

# TRANSPORT

## BIOMETHANE FUELLING A TRANSPORT REVOLUTION

*Save money while saving the planet*



## FOREWORD



The transport sector is now the largest emitter of greenhouse gas emissions (GHG) in the UK and is also the sector that has made the least progress in reducing GHG emissions since 1990. Not a day goes by without news about how passenger vehicles will become electric or how larger vehicles might run on alternative fuels 10, 15 or 20 years from now.

Not enough focus is placed on “here and now” solutions that can have an immediate and outsize impact on GHG emissions from UK road transport, and consequently very few people are aware of how quickly GHG emissions are today being reduced in the heavy goods vehicle (HGV) sector, and particularly in the long-haul HGV segment.

By the end of 2021, we estimate that 1 – 1.5% of the 130,000 long-haul HGVs in the UK will be running on biomethane from waste feedstocks. This might not seem like a big number, but the HGV fleet running on biomethane has doubled over the past 12 months and we expect the fleet to double again every year going forward.

Depending on the annual mileage, one long-haul HGV can reduce GHG emissions by as much as 170-180 tonnes per annum. This is equivalent to taking 170-180 passenger vehicles off the road for each biomethane-fuelled HGV that replaces one running on diesel and is being achieved today, with existing fuel production and vehicle technologies.

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## FOREWORD CONTINUED

You might ask what is driving the rapid switch from diesel to biomethane fuelled HGVs? The answer is simple; for fleets that have got near-term decarbonisation ambitions, it is the only mass-adoptable fuel and vehicle technology that is available today. There is simply no other economical and technically reliable solution that can be deployed across an entire fleet, that can suit all duty cycles, and that can deliver more than 85% reduction in GHG emissions. Biomethane produced from manure even achieves GHG negative emissions.

Using biomethane as a transport fuel is an immediate “no regrets” option that not only contributes to significant cuts in GHG emissions from HGVs, but also stimulates continued growth in the UK biomethane sector. As the refuelling network expands across the UK, biomethane as a transport fuel will become a win-win solution that is available to all UK hauliers and that continues to reduce the carbon footprint of a sector that has always been seen as very hard to decarbonise.

**Philip Fjeld**  
**CEO CNG-Fuels**



# TRANSPORT – THE UK’S LARGEST EMITTER OF GREENHOUSE GAS EMISSIONS

**No other sector emits more emissions than transport.  
No other sector has decarbonised slower than transport.**

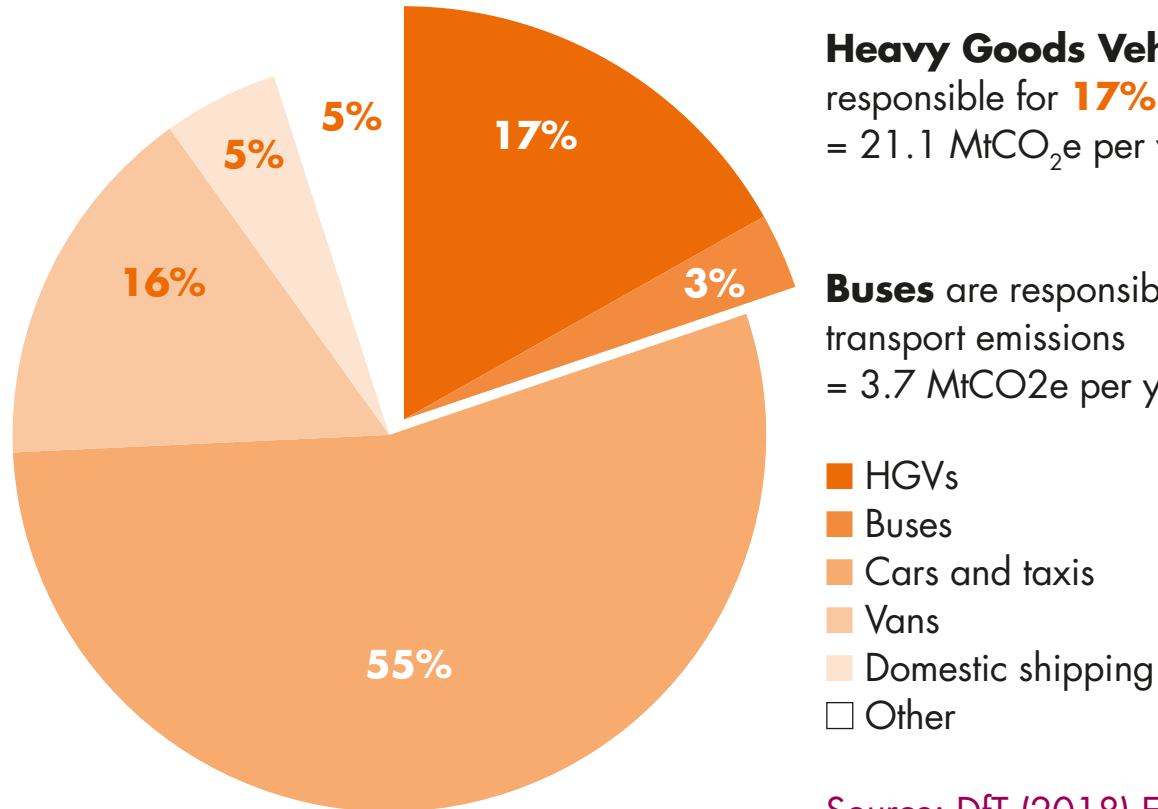
	UK emissions	Emissions reduction since 1990	
<b>TRANSPORT</b>	27%	73%	Other
Energy supply	21%	71%	Waste management
Business	17%	66%	Energy supply
Residential	15%	32%	Business
Agriculture	10%	14%	Residential
Other	5%	13%	Agriculture
Waste management	4%	5%	<b>TRANSPORT</b>

Source: BEIS (2019) UK Greenhouse Gas Emissions



# BREAKDOWN OF TRANSPORT EMISSIONS

## UK emissions by transport mode (2018)



**Heavy Goods Vehicles (HGVs)** are responsible for **17%** of these transport emissions = 21.1 MtCO<sub>2</sub>e per year.

