEAN FUTURES ACCELERATOR

CHALLENGE SUPPORT WORKSHOPS

CHALLENGE 1 – GREENER EV COMPONENTS &
CHALLENGE 2 – CIRCULAR ECONOMY OF TRANSPORT

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10:00 – 10:15

INTRODUCTION TO THE VLRNIC & THE CLEAN FUTURES ACCELERATOR

Name:

- Naomi Arblaster

Job Title:

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Organisation:

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INTRODUCTION TO THE VLRNIC & THE CLEAN FUTURES ACCELERATOR
HOUSEKEEPING

- No fire alarm planned / in the event of a fire:
  - Turn right out of room and right again through the double doors – take the stairs to Level 0 (lifts will be out of action)
  - Take your nearest exit and make your way to the Upper Car Park

- Location of toilets
  - Turn right out of room and right again through the double doors - toilets are on the landing

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INTRODUCTION TO THE VLRNIC & THE CLEAN FUTURES ACCELERATOR
AGENDA

- 09:30 – 10:00 - Arrival & Refreshments
- 10:00 – 10:15 - Introduction to the VLRNIC & the Clean Futures Accelerator
- 10:15 – 10:30 - Railway Industry Architecture
- 10:30 – 10:45 - Introduction to Challenge Themes 1 & 2
- 10:45 – 11:45 – Guest Speakers
  - *Angus Brummitt-Brown - Senior Project Manager for the Coventry VLR Project, Coventry City Council*
  - *Mr Mark Thompson - Managing Director, AceOn*
- 11:45 – 12:45 - BCIMO Facilities Tour
- 12:45 – 13:00 – Wrap up & Close Session
- 13:00 – 14:00 - Lunch & Networking

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The History of Rail

PAST 2 FUTURE

THE CASE FOR
VERY LIGHT RAIL

As we saw in the opening video...

- Rail has played a key role in the transportation of people since 1807, when the Swansea and Mumbles Railway became the UK's first fee-paying passenger railway service
- The railway industry went through its biggest period of innovation and growth between the 1840's and the 1890's
- By the mid-1950's the railways had fallen into significant decline, coinciding with the start of the phase of mass motorisation
- Despite government interventions, including the Modernisation Plan, Beeching Cuts, privatisation and the subsequent formation of Network Rail, this decline continued until 2008, when, due to the challenges of climate change, the need for a shift from cars back to public transport was identified

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THE CASE FOR
VLR – POLITICAL, ENVIROMENTAL & LEGAL DRIVERS

Since 2019, when the Climate Change Act was amended to legislate net zero emissions by 2050, there has been a major push from the UK government towards the *decarbonisation* of transport, achieved in part through the provision of *better-connected, rail-based,* public transport solutions:

Clean Air Strategy 2019

Reducing air pollution, including particulate and plastic pollution from brakes, tyres, and road wear

Call for Evidence 2019

Reviewing ways to integrate Light Rail, and other rapid transit solutions, into future transport networks

Future Mobility: Urban Strategy 2019

Maximising the benefits from transport innovation (emerging transport technologies and business models) in cities and towns

Future of Transport Programme 2019

Stimulating innovation in the transport sector - creating new markets, ensuring a 21st-century transport system, and securing the UK's position as a world-leading innovator

Transport Decarbonisation Plan 2021

Decarbonising the entire transport system

Great British Railways: Williams-Shapps Plan for Rail - 2021

Making the railways the backbone of a cleaner, more environmentally friendly, and modern public transport system

Future of Transport: Rural Strategy Due 2022

Delivering the benefits from transport innovation in rural areas – tackling mobility issues, improving connectivity and accessibility, increasing low carbon travel options and providing more integrated transport services

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THE SOLUTION
VLR

In summary, while the rail industry continues to innovate, there is a strong case for a new mode of rail-based public transport, that addresses these drivers...

That mode is called Very Light Rail (VLR)!

VLR can be used to supplement existing rail networks, delivering the following key benefits:

- Low or zero emissions
- Lower-cost (to build, operate & maintain)
- Fewer disruptions
- No unsightly overhead lines or concrete guideways
- Safety engineering appropriate to use case
- Improved urban and rural connectivity
- User-centred design
- Digital DNA
- Future autonomy

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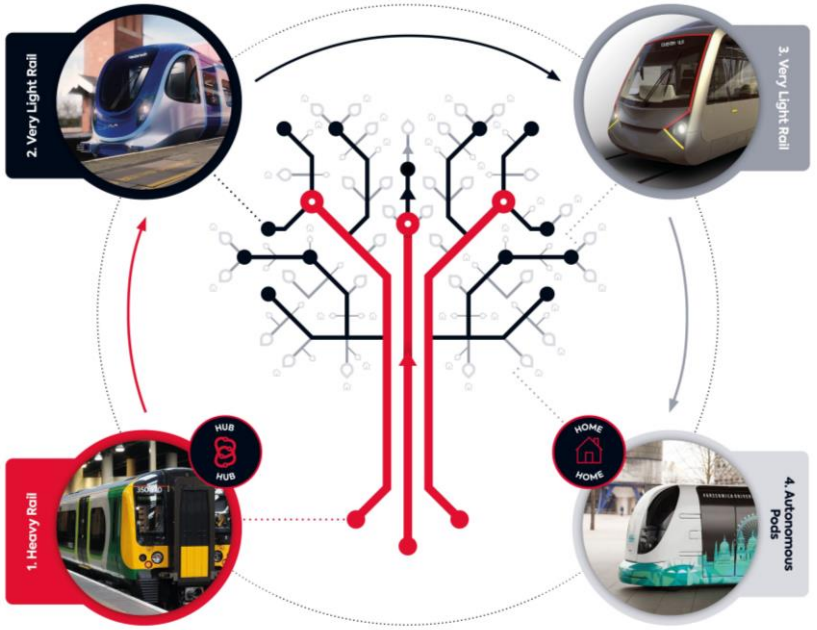
HUB-TO-HOME
JOURNEYS

VLR is being developed with the wider journey in mind, allowing passengers to take an integrated, seamless, and personalised journey from a central hub direct to their front door, using multi-modal public transport solutions

BCIMO uses the analogy of a tree to represent the UK's public transport network and a potential Hub-to-Home journey, as shown in this next video...



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INTRODUCTION TO BCIMO
THE VLRNIC IS BORN

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INTRODUCTION TO BCIMO
PURPOSE OF THE ORGANISATION

The Black Country Innovative Manufacturing Organisation (BCIMO) is a not-for-profit company limited by guarantee and the driving force behind the Very Light Rail National Innovation Centre, a brand new, state-of-the-art R&D facility based in Dudley in the West Midlands

This £32m multi-purpose centre, situated at the heart of the Black Country, offers a host of unique facilities including:

- A Rail Development and Test Site
- Serviced Office Spaces
- An Events Suite
- Engineering Laboratories – *to be fitted out over the next 12 to 24 months*

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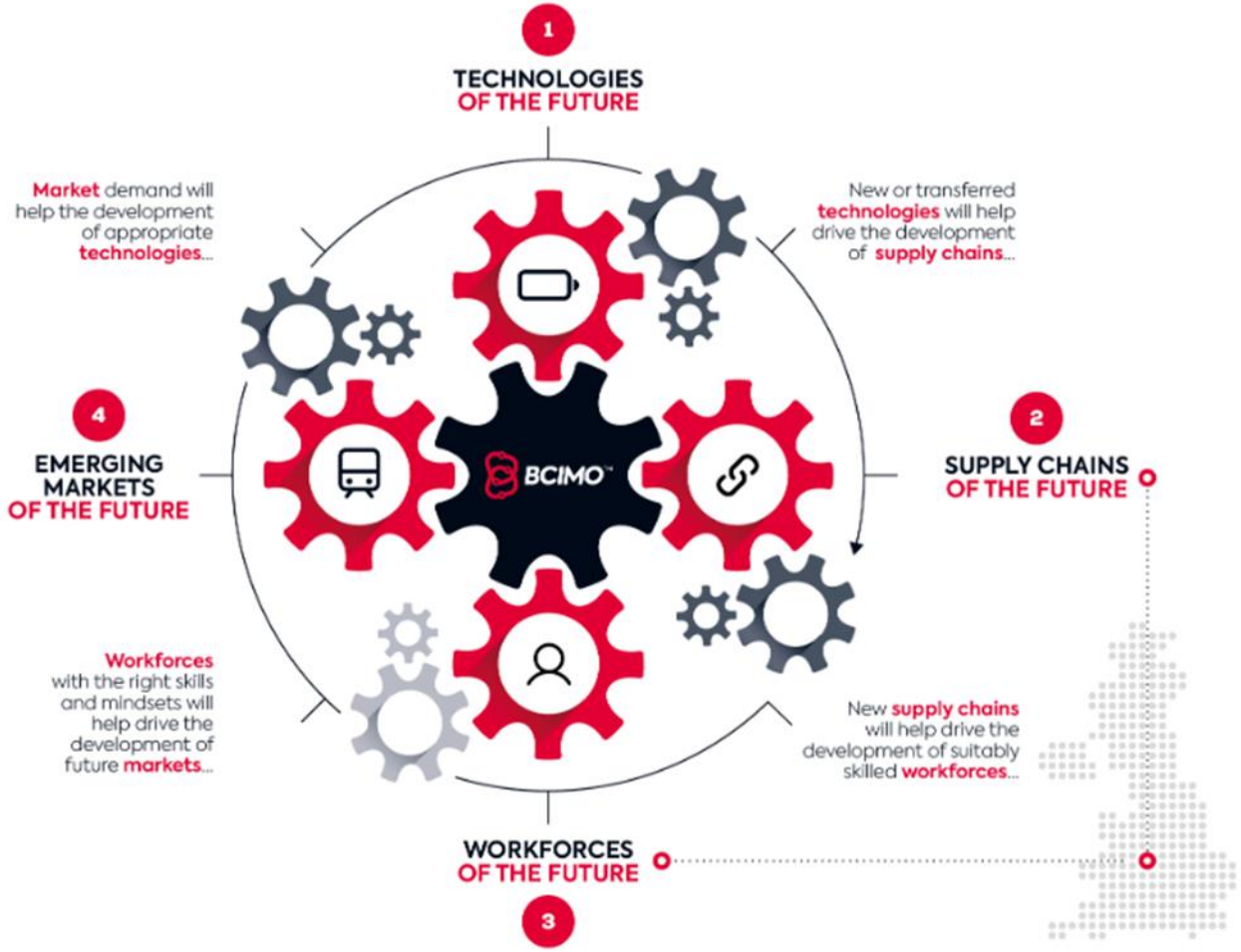
INTRODUCTION TO BCIMO
AREAS OF FOCUS

