

# The Journey to Net Zero

## The Journey Towards Emission Free Temperature-Controlled Distribution On Road Vehicles: An Industry Plan

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### Introduction

The UK Government's ambition to deliver a net zero economy by 2050, as well as the interim target of reducing emissions by 78% by 2035 will have profound impacts on all industrial processes. To meet this goal, industries are expected to undergo rapid change. As well as reducing Greenhouse Gas (GHG) emissions such as CO<sub>2</sub>, there is an urgent need to reduce the concentrations of pollutants known to cause detriment to human health emitted from our vehicles such as NO<sub>x</sub> and Particulate Matter (PM), particularly in crowded urban centres.

Temperature-controlled distribution is critical to the UK supply chain, ensuring perishable products including food and pharmaceuticals are transported safely across the cold chain and reach the consumer in the safest condition. It exists at every stage, from the farm to our homes, hospitals, restaurants and retail spaces. The cold chain is also a critical tool in national decarbonisation efforts – driving down postharvest food waste and the associated emissions of over production by preserving food quality for longer.

Despite these benefits, temperature-controlled distribution is also responsible for a range of GHG and air quality emissions emitted not only from a vehicle's primary engine, but also uniquely to the cold chain, from the operation of refrigeration units on vans and Heavy Goods Vehicles (HGVs) known as Transport Refrigeration Units (TRUs).

Emissions from temperature-controlled distribution come from four main areas (as detailed in Figure 1). Whilst all sources are critical to the overall decarbonisation of road haulage, this new report focuses on the specific emissions added by the operation of refrigeration units on vehicles.

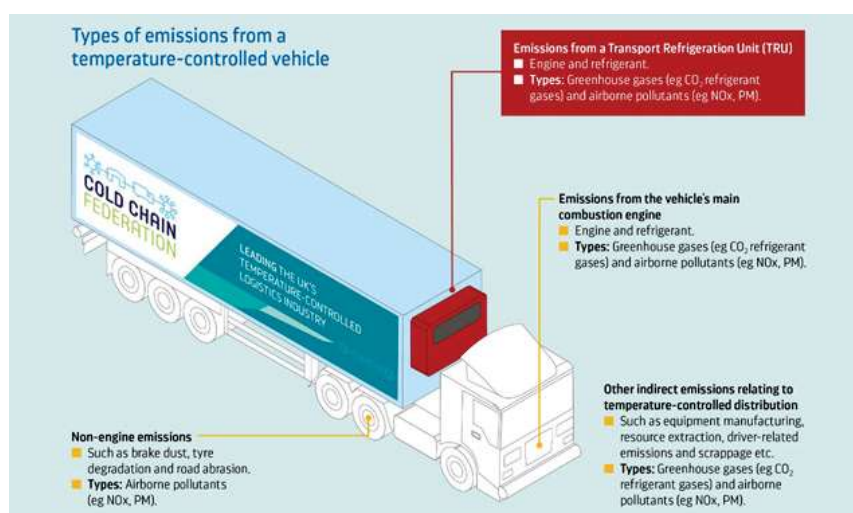


Figure 1: Types of emission from a temperature-controlled vehicle

The Cold Chain Federation and its members are committed to the goal of removing the reliance on diesel in transport refrigeration, however there are significant challenges which need to be overcome. The Journey Towards Emission Free Refrigeration on Road Vehicles is our vision for how a collaborative partnership between

industry, Government and innovators, supported by robust policy and economic support can achieve emission-free transport refrigeration in line with the UK's net zero by 2050 ambition.

A brief summary of the report is presented below. The full version can be downloaded at:  
<https://www.coldchainfederation.org.uk/cold-chain-net-zero-project/>

## The outlook for eliminating emissions from TRUs

There is a clear pathway towards refrigeration powered from the vehicle's main engine for fixed LGVs and rigids, but for these vehicles, completely removing emissions will be reliant of electrifying the main engine. 'Hybrid' systems are also increasingly being used for articulated HGVs to allow for the trailer's fridge to be powered from the HGV engine. This solution has benefits for air quality emissions but is still reliant on the diesel engine of the HGV. Other options exist for reducing emissions from the current fleet of TRUs such as HVO fuel.