**Buses** are responsible for **3%** of these transport emissions = 3.7 MtCO<sub>2</sub>e per year.

- HGVs
- Buses
- Cars and taxis
- Vans
- Domestic shipping
- Other

Source: DfT (2018) Energy and Environment



## HGVs AND BUSES

There are over **525,000** licensed HGVs operating in the UK (2019).

There are over **157,000** buses and coaches operating in the UK (2019).

**99.5%** of these vehicles are fuelled by diesel.

**96.9%** of these vehicles are fuelled by diesel.



### **Diesel's time is up!**

The sale of new diesel cars and vans is set to be banned from 2030. Heavier road vehicles will be next. The National Infrastructure Commission has recommended a similar ban for all HGVs.



## OPERATING HGVS



An average diesel HGV emits 865g CO<sub>2</sub>e per km driven, increasing to 1,002g CO<sub>2</sub>e per km driven fully laden.

1 km

An HGV may drive up to **200,000km per year**.

At this mileage, a diesel vehicle would emit 173 tonnes CO<sub>2</sub>e – the equivalent annual emissions from 78 cars.



## LOW EMISSIONS ZONES

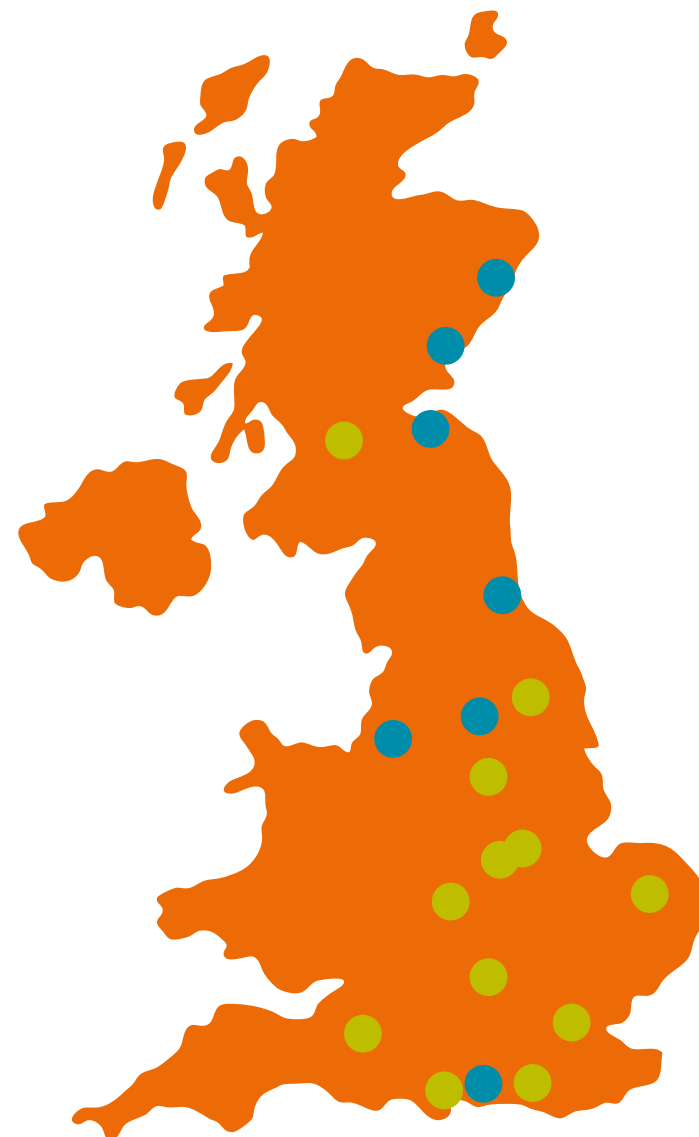
Increasingly UK cities are introducing low emissions zones (LEZs) and clean air zones (CAZs) to tackle greenhouse gas emissions and improve air quality:

### Established:

Bath  
Birmingham  
Brighton  
Derby  
Glasgow  
Leeds  
London  
Norwich  
Nottingham  
Oxford  
Southampton  
York

### Soon to be introduced:

Aberdeen  
Dundee  
Edinburgh  
Manchester  
Newcastle  
Portsmouth  
Sheffield



By 2023, the use of diesel HGVs within all these cities will likely be restricted and/or highly expensive.



## POTENTIAL SOLUTIONS

The use of diesel-fuelled HGVs is becoming increasingly expensive and restricted. The UK government is now considering banning the sale of all new diesel and petrol HGVs by 2030. So, what are the replacement options...

### Electricity

+ **Zero tailpipe emission.**

– **Technological barriers:**

Battery capacity, charge time.

– **Practical barriers:**

New vehicles or major retrofit, impractical to charge overnight. Viability of catenary system limited to certain routes.

– **Sustainability:**

Assumes all electricity is renewably generated.

### Hydrogen

+ **Zero tailpipe emission.**

– **Technological barriers:**

Blue hydrogen and CCUS not yet financially viable, hydrogen difficult to transport and store.