BCIMO is the central cog in this wheel of development activity, helping to *shape* and *accelerate* future industries, supporting government policy relating to *net zero*, *the future of transport* and *regional levelling up*



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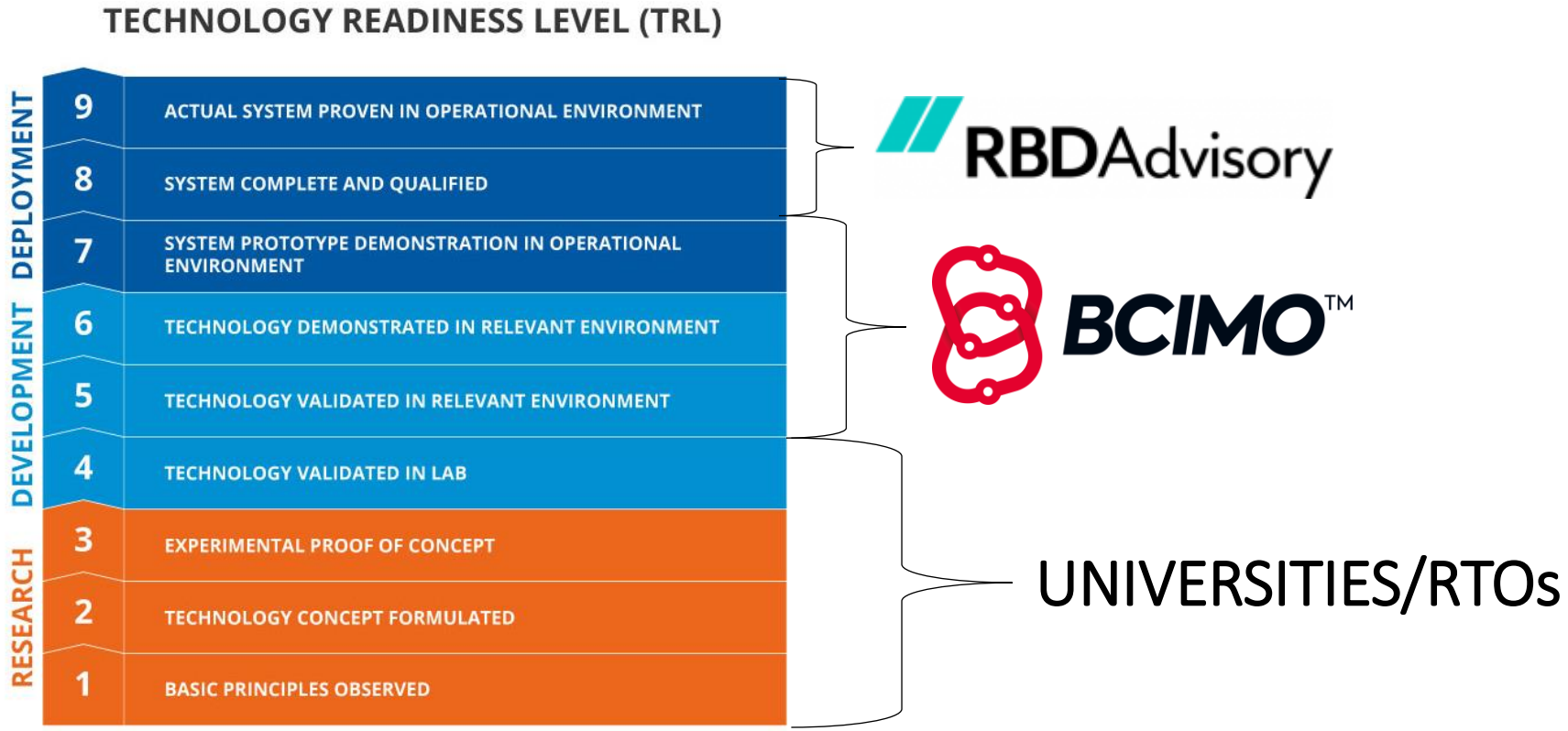
TECHNOLOGIES OF THE FUTURE
TESTING, DEMONSTRATION & COMMERCIALISATION OFFER



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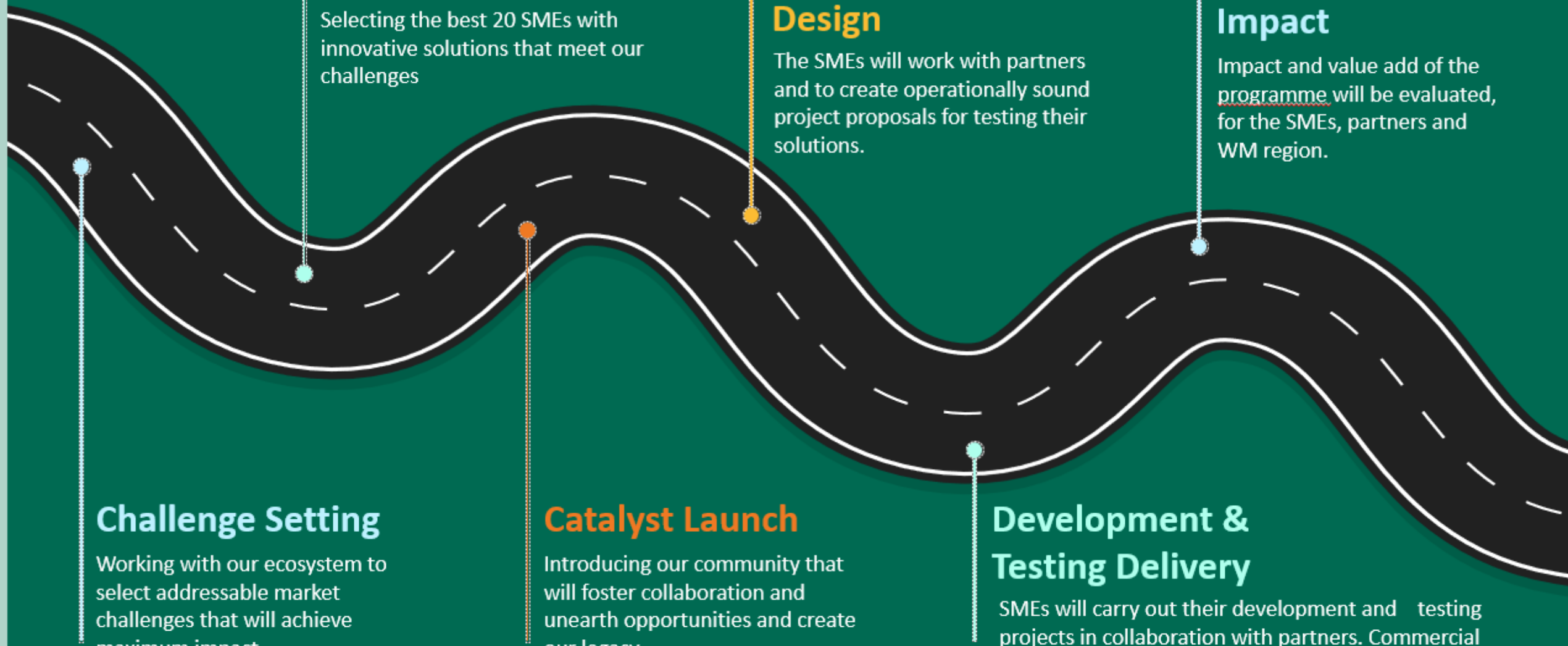
CLEAN FUTURES

Supporting the West Midlands to be at the heart of the Green Industrial Revolution

ROAD MAP



SME Selection

Selecting the best 20 SMEs with innovative solutions that meet our challenges

Development & Testing Design

The SMEs will work with partners and to create operationally sound project proposals for testing their solutions.

Evaluation & Impact

Impact and value add of the programme will be evaluated, for the SMEs, partners and WM region.

Challenge Setting

Working with our ecosystem to select addressable market challenges that will achieve maximum impact

Catalyst Launch

Introducing our community that will foster collaboration and unearth opportunities and create our legacy.

Development & Testing Delivery

SMEs will carry out their development and testing projects in collaboration with partners. Commercial support will be delivered.

BENEFITS

We're excited to work with you!

Gain access to front line innovation and industry insight that will accelerate your business.

