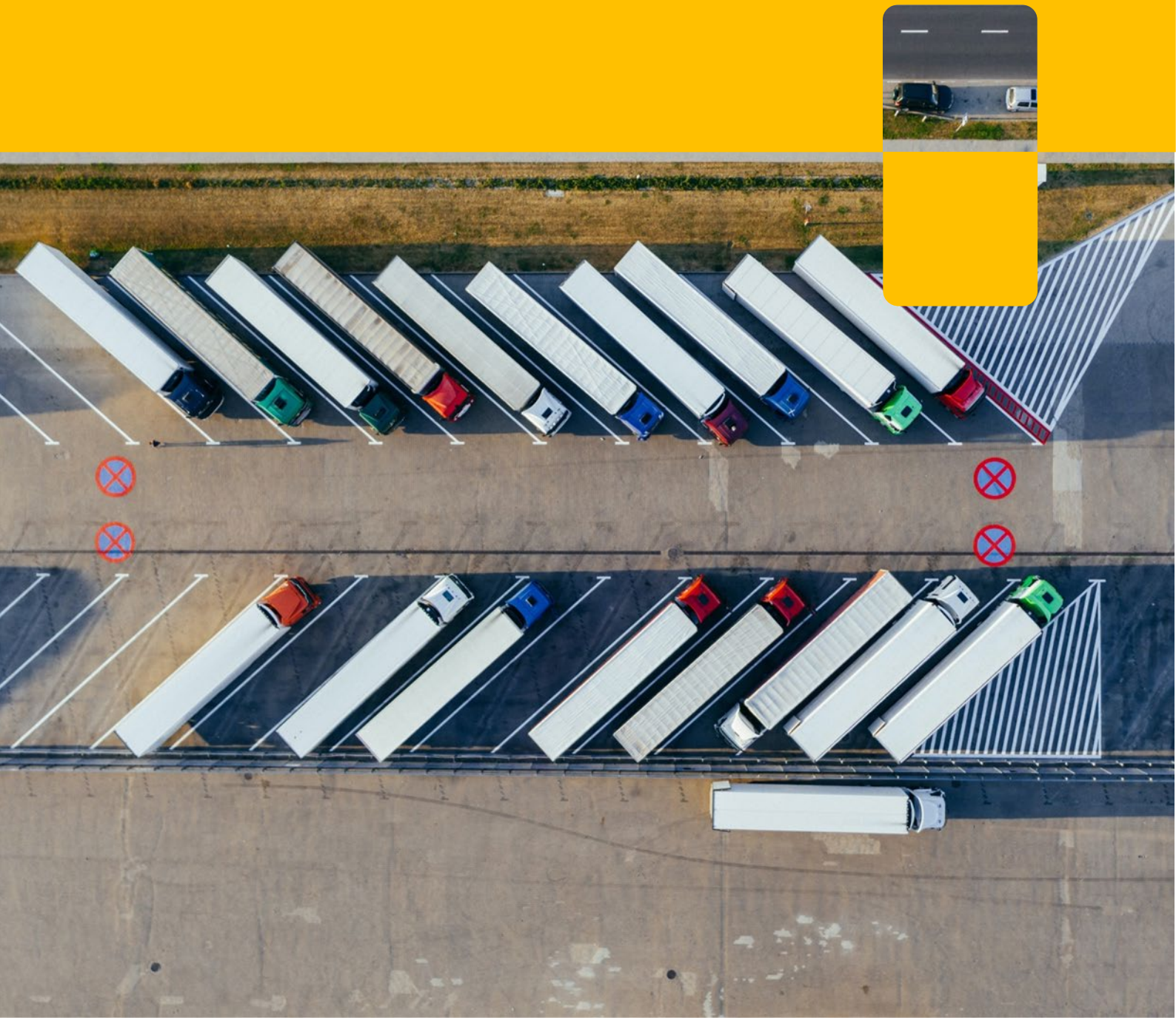


Fleet support guidance

Using biomethane to power your fleet

November 2024



Background

Methane (CH₄) is a greenhouse gas formed through natural processes. It is the main component of natural gas. Biomethane is methane formed from renewable materials rather than natural gas, although it is chemically identical, no matter the source. Methane has 28 times the global warming potential of CO₂. This is why a low carbon version can be attractive for some fleet operators.