– **Practical barriers:**

Requires a new gas grid nationwide.

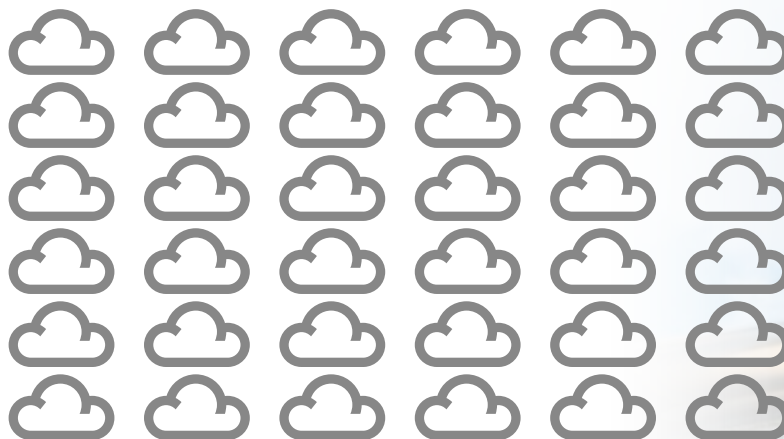
**These technologies are not yet ready for heavier modes of transport. They are unlikely to play a significant role in refuelling long-range HGVs within the next 15-20 years...**



## NEED FOR READY-TO-USE TECHNOLOGIES

The UK needs to decarbonise sectors immediately. We cannot wait for electricity and hydrogen technology to become commercially feasible.

We must immediately deploy the ready-to-use solutions.



Reducing annual emissions by  
**1 tonne CO<sub>2</sub>e in 2021**

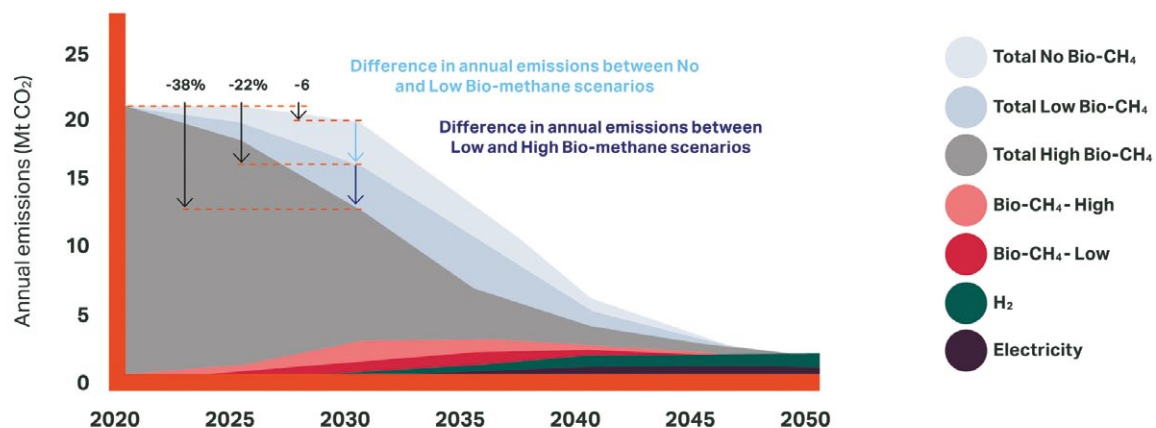
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Reducing annual emissions by  
**30 tonnes CO<sub>2</sub>e in 2050**

**A small change now equates to a significant change later.**

# BIOMETHANE VEHICLES

**Biomethane is a ready-to-use technology, capable of decarbonising transport immediately.**



Findings from a recent Element Energy report (2020): <https://bit.ly/2S2KUyT>

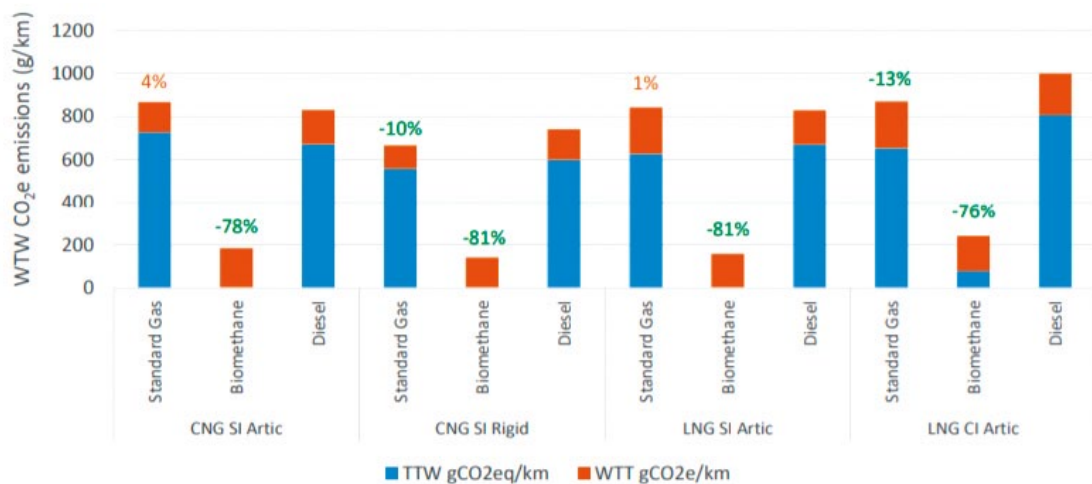
- If we rapidly deploy **biomethane**, emissions from HGVs could be **reduced by 38%** over the next 10 years.
- If we wait for electric/hydrogen trucks to be deployed, emissions would be cut by just 6% over the same period.