- Up to £50k cash contribution for development and testing
- Use of world leading test facilities from BCIMO and Coventry University
- Join a community to forge new collaborations

- Commercial support to help your business grow
- Opportunity to showcase solutions to key industry stakeholders
- Increase investment readiness

- Insights from buyers and supply chain
- Access to cutting edge research
- Respond to real world challenges from industry leaders

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BCIMO WINNERS SUPPORT PACKAGE

Commercialisation Support Package (up to 10 days of support)

- Up to 10 days of specialist rail support focused on commercialising your product into the rail sector
- Facilitated client & partner introductions on site
- A profile-raising advert / feature in Rail Business Daily
- A video demonstrating the SMEs technology and journey at the centre

Engineering Support Package (10 days of trial & demonstration support)

- Access to the Rail Development and Test Site facilities for trial & testing
- Bespoke support to develop a trial & demonstration plan
- Engineering support to trial & demonstrate your technology solution on site

Additional Services & Support (over the project lifetime)

- Free access to the Commercial & Investor Hub
- Free access to hotdesking facilities in the Clean Futures SME collaboration space
- Access to support with an allocated SME Development Manager
- Discounted access to our wider Meeting, Conference and Event spaces

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10:15 – 10:30

RAILWAY INDUSTRY ARCHITECTURE

Name:

- Alec Gillham

Job Title:

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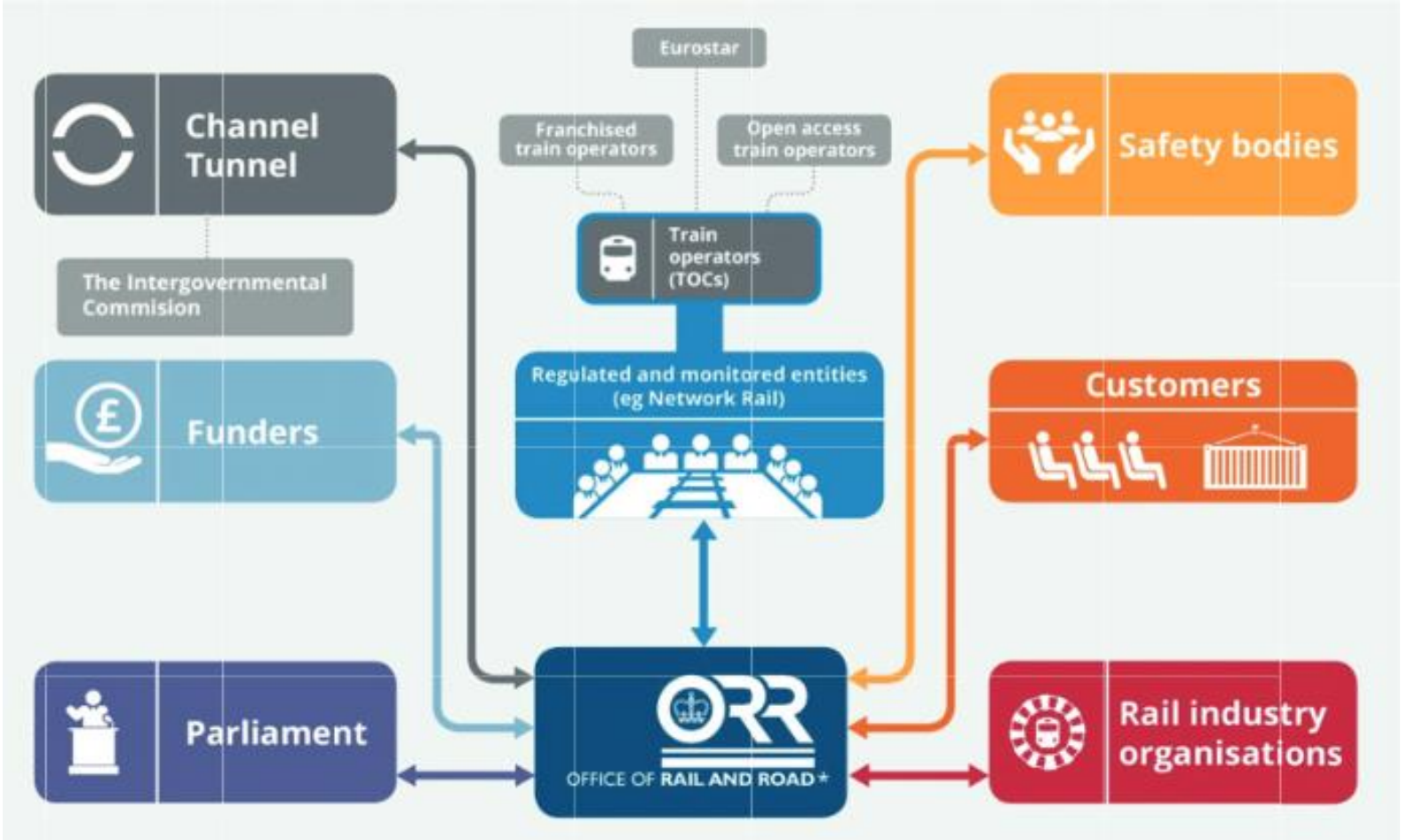
RAILWAY INDUSTRY ARCHITECTURE

UK RAILWAY ECOSYSTEM



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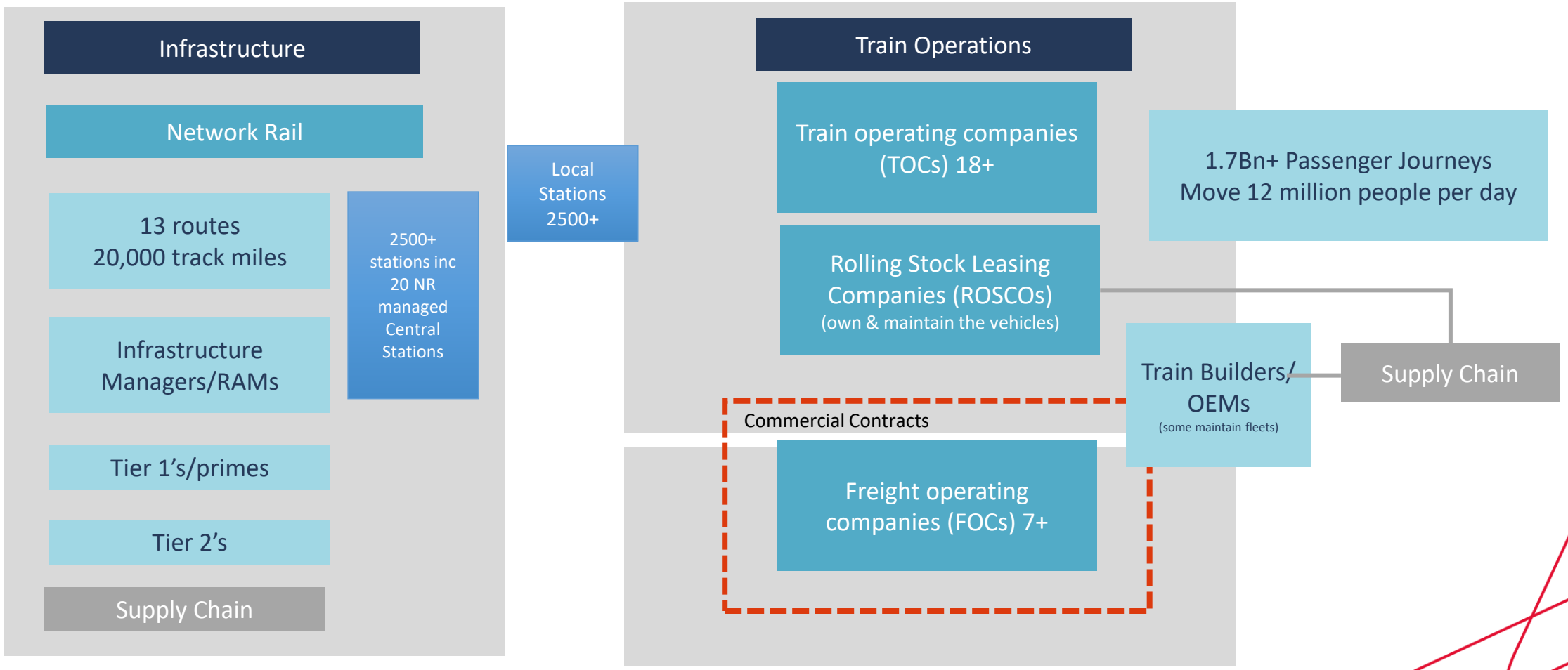
RAILWAY INDUSTRY ARCHITECTURE



