Department for Transport

Rail decarbonisation – it's a journey

Rail Decarbonisation Policy in Department of Transport (DfT)

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We are responsible for a range of environmental sustainability policy

This includes:

- Traction decarbonisation
- Decarbonising the rail estate
- Land use and biodiversity
- Air quality
- Integrated travel and modal shift
- Waste, litter and graffiti
- Noise
- Water pollution and use

HS2, which has its own regulatory framework in legislation, is outside the direct scope of our responsibility

Rail Environment

UK set out an ambitious government policy on decarbonisation

Deliver a net zero rail network by 2050

Ambition to remove all diesel-only trains (passenger and freight) from the network by 2040

Supporting modal shifts from road and air to rail

Alongside the Transport Decarbonisation Plan we published a Rail Environment Policy Statement

What is its purpose?

- The Policy Statement covers a much broader range of environmental sustainability issues than the Transport Decarbonisation Plan and sets a clear direction for the rail industry.

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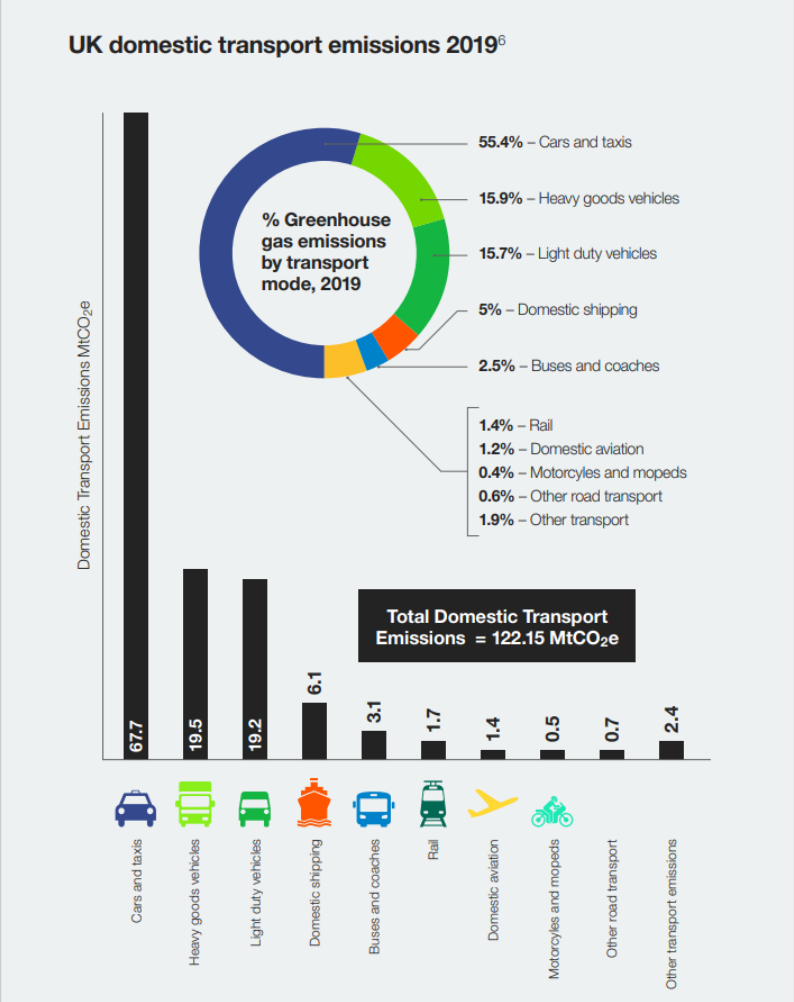
How does the this fit in with Governments plans for reforming the railways?

- Great British Railways will put environmental sustainability at its heart. A single organisation for track, train and stations, will better support the delivery of environmental objectives across all rail-environment policy areas.
- A new duty for Great British Railways to consider environment principles.