# WELL-TO-WHEEL EMISSIONS

Findings from the Low Emission Freight and Logistics Trial (2019):

Fuelling HGVs with biomethane can **cut well-to-wheel emissions by 80% per km driven**, compared to diesel.



Under the updated Renewable Energy Directive (REDII), biomethane produced from certain organic wastes will be recognised for being **carbon negative** – i.e., they will deliver greater than 100% emissions reduction.

## IMPROVING AIR QUALITY

**Transport is responsible for ~33% of NOx emissions and other pollutants. In 2017 alone, the costs of air pollution to the NHS and social care in England were an estimated £157 million.**

Findings from the Low Carbon Vehicle Partnership (2017) on behalf of the Department for Transport:  
<https://bit.ly/3cadViV>

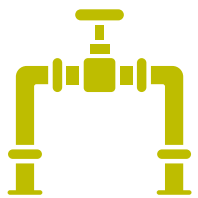
**NOx emissions are 99% lower in Euro VI model dedicated gas vehicles, compared to an equivalent Euro V diesel model.**

## THE PRACTICALITY OF BIOMETHANE



### Supply

Anaerobic digestion (AD) plants recycle organic wastes to generate biomethane and other bio-products. In the UK, there are currently 685 operational AD plants, with a combined capacity to produce over 16.2 TWh of biomethane per year. Biomethane production continues to grow each year.



### Transportation

Biomethane is chemically identical to fossil natural gas, and therefore can be directly injected into national gas grid and transported across the UK and Europe. It is compatible with all existing gas infrastructure.



### Utilisation

There are already over 600 gas-fuelled HGVs operating in the UK – and this number is growing rapidly. Major industry players, such as Asda and John Lewis, have already transitioned from diesel to gas fuelled trucks.

**In 2020, 93% of gas-HGVs and 100% of gas-buses were fuelled with biomethane.**



## ENERGY SUPPLY

Findings from ADBA's *Biomethane – the Pathway to 2030* report (2020): <https://bit.ly/3fVxJZJ>

Currently, the AD industry generates enough biogas to fuel **21% of all HGVs** operating in the UK.

At full potential, whereby all readily-available organic wastes are recycled through AD, an estimated 76 TWh of biomethane could be produced each year – enough to fuel an additional **76% of all HGVs**.

**In total, biomethane could fuel 97% of all HGVs.**

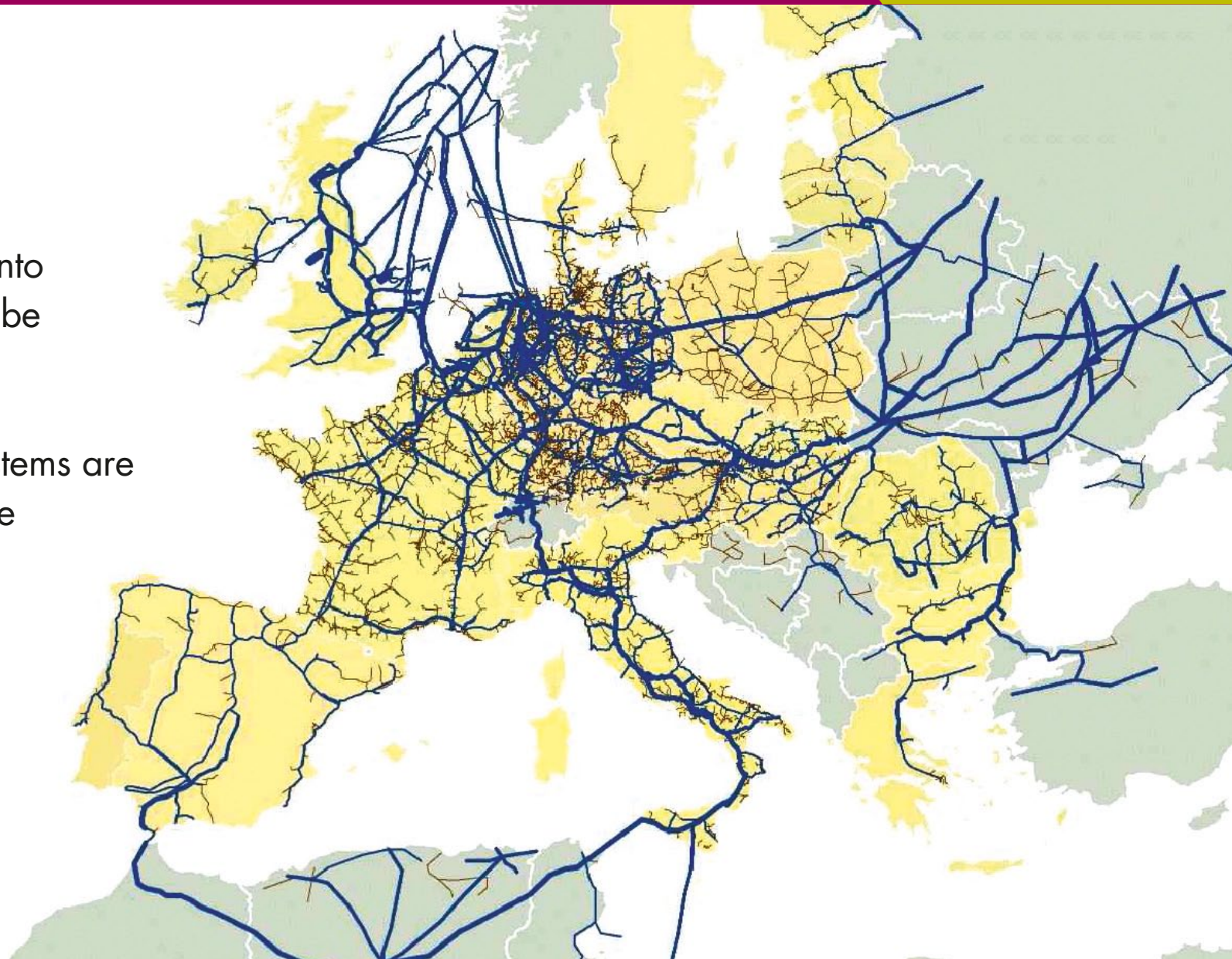
**Much of this biomethane may be carbon negative – actively reversing emissions from the transport sector.**