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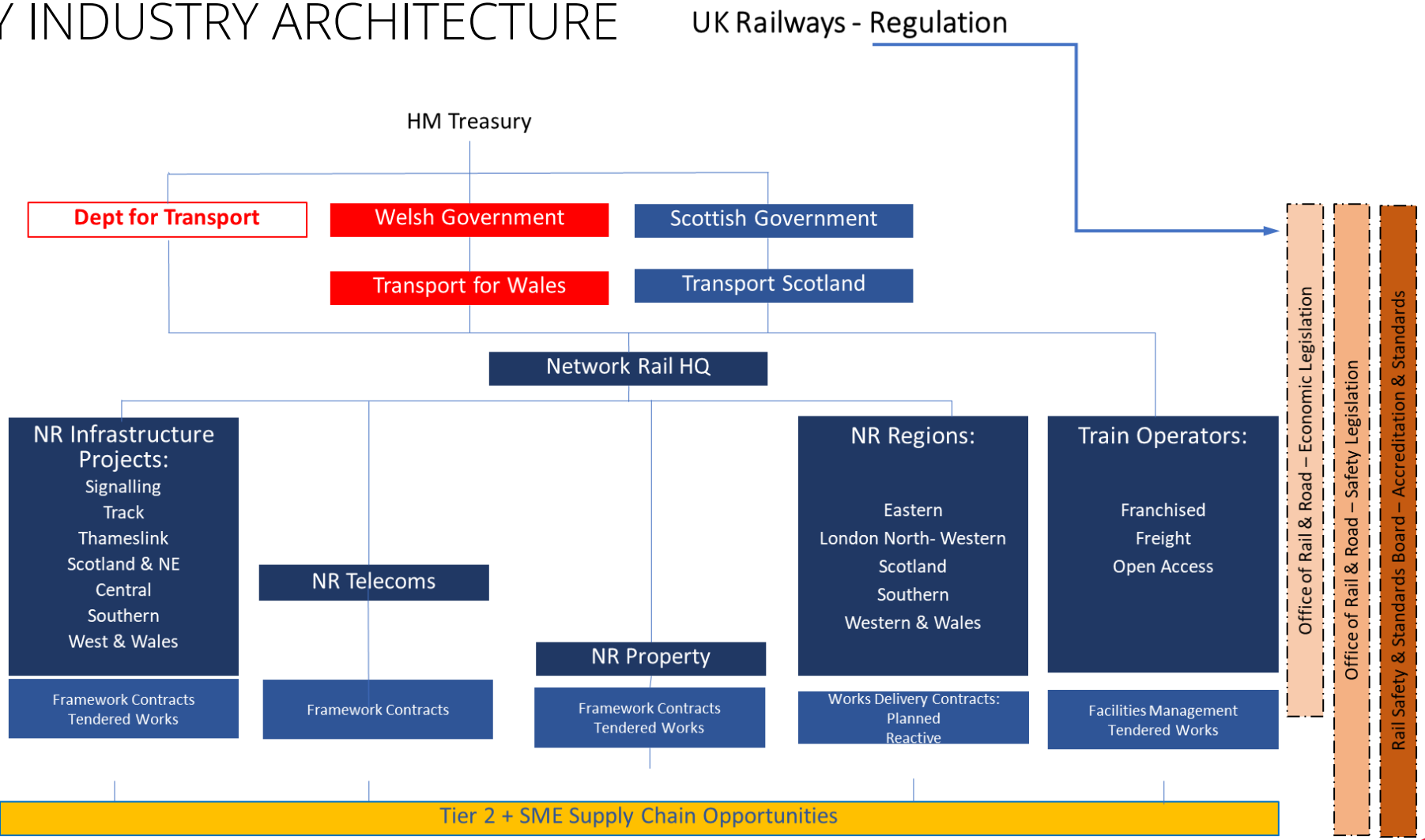
RAILWAY INDUSTRY ARCHITECTURE



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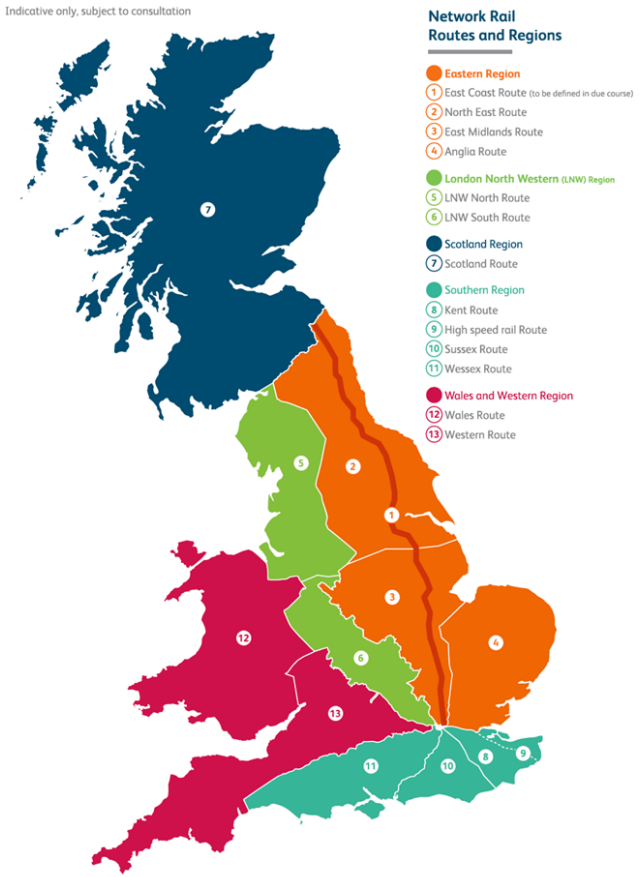
RAILWAY INDUSTRY ARCHITECTURE
CONTROL PERIOD 7

(CP7): 2024–2029

- Decentralised management of 5 regions £44Billion
- Each now has a regional MD
- Regions support the respective routes, 13 nationally
- ‘A number’ of NR services will be decentralised
- Product Acceptance remains a central function, led by the needs of routes / regions (x no. Engineering leads > 13 RAMs)
- Greater agility in delivering NR’s technical strategy
- More responsive to ‘bottom up’ innovation
- Better suited to local suppliers
- Lowers risk of ‘fatigue’
- Closer to customers; better service for passengers

- *N.B. detail subject to confirmation – restructuring ‘problematic’*



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10:30 – 10:45

INTRODUCTION TO CHALLENGE THEMES 1 & 2

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INTRODUCTION TO CHALLENGE THEMES 1 & 2
CHALLENGE STATEMENTS

Challenge Theme 1 - Greener EV Components

Design or produce components which reduce embodied carbon across the vehicle lifecycle

Challenge Theme 2 – Circular Economy of Transport

Design or manufacture solutions to reuse or recycle batteries and other vehicle components

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INTRODUCTION TO CHALLENGE THEME 1
GREENER EV COMPONENTS

Description

We are seeking solutions for life-cycle sustainability of electric vehicles which also aid in removing one of the largest blockers of uptake of clean transport technology: cost of acquisition and use. By combining sustainability and affordability, we aim to contribute to the desire of the population of users to choose sustainable options. We are looking for SMEs involved in manufacturing of systems and sub-systems for any type of electric vehicle from micro-mobility, through traditional road vehicles, to public transport, and HGVs and other large vehicles. This will also support the transition of traditional manufacturing and supply chains in the West Midlands to the electric vehicle market. In fact, companies making parts for conventional transport systems have high potential to access this challenge through changes to their process or selecting alternative materials or parts.

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INTRODUCTION TO CHALLENGE THEME 1
GREENER EV COMPONENTS

These include:

- Local manufacturers producing components for traditional vehicles at scale (with cost efficiencies) which could be adapted to EVs
- Use of alternative materials which are more sustainable or cost effective
- Lightweighting solutions or components for EVs
- SMEs solving challenges to adapt components for traditional vehicles for EVs, or manufacturing these components in a way which will become more cost effective than the existing solution at scale
- SMEs supporting designing or manufacturing EV components more efficiently (in terms of cost and/or emissions)
- Manufacturers of solutions to improve in-life serviceability of battery packs, even in cases where a single cell fails for example

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INTRODUCTION TO CHALLENGE THEME 2
CIRCULAR ECONOMY OF TRANSPORT

Description

The circular economy offers a plethora of potential innovations to improve the sustainability of manufacturing and transport. We aim to contribute to the circular economy in transport by reusing and recycling some of the biggest contributors to emissions today, which are rarely reused or recycled. This means focusing on products known to be needed for clean transportation technologies and elevating them to a higher tier of energy conservation within the circular economy; reduce > rethink > reduce > reuse > repair > refurbish > remanufacture > repurpose > recycle > recover. All solutions must consider their full lifecycle impact on emissions, financial viability, availability of components being reused or recycled, and demand for the new-life application. They should also have transferable learnings to identified additional opportunities beyond the circular material or product being trialled.

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INTRODUCTION TO CHALLENGE THEME 2
CIRCULAR ECONOMY OF TRANSPORT

We invite SMEs to contribute to this challenge through the following:

- New battery or other component designs which are more recyclable, or more easily disassembled: first life design with end-of-life kept in mind
- Solutions to accelerate or reduce costs of testing used batteries and other components to grade them and enable them to be reused, and to know for which applications they are likely to be viable
- Solutions to help recycle existing battery and other component designs, including the structure around battery cells including electronics beyond the life of the battery cells themselves
- New natural, fibre-based composite systems designed with end-of-life in mind
- Reduction in the need for primary sourcing of materials
- Solutions to recover and reuse fibre reinforcements, taking fiberglass or plastic systems used for reinforcement to reuse as part of a first-life application
- Solutions to directly redeploy vehicle systems or sub-systems, with as little additional transformation as possible
- Recycling or redeploying other components of vehicles which have a significant impact on emissions, and are not currently widely recycled or reused