The plan sets out that prior to the successful decarbonisation of HGV trucks, potentially quicker emission reductions will be achieved by powering the TRU from emission free sources, such as electric – in the form of 'smart batteries' or potentially hydrogen and nitrogen as this technology is developed. Electrifying the trailer has the additional benefit of being conducive to the current supply chain, with trailers charging at depots whilst they are being loaded/unloaded.

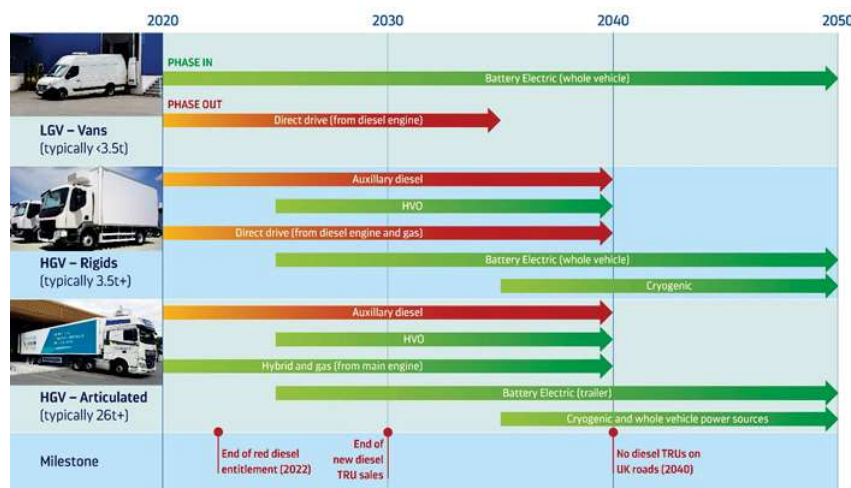


Figure 2: Technological outline for TRUs

Prior to 2030 the industry must look to reduce emissions from existing technology whilst trialling and building confidence in developing technology to become emission free by 2040.

Short term: by 2030 (transitioning to lower or emission free refrigeration)	Long term: by 2040 (move to emission free refrigeration)
<b>Vans and small rigids</b> <ul style="list-style-type: none"> <li>■ As more vans upgrade to at least Euro VI (or later) standards, those operating 'direct drive' systems will reduce emissions significantly.</li> <li>■ Increasing adoption of electric whole-vehicle solutions to achieve a fully electric refrigerated vehicle.</li> <li>■ Reduction in the GWP of gases used as a refrigerant due to F Gas regulations.</li> </ul>	<b>Vans and small rigids</b> <ul style="list-style-type: none"> <li>■ All vehicles will run their refrigeration systems from the main engine of the vehicle, which is likely to be electric by 2040.</li> <li>■ Emission free, or ultra-low refrigerants replacing high GWP gases.</li> </ul>
<b>Large rigids and articulated</b> <ul style="list-style-type: none"> <li>■ Improved efficiency in operation of refrigerated trailers to significantly reduce the overall emissions from auxiliary diesel TRUs.</li> <li>■ Some adoption of lower emitting fuels to reduce emissions, such as HVO and biofuels.</li> <li>■ Increasing adoption of hybrid technology to run systems from Euro VI (or later) engines where possible.</li> <li>■ Some adoption of 'smart battery' powered trailers as this technology becomes more viable.</li> <li>■ Reduction in the GWP of gases used as a refrigerant due to F Gas Regulations.</li> </ul>	<b>Large rigids and articulated</b> <ul style="list-style-type: none"> <li>■ No auxiliary diesel TRUs for large rigids, which will be able to be electrically powered by the main engine when in motion and by plug-in electric when stationary (or from batteries).</li> <li>■ Widespread adoption of smart battery technology to achieve mostly diesel free emissions from refrigerated trailers.</li> <li>■ Alternative technology such as nitrogen fully scoped and beginning to be adopted if viable.</li> <li>■ Emission free, or ultra-low refrigerants replacing high GWP gases.</li> <li>■ Decarbonisation of HGV engines could result in wider adoption of a single vehicle (truck and trailer) power source for both motion and refrigeration.</li> </ul>