## ENERGY TRANSPORTATION

Biomethane can act as a direct substitute to fossil natural gas. By injecting biomethane into Europe's extensive gas grid, green gas can be delivered wherever required.

Certification schemes and mass balance systems are commonly deployed across Europe to ensure that biomethane within the grid can effectively be tracked to the end user.









## BIOMETHANE-FUELLED VEHICLES

Biomethane is particularly well suited to decarbonise heavier vehicles, such as HGVs, refuse trucks and buses.

Gas vehicles operate using either:

- **Compressed** natural gas or biomethane (CNG or bio-CNG)
- **Liquified** natural gas or biomethane (LNG or bio-LNG).

	Vehicle Type & Weight	Available Models	Typical HP & Range
Dedicated Gas (CNG & LNG)	 26-44t GVW	Iveco Stralis NP Mercedes Econic Scania P, G and R Volvo F	Up to 460 HP Up to 1,600 km
	 18-26t GVW	Mercedes Econic Scania P Iveco Stralis Volvo F MAN TGM	Up to 460 HP Up to 800 km
	 < 26t GVW	Iveco Daily, Stralis & Eurocargo Mercedes Econic Scania P & G Volvo F MAN TGM	Up to 460 HP Up to 800 km
Dual Fuel	 26-44t GVW	Volvo F LNG	Up to 460 HP Up to 1,000 km

## COST SAVINGS

Using biomethane is not only about saving the planet, it can present fleet operators with **significant cost savings**.

Primarily due to the difference in fuel duty, natural gas is up to **40% cheaper** than diesel.



### **Diesel fuel duty of 57.9p per litre + VAT**

(charged on both product and duty)

These taxes typically represent 60-70% of diesel's pump price.



### **Natural gas fuel duty of 24.70p per kg\* + VAT**

(charged on both product and duty)

Certificates may also be purchased to confirm use of biomethane.

\*Duty rate is fixed until 2032. This additionally supports stable fuel prices.

## RETURN ON INVESTMENT (ROI)

Findings from the Low Emission Freight and Logistics Trail (2020): <https://bit.ly/34y04Pk>

Despite a higher initial capital investment and the typically higher maintenance costs compared to diesel, gas vehicles can provide a **ROI in 2 years with vehicles travelling 160,000 km/year.**

*“Strong business case proven for gas-powered vehicles using RTFO-approved biomethane, for long haul/regional operations.”*

**Low Emissions Freight and Logistics Trail (LEFT) – key findings**



## IMPROVING VEHICLE PERFORMANCE

Compared to diesel, drivers report that gas HGVs are:

- **Quieter**
- **More comfortable to drive**
- **Better engine braking**

Moreover, range can be significantly increased – for example, an LNG HGV's range can be increased by 45% compared to diesel.

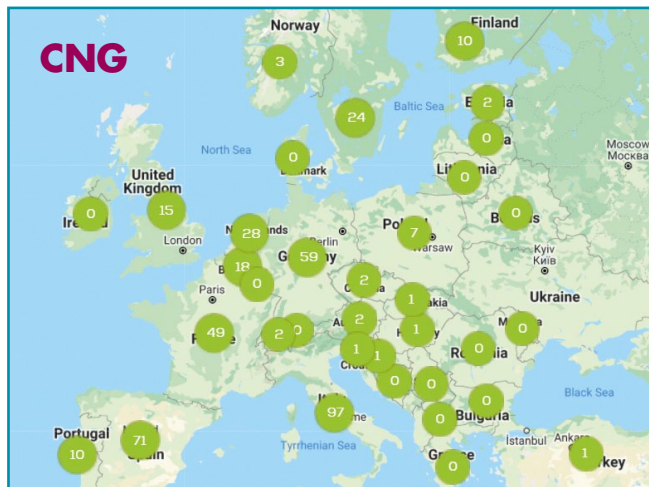
Gas vehicle reliability is similar to diesel comparators.



# GROWING REFUELLING INFRASTRUCTURE

Gas refuelling stations are being developed across the UK and Europe, where fleet operators are increasingly identifying the decarbonisation potential and cost savings offered by gas vehicles.

- In the UK, there are **29 CNG/LNG refuelling stations**.
- In Europe, there are over **4,000 CNG** and **400 LNG** refuelling stations.



Source: (UK) <https://gasvehiclehub.org/> (Europe) <https://ngva.eu>

# FLEET ADVICE TOOL

Cenex have developed the **LoCITY Fleet advice tool** to enable fleet operators to estimate how much money and carbon could be saved with a transition to gas-fuelled vehicles.