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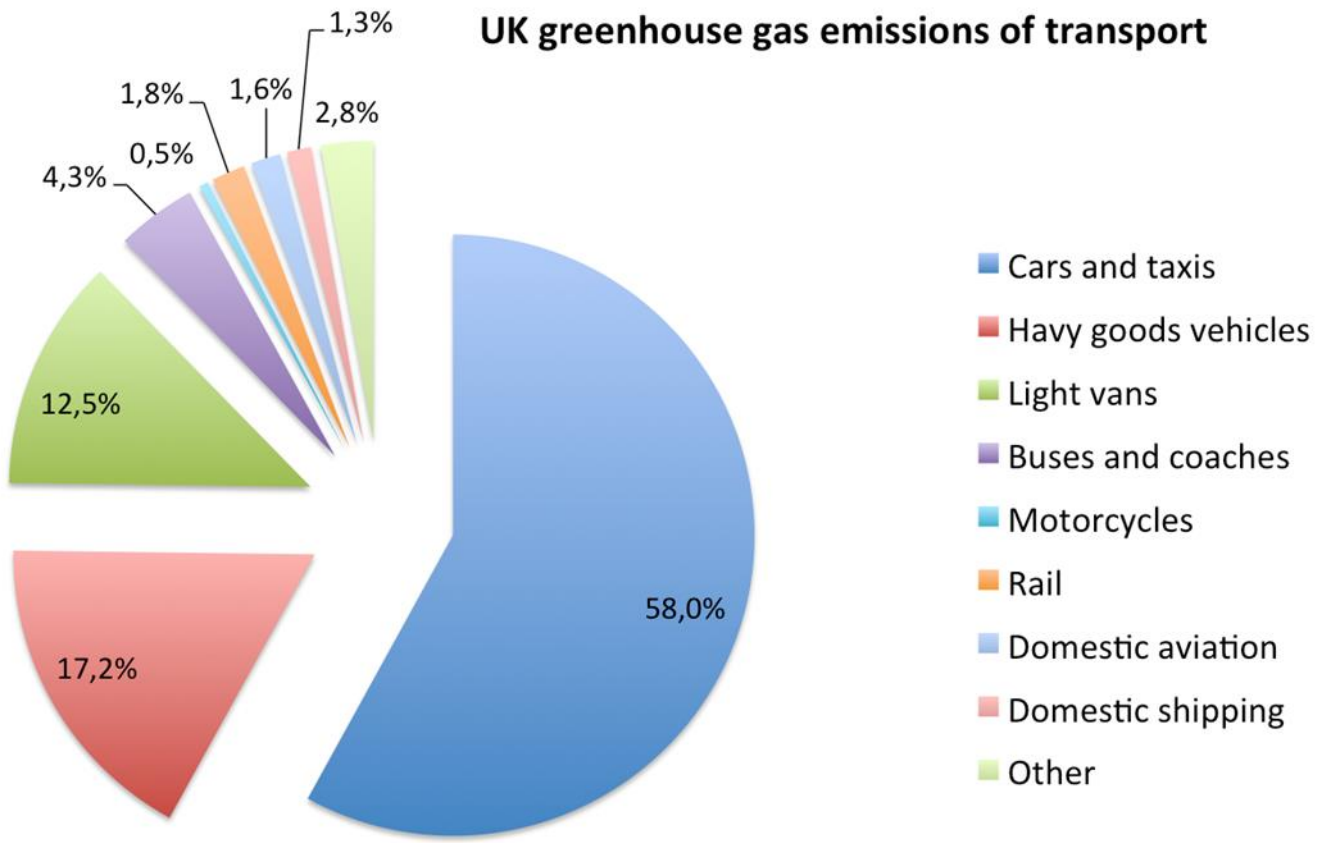
INTRODUCTION TO CHALLENGE THEMES 1 & 2
UK GREENHOUSE GAS EMISSIONS



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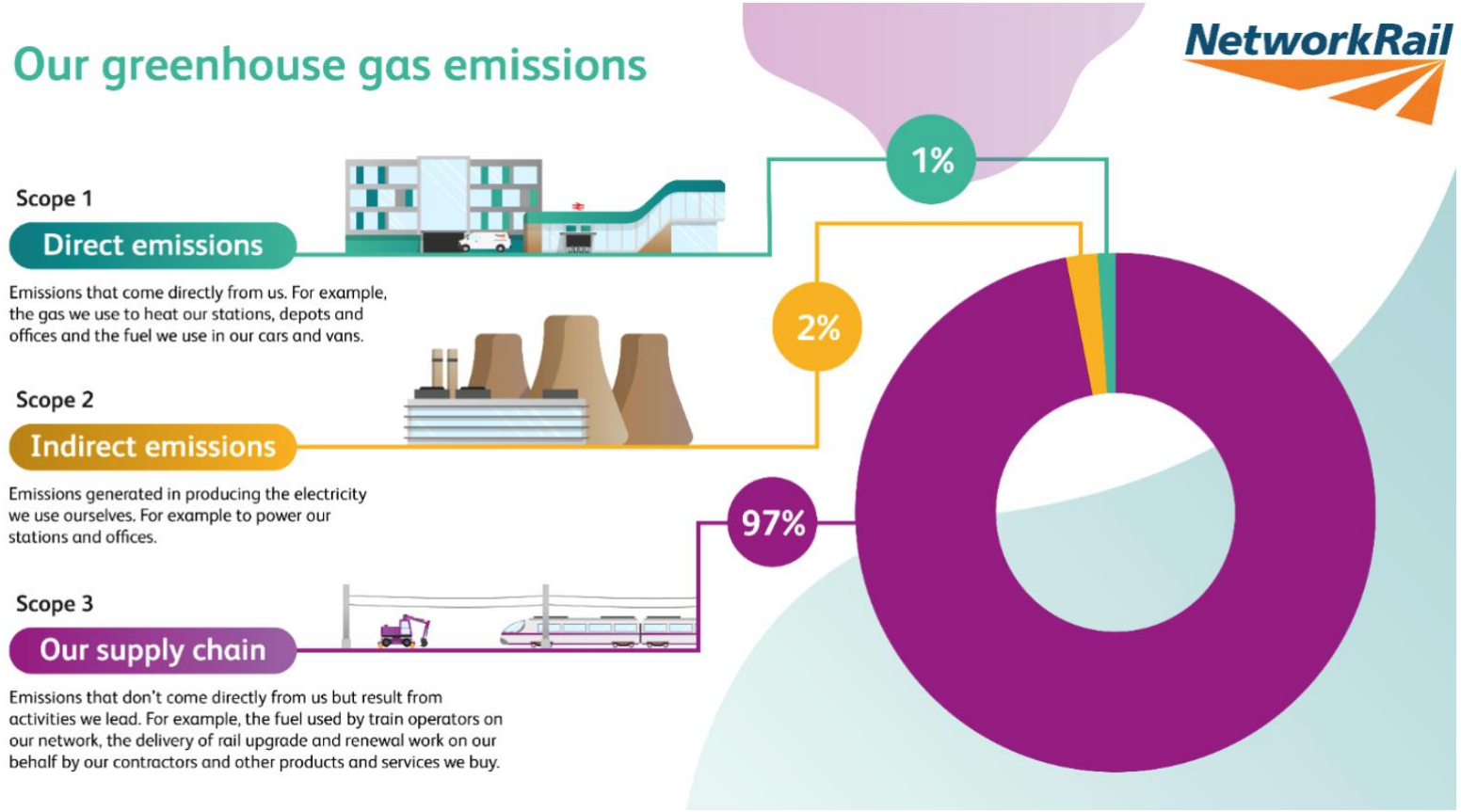
INTRODUCTION TO CHALLENGE THEMES 1 & 2
NETWORK RAIL'S GREENHOUSE GAS EMISSIONS



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INTRODUCTION TO CHALLENGE THEMES 1 & 2
CIRCULAR ECONOMY OF TRANSPORT

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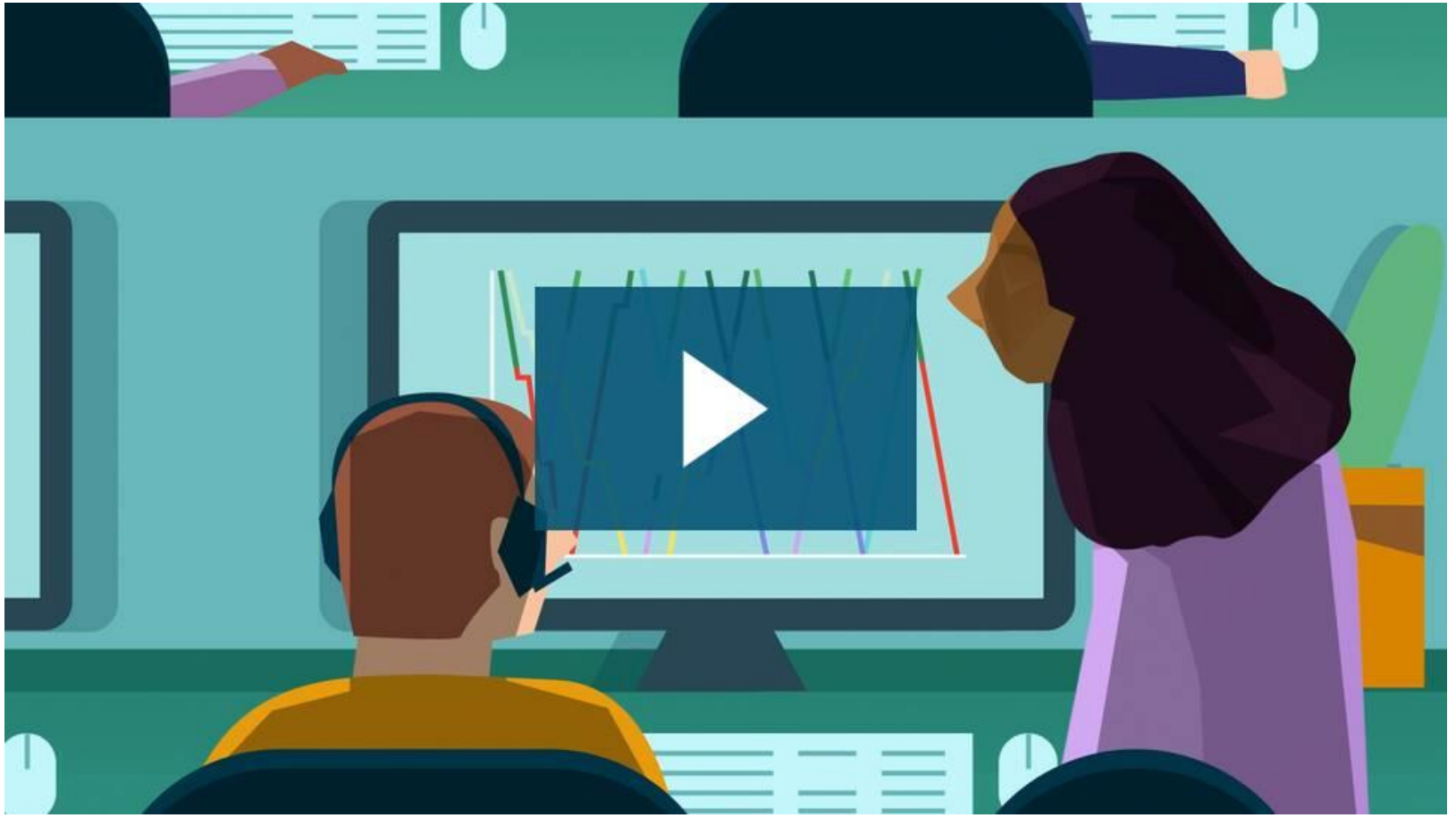
INTRODUCTION TO CHALLENGE THEMES 1 & 2
NETWORK RAIL'S LOW EMISSION RAILWAY



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10:45 – 11:15

INDUSTRIAL PRESENTATION ON THE CHALLENGES & OPPORTUNITIES

Name:

- Angus Brummitt-Brown

Job Title:

- Senior Project Manager for Coventry Very Light Rail

Organisation:

- Coventry City Council

Contact Details:

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Challenge 1 – Greener EV Components
Coventry Very Light Rail

Angus Brummitt-Brown

The Problems We Face

- Congestion
- High single occupant journeys
- Poor Air Quality
- Unreliable journey times
- Poor connectivity of public transport
- Low levels of inward investment.
- Areas of high deprivation
- High levels of unemployment
- High demands on our health services

<u>These are not unique to Coventry</u>

CHALLENGE STATEMENT – Design or produce components which reduce embodied carbon across the vehicle lifecycle.

