LowCVP
Low Carbon Vehicle Partnership

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The Low Emission Van Guide

Helping van operators reduce costs and emissions

LowCVP
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The LowCVP, which was established in 2003, is a public-private partnership working to accelerate a sustainable shift to lower carbon vehicles and fuels and create opportunities for UK business. Around 200 organisations are engaged from diverse backgrounds including automotive and fuel supply chains, vehicle users, academics, environment groups and others. LowCVP members have the opportunity to:

- Connect : With privileged access to information, you'll gain insight into low carbon vehicle policy development and into the policy process.
- Collaborate : You'll benefit from many opportunities to work – and network - with key UK and EU government, industry, NGO and other stakeholders.
- Influence : You'll be able to initiate proposals and help to shape future low carbon vehicle policy, programmes and regulations.

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Cenex was established in 2005 as the UK's first Centre of Excellence for Low Carbon and Fuel Cell technologies. Today Cenex operates as an independent not-for-profit consultancy specialising in the delivery of projects, supporting innovation and market development, focused on low carbon vehicles and associated energy infrastructure.

Acknowledgements

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Glossary

BEV	Battery Electric Vehicle
CAZ	Clean Air Zone
CCZ	Congestion Charge Zone
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
DfT	Department for Transport
DNO	Distribution Network Operator
E-REV	Extended Range Electric Vehicle
EU	European Union
EV	Electric Vehicle
FAME	Fatty Acid Methyl Ester
FORS	Fleet Operator Recognition Scheme
FTA	Freight Transport Association
GHG	Greenhouse Gas
GWP	Global Warming Potential
GVW	Gross Vehicle Weight
H_2	Hydrogen
HVO	Hydrogenated (Hydrotreated) Vegetable Oil
kW	Kilowatt
LEZ	Low Emission Zone
LowCVP	Low Carbon Vehicle Partnership
LPG	Liquefied Petroleum Gas
MPG	Miles Per Gallon
NEDC	New European Drive Cycle (Legislative)
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
OEM	Original Equipment Manufacturer
OLEV	Office for Low Emission Vehicles
PHEV	Plug-In Hybrid Electric Vehicle
PIVG	Plug-In Van Grant
PM	Particulate Matter
RDE	Real Driving Emissions
REEV	Range Extended Electric Vehicle
SMMT	Society of Motor Manufacturers and Traders
TTW	Tank to Wheel
ULEZ	Ultra Low Emission Zone
VED	Vehicle Excise Duty
WLC	Whole Life Cost
WLTP	World-harmonised Light vehicle Test Procedure
WTW	Well-to-Wheel
ZEZ	Zero Emission Zone

Contents

Introduction

This guide is intended for fleet managers and procurement practitioners from local authorities and small and medium enterprises (SMEs). The guide provides an overview of low emission vans, alternative fuels and fleet management best practice, and directs you to resources and tools to help you learn more.

There were 4.1 million light goods vehicles licensed in the United Kingdom at the end of Q3 2018[1], a figure which has increased 25% in 10 years. These vehicles are vital to move goods and services around the country. However, vans are responsible for 33% of road transport oxides of nitrogen (NOx) and approximately 19 million tonnes CO_2 per year[2]. This guide will help fleets make the most of their vans, while minimising negative environmental impacts.

The guide explains the range of low emission fuels and technologies on the market and helps you choose the most suitable option for your fleet. The guide:

- Provides information on the low emission van market and government policy.
- Gives van operators the knowledge and resources required to assess which technologies are appropriate for their fleet.
- Explains the benefits and required considerations of low emission fuels and technologies.
- Provides case studies showing the cost savings achievable from low emission fuels and technologies.
- Explains the best practice options to reduce costs and emissions from conventional vehicles.

You can find more about low emission vans on the LowCVP's Low Emission Van Information Hub. You can also use the LoCITY Fleet Advice Tool, developed by Cenex, to compare low emission fuels and technologies based on your own fleet data. See the 'What to do next?' section at the end of this guide for links to these resources.

Disclaimer

Although we have selected specific vehicles to use for our whole life cost calculations, Cenex and LowCVP do not endorse any particular makes and models. Whole life cost calculations are illustrative only; fleets should undertake or commission their own analysis to determine likely financial performance. All facts and figures are correct at the time of writing (March 2019).

Why Choose a Low Emission Van?

The right low emission van saves you money, reduces your environmental impact and helps you win new business.

Better for business

Reducing carbon dioxide (CO_2) emissions from vehicles normally means you are also **spending less money on fuel**.

Low emission vans also help demonstrate environmental commitment and enhance your organisation's image. **Corporate social responsibility** is more important than ever, while your organisation's reputation, in the eyes of the public, customers, suppliers and industry bodies, has never been under greater scrutiny.

Transport for London and many local authorities include performance standards for low emission vans within their **contract tendering** process. Organisations across the UK are following their lead. By operating a low emission van, you will be a step ahead of other bidders. Consumer surveys are pointing in the same direction; people expect governments and businesses to be more ambitious about shifting to low and zero emission vehicles.

Better for air quality and health

Poor air quality is estimated to contribute to up to 36,000 premature deaths a year in the UK[3]. Many UK cities are developing measures to reduce emissions from vehicles. In London, the **Ultra Low Emission Zone (ULEZ)** was launched in April 2019. Diesel vans operating in the zone must meet Euro 6 emissions standards or pay a daily charge. Euro 6 is the latest standard introduced to regulate the level of pollutants released from the tailpipes of light vehicle engines. Euro 6 aims to reduce the levels of harmful emissions including NOx, carbon monoxide and particulate matter (PM).

Other UK cities are introducing measures to improve air quality. Birmingham and Leeds plan to introduce **Clean Air Zones (CAZ)** by 2020, with the former confirmed to include vans. Many more cities are actively exploring options to improve air quality. As the case studies in this guide show, many companies and organisations are already saving money from operating low emission vehicles. Improved vehicle availability and choice – together with the introduction of CAZs – is further **strengthening the case** for acquiring cleaner vehicles. By changing to a low emission van, you may help improve your own health outcomes and will help improve the wellbeing of others.

Better for the environment

We must all take steps to reduce **greenhouse gas (GHG) emissions** (most notably CO_2). The planet's average surface temperature has risen about 1°C since the late 19th century, driven largely by human-made GHG emissions. Most of the warming occurred in the past 35 years and the 20 warmest years on record have all been in the past 22 years. The impacts of long-term global warming are already being felt, for example in sea level rise and coastal flooding, heatwaves, intense precipitation, and ecosystem change. Scientists are clear that to avoid catastrophic changes to human society over the next few decades, we have to stop burning fossil fuels by the end of the 2020s, and preferably sooner. Transport is the largest source of GHG emissions in the UK, so we don't have time to lose, we urgently need to switch to using low emission vehicles.

The UK Government has introduced various measures and incentives to encourage low emission vehicle uptake as part of its 2018 Road to Zero strategy[4]. These are set out in the Grants and Incentives section of this guide. Additional measures may include bringing van **Vehicle Excise Duty (VED)** in line with the CO_2-emissions based bands used for car VED[5]. Government has also set an ambition to end the sale of conventional petrol and diesel cars and vans by 2040.

Better for everyone

Procedures for testing and reporting vans' fuel and emissions performance are improving. The **Worldwide Harmonised Light Vehicle Test Procedure (WLTP)** is a new global regulation for measuring pollutant and CO_2 emissions and energy consumption in light duty vehicles. It replaces the New European Driving Cycle (NEDC) that was used for over 20 years. WLTP uses improved dynamic and robust test procedures, and better reflects real-world driving conditions. It produces results more in keeping with real-world values, improving business and consumer confidence in fuel economy, emissions and electric range values for new vehicles.

WLTP is mandatory for all new cars and car-derived vans from September 2018, and for all new vans from September 2019. Vehicles' actual performance is not affected by the transition to WLTP. However, WLTP will result in a higher g/km CO_2 value for a specific vehicle compared to NEDC because it is **more rigorous and more realistic**. New vans will also be subject to a more stringent compliance regime, known as **Real Driving Emissions (RDE)**. This is an on-road test of pollutant emissions. RDE complements the WLTP laboratory test, ensuring vehicles deliver low emissions over a wide range of driving environments.

Technologies for low emission vans

There are plenty of misconceptions about alternatively fuelled vehicles, but trustworthy information from reliable, independent sources makes it easier for you to **find the best solution for your business**. That's why we've put together this guide. The following page explains the factors to consider when choosing a low emission van or technology, in three categories: operational, financial and environmental. The majority of the guide consists of topic sheets on different fuels and technologies, showing how each performs against these criteria. The topic sheets explain vehicle availability and deployment options and include an example **whole life cost (WLC)** calculation and case study.

[1] DFT VEH01 https://www.gov.uk/government/statistical-data-sets/all-vehicles-veh01
[2] DfT Road to Zero https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/739460/road-to-zero.pdf
[3] COMEAP 2018 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/734799/COMEAP_NO2_Report.pdf
[4] DfT Road to Zero https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/739460/road-to-zero.pdf
[5] Under review by Treasury at the time of writing

Factors to Consider

You can use this guide to undertake an assessment of the suitability of different low emission fuels and technologies for your fleet. The assessment criteria are divided into three categories:

- **Operational:** vehicles must be practical, including having enough range, payload and load volume to meet your needs.
- **Cost:** vehicles should primarily be assessed on a whole life cost basis, though upfront cost and funding mechanism should also be considered.
- **Environment:** vehicles should have clear environmental benefits compared to a conventional diesel model and be compliant with any local regulations.

The criteria are set out in the table below. Symbols introduced here are used throughout the guide to help explain the benefits and drawbacks of each fuel and technology.