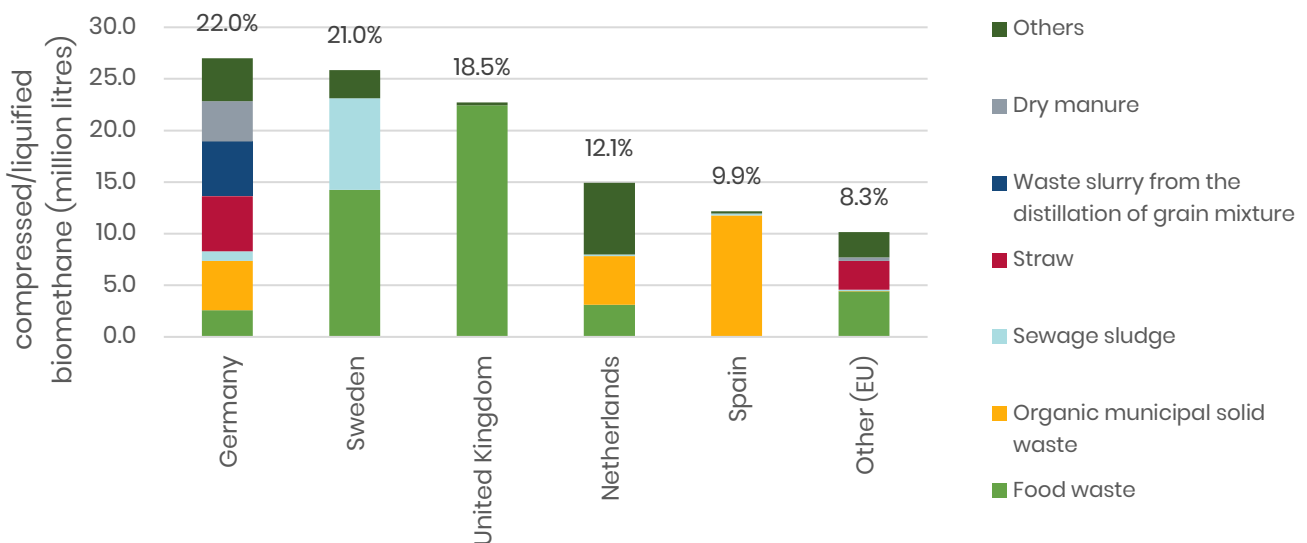
Using biomethane in road vehicles has various advantages. Vehicles using this fuel are quieter while operating. They also produce less nitrous oxide (NO_x) and particulate matter (PM) emissions. Biomethane has significant greenhouse gas savings compared with many alternative low carbon fuels.

Biomethane supply and composition

When used for road transport, biomethane is sold by a network of suppliers aligned with the renewable transport fuel obligation (RTFO). Through its annual reporting, the RTFO clarifies the nature and origin of feedstocks (Figure 1).

In 2021, the RTFO supplied 57 million litres of biomethane. Of these, 19% originated from UK feedstocks and the remainder from Europe. In all, 99.6% of biomethane supplied was from 'double counted feedstocks'. This means it was produced from feedstocks the RTFO classifies as wastes and residues. The three most common feedstocks used were food waste, organic municipal solid waste, and sewage sludge. These three types accounted for over 80% of the total biomethane supplied (by volume).

Figure 1: Composition of feedstocks for biomethane in European countries and volume produced, RTFO 2021 annual report



Biomethane production and certification

There are several production pathways for biomethane. The two most used are anaerobic digestion (the most common) and biomass gasification and methanation. Both use organic matter feedstocks to produce methane.

With anaerobic digestion, the biogas produced first must be upgraded (purified) before it can be used. The biogas is a mixture of methane, carbon dioxide, water vapour, and a range of other contaminants. This means the methane must be separated in the upgrading process. It can then be used directly in vehicles or injected into the gas grid.

Most biomethane is supplied to consumers through the mains gas grid. Certifications and mass balances make sure the amount of biomethane extracted by a consumer at point B matches the amount injected at point A.

What certification schemes are used?