- West Midlands today, over 3 million cars, 4 million projected by 2030.
- We need the population to choose sustainable transport options.

- We are looking for SMEs involved in manufacturing of systems and sub-systems for any type of electric vehicle from micro-mobility, through traditional road vehicles, to public transport, and HGVs and other large vehicles.


Coventry East (Line 1)
Coventry South West
Coventry North
Coventry South-East
South West extension
South East extension
Coventry Arena
Ansty Park
University Hospital Coventry and Warwickshire (UHCW)
Proposed UK Growth Hub / HS2 Interchange / Birmingham Airport
City Centre
Coventry University
Binley Business Park
Tile Hill Railway Station
Railway Station
University of Warwick
JLR Whitley
Kings Hill development
Coventry South Station (proposed)

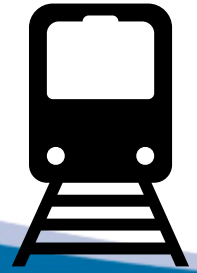
What is CVLR?

An urban mass transit solution that is

- Affordable,
- Environmentally friendly
- Efficient,
- Integrates all aspects of public transport from first / last mile options through bus, tram and heavy rail.

This is not a panacea!

Heavy Rail



CVLR

Bus

Micro mobility

Light Rail is Not Affordable for Small or Medium size Cities

The **cost** of building the 11km long **Midland Metro extension** from Wednesbury to Brierley Hill to the north-west of Birmingham has risen by £50M to £449.5M. The increase was announced in board papers ahead of a West **Midlands** Combined Authority (WMCA) Investment Board meeting next week. 7 Mar 2019

£ 41 million / km

Rail Magazine

Manchester Metrolink's new £350 million Trafford Park Line to ...

Transport for Greater Manchester confirmed the £350 million Trafford Park Line (TPL) will open seven months earlier than pla…

27 Dec 2019

£ 63 million / km

The Times

Final cost of Edinburgh trams scheme will be £1 billion

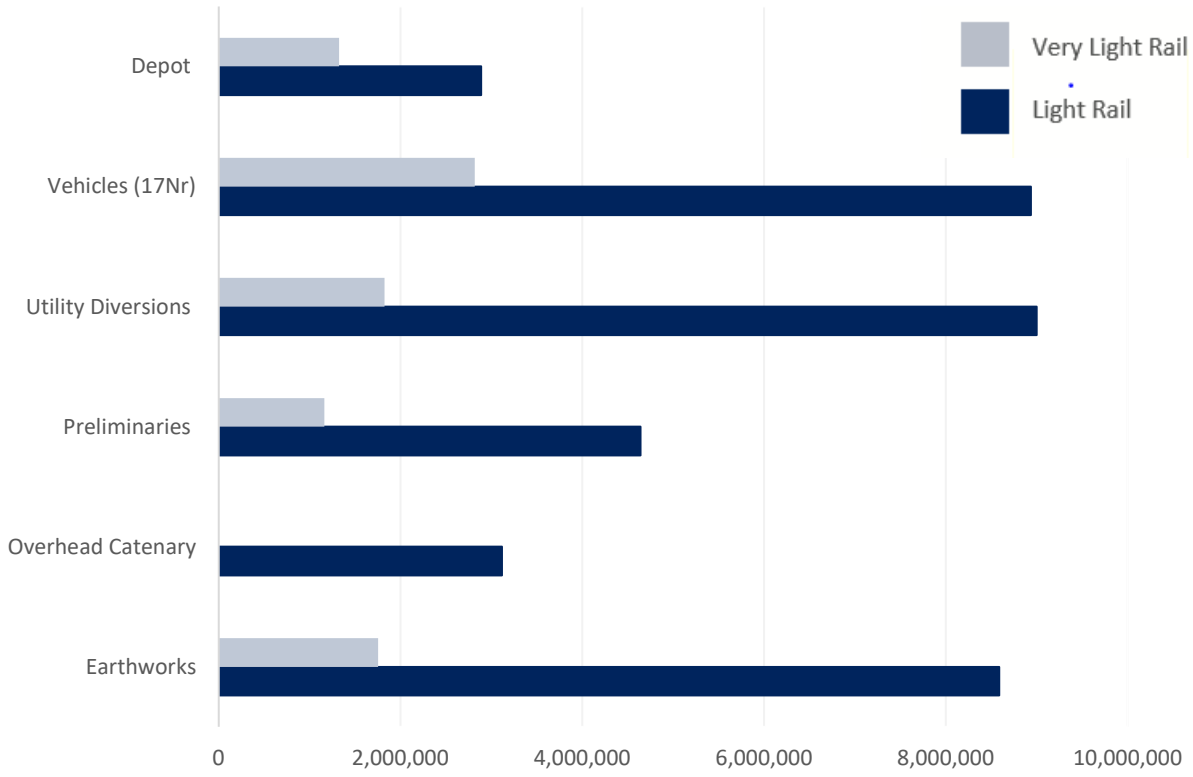
Euan Mackenzie, QC, counsel for the inquiry, said that on top of the official £776 million price tag there had been £44 million of tram-related ...

14 Dec 2017

£ 71 million / km

Utility Conflict Example

The Aim of CVLR is to change this



Benefits of CVLR:

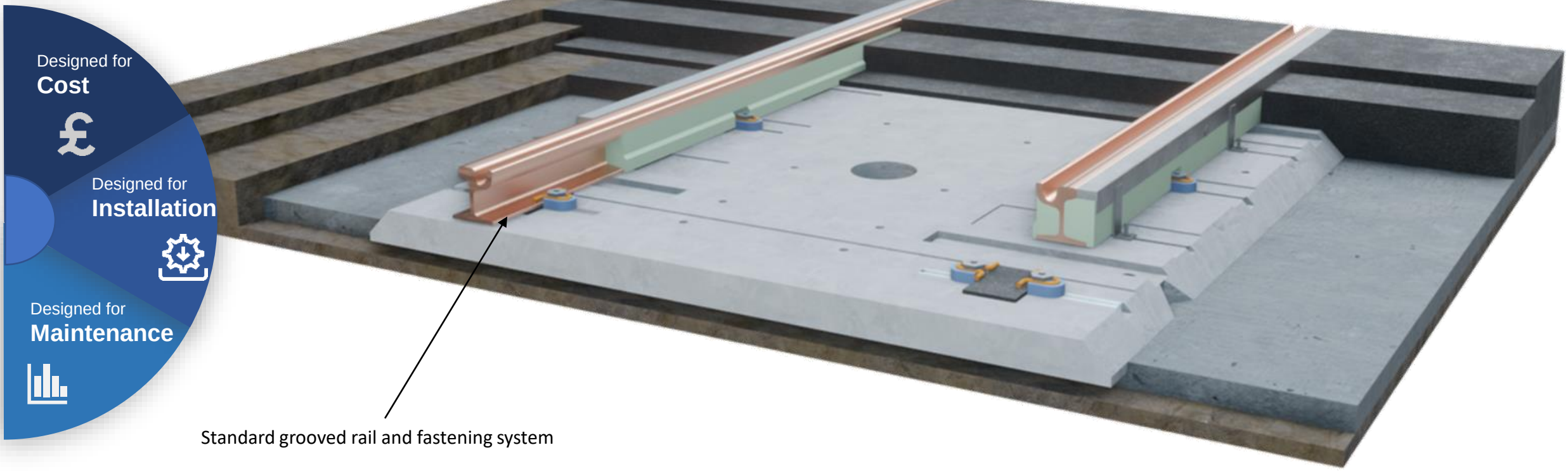
- ✓ Simplified depot
- ✓ Low cost vehicle
- ✓ No overhead catenary
- ✓ Minimal utility diversions
- ✓ Reduced preliminaries
- ✓ Reduced earthworks
- ✓ Target construction cost:

  £10m/km

Coventry Very Light Rail Track System

System designed to be integrated within existing highways and support HGV loads

CAPEX target: £4m / km double track installation



Standard grooved rail and fastening system

Eliminates the need for a concrete foundation layer.

Total dig depth of 30cm avoids physical clashes with most buried.

Coventry Very Light Rail Track test site at the University of Warwick

Coventry Very Light Rail Track test site at Whitley Depot

4.5% slope and a straight transitioning to 25m radius curve

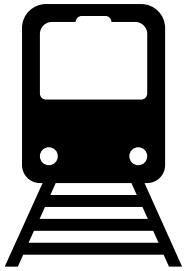
Coventry Very Light Rail future track test site at the VLRNIC


Zero-emission battery electric vehicle
High-power charging at the end of the line, no overhead equipment
COVENTRY ULR
Capacity for 56 people, 20 seated
Lightweight construction
All axles driven for maximum traction
Low-floor for easy entry
Regenerative braking
Low lifetime-cost track designed for easy construction and long life
Designed for tight (15m) curves

Affordable, Sustainable Transport

We are looking for innovation across an integrated transport system

Heavy Rail



CVLR

Bus

Micro mobility

THANK YOU FOR LISTENING!