Figure 3: Outlook for eliminating emissions from TRUs

## What can be achieved?

Based on the findings of the report, we present four industry targets for removing emissions from TRUs:





 <b>INDUSTRY TARGET 1</b> No transport refrigeration units (TRUs) to be sold into the UK market containing refrigerants with a GWP of more than 300 by 2025.	 <b>INDUSTRY TARGET 2</b> No transport refrigeration units (TRUs) should use refrigerants with a GWP of more than 300 by 2035 (in line with the Kigali agreement).
 <b>INDUSTRY TARGET 3</b> Ambition that no new diesel TRU should be placed on the UK market after 31 December 2029.	 <b>INDUSTRY TARGET 4</b> No vehicle operating on UK roads should be using a diesel powered TRU after 31 December 2039.

Figure 4: Industry targets for removing emissions from TRUs

Barriers to delivery of these targets:

- Infrastructure – provision of required charging or fuelling infrastructure for electric, or hydrogen/nitrogen fuels
- Maintenance, reliability and operator confidence – including training engineers for alternative technologies
- Affordability and the case for investment – the significant cost differential of developing technology and supporting infrastructure relative to traditional diesel TRUs

## How this plan can be achieved – industry led action, supported by effective Government regulation and investment

Operators should:

- Continue to reduce air quality and GHG emissions from TRUs through more efficient usage of existing equipment whilst trialling and adopting lower emitting, or emission-free alternatives to diesel and high GWP refrigerants as they come to market and are financially viable.

TRU manufacturers should:

- Continue to reduce the use of high GWP refrigerants in line with F Gas Regulations and seek to increase the pace of innovation in design aimed at reducing air quality and GHG emissions.

Trailer and refrigerated van manufacturers should:

- Continue to push the limit of trailer design to maximise thermal efficiency and continue to seek innovative solutions to generate emission free power from the trailer's roof, axles and brakes.

The Cold Chain Federation will:

- Consult on the introduction of industry-led scheme to promote best practice in efficient temperature-controlled distribution.
- Produce a best practice guide for businesses and operators to maximise the efficient operation of TRUs and reducing associated emissions.
- Continue to support efforts to quantify emissions from temperature-controlled distribution (as detailed in our 'Defining a Net Zero Cold Chain' document) and to track progress of this plan through regular reviews. The first review will be completed no later than December 2025

The Government must:

- Provide confidence and a clear deployment strategy for the technologies which will be backed to become widespread in the future to give operators confidence in major investments in developing technology e.g. electric, hydrogen, biofuels.
- Provide a clear investment strategy to facilitate the improvement of electric charging for vehicles and temperature-controlled trailers at depots and at rest points along the road network which must include subsidies or grants to overcome the significant costs for operators of installation of equipment.
- Support the targets set out by this plan with effective regulation and policy to achieve successful implementation (see report for full details of policy recommendations)
- Support the investment in trials, or adoption of lower and emission free technologies through Green Funds, extension of super tax credits, Grants or other tax allowances and ensure that research funding is allocated to realistic solutions.
- Ensure the requirements of temperature-controlled operators are taken into account when developing the freight system of the future as outlined in the Transport Decarbonisation Plan.

The full report, The Journey to Emission Free Refrigeration on Road Vehicles can be downloaded from the Cold Chain Federation website, along with other publications and information on our Net Zero Project:

<https://www.coldchainfederation.org.uk/cold-chain-net-zero-project/>