Operational	**Range**	Vehicle range requirements will depend on the intended duty cycle, access to recharging and refuelling infrastructure, and dwell time to allow recharging to take place.
	Recharging / refuelling infrastructure	Some vehicles and duty cycles work best with depot-located recharging and refuelling infrastructure. Others will need access to shared or public infrastructure.
	Payload	Many low emission fuels and technologies are only available in certain vehicle classes, so a need to carry a large payload may reduce vehicle choice in some categories. Similarly, needing a large load volume may rule out some options. In conventional diesel vehicles, using smaller and lighter vehicles where appropriate is one of the most effective ways to reduce costs and emissions.
	Load volume	
	Dealer support and servicing	Ensure that in-house or outsourced maintenance and servicing functions are qualified to work on your chosen fuel or technology.
Financial	**Upfront cost**	Many alternatively fuelled vehicles have an upfront price premium compared to a diesel model, which may put additional pressure on budgets.
	Running cost	Most low emission fuels and technologies will save you money in running costs, compared to diesel. With emission zone charges, road tolls and parking potentially differentiated by vehicle types, operational costs are becoming more complex
	Whole life costs	Financial assessment should be based on the total cost of ownership, rather than just upfront or running costs. Typically, savings will be achieved if your annual mileage is high enough to allow the lower running costs to offset the initial investment. This guide provides example whole life cost calculations for all the fuels and technologies discussed.
	Funding mechanism	Higher capital costs, shifting residual values and vehicle availability all influence the decision of whether to purchase or lease.
Environmental	**Pollutant emissions**	Pollutant emissions should be assessed at the tailpipe; CO_2 emissions should be assessed on a well-to-wheel (WTW) basis[6]. You may place greater importance on reducing one or other types of emissions, depending on your organisation's strategic priorities, customer demands, or local regulations.
	CO_2 emissions	
	Noise	Some low emission fuels and technologies can be quieter in operation than a diesel vehicle.
	Local considerations	Local regulations such as Clean Air Zones or Zero Emission Zones may play a role in determining which fuel or technology you select.

[6] **Well-to-wheel emissions include the emissions from producing, transporting and combusting fuel**

Grants and Incentives

The UK Government, local authorities and transport authorities offer a range of grants and incentives to encourage the purchase and operation of low emission vans. Figures are correct at the time of writing.

Grants and incentives for organisations

Incentive	Information	Value
Plug-in van grant (≤ 3.5 tonnes)	Government grant administered by OLEV to support the uptake of plug-in light commercial vehicles (≤ 3.5 tonnes). Grants are applied at the point of purchase, so fleets do not need to apply. Refer to the OLEV website[7] for the latest grant values and eligible vehicles. The Road to Zero strategy, published in 2018, guaranteed the continuation of the van grant until at least 2020, although the grant value is expected to be reviewed in 2019.	**20% of the purchase price of a plug-in van, up to a maximum of £8,000.**
Plug-in van grant (> 3.5 tonnes)	Extension of the plug-in van grant to cover heavy goods vehicles (> 3.5 tonnes). Refer to the OLEV website[8] for the latest grant values and eligible vehicles.	**20% of the purchase price of a plug-in Class N2 or N3 HGV, up to a maximum of £20,000.**
Electric Vehicle Homecharge and Workplace Charging Schemes	Government grants administered by OLEV to support the wider use of electric and hybrid vehicles. Refer to the OLEV website[9] for the latest grant values and eligibility criteria.	**75% off the total capital costs of a chargepoint and associated installation costs, up to a maximum of £500.**
On-street Residential Chargepoint Scheme	A grant administered by OLEV and available to local authorities to provide charging infrastructure to those who don't have access to off-street parking.	**Up to £7,500.**
Vehicle Excise Duty	VED on zero tailpipe emissions vehicles is £0.	**Up to £262.50.**
Enhanced capital allowances	Businesses can claim 100% of the cost of zero emission goods vehicles in the tax year that you buy them. If you pay corporation tax at 19% and buy an electric van for £20,000, your tax bill will be reduced by £3,800. You cannot claim an enhanced capital allowance if you have received the plug-in van grant.	**£3,800 on a £20,000 Purchase**
Fuel duty	The Government provides a preferential rate of duty on cleaner fuels such as CNG and LPG. Electricity and hydrogen are exempt from fuel duty.	**Up to 70% reduction in fuel costs.**
Free or discounted parking	Some cities offer free or discounted parking at public charge points for electric vans.	**Up to £10 per day.**
London Congestion Charge	Vans that emit 75g/km or less of CO_2 are eligible for a 100% discount on the London Congestion Charge. From 8 April 2019, vehicles will also need to meet the Euro 6 emission standard and have a minimum 20 mile zero emission capable range. From 25 October 2021, only pure electric vehicles will be eligible for the 100% discount. The discount will be removed entirely from 2025 for all vehicles.	**£11.50 per day, or £10.50 if using Autopay.**
Scrappage scheme (London only)	The Mayor of London has launched a scrappage scheme for micro businesses and charities driving vehicles in the capital. Grants comprise scrappage payments and contribution towards running costs of an electric vehicle.	**£3,500 for scrapping an eligible vehicle plus £2,500 towards running costs of a replacement electric vehicle.**
Clean Air Zones (including the ULEZ)	Many cities in the UK could introduce a Clean Air Zone, which will require diesel vehicles that do not meet the Euro 6 standard to pay a daily charge. Local incentives may also apply such as local scrappage schemes and free or discounted parking and charging.	**Up to £12.50 per day.**

Incentives for drivers

Van benefit charge	The UK Government value the benefit of using a company van for personal use at £3,350 per year. The driver pays tax on this value. For zero emission vans, the benefit is set at 40% of this value, i.e. £1,340. The differential is being reduced and will reach parity with the full taxable rate in April 2022.	**£402 for a 20% taxpayer.**
Van fuel benefit charge	Similarly, there is a charge of £633 if the company provides free fuel for personal journeys in a conventional vehicle. Zero emission vehicles are exempt from this charge.	**£633 per year.**

[7] https://www.gov.uk/plug-in-car-van-grants, [8] https://www.gov.uk/plug-in-car-van-grants,
[9] https://www.gov.uk/government/collections/government-grants-for-low-emission-vehicles

Topic Sheet 1 Battery Electric Vans

Technology overview

A battery electric vehicle (BEV) stores energy in a battery (usually lithium-ion) and delivers its power to the wheels through an electric motor. Braking energy is captured by the electric motor and stored as electrical energy in the battery.

Vehicle availability

Battery electric vans are a high maturity technology, with products available from a range of major manufacturers (OEMs). Examples of vehicles are:

- **Small vans**: Porter chassis, panel and tipper light duty vehicles
- **Medium vans**: Nissan eNV200, Citroen Berlingo Electric, Peugeot Partner Electric, Renault Kangoo Z.E. Additional products such as the Mercedes-Benz e-Vito are expected to be on the market soon.
- **Large vans**: LDV EV80, Iveco Daily, BD Auto, Renault Master Z.E. More vehicles are expected to be on the market soon including Volkswagen e-Crafter and Mercedes-Benz eSprinter.

Deployment

- **Ideal operation**: BEVs are best suited to city and urban environments. Vehicles are typically returned to their base or depot to recharge, although some organisations allow employees to take them home to recharge. The growing number of fast and rapid public charging stations allows top-up charging during the day. Links to charging station maps are provided in the 'What to do next?' section.
- **Example fleet types**: City courier, light delivery, service engineer, public sector.

Operational

Range:

BEVs have a typical real-world range of up to 150 miles on a single charge, depending on battery capacity. Aggressive driving, carrying heavy payloads, and use of heating and air conditioning will all reduce range.

BEV range testing

Battery electric vans were tested by TfL's LoCITY programme (www.locity.org.uk) and the results are expected to be published soon. A selection of electric vans was tested over a range of representative driving cycles and conditions to better understand range impacts. A summary of results from individual tests is as follows:

Typically, vehicles covered 25% fewer miles on higher speed driving cycles, compared to a city centre environment. This is consistent with the new WLTP based testing regime.

An aggressive driving style reduced city centre range by up to 50%, compared to a sedate driving style.

Running a van with a full payload may decrease the range by up to 30% compared to a lightly loaded van.

Heavy use of cabin heating in cold ambient temperatures can reduce range by up to 25% in city driving.

The LoCITY work will help buyers of new electric vans and they should also look for the new WLTP data to help assess the range performance.

Payload:

The increased GVW allowance on the B category driving licence from 3.5 tonnes to 4.25 tonnes for alternatively fuelled light commercial vehicles may compensate for any lost payload due to the additional weight of the batteries.

Load volume:

Load volume is the same as for an equivalent diesel model.

Recharging:

There are over 11,000 public chargepoint devices (20,000 connectors) in the UK at around 7,000 locations[10], although not all will be suitable for vans due to space and access constraints. BEVs typically take up to 10 hours to recharge from a slow chargepoint, but some models can take an 80% charge in 30 minutes from a rapid chargepoint.

Financial

Upfront cost:

Cost premiums are as little as £2,000 for small panel vans (including the OLEV Plug-in Van Grant), although this rises significantly for larger vehicles.

Running cost:

Electricity is substantially cheaper than diesel on a pence per mile basis. BEVs have fewer moving parts and reduced brake wear due to regenerative braking, so maintenance costs are usually lower as well.

Whole life costs:

Savings can often be achieved at moderate mileages and vehicle lifecycles. Additional incentives such as a 100% discount on London's Congestion Charge can help strengthen the business case.

Environmental

Pollutant emissions:

BEVs produce zero tailpipe emissions, making them ideal for improving air quality in cities.