Angus.Brummitt-Brown@coventry.gov.uk

RLB Rider Levett Bucknall

INGEROP Inventing for tomorrow

TDI TRANSPORT DESIGN INTERNATIONAL

Dudley Metropolitan Borough Council

WMG THE UNIVERSITY OF WARWICK

CWLEP Coventry & Warwickshire Local Enterprise Partnership

Black Country LEP Building Growth with MIDLANDS ENGINE HM Government

West Midlands Combined Authority

11:15 – 11:45

INDUSTRIAL PRESENTATION ON THE CHALLENGES & OPPORTUNITIES

Name:

- Mark Thompson

Job Title:

- Managing Director

Organisation:

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CLEAN FUTURES ACCELERATOR

Locally-led Innovation Accelerators delivered in partnership with DSIT, Innovate UK and City Regions

Department for Science, Innovation & Technology

Innovate UK

West Midlands Combined Authority

"Offering solutions today for tomorrow's world"

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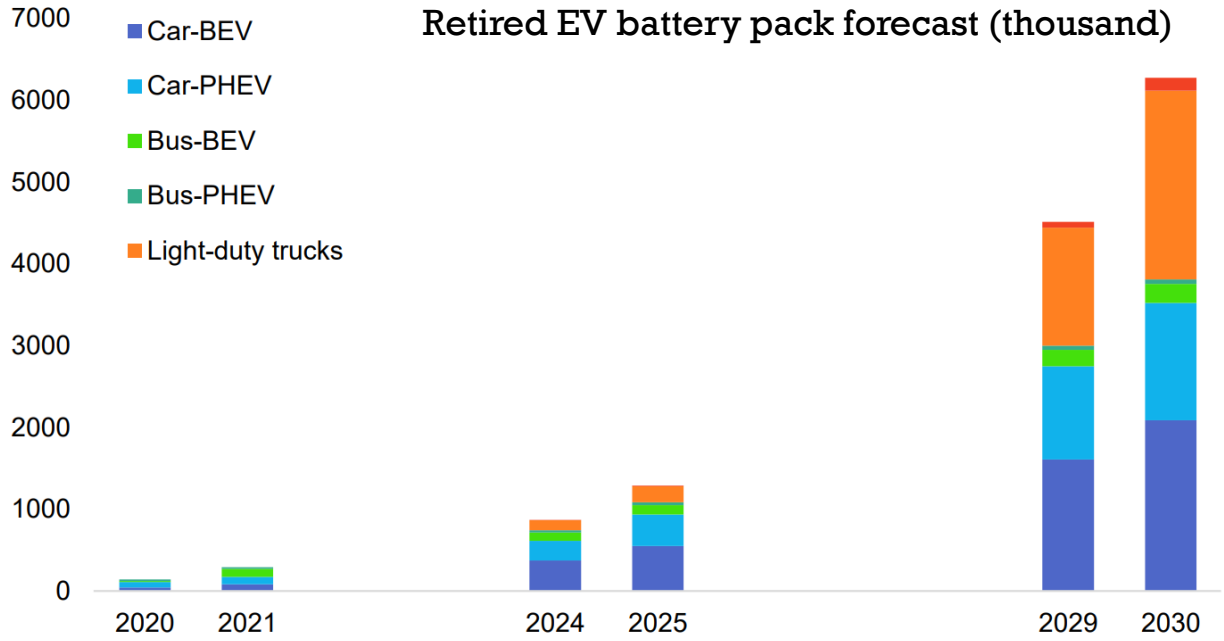
Circular Economy

- Over 6 million battery packs retiring from EVs per year by 2030.
- Available capacity from second-life batteries will reach close to 280GWh per year by 2030.



Second-life

Recycling

The initial status and the value of second-life batteries depend on how they were designed, manufactured and used in electric cars during their first life.

The cost and revenue of second-life batteries depend on how they are collected, tested, graded, repackaged and utilized in secondary applications.

- Additional revenue streams
- Currently recycling cost is high – second-life could help postpone recycling phase, turning recycling into a profit
- Repurposing cost and reduced new battery price could be threats to second-life batteries

- Improved security in raw material supply
- Decreasing cost in recycling and improvements in recycling technologies could help further reduce battery cost
- Profitability subjective to future metal price, supply, and demand (next-generation battery technologies).

The recycling technologies and the market price of battery raw materials determine whether recycling is a cost or profit for businesses and whether it is more attractive than second use.

Battery manufacture

EV production

Electronics remanufacture

Charge and balance

2nd life Portable Energy Storage

Disassemble pack

Raw material

Battery repurposing

Battery Recycling

AceOn
AceOnGroup.com
Renewable Energy + Battery Specialists

Automated 42v 1st Life

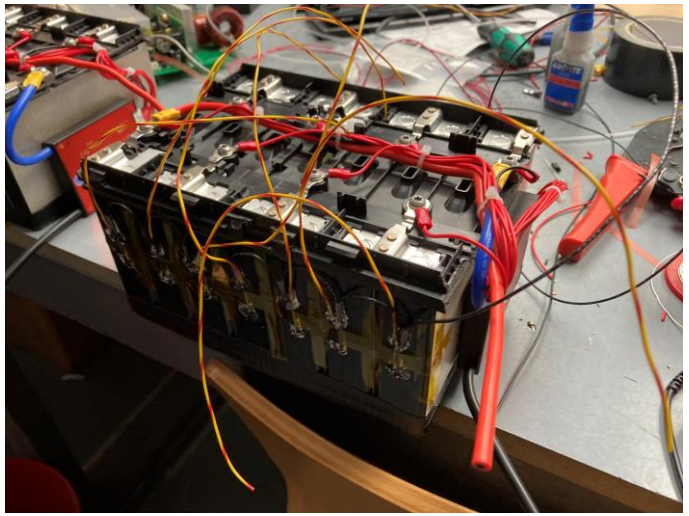
Li- ion

18650 packs

21700 packs

EV 2nd Life

ACEON APPROVED TO DISMANTLE JLR EV BATTERIES



Presented to the JLR Board & Exhibited Concept in Berlin Formula E Trackside Our AceOn Prototype

Race Track Berlin April 22

JLR Gaydon

Swappable PES Battery

2nd Life Electric Vehicle (EV) Battery

JLR Prototype – July 2023

On demand battery case manufacture capability

Modular design and assembly

Options:

Fill with new prismatic cells

Manufacture with 18650 pack to fit into holder

Produced on automatic welding machine

Version for Mitsubishi pack ? Larger design

Charger into PES Battery

AceOn Swappable PES Battery Concept

1st Draft Design – August 2023

Ideas:

Vertical Type A (preferred)

Horizontal Type B

IP67 Waterproof

ABS Material

Grant to bring enclosure to market for New PES

Charger into PES Battery

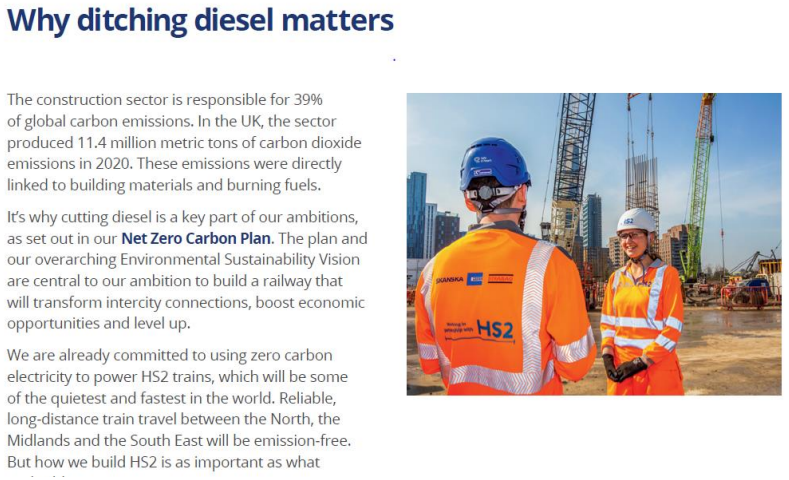
Prototype Renewable Energy Workshop at UoW on May 04 2023

HS2 DIESEL-FREE PLAN

- Customers & contractors demanding to reduce diesel generators on site

  https://assets.hs2.org.uk/wpcontent/uploads/2022/12/26234_HS2_DieselFreePlan_CS1763a_Artworked_final_accessible2.pdf

- PES to be tested for Railtrack Approval

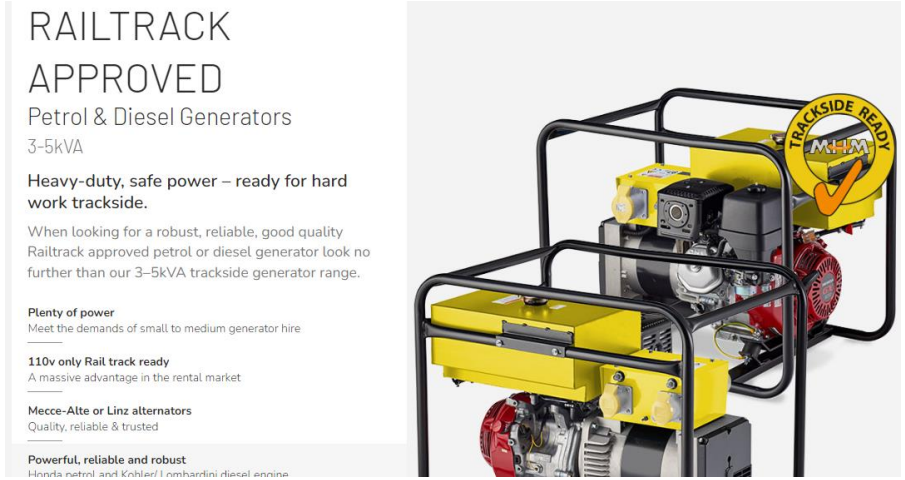


Why ditching diesel matters

The construction sector is responsible for 39% of global carbon emissions. In the UK, the sector produced 11.4 million metric tons of carbon dioxide emissions in 2020. These emissions were directly linked to building materials and burning fuels.