The scale of the Challenge: Rail as part of wider transport emissions



- Transport is the largest contributor to UK domestic greenhouse gas emissions, contributing 27% of UK domestic emissions in 2019.

- In 2019, Greenhouse Gas emissions from rail (passenger and freight) made up just 1.7% of the UK's domestic transport emissions, while 9% of passenger miles travelled in Great Britain were by rail.

The scale of the challenge

- As of March 2022, 6,042 km (approx. 3,700 miles) of route is electrified (38.1%) in Great Britain.

- While 70% of the passenger rail fleet is electric, there are still around 3,700 diesel vehicles on the network, and most of the freight fleet is diesel.

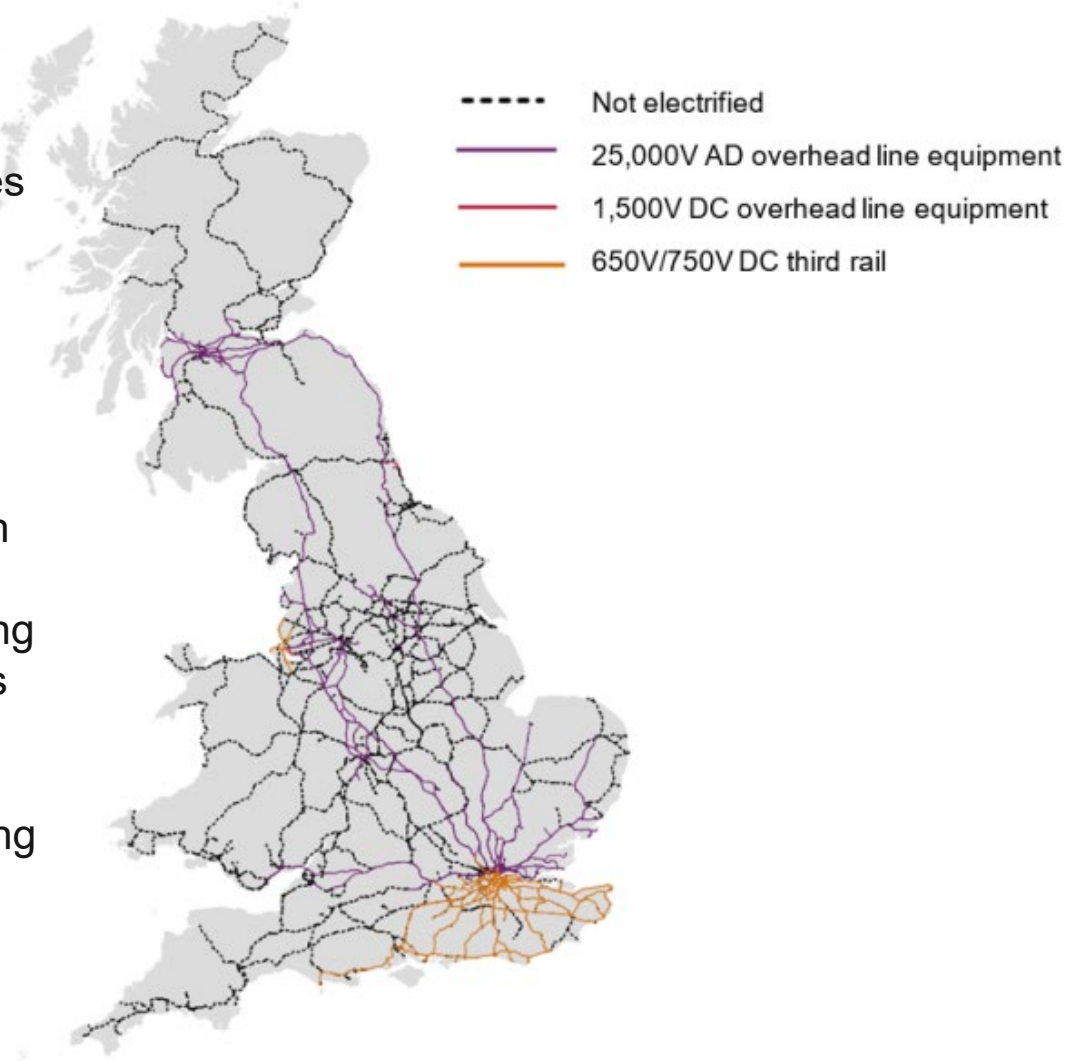
- To meet the 2050 net zero goal across the economy, the majority of the diesel vehicles will need to be replaced with zero-carbon alternatives.