CO_2 emissions:

They deliver CO_2 savings of 50% to 70% on a WTW basis[11], which accounts for the carbon intensity of electricity production. This benefit will increase as the electricity grid decarbonizes.

Noise:

BEVs are quiet in operation, particularly at low speeds, helping reduce noise in urban environments. Legislation requires Acoustic Vehicle Alerting Systems to be fitted to all new pure electric and plug-in hybrid vehicles to improve the safety of vulnerable road users.

[10] https://www.zap-map.com, [11] Derived from analysis using the LoCITY Fleet Advice Tool of vehicles under different duty cycle conditions

Topic Sheet 1
Battery Electric Vans

Whole Life Cost Example

	Nissan NV200 1.5dCI Acenta 110hp (Diesel)	Nissan e-NV200 Acenta (Electric)
Vehicle cost	*£16,960*	*£27,219*
Plugin van grant discount		*£5,444*
Fuel costs	*£7,686*	*£2,869*
Road tax	*£1,250*	*£0*
Maintenance costs	*£2,730*	*£1,913*
Resale value	*£3,078*	*£4,697*
Life time cost	*£25,549*	*£21,860*
Cost per mile	*£0.341*	*£0.291*
Whole life cost savings		***£3,688***
If used in the London Congestion Zone (5 days/week)		
Life time cost	*£41,799*	*£21,860*
Whole life cost savings		***£19,938***

Vehicle:
2.2t Small panel van

Annual mileage:
15,000 miles (60 miles per day)

Ownership period:
5 years

Emissions:
Tailpipe CO_2 = 100% saving
Well-to-wheel CO_2 = 64% saving

The example shows the economic case for electric vehicles is strong. The plug-in van grant, lower fuel cost, zero road tax, lower maintenance costs and stronger residual value all work together to offer substantial whole life cost savings.

When regional incentives, such as free entry into the London Congestion Charging Zone are included, the whole life savings available become comparable to the purchase cost of the vehicle.

How we calculated the whole life cost and emissions

All Costs exclude VAT. **Purchase Cost** Commercial Fleet Van Running Cost tool. **Fuel Consumption** calculated from LoCITY Fleet Advice Tool. **Fuel Cost** diesel 2018 average @£1.08 per litre, electricity @£0.11 per kWh. **Maintenance Cost** Commercial Fleet Van Running Cost tool. **Resale Value** Commercial Fleet Van Running Cost tool. **Emissions** UK Government fuel emission factors applied to estimated fuel consumption.

Case study: **Leeds City Council**

The Leeds City Council (LCC) van fleet supports departments including property maintenance, highway maintenance, greening, parks, and waste management. LCC has an ambition for all vehicles to operate using an alternative fuel by 2025. It has deployed more than 80 Nissan eNV200 vans and has a further 12 EVs on order.

The Nissan eNV200 was selected as it is a proven product in the market and performed well during trials. The use of EVs has been so successful that LCC now views them as the default option, with diesel vehicles to be provided only where it can be shown that an EV is not suitable. LCC needs to procure an additional 300 vans and intends to acquire EVs in all possible cases.

The council has upskilled its 30 engineers to enable them to work on EVs. Fleet engineers have completed level one City and Guilds training for EVs, which means they can work on the vehicles safely and carry out servicing and maintenance. LCC aims to offer City and Guilds levels two and three so that by the time the warranties expire, they can carry out whatever work is required.

LCC's biggest challenge is ensuring there are enough chargepoints to support these vehicles. It undertook an innovative trial in which drivers took vans home and plugged them in to a domestic chargepoint, with costs paid by the council. Based on the success of this trial, LCC is now poised to roll this out across the fleet supporting the fleet strategy.

LCC continues to act as a flagship authority for deploying EVs and offering advice and guidance to public and private sector organisations.

Next steps Go to the 'What to do next?' section to find links to the LoCITY whole life cost tool, maps of public charging station locations and other resources.

Topic Sheet 2 - Plug-in Hybrid and Extended Range Electric Vehicles

Technology overview

Plug-in hybrid electric vehicles (PHEV) and extended range electric vehicles (E-REV) both have an internal combustion engine as well as a battery and electric motor. PHEVs are parallel hybrids, which means the wheels can be driven by either the combustion engine or the electric motor. E-REVs are series hybrids, so the wheels are always powered by the electric motor and the battery is recharged by the combustion engine. PHEVs and E-REVs offer the practicalities of a conventional van, with a longer total range than a BEV, and many of the benefits of a pure electric vehicle.

Vehicle availability

PHEVs and E-REVs are a medium maturity technology, but supply remains limited. There is only one PHEV eligible for the OLEV plug-in van grant: the Mitsubishi Outlander Commercial. The Ford Transit Custom Plug-in Hybrid (which is strictly an E-REV) is scheduled for volume production in 2019.

Deployment

- **Ideal operation**: PHEVs and E-REVs are best deployed primarily in city and urban environments, with some longer journeys being undertaken. They are less efficient than diesel vehicles at steady high speeds such as motorway driving and can therefore be more expensive on a whole life cost basis if annual mileage is high. The combination of conventional and electric power means they are flexible and can be used on either back-to-base operations or duty cycles where employees take the vehicles home. The Outlander PHEV can be topped up during the day using rapid chargepoints. Links to charging station maps are provided in the 'What to do next?' section.
- **Example fleet types**: City courier, light delivery, service engineer, public sector organisations.

Operational

Range:

The Outlander PHEV and Transit PHEV both have an electric-only range of just over 30 miles. Total range using the internal combustion engine will typically be similar to a conventional petrol or diesel model.

Payload:

The increased GVW allowance on the B category driving licence from 3.5 tonnes to 4.25 tonnes for alternatively fuelled light commercial vehicles may compensate for any lost payload due to the additional weight of the batteries.

Load volume:

Load volume is the same as for an equivalent diesel model.

Recharging / refuelling times:

There are over 11,000 public chargepoint devices (20,000 connectors) in the UK at around 7,000 locations. Charging times for PHEVs and E-REVs are lower than for BEVs because of the smaller battery capacities. PHEVs and E-REVs take around five hours to recharge from a slow chargepoint, but some models can accept an 80% charge in 15 minutes from a rapid chargepoint.

Financial

Upfront cost:

PHEVs and E-REVs may be expected to have a price premium compared to a diesel alternative. This is around 25% in the case of the Outlander, although both versions of this vehicle retail at similar prices once the OLEV plug-in van grant has been applied. Pricing for the Transit PHEV was not available at the time of writing but should be available now on the Ford website.

Running cost:

Electricity is substantially cheaper than diesel on a pence per mile basis, so running costs are highly sensitive to the proportion of miles driven using electric power. Maintenance costs are similar to a petrol or diesel model.

Whole life costs:

Maximising the electric-only mileage is key to achieving whole life cost savings. PHEVs and E-REVs with a minimum 20 mile zero emission capable range are currently eligible for a 100% discount on London's Congestion Charge, though this incentive will be removed in October 2021.

Environmental

Pollutant emissions:

PHEVs and E-REVs produce zero tailpipe emissions when driven in electric-only mode, so they can help improve air quality in cities.

CO_2 emissions:

They can deliver CO_2 savings of up to 50% on a WTW basis, if they are driven wholly on electric mode. This benefit will increase as the electricity grid decarbonizes. In real world use, where the combustion engine is used, CO_2 savings are likely to be lower than this.

Noise:

PHEVs and E-REVs are nearly silent in operation in electric-only mode, particularly at low speeds, helping reduce noise in urban environments.

Topic Sheet 2 - Plug-in Hybrid and Extended Range Electric Vehicles

Whole Life Cost Example

	Mitsubishi Outlander 2.2DI-D Juro (Diesel)	Mitsubishi Outlander Hybrid 4H (PHEV)
Vehicle cost	*£23,816*	*£31,600*
Plugin van grant discount		*£6,320*
Fuel costs	*£3,377*	*£2,769*
Road tax	*£1,000*	*£0*
Maintenance costs	*£1,609*	*£1,634*
Resale value	*£9,904*	*£11,552*
Life time cost	*£19,899*	*£18,131*
Cost per mile	*£0.497*	*£0.453*
Whole life cost savings		***£1,768***
If used in the London Congestion Zone (5 days/week)		
Life time cost	*£32,899*	*£18,131*
Whole life cost savings		***£14,768***

Vehicle:
2.2t PHEV van

Annual mileage:
10,000 miles (40 miles per day)

Ownership period:
4 years

Emissions (when in electric mode):
Tailpipe CO_2 = 100% saving
Well-to-wheel CO_2 = 64% saving

The example shows there are savings available for the PHEV when utilising regional incentives such as free entry into the London Congestion Charging Zone.

In this example the PHEV assumes 1 daily charge, equivalent of 25 miles in electric mode.

Savings will diminish if the vehicle is not fully charged each day and/or more miles are undertaken in petrol mode.

How we calculated the whole life cost and emissions

All Costs exclude VAT. **Purchase Cost** Commercial Fleet Van Running Cost tool. **Fuel Consumption** calculated from LoCITY Fleet Advice Tool. **Fuel Cost** diesel 2018 average @£1.08 per litre, petrol 2018 average @£1.05 per litre, electricity @£0.11 per kWh. **Maintenance Cost** Commercial Fleet Van Running Cost tool. **Resale Value** Commercial Fleet Van Running Cost tool. **Emissions** UK Government fuel emission factors applied to estimated fuel consumption.

Case study: **Transport for London**

The Ford Transit Custom PHEV was deployed in trials with a sample of fleets which integrated the vehicles into their day-to-day operations. An advanced telematics system collected real-time data on the vans' performance in order to understand how the benefits of electrified vehicles could be maximised.