<https://bit.ly/3wPgQ8u>

The screenshot displays the LoCITY Fleet Advice Tool interface. On the left is a sidebar with navigation options: OPTIONS, ADVANCED, and START OVER. The main content area is titled 'Diesel Vehicle MPG' and shows a comparison against Euro VI/6 Diesel. A yellow warning box states: 'Although diesel appears viable in some cases, the Mayor of London is working with London boroughs to develop and implement zero emission zones in town centres from 2020 and a zero emission zone in central London from 2025, both of which are likely to place further restrictions on fossil-fuelled vehicles, especially diesel.' Below this, a section for 'Battery Electric Vehicle (Original Equipment Manufacturer)' shows significant benefits: a £50,300 increase (130%) in whole life cost, zero air quality emissions, a 23.4 tonne reduction (100%) in tank-to-wheel CO2 emissions, and a 19.4 tonne reduction (70%) in well-to-wheel CO2 emissions. The maturity level is set to 'High'. Navigation buttons for 'NEW', 'DOWNLOAD', and 'WHAT NEXT' are visible at the bottom.

## CERTIFYING BIOMETHANE USE

Fleet operators wishing to use biomethane, instead of fossil gas from the grid, can do so by purchasing one of two types of certificates:

### 1 Renewable Transport Fuel Certificates (RTFCs)

In 2008, the Department for Transport (DfT) placed an obligation on transport fuel suppliers to source a proportion of their fuel from renewable sources, known as a Renewable Transport Fuel Obligation (RTFO). To meet this obligation, suppliers can purchase RTFCs from producers of renewable transport fuel. For biomethane, 1.9 certificates can be allocated per kg of green gas used to refuel vehicles; this may be doubled to 3.8 certificates per kg if the biomethane is produced from the treatment of wastes/residues.

The price of an RTFC is market driven, principally determined by the differential cost of fossil diesel and used cooking oil. Since Nov 2019, the RTFC index price has largely remained over 25p per certificate. However, up until Jan 2021, suppliers were able to buy out of the obligation at 30p per certificate – effectively placing a ceiling on RTFC price. In a bid to avoid suppliers buying out of the obligation, and therefore losing the scheme's carbon savings, the DfT increased the buy-out to 50p per certificate. Since the start of 2021, the RTFC price has slowly started to rise above 30p/RTFC.

At present, there is a rapidly growing market for biomethane and their RTFCs.

#### For reference

30p/RTFC roughly equates to 4.1 p/kWh  
(or 8.2p/kWh if derived from wastes).

Continued >

## CERTIFYING BIOMETHANE USE

### 2 Biomethane Certificates (BMCs)

Operated by Green Gas Trading (GGT), these certificates enable any company using gas from the grid to purchase biomethane from the producer and therefore claim the carbon savings. Unlike the RTFO, the scheme is not confined only to transport. BMCs have been purchased by domestic energy suppliers and operators of bus fleets alike.

One BMC equals one MWh of biomethane. The value of BMCs are determined by several factors, such as the feedstocks used to produce the gas and therefore the carbon savings on offer. However, they have generally been trading for £5-9/MWh over the last 12 months.

**BMCS**  BIOMETHANE  
CERTIFICATION  
SCHEME

**GGT**  GREEN GAS  
TRADING



## CONCLUSION

### Using biomethane as transport fuel is...

#### Green

- Fuelling heavier vehicles with biomethane offers substantial carbon savings. If wastes are treated, biomethane can be carbon negative – i.e., reducing emissions by greater than 100% compared to diesel.
- The use of biomethane vehicles can also improve air quality, cutting NOx emissions down to negligible levels.

#### Ready to use

- The entire biomethane-to-transport supply chain is ready to use and ready to scale up. The AD industry and its biogas production has grown rapidly over the last 10 years with the development of over 500 new plants.
- Other renewable technologies, such as electricity and hydrogen, are not ready to decarbonise heavier vehicles at scale – at least not for another 15-20 years.

#### Profitable

- Fleet operators are increasingly making the switch to biomethane HGVs, buses and trucks, recognising the cost savings on offer.
- Transitioning to gas vehicles can provide a return on investment in just two years.
- Moreover, drivers prefer gas vehicles, reporting improved vehicle performance.

## CASE STUDIES

**CNG Fuels**

Refuelling gas vehicles

**Air Liquide**

Refuelling gas vehicles

**Asda**

Biomethane HGVs

**Royal Mail**

Biomethane HGVs

**Liverpool City Council**

Biomethane refuse trucks

**Warrens Group**

Biomethane refuse trucks

**Nottingham City Transport**

Biomethane buses



## CNG FUELS



CNG Fuels has more than 20 large public-access refuelling stations either in operation or in development, spread across England, Scotland and Wales. Once all are constructed, the 300-mile return range from these stations will cover the vast majority of Great Britain.

Each station can typically refuel more than 500 trucks per day with 100% renewable and sustainable biomethane fuel. CNG Fuels is the largest biomethane supplier to heavy goods vehicles in the UK.

- **Fast refuelling.** Filling an HGV with compressed biomethane takes just 6-8 minutes.
- **Without compromising range.** An HGV filled with CNG can have a range of up to 600 miles.
- **Verify carbon savings.** Since 2016, 100% of the fuel dispensed at CNG Fuels' Bio-CNG station network has been audited and verified under the Renewable Transport Fuel Obligation (RTFO) scheme, enabling fleet operators to validate the use of biomethane and claim the carbon savings through the government-run scheme.