1. **Renewable transport fuel certificates (RTFCs)**. Supplied by the RTFO, these digital certificates show that a renewable fuel has been supplied. For each kilogram (kg) of green gas used to refuel vehicles, 1.9 certificates can be allocated. This doubles to 3.8 certificates per kg if the biomethane comes from the treatment of wastes or residues. Using RTFCs in combination with Renewable Fuels Assurance Scheme (RFAS) declarations is the standard approach for certifying the supply of biomethane for transport use in the UK.
2. **Renewable gas guarantees of origin (RGGOs)**. Issued by the Green Gas Certification Scheme (GGCS). [The GGCS](#) makes sure only one RGGO is issued for each unit injected and that it is transferred securely to the end consumer. The GGCS issues RGGOs for most biomethane injection in the UK (80%). However, it's not commonly used in transport. In 2022, just 0.6% (29 GWh) of biomethane [supplied through the GGCS was for use in transport](#). This is compared with 444 GWh of biomethane delivered through the RTFO in the previous year.

What forms of biomethane are available?

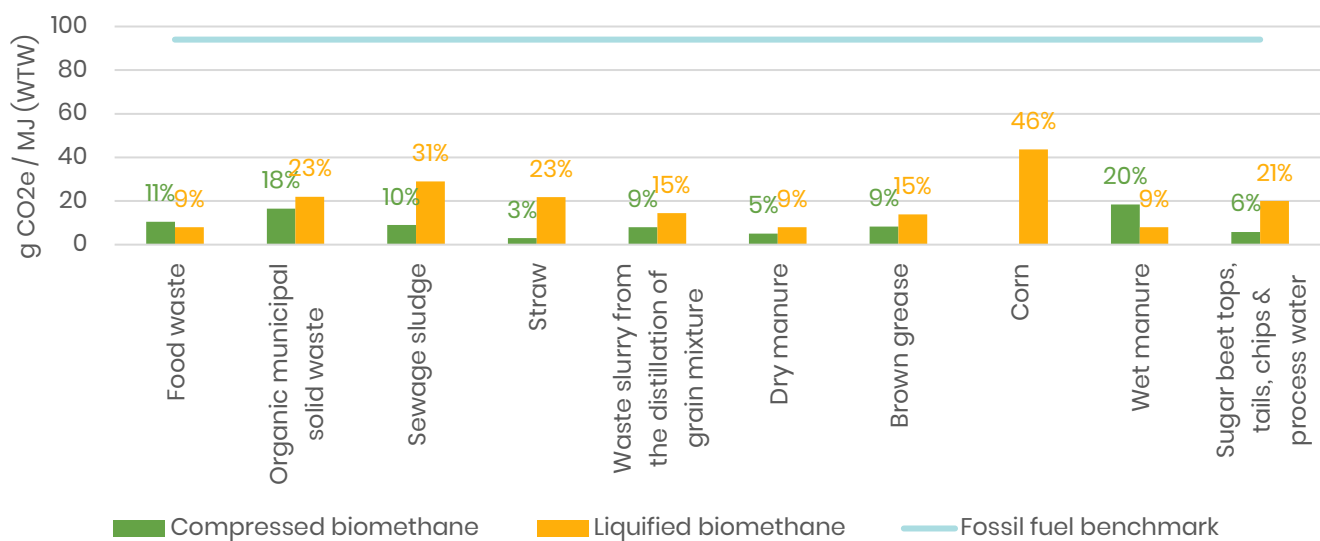
Biomethane is available in two forms:

	Compressed natural gas	Liquefied natural gas
Pressure	2,900 psi (ambient temperature)	145 psi (-162 °C)
Energy density	2.2 kWh / l 12.55 kWh / kg	5.68 kWh / l 12.55 kWh / kg

Greenhouse gas credentials

The greenhouse gas performance of biomethane is strong compared with fossil fuels. The credentials vary depending on the feedstocks used. This is shown below for the 10 most prevalent feedstocks of biomethane [supplied through the RTFO in 2021](#). The worst-performing feedstock in this example was corn-derived liquified biomethane, which is shown to reduce emissions by around half compared with fossil fuels. By contrast, using compressed biomethane derived from straw indicates a saving of around 97% (Figure 2).