Transport for London was one of the fleets which participated in the trial. Integrating the vehicles into the fleet was relatively straightforward. Drivers were assisted in adjusting their driving style to use the vehicles efficiently and were instructed to plug the vehicle in when not in use.

Drivers were excited to trial the new technology and enjoyed the fact that the vehicles were easy to drive, and quieter and smoother than diesel models. They also appreciated helping to improve London's air quality. The Transit Custom PHEV used in the trial was equipped with geo-fencing technology that switches the vehicle into electric mode when entering the Congestion Charge Zone. This eases the journey by not relying on the driver to make the switch manually, and helps TfL achieve its environmental objectives.

Glenn Jones, Fleet Development Manager for TfL said "the trial showed that the ideal application for this vehicle would be routes that have high journey time inside the Congestion Charge Zone. Returning the vehicle to depot is ideal in our business for vehicles to be recharged and take advantage of the lower operating costs when driving within the zone, as well as the benefits of zero emissions".

At the conclusion of the trial, TfL reported that 34% of the total distance driven was completed on electric power, increasing to 95% within the Congestion Charge Zone.

TfL will feed the results of the trial into its fleet development strategy to continue reducing emissions and improving air quality in the capital.

Next steps Go to the 'What to do next?' section to find links to further resources, the LoCITY whole life cost tool, and maps of public charging station locations.

Topic Sheet 3 - Charging Infrastructure

Choosing the correct charging infrastructure for your fleet and utilising it efficiently will ensure that operational requirements, such as charging speed and the number of vehicles capable of being charged at any given time, are met. The specifications of charging infrastructure should address any electricity supply constraints whilst minimising the cost of installation.

Charging speeds

Estimated charging speeds are provided below, though they vary depending on vehicle battery capacity.

- Slow charging (up to 3kW) is supplied via a three pin socket. This can be used in an emergency, but charging can take well over 12 hours to reach full capacity and is less safe than using a dedicated outlet.
- Standard charging (3.5 to 7kW) can supply a full charge in 11 to 16 hours from a 3.6kW unit or five to eight hours from a 7KW unit.
- Fast Charging (above 7 and below 25kW) typically provides an 80% charge in four to seven hours from a 7kW unit and 1.5 to two hours from a 22kW unit.
- Rapid charging for vans is typically supplied at 50kW via a direct current (DC) which would provide a large electric van with an 80% charge in just under an hour.

Charging connectors

Slow and standard charging is supplied by either a Type 1 or Type 2 alternating current (AC) connector. Vehicles will be supplied with the appropriate lead for connecting to these chargepoints, which are typically installed at residential or workplace sites and on the kerbside.

Fast and rapid charging can be supplied by either AC or direct current (DC). AC rapid charging is always supplied via a Type 2 connector. DC rapid charging has two connector types, depending on the vehicle. Japanese vehicle manufacturers such as Nissan and Mitsubishi use the CHAdeMO connector. European vehicle manufacturers use the Combined Charging System (CCS). Rapid chargepoints have tethered cables for both DC protocols, and usually for AC Type 2 as well

Hardware costs

Power rating has a significant impact on hardware costs. It is therefore crucial to select the appropriate power rating for each location and scenario, considering expected dwell time[12] for each vehicle type and the distance travelled between charges. Indicative costs for standard chargers, excluding installation costs are as follows:

Chargepoint Type	Cost Range[13]
Type 2 3.6kW Wall Mounted	**£300-£500**
Dual Type 2 Wall Mounted 7 kW	**£1,700-2,700**
Dual Ground Mounted 7kW	**£1,700-5,000**
Dual Type 2 Wall Mounted 22kW	**£1,800-4,000**
Dual Type 2 Ground Mounted 22kW	**£3,000-5,000**
Triple outlet 43-50kW, Type 2, CHAdeMO and CCS	**£16,000-30,000**

Procurement and installation guidance

Chargepoint procurement and installation can be planned by applying the 'eight Ps'.

1. **Placement**: Selecting the right location is vital to maximise use of the infrastructure and minimise expenditure. Excavation and cabling costs increase with distance between the electrical supply and the chargepoint site and are generally the most expensive aspects of an installation.
2. **Product**: Determine the type and rate of chargepoint before requesting quotes. Consider the daily mileage that vehicles will need to cover, how frequently they can be recharged and how long they can stop for to recharge.
3. **Power**: the availability of a suitable power supply has a significant impact on charge point placement, price and operation.
4. **Price**: Don't base decisions solely on initial capital outlay. Review the quality and reliability of the hardware and compare costs for servicing and maintenance.
5. **Payment**: If your chargepoints will be available for other individuals or fleets to use, consider how they will pay for their charge, including using Pay As You Go.
6. **Proprietorship**: there are various ownership and operating models available, including own and operate in-house, appoint a third party operator, lease ownership, and concessionaire model.
7. **Project:** Management: Procuring and installing chargepoint infrastructure can be complex and should be managed by a dedicated individual or contracted organisation.
8. **Publicity**: Raise awareness of the availability of chargepoints among potential users, including staff, visitors and contractors, and compatibility with different vehicle types.

Installation costs

Installation costs vary depending on the site, hardware, and ownership model. Detailed site surveys are required to provide accurate quotes. Indicative costs are as follows:

Small upto 70kVa	Medium (200kVa - 1000kVa)	Large above 1000kVa
Number of Charge Points		
1-3 Fast or 1 rapid	10-50 Fast, 4-20 Rapid or 1-6 Ultra-Rapid	50+ Fast, 20+ Rapid or 6+ Ultra-Rapid
Approximate Connection Time		
8-12 Weeks	8-12 Weeks	6 Months +
Approximate Connection Cost		
£1000 - £3000	£4,500 - £75,000	£60,000 - £2 Million
Other Consideration Affecting Cost		
Street work costs	- Street work costs - Legal costs for easement and wayleaves	- Street work costs - Legal costs for easement and wayleaves - Planning permission - Space for a Substation

[12] The amount of time an electric vehicle will remain stationary at a charge point, [13] Variability in costs of a given charger type is due to supplier differences in business model, construction materials, components and component costs.

Topic Sheet 3 - Charging Infrastructure £

Key stakeholders

- **Distribution Network Operators (DNOs)**. DNOs are responsible for ensuring that the local electrical network has the capacity and reliability to meet demand. Increases in customer demand can require the DNO to carry out network upgrades. Costs are passed to the end customer and vary significantly depending on the additional demand required. Engage the DNO early to agree a timescale and allow time to secure funding.
- **Energy suppliers**. Installations may require a new electrical supply point and meter point administration number (MPAN), which is provided by the relevant energy supplier. This is a free service; however, you will need to agree a tariff for the supply point with your energy supplier or add it to an existing tariff. Engage your energy supplier early to avoid delays to the timescale.
- **Landlords**. Landlords' permission should be sought for any charge point installations prior to starting work. This may require updates to legal agreements which can incur costs and will take anywhere from a few weeks to a year.
- **Internal partners**. Effective engagement with internal stakeholders is an essential part of a successful installation. The health and safety team must be consulted as the installation contractor will be subject to their rules and processes, so these must be set out during the procurement process. Ensure you have considered the management sign-off needed and the timescales involved.

For more information please refer to the UK Electric Vehicle Supply Equipment Procurement Guidance[14].

Potential barriers and how to overcome

Barrier	Solution
Your vehicle depot lacks sufficient electrical supply.	Charging multiple vehicles at the same time places a large demand on local electricity network supply, particularly at peak times. Smart charging – the ability for EV supply equipment to control the timing of charging and the power output level in response to a user-defined input or signal – can help manage this demand and offset the need for costly network upgrades. On-site electricity generation and/or electrical storage can also help.
Your vehicle depot doesn't have enough space to install lots of chargepoints.	The range of new BEVs is increasing so they may not need to be charged every day. Analyse individual duty cycles to determine whether charging can be provided at work locations or public rapid chargepoint locations. Alternatively, consider allowing drivers to recharge vehicles at their homes.
Drivers take vehicles home but don't have off-street parking.	Grants of up to £7,500 are available from OLEV for local authorities to provide charging infrastructure to those who don't have access to off-street parking.

Case study: **Gnewt Cargo**

Gnewt Cargo was established as a zero emissions London delivery operation in 2009. It offers a low carbon, pollution-free delivery service to carriers and retailers such as ASOS and UK Mail.

The business was purchased by Menzies Distribution in 2017 and the operation was moved from its Bermondsey depot to the Menzies site in Bow, east London.

Gnewt's early fleet consisted of a mix of electric bikes, quadricycles, and a handful of small electric vehicles. Today, it operates more than 70 electric vans, posing significant challenges for charging infrastructure. The Bow site has a limited electricity supply to charge 70 vehicles at the same time, and network upgrades would be costly.

EO Charging was commissioned to propose a solution. It has installed a mix of 60 7kW and 22kW chargepoints supported by two EO Hubs which provide 'smart' control of charging. This allows power to be allocated to individual vehicles to minimise demand on the grid and ensure vehicles are always topped up when needed. The driver doesn't need to do anything other than park and plug in the vehicle.

Sam Clarke, founder of Gnewt Cargo said: "Our smart chargers manage the overall charge input into the vehicles such that it does not exceed a set maximum level and ensures that all the vans are fully charged overnight and ready to use the next day."

The smart charging system has not led to any safety-related issues or concerns and continues to help Gnewt save money and reduce emissions.

Next steps Go to the 'What to do next?' section to find links to the UK EVSE Procurement Guide and other UK EVSE documents, and a best practice guide to charging infrastructure published by the Energy Saving Trust.