It's why cutting diesel is a key part of our ambitions, as set out in our **Net Zero Carbon Plan**. The plan and our overarching Environmental Sustainability Vision are central to our ambition to build a railway that will transform intercity connections, boost economic opportunities and level up.

We are already committed to using zero carbon electricity to power HS2 trains, which will be some of the quietest and fastest in the world. Reliable, long-distance train travel between the North, the Midlands and the South East will be emission-free. But how we build HS2 is as important as what



Future Development to Create PES Charging Station

12s PES Battery Charging Station

Prototype Cub for One JLR Swappable Battery

Ukraine Grant ?:

2 Rack Charging Station

Charging Rack Station

AceOn PES Showcasing Carbon Savings

UK Case Study – Munchbox Roadside Kiosk

https://www.aceongroup.com/news/jackie-serves-up-a-green-treat-thanks-to-aceon-2/

For 25 years Munchbox kiosk has used a petrol generator to power their lighting, fridge freezer, toaster and others electrical appliances.

Weekly petrol consumption has been ~12 litres/week (624litres/annually) creating a CO2 output of ~27.72Kg/week (or 1441Kg/year).

Munchbox trialled AceOn's PES which cost £2 to charge powering the kiosk for a week.

Using average fuel emissions annual benefits include:

- Reduced pollution and noise
- Removes requirements for handling petrol in catering environment
- Cost saving - £800
- CO2 reduction – 1441Kg
- Petrol reduction – 624 litres

How much carbon dioxide does your vehicle produce? (+ calculator) (drivingtests.co.nz)

11:45 – 12:45

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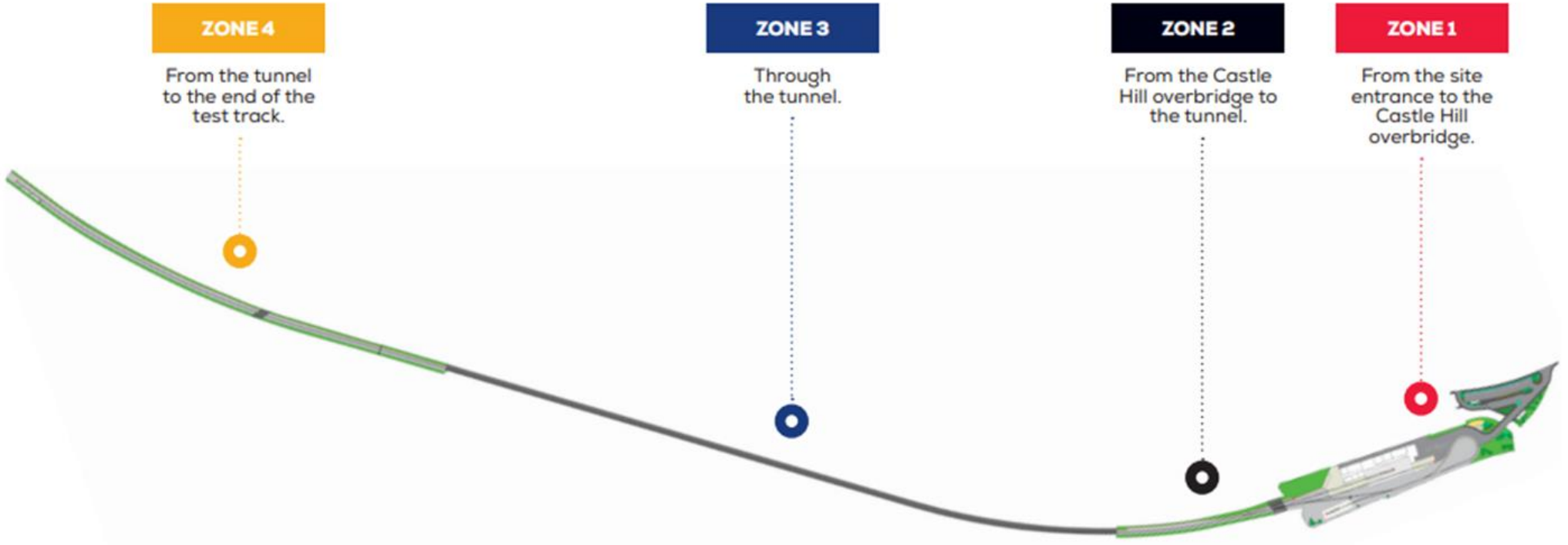
INTRODUCTION TO THE RAIL DEVELOPMENT & TEST SITE (RDTS)



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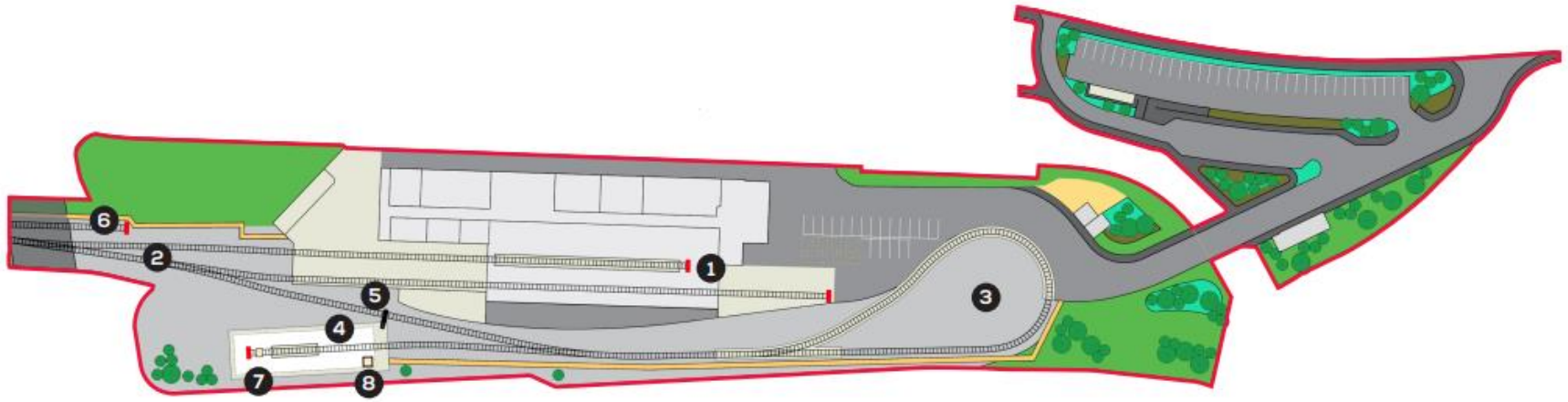
RDTS SAFETY INDUCTION (WORKSHOP & TEST TRACK)

ZONE 1

1. Engineering Hall & Test Labs
2. Test Track 1
3. Test Loop
4. Workshop
5. Rapid Charger
6. Siding
7. Shunter
8. Lifting Jacks



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RDTS SAFETY INDUCTION (WORKSHOP & TEST TRACK)

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RDTS SAFETY INDUCTION (WORKSHOP & TEST TRACK)

- A hi-vis vest needs to be worn when walking from the VLRNIC to the Workshop via the safe walking route.
- You must take special precautions when crossing the track using the level crossing. There will be occasions when there are rail vehicle movements along the Test Track and the level crossing.
- Pay attention to all barriers and warning signs. If there is a barrier, stop and look for vehicle movements.
- If there is a vehicle moving you must wait for the driver to sound the horn, raise your hand so that he knows you are there and wait for the vehicle to pass before you proceed to walk across the level crossing.
- After entering the Workshop sign into the visitors' book.
- The fire alarm is tested on Mondays at 11.30am. This will sound for less than 1 minute.
- Fire exits are clearly marked and located around the Workshop.

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RDTS SAFETY INDUCTION

- On hearing the fire alarm, make your way to the emergency muster point, located in the Upper Car Park. There are two safe walking routes to the Upper Car Park, one behind the building beside the Tipton Road wall and one in front of the Workshop using the level crossing. Use the safest route.
- If you discover a fire, break the glass at the nearest call point to sound the alarm and make your way to the emergency muster point.
- At the emergency muster point the allocated fire warden will take a register to ensure 100% attendance.
- The allocated first aider will also administer first aid where required.
- If an accident occurs in the Workshop or on the Test Track this must be entered into the accident book in the Workshop.
- No unauthorised photographs are to be taken in the Workshop.
- When working in the Workshop appropriate PPE should be worn for the task being undertaken. For example. When entering the pitted area, minimum PPE requirements are hi-vis vest/top, safety boots, hard hat/bump cap and safety glasses.

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- Before using any chemicals on site, you should read the COSHH sheet and wear the appropriate PPE required.
- Care is to be taken when moving around the Workshop and Test Track as vehicle movements are to be expected.
- All vehicle movements will be carried out by authorised personnel ONLY.
- Vehicle movements will be coordinated by the Site Supervisor.
- The Site Supervisor will brief visitors on any planned train movements on the day of arrival.
- Directional points on the Test Track are to be operated, locked/unlocked by authorised persons ONLY.
- When accessing the Test Track use Safe Walking routes when available, minimum PPE requirements are hi-vis vest/top, safety boots and hard hat/bump cap.
- You must take special precautions when crossing the track. Anyone who does NOT hold a personal track safety (PTS) certificate or have not been authorised by the Site Supervisor must be escorted by someone with PTS certification.

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THANK YOU
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