In December 2020, Foresight Group backed CNG Fuels with £80 million to build a network of stations across the UK. This funding has been in response to the notable increase in demand for biomethane as transport fuel over the last few years. Major UK companies are replacing their diesel HGV fleet with biomethane-fuelled ones.

*"We expect the number of CNG trucks on UK roads to double in 2021 as fleet operators take action to support the government's Net Zero targets."*

**Baden Gowrie-Smith, Chief Financial Officer of CNG Fuels**

### Clients served:

- John Lewis
- ASDA
- Warburtons
- Dixon
- Royal Mail
- Waitrose
- Home Bargains
- Hermes
- Argos
- Cadent



## AIR LIQUIDE – BIOGAS SOLUTIONS UK



Air Liquide has been producing biomethane from organic waste, primarily food waste, since 2015 in the UK. So far, they have developed over 30 installations: 10 production plants taking biogas from the AD of food waste, and a further 20 dispensing 100% biomethane into transport for trucks and buses.

Air Liquide also focusses on opportunities for developing a circular economy, recycling what today are classed as wastes and converting them into resources for the energy transition, to renewable gas in particular. There is a significant opportunity today for biomethane production and deployment in the UK. ADBA has identified a potential 170 million tonnes of organic feedstock that could be converted given the right markets and policy support.

- **Pioneering biomethane to transport.** Air Liquide was the first company to value biogas RTFC's in the UK, working with trade associations and regulatory bodies on all the processes to validate and approve this route. Dedicated professionals in the field ready to work with other producers to value gas in this chain.
- **Production capability.** Technology provider and investor in biogas to biomethane upgrading.
- **Dispensing.** Unique network for trucks and buses with over 20 stations with CNG and LNG capability.
- **Whole chain supply.** Expertise across the whole supply chain from production to dispensing and management of custody of the gas throughout the process in accordance with a complex and changing regulatory environment.

### Technology:

In-house technology to purify Biogas and to recover CO<sub>2</sub>.

### Production:

Portfolio of Production sites for Biomethane including 10 in UK.

### Refuelling:

Network of 20 refuelling stations in the UK and circa 100 in Europe.



## ASDA STORES – HGVS



ASDA Stores Ltd has started to replace its fleet of diesel HGVs with biomethane-fuelled equivalents. The supermarket's gas-fuelled fleet has grown significantly over the last 2-3 years, with their latest order adding over 200 new liquefied natural gas (LNG) trucks.

The transition to biomethane HGVs has been so successful, ASDA now aims to convert their core fleet of 1,000 vehicles to gas by 2024.

- **Improved range.** The longest return trip performed by an ASDA truck is 380 miles. This is comfortably achieved with a quarter tank of biomethane within the Volvo FH LNG.
- **Longer replacement cycle.** Biomethane trucks will remain in service for 12 months longer than their diesel counterparts. ASDA is confident that all their trucks, even those in operation 24/7, will 'go the distance'.
- **Preferred by drivers.** ASDA's drivers have reported gas trucks are smoother and quieter, and their vast range removes any anxiety over refuelling requirements.
- **Low carbon.** Trials demonstrated that switching to biomethane trucks could reduce their carbon emissions by more than 80%.



*"We like to think big, start small, and scale fast – and that's precisely what we've accomplished with this move to biomethane."*

**Sean Clifton, Senior Manager of National Fleets at ASDA**

### Number of biomethane HGVs in fleet:

- Dec 2018 = 2
- Dec 2020 = 253
- 2024 target ≈ 1,000
- May 2020 = 51
- End of 2021 > 500

### Refuelling provider:

Air Liquide and Gasrec, via a combination of on-site and open-access stations.

### Vehicle model:

Volvo FH LNG

## ROYAL MAIL - HGVS



In 2019, Royal Mail added two biomethane-fuelled HGVs to their fleet following highly successful trials. With the aim of decarbonising their UK operations, each truck saved the Royal Mail an estimated 107 tonnes CO<sub>2</sub>e per year. As a result, in May they announced they are to expand their fleet, with an order of 29 additional biomethane HGVs.

Each 40 tonne HGV has a range of up to 400 miles, while cutting greenhouse gas emissions by 84% and particulate matter by 99%, compared to diesel equivalents.

To make best use of existing infrastructure, the Royal Mail is operating their gas fleet in England's northwest. However, bio-CNG refuelling facilities are due to be expanded in locations across the UK in the coming years.

- **Low emission deliveries.** With its largely on-foot final mile delivery model, Royal Mail claims to have the lowest reported CO<sub>2</sub> emissions per parcel among UK delivery companies.
- **Cost effective decarbonisation.** Biomethane HGVs are recognised as ready to use technology capable of tackling heavier modes of transport.

*"Bio-CNG is a significantly more cost-effective and lower carbon alternative fuel to diesel for HGVs. These vehicles enable us to deliver large payloads of parcels in the most environmentally-friendly way possible."*

**James Baker, Chief Engineer and Fleet Director at Royal Mail**

### Fleet:

31 bio-CNG HGVs, fuelled with 100% biomethane.

### Refuelling:

CNG Fuels

### Vehicle model:

Iveco Stralis NP 460  
low emission trucks.



## LIVERPOOL CITY COUNCIL – REFUSE VEHICLES



With a fleet of 20 biomethane-fuelled refuse collection vehicles, Liverpool City Council boasts the UK's largest eco-friendly waste management fleet. The transition to gas trucks attracted an investment of £3.4 million from Liverpool Streetscene Services Ltd (LSSL), a subsidiary of Liverpool City Council.