[14] http://ukevse.org.uk/resources/procurement-guidance/

Topic Sheet 4 - Liquefied Petroleum Gas and BioLPG

Technology overview

Liquefied petroleum gas (LPG) is a fossil fuel extracted alongside natural gas and is also a by-product of oil refining. LPG is stored on vehicles under pressure as a liquid and combusted in spark ignited engines to power the vehicle. BioLPG is a new renewable fuel that is chemically identical to LPG but created from renewable feedstocks. It is a 'drop-in' fuel, which means it can be used in the same way as standard LPG.

Vehicle availability

LPG is a high maturity technology. However, although LPG vehicles are supplied by mainstream manufacturers in continental Europe, there are none currently available in the UK. Petrol vans can be converted to run on LPG by an installer approved by UKLPG. Diesel vans would need to have a petrol engine fitted in place of the compression ignition unit.

Deployment

- **Ideal operation:** LPG vehicles are versatile and can be used on mixed duty cycles with city, suburban and motorway driving environments. They can be used in situations where vehicles are returned to base or taken home by drivers, as they usually rely on public rather than depot-based refuelling. Back to base LPG refuelling facilities can be installed where required and can dispense bioLPG.
- **Example fleet types:** City and long distance courier, delivery, service engineer, local authority and emergency services support vehicles.

Infrastructure

- **Refuelling times**: Refuelling a vehicle with LPG is similar to refuelling with petrol or diesel and takes no additional time.
- **Refuelling locations**: There are around 1,500 LPG refuelling stations in the UK, most of which are on conventional fuel forecourts.

Operational

Range:

LPG powered vehicles can undertake similar duties to conventional vehicles due to the long range available between refuelling events. Vehicles can be operated on petrol if LPG refuelling is not available.

Payload:

Payload is marginally reduced due to the additional weight of the LPG tanks.

Load volume:

Load space is normally not affected as the LPG tanks are usually mounted in the spare wheel cavity.

Warranties:

An additional third party warranty may be needed for an LPG vehicle, as the conversion process may invalidate the original warranty. Check with the LPG conversion company to see what warranty they can offer.

Utilisation:

Consider where the vehicle will be used and any restrictions in place. For example, LPG vehicles are not permitted to access some car parks or to use the Eurotunnel.

Financial

Upfront cost:

Retrofit LPG van conversion costs start from around £1,500 for petrol vehicles, and around £8,000 for diesel vehicles.

Running cost:

LPG is less efficient than diesel, so more litres of fuel are consumed per mile. However, LPG is cheaper at the pump due to a preferential rate of fuel duty, making it cheaper than diesel on a pence per mile basis.

Whole life costs:

whole life cost savings can be achieved with petrol conversions if enough miles are driven to payback the initial capital cost. Payback on diesel conversions is typically only possible in specialised, high value, high mileage vehicles.

Environmental

Pollutant emissions:

NOx and PM emissions are similar to those for petrol vehicles. Accredited LPG retrofit systems typically have slightly lower emissions than Euro 6 diesel and are significantly cleaner than older diesel engines[15]. It's important to check that converted vehicles will comply with CAZ and ULEZ requirements.

CO_2 emissions:

LPG vehicles offer similar CO_2 emissions compared to diesel vehicles and improved CO_2 emissions compared to petrol vans. Vehicles using bioLPG can achieve WTW CO_2 savings of up to 86%, compared with fossil diesel[16].

Noise:

LPG vehicles use the same engine technology as petrol vehicles and therefore have comparable noise emissions.

[15] [16] Element Energy: The scope for petrol and LPG vans in the UK, 2018

Topic Sheet 4 - Liquefied Petroleum Gas and BioLPG

Whole Life Cost Example

	Vauxhall Combo 1.4i 95PS (petrol)	Vauxhall Combo 1.4i 95PS (LPG)
Vehicle cost	*£15,423*	*£15,423*
LPG Conversion		*£1,250*
Fuel costs	*£13,579*	*£9,823*
Road tax	*£1,250*	*£1,250*
Maintenance costs	*£3,460*	*£3,835*
Resale value	*£903*	*£903*
Life time cost	*£32,809*	*£30,803*
Cost per mile	*£0.328*	*£0.308*
Whole life cost savings		***£2,006***

Vehicle:
2.0t Small panel van

Annual mileage:
20,000 miles (80 miles per day)

Ownership period:
5 years

Emissions:
Tailpipe CO_2 = 14% saving
Well-to-wheel CO_2 = 20% saving

In this example the fuel savings from using LPG recoup the cost of the system and the additional maintenance costs (£60 per 12,000 miles).

LPG conversions provide whole life cost savings when compared to petrol vehicles and similar whole life costs when compared to diesel vehicles, with the advantage of better air quality and lower noise performance.

How we calculated the whole life cost and emissions

All Costs exclude VAT. **Purchase Cost** Commercial Fleet Van Running Cost tool. **Fuel Consumption** calculated from LoCITY Fleet Advice Tool. **Fuel Cost** petrol 2018 average @£1.05 per litre, LPG 2018 average @£0.53 per litre. **Maintenance Cost** Commercial Fleet Van Running Cost tool. **Resale Value** Commercial Fleet Van Running Cost tool. **Emissions** UK Government fuel emission factors applied to estimated fuel consumption.

Case study: **Isle of Anglesey Council**

Isle of Anglesey County Council's fleet department faces a range of challenges and pressures familiar to many local authorities, including tight budgets and the need to improve environmental performance.

The council reviewed alternatives to diesel and concluded that LPG could help achieve both financial and environmental objectives. They have been using LPG for over 10 years, and currently run a fleet of 86 LPG cars and light duty vans, and estimate they are saving an average of £1,000 per vehicle per year, compared to diesel.

Gareth Owens, Fleet Manager for the council, said: "LPG works, it saves money and is environmentally friendly".

Anglesey Council maintains and services their vehicles in an on-site workshop. The team are trained to service LPG systems, meaning they can keep the fleet moving with limited VOR (Vehicle Off Road) time. Coupled with their on-site LPG refuelling tanks, the fleet is self-sufficient and continuing to grow.

Under Gareth's continued efforts, Anglesey Council is demonstrating that running a fleet of LPG vehicles can be cost effective and environmentally beneficial. Gareth aims to increase the number of LPG vehicles in the fleet, ideally replacing larger diesel vans if LPG options become available.

Next steps Go to the 'What to do next?' section to find details of UKLPG, the national LPG trade association, which hosts a map of refuelling infrastructure.

Topic Sheet 5 - Compressed Natural Gas and Biomethane

Technology overview

Natural gas is predominantly methane and is the same fuel used by central heating boilers and cookers in the UK. It is a clean burning fuel, with lower levels of pollutant and GHG emissions than conventional mineral fuels. Compressed Natural Gas (CNG) is stored on vehicles in pressurised cylinders at 200 to 250 bar and consumed via a dedicated gas engine. Biomethane is an ultra-low carbon variant of CNG from 100% renewable and sustainable organic material. It is chemically identical to CNG and can be used in vehicles in the same way.

Vehicle availability

CNG is a high maturity technology, particularly for larger commercial vehicles, but supply of vans remains limited. The only van available in the UK from a major manufacturer is the Iveco Daily large panel van. Porter supplies CNG chassis, panel and tipper light duty vehicles in left hand drive only.

Deployment

- **Ideal operation**: CNG vehicles are versatile and can be used on mixed duty cycles with city, suburban and motorway driving environments. They are usually deployed on back to base operations, but other options can be considered depending on the local availability of refuelling infrastructure. A high annual mileage is generally required to achieve payback.
- **Example fleet types**: City and long distance courier, delivery, service engineer, local authority.

Infrastructure

- **Refuelling times**: Refuelling times are similar to diesel when the gas is stored at the refuelling station ready to be dispensed to a vehicle. Overnight slow filling options exist where gas is directly fuelled into the vehicle tanks from the natural gas mains.
- **Refuelling locations**: Installing and operating a depot-based refuelling station is expensive. This typically limits applications to large fleets, vehicles with high fuel consumption (such as refuse collection vehicles), or fleets which can share a facility. The UK's public CNG refuelling infrastructure is limited at present but is expected to increase over the next few years.

Operational

Range:

The Iveco Daily has a range of up to 310 miles, making it practical for many commercial vehicle duty cycles.

Payload:

The increased GVW allowance on the B category driving licence from 3.5 tonnes to 4.25 tonnes for alternatively fuelled light commercial vehicles may compensate for any lost payload due to the additional weight of the fuel tanks.

Load volume:

Vehicles should have the same load volume as an equivalent diesel.

Financial

Upfront cost:

Gas vans attract a price premium of around £3,000 to £5,000 compared to a diesel equivalent.

Running costs:

The cost of gas is cheaper than diesel on a pence per mile basis, primarily due to a preferential rate of fuel duty.

Whole life costs:

The additional capital cost of a gas vehicle can be repaid through lower running costs if annual and lifecycle mileage is high enough.

Environmental

Pollutant emissions:

Methane burns much cleaner than diesel, producing very low PM and NOx emissions, without the need for complex emission aftertreatment systems. LowCVP testing suggests that dedicated gas vehicles are cleanest on steady-speed duty cycles (NOx emissions can be 41% lower in dedicated gas vehicles than an equivalent Euro VI model) but are broadly similar to Euro 6/VI in lower speed urban or city operations. It's important to check that vehicles will comply with CAZ and ULEZ requirements.

CO_2 emissions:

Standard CNG can reduce carbon emissions by up to around 5% compared to diesel in motorway operation but is unlikely to have benefits in city centre driving[17]. This saving can increase to 90% or more for biomethane, on a WTW basis, depending on the feedstock used to generate the biomethane.

Noise:

Vehicle manufacturers claim that CNG vehicles are quieter than diesel models, but this hasn't been independently verified.