Figure 2: Well to wheel emissions intensity for biomethane from feedstocks, RTFO 2021 data



For RTFO reporting, the Department for Transport advises emissions of the fuel in use should be taken as zero. However, the Department for Energy Security and Net Zero (DESNZ) reports Scope 1 emissions for biofuels in its annual conversion factor publications. For more information on scopes, see our guidance on scope emissions reporting.

As the RTFO deems CO₂ tailpipe emissions zero for all biofuels, the low Scope 1 CO₂e figure reported by DESNZ is made up solely of non-CO₂ pollutants such as methane. In DESNZ's 2023 conversion factors, Scope 1 emissions for compressed biomethane are 0.1 g/MJ. This is less than 1% of the [total well to wheel emissions for compressed biomethane of 12.78 g CO₂e/MJ](#).

Air quality credentials

Compressed natural gas (CNG) and liquefied natural gas (LNG) vehicles running on biomethane create tailpipe emissions in the same way as other internal combustion engine (ICE) vehicles. However, they are often reported as emitting fewer PM and NO_x emissions than conventional petrol and diesel vehicles.

Robust and comparable data between diesel or petrol ICE vehicles and CNG or LNG vehicles is limited. If looking for a meaningful comparison, it's important to compare like for like data. This

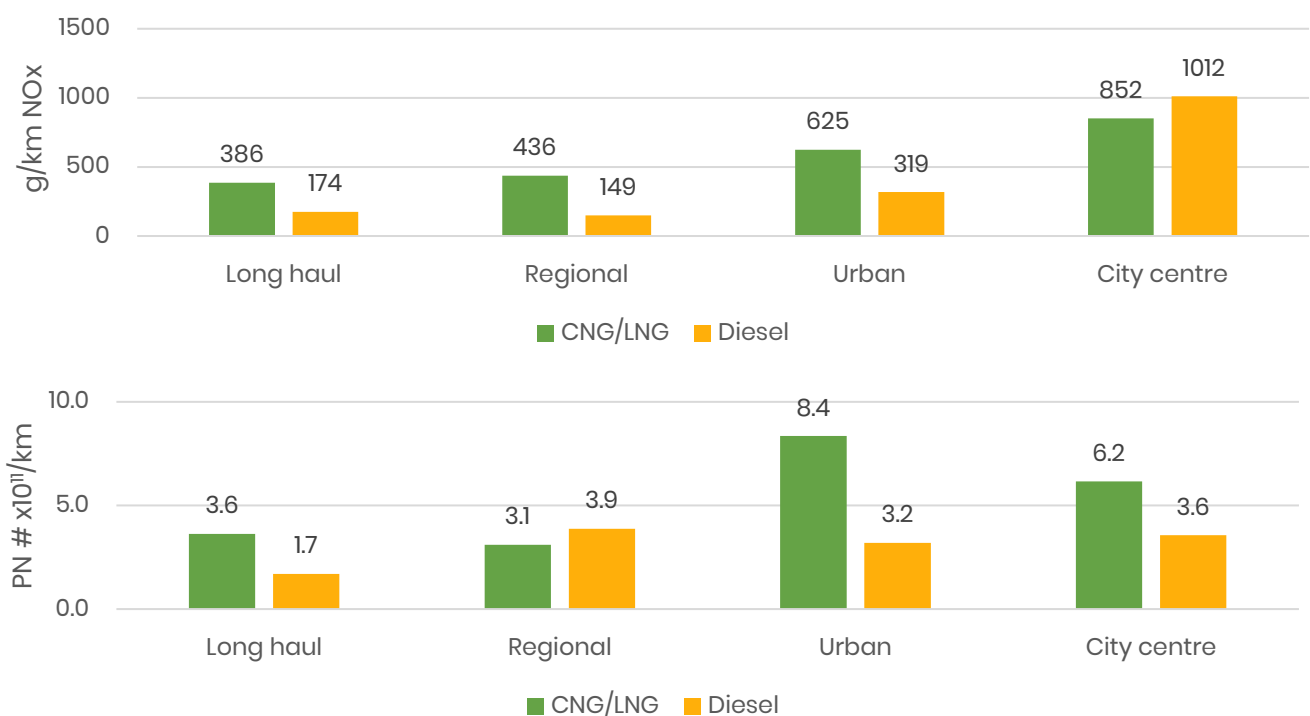
helps to build a representative picture of the relative difference in emissions. For example, a Euro 6 CNG vehicle against a Euro 6 diesel vehicle.