Figure 4: UK Rail network showing 25kV electrification in green and 750V DC third rail in yellow

Recent progress has been strong

- Rail Since 2010, more than 1,200 miles of electrification has been delivered in Great Britain, including almost 800 miles in England and Wales in the last seven years.

- Electrification of more lines will play an important role in our programme to achieve our Net Zero 2050 target, along with new traction technologies such as battery and hydrogen trains. We will assess the economic case and operational requirements when deciding which technology to deploy on a line.

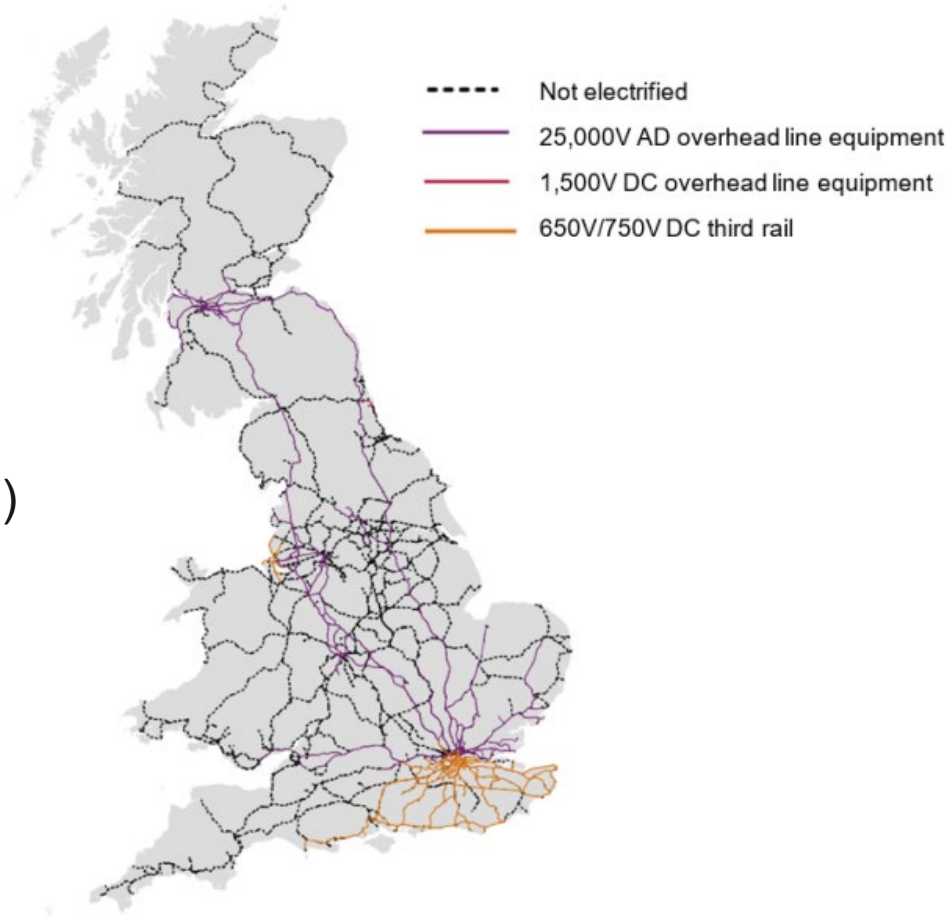


Infrastructure investment

Progress to date

The Integrated Rail Plan (IRP) outlines the biggest ever single Government investment in Britain's rail network, setting out £96 billion worth of investment into the railways of the North and Midlands.