[17] DfT Emissions Testing of Gas-Powered Commercial Vehicles https://assets publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/581859/emissions-testing-of-gas-powered-commercial-vehicles.pdf

Topic Sheet 5 - Compressed Natural Gas and Biomethane

Whole Life Cost Example

	Iveco Daily Euro 6 RDE Hi-MATIC (Diesel)	Iveco Daily Natural Power Hi-MATIC (CNG)
Vehicle cost	*£28,000*	*£33,500*
Fuel costs	*£26,637*	*£16,820*
Road tax	*£1,500*	*£1,500*
Maintenance costs	*£7,005*	*£7,770*
Resale value	*£5,095*	*£3,455*
Life time cost	*£58,047*	*£56,135*
Cost per mile	*£0.387*	*£0.374*
Whole life cost savings		***£1,912***

Vehicle:
3.5t CNG Large Panel Van

Annual mileage:
25,000 miles (100 miles per day)

Ownership period:
6 years

Emissions:
Tailpipe CO_2 = 5% saving
Well-to-wheel CO_2 = 5% saving
(up to 80% for biomethane)

The cost example opposite shows that the additional purchase cost of a CNG Iveco covering 25,000 miles per annum saves the operator over £2000 on a whole life cost basis over 6 years.

The price of CNG varies significantly between suppliers. Availability of low cost CNG coupled with high annual mileage are key factors in achieving an overall whole life cost saving.

How we calculated the whole life cost and emissions

All Costs exclude VAT. **Purchase Cost** Commercial Fleet Van Running Cost tool. **Fuel Consumption** calculated from LoCITY Fleet Advice Tool. **Fuel Cost** diesel 2018 average @£1.08 per litre, gas @ 0.70£/kg from CNG Fuels public filling station. **Maintenance Cost** Commercial Fleet Van Running Cost tool. **Resale Value** Commercial Fleet Van Running Cost tool. **Emissions** UK Government fuel emission factors applied to estimated fuel consumption.

Case study: **Northern Gas Networks**

Northern Gas Networks (NGN), the gas distributor for the North, trialled two CNG-fuelled vans in their fleet from 2016 to 2017. Exploring cleaner, greener fuels to reduce the environmental impact of its fleet is a major focus for NGN, as the UK looks towards a low carbon energy future.

Vehicles were deployed in everyday use, covering 30,000 miles in total. Analysis by Cenex found that CO_2 emissions performance was likely to be similar to that of a diesel van, ranging from -7% to +10% depending on the vehicle type and operating cycle. A step-change in performance is achievable if 100% biomethane is used, resulting in CO_2 savings of up to 87% on a WTW basis.

NGN refuelled its gas vehicles using a nearby local authority CNG refuelling facility. On average, vehicles needed to be refuelled once every two days, reflecting the daily mileage range requirement of between 100 and 150 miles.

No major reliability or operational issues were reported regarding the gas vehicles on the trial. From a practical perspective, there is potential for further deployment of gas-powered vehicles in the NGN fleet. However, this depends on further reductions in the cost of the vehicles and/or fuel.

Next steps Go to the 'What to do next?' section to find a link to the Gas Vehicle Hub, which hosts a map of the UK's gas infrastructure and latest information about vehicle availability.

Topic Sheet 6 - High Blend Biodiesel

Technology overview

Biodiesel is produced from renewable feedstocks such as waste plant products or used cooking oil and is a low carbon, sustainable alternative to mineral diesel. Biodiesel blended at low levels is already available at many diesel pumps; fuel suppliers can blend up to 7% biodiesel with conventional diesel and later in 2019 all diesel fuel pumps will be labelled as B7. So-called B7 is compatible with any diesel-fuelled commercial vehicle.

There are two primary types of biodiesel available for use in higher blends for road transport:

- **Paraffinic fuels**, for example Hydrotreated Vegetable Oil (HVO) or Gas to Liquid (GTL), are chemically very similar to forecourt diesel and as such are approved by a growing number of vehicle OEMs for use at blend levels up to 100% under standard maintenance and warranty conditions. Renewable paraffinic fuel such as HVO is often known as green diesel.
- **Fatty Acid Methyl Ester (FAME)** is the most common biodiesel but at higher than B7 blends will require special fuel storage, vehicle compatibility and maintenance arrangements and as such is not warrantied for use at blends above 7% by all OEMs.

These fuels are not available on forecourts but can be supplied for use in fuel bunkers. Increasing the proportion of HVO or FAME decreases WTW CO_2 emissions.

Vehicle availability

HVO and FAME may be used in place of diesel in a conventional vehicle, although you must check the impact on warranty and maintenance requirement, particularly for high blends of FAME such as B30.

Deployment

- **Ideal operation**: High blend biodiesel provides significant WTW CO_2 savings and some limited air quality benefits. Therefore, it is ideal for use on mixed use and motorway duty cycles, where other alternative fuels are less efficient. It should be used in a back to base operation, because of the lack of public/retail refuelling availability.
- **Example fleet types**: City and long distance courier, delivery, service engineer, local authority.

Infrastructure

- **Refuelling times**: Refuelling methods and times are the same for conventional diesel and biodiesel.
- **Refuelling locations**: Blends above 7% are not available from fuel forecourts. Biodiesel suppliers can provide higher blends for dispensation at your depot.

Operational

Range:

The range is the same whether the vehicle is run on conventional diesel or biodiesel

Payload:

Payload is not impacted.

Load volume:

Load volume is not impacted.

Warranties:

HVO can usually be used as a direct replacement or “drop in fuel” for conventional diesel without any impact on maintenance or warranty, though you should always check with the vehicle manufacturer first. High blends of FAME can only be used in a limited range of vehicles. PSA Group warrant high pressure diesel injection engines to run on FAME blends of up to B30 (30% blend) but only with special service schedules and only in captive fleets. Mercedes and Iveco warrant various higher strength blends depending on the vehicle model. Fuels must meet the following standards: EN15490 for HVO, EN16709 for B20/B30, and EN14214 for 100% FAME.

Servicing:

Where OEMs warranty higher blends of FAME, they are likely to require special service schedules.

Financial

Upfront cost:

There is no additional cost premium for the vehicle. Higher blends of biodiesel are typically slightly more expensive per litre than conventional diesel.

Running cost:

HVO combustion is similar to conventional diesel, so consumption in miles per gallon are broadly the same. Servicing and warranty costs may increase when FAME is used and, due to its lower energy content, a small increase in fuel consumption (3% for B30) is expected. Currently, HVO is significantly more expensive than diesel, so it is unlikely to be used in large quantities without government subsidies; in addition, there are issues with constrained supply of this fuel.

Whole life costs:

High blend biodiesel is typically slightly more expensive than conventional diesel on a whole life cost basis.

Environmental

Pollutant emissions:

Biodiesel combustion is similar to conventional diesel, so tailpipe emissions will be very similar. There is emerging evidence that, in heavy goods vehicles (HGVs), HVO can offer some air quality benefits compared to conventional diesel. However, there is no clear evidence that this also applies to vans.

CO_2 emissions:

Biodiesel use can offer significant reductions in carbon emissions depending on what it’s made from. Although tailpipe emissions are unaffected, B30 from used cooking oil can provide WTW CO_2 reductions up to around 28%.

Noise:

Noise levels are similar to conventional diesel.

Topic Sheet 6 - High Blend Biodiesel

Whole Life Cost Example

	Peugeot Partner L1 1.6BlueHDi 100HP (Diesel)	Peugeot Partner L1 1.6BlueHDi 100HP (Biodiesel B30)
Vehicle cost	*£16,868*	*£16,868*
Fuel costs	*£7,638*	*£7,821*
Road tax	*£1,250*	*£1,250*
Maintenance costs	*£2,805*	*£3,105*
Resale value	*£2,851*	*£2,851*
Life time cost	*£25,711*	*£26,194*
Cost per mile	*£0.343*	*£0.349*
Whole life cost savings		***-£483***

Vehicle:
2.0t Small panel van

Annual mileage:
15,000 miles (60 miles per day)

Ownership period:
5 years

Emissions:
Tailpipe CO_2 = 0% saving
Well-to-wheel CO_2 = 27% saving

It is possible to purchase biodiesel for the same price as regular diesel however an investment in infractructure of between £5k-£100k would be needed for fuel tanks if the fuel is not bought from the nozzle. Biodiesel also has a lower energy content than regular diesel so mpg is reduced.

Biodiesel vehicles are comparable in price to run vs regular diesel however savings in CO_2 emissions are large. The B30 blend that has been used in the example saves 27% on CO_2 over the full fuel cycle however using a B100 blend will save up to 88%.

How we calculated the whole life cost and emissions

All Costs exclude VAT. **Purchase Cost** Commercial Fleet Van Running Cost tool. **Fuel Consumption** calculated from LoCITY Fleet Advice Tool. **Fuel Cost** diesel 2018 average @£1.08 per litre, biodiesel B100 price match against diesel @£1.08 per litre. **Maintenance Cost** Commercial Fleet Van Running Cost tool. **Resale Value** Commercial Fleet Van Running Cost tool. **Emissions** UK Government fuel emission factors applied to estimated fuel consumption.

Case study: **London Borough of Hackney**

At just over 470 vehicles, London Borough of Hackney (LBH) operates one of the largest local authority fleets in London of which approximately 270 are light commercial vehicles. The LBH fleet used FAME biodiesel in blends of up to 100% for several years, saving hundreds of tonnes of CO_2. LBH specified that the fuel must be made without animal fats as they can solidify in very cold temperatures.

More recently, LBH has trialled HVO. As it is made from waste oils, it offers lifecycle CO_2 emissions savings of up to 80% compared to conventional diesel. Testing undertaken by Millbrook Proving Ground found NOx reductions at the tailpipe of 69% and 28% in multi-drop and refuse collection operations respectively, compared to Euro VI diesel. The fuel has also performed well from an operational point of view.