In 2020, TRL published the findings of the [Low Emission Freight and Logistics Trial](#) into real world emissions from biomethane vehicles. The study involved carrying out laboratory tests of varied operational cycles on four CNG and LNG heavy goods vehicles (HGVs) of both spark and compression combustion technologies. The key observation on the air quality performance of both the CNG and LNG vehicles (along with other 'transition technologies') was as follows:

“They all have exhaust emissions and may only have limited complementary air quality benefits over and above the already very effective Euro VI systems. Generally, any such benefits are quite modest relative to Euro VI diesel vehicle emissions and savings in some areas (e.g. NOx) are often accompanied by increases in others (e.g. particulates).”

When the data for the various test scenarios conducted by LowCVP and the other study partners is averaged, CNG and LNG vehicles generally show worse NOx and PM emissions compared with diesel. However, the results varied significantly, which suggests a more comprehensive assessment of relative performance is needed.

Figure 3: Levels of NOx and PN emissions observed from CNG/LNG versus diesel fuels



How is biomethane sold?

There are a range of [commercial CNG fuelling networks in the UK](#), the largest operated by CNG Fuels. Many CNG vehicle fleet operators install fuelling infrastructure at their depots. A [study by Zemo in 2021](#) estimated that 60% of refuelling for CNG HGVs takes place at depots, rather than using public

infrastructure. Public LNG fuelling infrastructure is limited, with only [around 13 LNG fuel stations across the UK](#).

Which vehicles can run on biomethane?

The number of smaller CNG vehicles available has reduced notably in recent years, leaving just the Iveco Daily in the van segment. There are no cars or small- or medium- sized vans available. At the same time, BEVs in these vehicle classes have become increasingly available. The offering of CNG and LNG HGVs remains strong, with a range of vehicles available from many of Europe's largest manufacturers.

Car	Small van	Medium van	Large van	Medium HGV	Large HGV	Bus
			Iveco Daily Hi-Matic Natural Gas (CNG)	Iveco Eurocargo Natural Gas (CNG)	Iveco S-Way Natural Gas (CNG/LNG)	Scania Citywide LF (CNG)
			None currently available from original equipment manufacturers	Mercedes Benz Actros (CNG)	Volvo FM gas-powered (LNG)	
				Volvo FE (CNG)	Scania R & S Series (CNG/LNG)	
				Scania P & G series (CNG/LNG)		

How expensive are biomethane vehicles to buy and run?

Biomethane tends to be cheaper per kWh compared with other transport fuels. This is largely due to how biomethane is taxed. As of April 2024, fuel duty on diesel is 52.95/litre + VAT. On natural gas (and biomethane) it is fixed at 22.57/kg + VAT.

Biomethane vehicles can require up to 20% more energy to run than an equivalent ICE vehicle. This should be considered, as well as the energy's unit price. Gas powered vehicles are also more expensive to buy and service. CNG vehicles are typically around 20% more expensive to buy and 10% more expensive to maintain.

Glossary

Acronym	Stands for	Notes
CNG	Compressed natural gas	Storage pressure of 250 bar.
LNG	Liquefied natural gas	Natural gas (predominantly methane) chilled to -162°C to enable a volumetric energy density around double that of CNG. Storage pressure of 5-10 bar. Same tax treatment as CNG.
RFAS	Renewable Fuels Assurance Scheme	The RFAS is a scheme run by ZEMO. It aims to verify claims made by companies supplying renewable fuels to vehicle operators about their product's greenhouse gas emissions saving performance and the origins of feedstocks used.
RTFO	Renewable Transport Fuel Obligation	The RTFO is a requirement placed on large transport fuel suppliers. It ensures a growing use of renewable transport fuels in the UK transport fuel mix. If a supplier does not supply the required level of renewable fuels, they must buy out of their obligation at 50p per RTFC. Alternatively, they can purchase surplus RTFCs from suppliers who have sold more than they are required to.

Our mission is to address the climate emergency. [Our team of expert fleet consultants can support you](#), wherever you are on your fleet decarbonisation journey. We work with all types of public and private sector fleets, from cars to heavy goods vehicles, providing bespoke advice and training to transition your fleet towards net zero.