Three years ahead of schedule, Liverpool is excelling on its decarbonisation targets. Travelling over 240,000 km per year and fuelled using 100% biomethane, this fleet of refuse trucks is helping to deliver these goals.

- **Cleaner air.** The City's CNG vehicles emit 90% less nitrous oxide than previous diesel trucks.
- **Saving money.** Due to the lower fuel duty of gas, refuelling the trucks costs the City Council 35% less, compared to like-for-like diesel vehicles.
- **Better working conditions.** Waste collectors prefer these biomethane trucks, reporting improved air quality, less noise and less vibration. Additionally, the low cab entry improves their ease of use and safety.
- **Reliable.** The trucks display high levels of reliability, requiring minimal downtime.
- **Clean Air Zone compliant.** Like many other cities, the Council and Defra are looking to introduce clean air zones within Liverpool, charging the highest polluting vehicles. By switching to biomethane trucks, Liverpool is demonstrating thought-leadership and showcasing the practical and economic feasibility of transitioning away from diesel fuel.

*"This investment in a new fleet of refuse vehicles is a great statement of intent in our goal to make Liverpool a cleaner and greener city."*

**Joe Anderson, former Mayor of Liverpool**

### Fleet:

20 bio-CNG refuse trucks, fuelled with 100% biomethane.

### Refuelling:

A CNG station was installed at LSSL's waste collection depot.

### Vehicle model:

Mercedes-Benz Econic chassis with Faun Zoeller Variopress 10.5 tonne load capacity



## WARRENS GROUP – REFUSE VEHICLES



As a forward thinking, wholly-owned subsidiary of BioCapital LTD, Warrens Group places AD at the heart of a circular economy for organic wastes. In this circular system, nothing is wasted.

Warrens Group purchased their first two CNG powered waste collection vehicles in 2018. These vehicles were purchased alongside the Warrens Emerald Biogas CNG fuelling station, which takes gas produced in the AD plant. The waste collection vehicles effectively fuel from the material they collect. The ultimate circular project.

- **Food waste is collected from various sources**, such as commercial and retail entities. Organic waste might include effluents from the manufacture of food/drink and used cooking oils.
- **Biomethane-fuelled refuse vehicles transport food waste to Warrens Emerald biogas plant – the North East’s largest anaerobic digestion facility.** This AD plant safely treats the waste, generating 100 GWh of biogas a year and over 100,000 tonnes of renewable biofertiliser (digestate). As the optimal technology for treating food waste, AD also avoids emissions otherwise released when organic waste is sent to landfill or incineration.
- **Biomethane used to refuel Warren Group’s refuse truck fleet.**
- **Excess energy is used to heat and power homes with renewable energy.**
- **Biofertiliser is spread back to land, recycling nutrients and displacing harmful artificial fertilisers.**

### Warrens Emerald biogas plant:

Capacity to treat over 115,000 tonnes of food waste per year.

### Biogas generated:

100 GWh per year.

### Refuelling:

Entire fleet of biomethane-fuelled trucks by 2025, refuelled directly from the AD plant.

### Local energy:

Powering 19,000 homes.





## NOTTINGHAM CITY TRANSPORT – BUSES



One of the earliest adopters of biomethane buses in 2017, Nottingham City Transport (NCTX) now operate the largest fleet of biomethane-fuelled, double decker buses in the world. Nottingham City Transport are working in partnership with Nottingham City Council, Scania, Alexander Dennis and Roadgas, with part funding from OLEV (Office of Low Emission Vehicles), to switch to biomethane buses – representing a total investment of £16.8 million in green transport. NCTX recognise the importance of developing a circular economy to recycle wastes and return the products to the community. Here, food wastes, farm wastes and sewage are treated via anaerobic digestion (AD) to generate the biomethane used to fuel public transport.

- **Save carbon.** NCTX state that switching from diesel to biomethane buses cuts carbon emissions by 84%, estimating that the fleet cuts annual emissions by 8,000 tonnes CO<sub>2</sub>e, compared to diesel.
- **Cleaner air.** Similarly, buses release very low quantities of particulate matter (soot) and hydrocarbons, harmful to human health. The fleet also cuts nitrous oxide emissions by up to 36 tonnes per year.
- **Cost effective.** The increased capital cost of gas buses and refuelling infrastructure are roughly offset by the cheaper cost of gas fuel.
- **Superior to electric alternatives.** Electric buses demonstrated insufficient range and are potentially more expensive. Buses require a range of 350 miles, which could only be delivered, both economically and practically, using biomethane buses.

### Fleet:

120 biomethane buses (CNG)  
+23 new buses by end-2021.

### Refuelling:

'Roadgas' designed and built a refuelling station at Nottingham's Parliament Street Garage.

### Vehicle model:

Enviro400CBG City, developed by Scania and manufactured by Alexander Dennis Limited.



## SPONSORS



### TiApm

TiApm is a worldwide supplier for storage tanks, road tankers and ISO containers for all kind of gases (liquefied, compressed and cryogenics), designed according major international standards.

[www.tiapm.it/](http://www.tiapm.it/)  
[sales@tiapm.it](mailto:sales@tiapm.it)



### Zevon Energy

Zevon Energy specialises in ROC trading and securing market leading Power Purchase Agreements (PPA's) for our clients across GB. We also offer guidance on the RTFO and a platform to trade for RFTC's.

<https://zevonenergy.com/>  
[info@zevonenergy.com](mailto:info@zevonenergy.com)



## FIND OUT MORE

If you are interested in finding out more about ADBA, please contact

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