LBH's Corporate Fleet Manager Norman Harding said: "we're very committed to reducing emissions from our fleet operations. Electric vehicle technology is not quite there yet for larger vehicles, so we intend to continue to use high blend renewable fuels wherever possible".

Based on the positive results from the emissions analysis, and success of the in-service testing, LBH will shortly be undertaking a procurement exercise for bulk HVO supply. LBH's pioneering work on biodiesel helped the council win the Energy Saving Trust Fleet Hero Award in 2018.

Next steps Go to the 'What to do next?' section to find a link to the Greater London Authority's Mayor's Biodiesel Programme resources.

Topic Sheet 7 - Hydrogen Fuel Cell and Dual Fuel H_2

Technology overview

When managed correctly, hydrogen is a safe, clean burning energy source which can offer significant WTW carbon emissions benefits. It is stored on vehicles in compressed hydrogen cylinders and can be used to power a vehicle in one of two ways:

- Fuel cell vehicles use hydrogen fuel cells to top up a battery which powers an electric motor. For vans, this option is currently only used as a range extender on electric vehicles, which can be refuelled with hydrogen and recharged from a chargepoint.
- Dual fuel systems mix and combust hydrogen and diesel in a compression ignition engine.

Vehicle availability

There are no hydrogen fuel cell or dual fuel vans available from major manufacturers. Retrofit suppliers include Symbio FCell for fuel cells and ULEMCo for dual fuel systems.

Deployment

- **Ideal operation**: Fuel cell systems are ideal for urban operations where the air quality benefits are greatest. Dual fuel systems provide both air quality and CO_2 benefits, so can be used on a wide range of duty cycles. Access to refuelling infrastructure is critical to making hydrogen work as a road transport fuel.
- **Example fleet types**: City courier, delivery, service engineer

Infrastructure

- **Refuelling times**: Hydrogen refuelling takes a similar amount of time to that of a conventional diesel or petrol vehicle.
- **Refuelling locations**: Across the UK there are 13 publicly accessible hydrogen refuelling locations (at the time of writing). The network of refuelling infrastructure provision is growing with more stations expected to open in 2019.

Operational

Range:

Range depends on the technology used, the size of hydrogen tanks specified, and the degree of substitution of hydrogen for diesel or electricity. Dual fuel vehicles will have a similar total range to a conventional diesel model. Fuel cell range extenders have a range of around 200 miles, depending on the base vehicle range.

Payload:

Payload is reduced by around 10% due to the additional weight of the hydrogen tanks, though this is offset by the increased GVW allowance on the B category driving licence from 3.5 tonnes to 4.25 tonnes for alternatively fuelled light commercial vehicles.

Load volume:

Most systems can be installed without affecting the load volume, though some fuel cell range extenders have the hydrogen tanks fitted in the load space.

Safety:

Hydrogen is a very light gas and therefore any leaks vent quickly to the atmosphere, rather than pooling on the ground like a liquid fuel. This makes it relative safe as an energy source, though additional safety arrangements may be needed for vehicle workshops or other enclosed spaces.

Financial

Upfront cost:

Retrofit costs can be 100% or more of the cost of the base vehicle.

Running cost:

Hydrogen costs around £10 per kilogramme. Running costs are typically slightly higher than diesel on a pence per mile basis. Some in-service incentives are available, such as a 100% discount on the London Congestion Charge for fuel cell vehicles, or exemption from ULEZ fees for eligible dual fuel vehicles.

Whole life costs:

Hydrogen vehicles are generally more expensive than petrol or diesel on a whole life cost basis, although costs are expected to reduce as the technology matures. Hydrogen has a role to play in reducing transport's environmental impact, and as such the UK Government and the EU offer funded demonstration activity in which fleets can get involved.

Environmental

Pollutant emissions:

Hydrogen fuel cell systems emit only water vapour so there are no pollutant emissions. By displacing some diesel with cleaner-burning hydrogen in a dual-fuel system, pollutant emissions may also be reduced.

CO_2 emissions:

Hydrogen fuel cell systems emit only water vapour so there are no tailpipe CO_2 emissions. For both systems, WTW CO_2 emissions vary significantly depending on the hydrogen manufacturing process. Savings of up to 50% can be achieved if hydrogen is made using renewable energy but emissions are comparable to diesel or worse where grid electricity is used[18].

Noise:

Fuel cell vehicles are very quiet in operation, similar to electric vehicles. Dual fuel vehicles have comparable noise levels to diesel models.

[18] Cenex analysis using Committee on Climate Change and Defra figures plus real-world trial data from Hytrec2 vehicles

Topic Sheet 7 - Hydrogen Fuel Cell and Dual Fuel H_2

Whole Life Cost Example £

	Kangoo 1.5dCi ENERGY 90PS (Diesel)	Kangoo Maxi ZE Crew (BEV with SymbioFCell hydrogen fuel cell range extender)
Vehicle cost	*£16,760*	*£49,951*
Plugin van grant discount		*£4,358*
Fuel costs	*£14,177*	*£8,194*
Road tax	*£1,750*	*£0*
Maintenance costs	*£5,964*	*£4,991*
Resale value	*£1,270*	*£1,270*
Life time cost	*£37,382*	*£57,508*
Cost per mile	*£0.267*	*£0.411*
Whole life cost savings		***NA***
If used in the London Congestion Zone (5 days/week)		
Life time cost	*£60,132*	*£57,508*
Whole life cost savings		***£2,623***

Vehicle:
2.2t Hydrogen fuel cell range extended EV van

Annual mileage:
20,000 miles (80 miles per day)

Ownership period:
7 years

Emissions:
Tailpipe CO_2 = 100% saving

Well-to-wheel CO_2 = variable, depending on hydrogen manufacture and vehicle technology

The example shows a saving is available from the fuel cell range extended battery electric van. The plug-in van grant, EU grant and daily free entry into the London Congestion Charging Zone combine to offer a positive total cost of ownership. In this example the vehicle covers 70 miles per day using electricity stored in the battery through normal charging and 10 miles per day using electricity generated on-board from the hydrogen range extender. The range extender allows the whole capacity of the EV battery to be used every day, taking full advantage of low cost grid electricity.

Because the cost of hydrogen from refuelling stations is currently high, cost savings will diminish if more miles are driven using the on-board hydrogen fuel cell.

How we calculated the whole life cost and emissions

All Costs exclude VAT. **Purchase Cost** Commercial Fleet Van Running Cost tool. **Fuel Consumption** manufacturer's literature with a 20% real-world small van uplift factor applied for EV, fuel cell consumption from manufacturers data. **Fuel Cost** diesel 2018 average @£1.08 per litre, electricity @£0.11 per kWh, Hydrogen @ £10 per kg. **Maintenance Cost** Commercial Fleet Van Running Cost tool + £225 per annum for range extender. **Resale Value** Commercial Fleet Van Running Cost tool + £2,250 buy back guarantee from SymbioFCell.

Case study: **Yorkshire Ambulance Service**

Yorkshire Ambulance Service (YAS) has signed the Clean Van Commitment, aiming to reduce emissions for vehicles under 3.5 tonnes to zero by 2028. To help achieve this target, YAS operates both dual fuel and fuel cell range extender hydrogen vehicles.

YAS procured a retrofit dual fuel patient transport vehicle, supported by an OLEV grant. The Peugeot Boxer runs on hydrogen mixed with diesel, using H2ICED® technology from specialist converter ULEMCo. Around 35 to 45% of the vehicle's energy comes from hydrogen, giving the equivalent saving in tailpipe CO_2 emissions. The vehicle has been in the fleet since early 2018 and is working well, with no reported operational or reliability issues.

YAS has also procured two hydrogen electric range extender vans. The Renault Kangoo ZEs were converted by Arcola Symbio and can be run on electric or mixed hydrogen and electric power. The vehicles produce zero emissions at the tailpipe, so they are ideal for operating in areas with poor air quality.

Alexis Percival, Environmental and Sustainability Manager for YAS says the key to integrating these vehicles into the fleet has been employee engagement and training. This is particularly complex where two new technologies are involved, so drivers need to be trained on driving and refuelling with electricity and hydrogen. Overall, drivers have accepted the vehicles and have adapted to the new requirements.

YAS now plans to design a hydrogen electric powered front line ambulance as part of their ongoing commitment to environmental improvement.

Next steps Go to the 'What to do next?' section to find a link to ZapMap, which includes hydrogen refuelling station locations.

Van Fleet Best Practice

Lowering emissions from your van fleet doesn't necessarily mean using alternative fuels. There are measures you can implement to significantly reduce costs and emissions from your conventionally fuelled commercial vehicles. Fleet management best practice can be broken down into three areas:

- Acquire clean, efficient vehicles.
- Drive and manage your vehicles efficiently.
- Drive less.