- Committed schemes:
  - Transpennine Route Upgrade (TRU) between Manchester, Leeds and York
  - Midland Main Line (MML) between London St Pancras, the East Midlands and Sheffield
  - Wigan to Bolton - £78 million



Innovation into new traction technologies

Government funding

- First of a Kind is a yearly competition funded by Department for Transport and delivered by Innovate UK in partnership with Knowledge Transfer Network. The competition funds unique innovations within rail sector.
- Since the start of 2019, the Department has provided just over £12.5m of funding through these competitions that will help decarbonise the railway or reduce harmful emissions.

EXAMPLE:

Echion Technologies are leading Project UBER (Ultra-high power Battery for low Emission Rail). This is a successful First of a Kind winner aiming to demonstrate the suitability of XNO(tm) battery technology for passenger trains that can be powered by the AC overhead electrification and charge a battery from the overhead wire or another form of 'standard' trackside power to run in battery-only mode on unelectrified section of a route.

Hydrogen technology and trials

- Alstom and Eversholt MoU to develop 10 x three car hydrogen trains based on the latest Aventra platform.
- Other hydrogen demonstrators are being developed e.g. Porterbrook (Hydroflex).
- In Scotland, tests of a 314 locomotive retrofitted with a hydrogen fuel cell are underway.
- University of Birmingham spin out company, Vanguard is retrofitting hydrogen fuel cell technology to a class 08 diesel locomotive.

Battery technology and trials

- Battery trains have been in operational service in Europe and the far east for several years now.
- Recently the record was broken in Germany for the longest single distance operated by a battery electric train (224km).
- 2015: IPEMU fitted batteries to a Class 379 vehicle in operation with Greater Anglia to understand the potentials of battery traction.
- 2023: Vivarail has brought the first commercially viable battery train to market retrofitting Class 230s (ex LU D-Stock) with batteries. Scheduled passenger service in the Thames Valley.
- 2023: Battery trains deployed on Merseyrail metro services to extend operation beyond third rail DC network.
- 2026: In Scotland, plans are underway to trial and introduce battery trains to the network to reach Scottish Government's commitment to have no diesel trains on the network by 2035.

Thank you

Air Quality

Diesel train emissions comprise of harmful pollutants:

- **Nitrogen oxides (NOx/NO_2):** produced by the combustion process of diesel engines.
- **Particulate Matter (PM):** emitted by diesel engines but also produced through abrasion (brake and track wear).
- Diesel trains in the UK were not covered by **mandatory emission standards** until 2005. Standards for rail have been tightened more slowly than for roads and only apply to new or retrofitted trains.

Air pollution is a serious health risk:

- **Short-term exposure (over hours or days)** can exacerbate asthma and affect lung function.
- **Long-term exposure (over years or a lifetime)** can cause chronic conditions such as heart and lung disease.

Diesel train emissions can lead to local air quality problems:

- Nationally, the railway's contribution to total UK emissions is small, contributing **2.5% of total NOx** and **less than 1% of total PM**. However, diesel trains can contribute significantly to **local pollution hotpots**, especially in and around **enclosed stations**.

- The Department initially funded air quality monitoring studies at **3 large enclosed stations**: Birmingham New Street, London King's Cross and Edinburgh Waverly.
- These studies found that concentrations of **NO_2** and **PM** were **significantly higher** than some of London's busiest roads, and in the case of Birmingham New Street, **exceeded legal Workplace Exposure Limits** that apply inside stations.

Biodiversity, Non-traction decarbonisation and Active and integrated travel to stations

- **100%** of Network Rail cars and vans will be **zero emission vehicles** by **2027.**
- **Targets** will be set for **renewable energy** generation and **use at stations.**
- NR will achieve net zero biodiversity by 2024 and **biodiversity net gain by 2035.**
- **Zero waste will go to landfill** by **2025** and increasingly challenging recycling targets will continue to be set.