Drive clean, efficient vehicles	**Procure clean, efficient vehicles**	Specify the right size vehicle for the job need and duty cycle. This can often mean downsizing from the vehicle being replaced and operating a fleet with a mix of vehicle types and sizes. Within the selected vehicle class, compare CO_2 and mpg figures to identify the most efficient models. All new vehicles sold in the UK will meet the latest Euro 6 emissions standard, meaning they are compliant with forthcoming CAZ and ULEZ requirements.
	'Eco' technology	Consider specifying stop-start technology on vans operating in congested, urban environments. These systems cut out the engine when stationary to reduce fuel consumption and emissions. Rev limiters can also be effective in these conditions. Vehicles that are driven primarily on motorways and A roads should be fitted with speed limiters, which can pay for themselves in reduced fuel costs. Driving at 60 miles per hour uses 17% less fuel than driving at 70 miles per hour[19].
	Vehicle maintenance	Well maintained vehicles run efficiently. For example, a 20% drop in tyre pressure can increase fuel consumption by 2%. A blocked diesel particulate filter can increase pollutant emissions and will lead to the vehicle failing its MOT.
Drive and manage vehicles efficiently	**Fleet benchmarking**	Getting an accurate baseline of your fleet's performance, and then tracking improvements, is critical to reducing costs and emissions. Schemes such as the Freight Transport Association's Van Excellence, the Fleet Operator Recognition Scheme, and EcoStars can help you benchmark your fleet and learn from other organisations. Visit the Freight Portal[20] to find links to these schemes
	Fuel management	Measuring your fleet's fuel consumption is the first step to driving reductions. Consider appointing a 'Fuel Champion' to monitor individual vehicle mpg and implement fuel efficiency improvements.
	Reduce weight	Specify lightweight racking if required, and ensure unnecessary tools and equipment are removed from vans. A 150kg reduction in weight in a typical diesel van improves fuel consumption by 3%.
	Driver behaviour	Provide in-cab driver training, which can improve mpg on the day of training by around 15%. This should be supported by careful monitoring of fuel and mileage data, with league tables and incentives to encourage efficient driving. Driver aids such as Ashwoods Lightfoot provide real time visual and audible feedback to the driver, delivering efficiency improvements of between 10% and 20%.
Drive less	**Route planning**	Route planning software or free online maps can be used to plan the best route between destinations, helping eliminate unnecessary mileage and often include traffic monitoring.
	Share	It may be possible for vehicles and journeys to be shared, for example if you have several employees attending the same site.
	Mode shift	Consider whether employees could use public transport, cargo cycles or electrically assisted bikes for some of their journeys.

Next steps Go to the 'What to do next?' section to find links to LowCVP's Low Emission Van Hub, the Energy saving Trust Transport Advice website, and LoCITY reports and resources.

The key to fleet management is that you can't evaluate and improve performance without collecting and analysing data. Fuel cards and telematics form the basis of a good fleet management approach, with reports used to target and monitor interventions.

[19] Cenex Fleet Carbon Reduction Tool, [20] https://thefreightportal.org/

Summary Matrix

The differences between the low emission van technologies discussed in this guide are summarised in the table below.

Key: ✓ Better than Diesel ∼ Similar to Diesel ✗ Worse than Diesel

<table>
<tr><th></th><th>BEV</th><th>PHEV</th><th>LPG / BioLPG</th><th>CNG / biomethane</th><th>HVO / FAME</th><th>Hydrogen</th></tr>
<tr><td rowspan="2">Whole life cost</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>∼</td><td rowspan="2">✗
Depends on grant funding</td></tr>
<tr><td colspan="4">Cost improvements dependent on annual mileage and ownership period</td><td>Small WLC increase</td></tr>
<tr><td rowspan="2">Financial incentives</td><td colspan="2">Vehicle and infrastructure funding. 100% London Congestion Charge discount.</td><td rowspan="2">Reduced fuel duty rate</td><td rowspan="2">Reduced fuel duty rate</td><td rowspan="2">None</td><td rowspan="2">No fuel duty applied to hydrogen</td></tr>
<tr><td>Enhanced capital allowance OR plug-in van grant. No fuel duty and £0 VED</td><td>No fuel duty on electricity</td></tr>
<tr><td>Market status</td><td>Widely available</td><td>Increasing availability</td><td>Conversions only</td><td>Limited availability</td><td>Some models warrantied for HVO use</td><td>Conversions only</td></tr>
<tr><td>Ideal operating location</td><td>City and urban environments</td><td>City and urban environments, some longer journeys</td><td colspan="2">Mixed duty cycles with city, suburban and motorway driving environments</td><td>Mixed use and motorway duty cycles</td><td>City and urban environments</td></tr>
<tr><td>Ideal refuelling location</td><td colspan="2">Depot, drivers' homes or public charging</td><td colspan="2">Primarily using public refuelling stations; depot-based refuelling can be provided</td><td>Depot-based</td><td>Primarily using public refuelling stations; depot-based refuelling can be provided</td></tr>
<tr><td>Example use</td><td>City courier, light delivery, service engineer, public sector</td><td>City courier, light delivery, service engineer, public sector</td><td colspan="3">City and long distance courier, delivery, service engineer, local authority and emergency services</td><td>City courier, light delivery, service engineer, public sector</td></tr>
<tr><td>Range between refuelling</td><td>Up to 150 miles</td><td>Around 30 miles on electric power</td><td colspan="2">∼
Around 300 miles</td><td>✓
As per a conventional vehicle</td><td>150 to 200 miles on hydrogen (technology dependent)</td></tr>
<tr><td>Payload impact</td><td>None</td><td>None</td><td>None</td><td>None</td><td>∼
Marginal reduction</td><td>∼
Marginal reduction</td></tr>
<tr><td>Refuelling considerations</td><td colspan="2">Increasing network of public chargers. Time to recharge is vehicle dependent</td><td>Widespread public infrastructure</td><td>Limited public infrastructure</td><td>No public infrastructure</td><td>Limited public infrastructure</td></tr>
<tr><td>Fuel lifecycle CO_2 emissions</td><td>✓
Up to 70% reduction</td><td>✓
Up to 70% reduction when in EV mode</td><td>✓
Similar to diesel. Substantial savings for BioLPG</td><td>✓
Similar to diesel. Substantial savings for BioCNG</td><td>✓
Substantial savings depending on feedstock</td><td>Depends on proportion of hydrogen consumed in relation to diesel or electricity</td></tr>
<tr><td rowspan="2">Air quality emissions</td><td rowspan="2">✓
Zero emissions</td><td rowspan="2">✓
Zero emissions in EV mode</td><td colspan="2">✓
Good for air quality emissions</td><td>∼
Similar to diesel</td><td>✓
Good for air quality emissions, depending on technology</td></tr>
<tr><td colspan="4">Check for compliance with CAZ and ULEZ standards</td></tr>
<tr><td>Ultra Low Emission Vehicle status</td><td>Yes</td><td>Yes</td><td>No</td><td>No</td><td>No</td><td>Yes (fuel cell)</td></tr>
</table>

What to do Next?

Use these resources to carry out your own research on your chosen fuels, then contact your dealer or a manufacturer to arrange a vehicle trial.

General Advice and Calculator Tools	
The Low Emission Van Hub on the LowCVP website provides advice for operators looking to make the switch to low emission vans.	**www.lowcvp.org.uk/Hubs/lev.htm**
The free-to-use LoCITY Fleet Advice Tool provides guidance on the economic and environmental performance of low emission technologies.	**fleetadvicetool.cenex.co.uk**
Van Chooser allows users to find a vehicle that meets their criteria and has the best fuel economy and lowest CO_2 emissions.	**www.vanchooser.net**
The Commercial Fleet tool has list prices and running costs for most vans on the market.	**www.commercialfleet.org/tools/van/running-costs**
Official UK Government factors for converting your fuel use into carbon emissions.	**www.ukconversionfactorscarbonsmart.co.uk**
UK government database of official CO_2 and fuel consumption data.	**https://www.gov.uk/CO_2-and-vehicle-tax-tools**
Battery Electric and Plug-in Hybrid Electric	
Zap Map shows public access chargepoints, vehicle model availability and chargepoint provider.	**www.zap-map.com**
The Go Ultra Low web site provides information about switching to ultra low emission vehicles and vehicle availability.	**www.goultralow.com**
The Office for Low Emission Vehicles (OLEV) provides a list of vans that are eligible for the Plug-in Van Grant.	**www.gov.uk/government/publications/plug-in-van-grant**
UKEVSE, the electric vehicle supply equipment association, provide a guide to siting, procuring and installing chargepoints.	**www.ukevse.org.uk**
Energy Saving Trust has published a best practice guide aimed at helping fleets understand the different aspects of charging infrastructure.	**www.energysavingtrust.org.uk**
LPG	
The trade association for the LPG industry in the UK.	**https://www.uklpg.org/**
Drive LPG provides advice and information about converting to LPG including a list of approved installers.	**www.drivelpg.co.uk**

CNG	
The Gas Vehicle Hub provides impartial information about the costs and benefits of operating gas vehicles and hosts an up-to-date map of the UK's gas refuelling infrastructure.	**www.gasvehiclehub.co.uk**
Biodiesel	
Greater London Authority: Mayor's Biodiesel Programme.	**www.london.gov.uk/biodiesel**
Hydrogen	
Maps showing the location of UK (and global) hydrogen filling stations, with supporting information.	**www.zap-map.com** **http://www.netinform.net/H2**
Fleet Advice and Best Practice	
The Freight Portal has resources to help fleets become more sustainable, and signposts fleet support schemes.	**https://thefreightportal.org**
Van Excellence is a Freight Transport Association scheme which recognises excellence and improves operational standards.	**http://www.vanexcellence.co.uk**
The Energy Saving Trust Fleet Advice programme offers information and advice to fleets in England and Wales.	**www.energysavingtrust.org.uk/transport**
Fleet Operator Recognition Scheme is a voluntary accreditation scheme for fleet operators with a focus on safety, efficiency, and the environment.	**www.fors-online.org.uk**

The information and advice given is based on public domain sources, data supplied by companies, in-house knowledge and analysis, and engagement with stakeholders. While the information is provided in good faith, the ideas and analysis presented in this guide report must be subject to further investigation, and account for factors not presented here. The authors disclaim liability for any investment decisions made based on this guide.

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The LowCVP, which was established in 2003, is a public-private partnership working to accelerate a sustainable shift to lower carbon vehicles and fuels and create opportunities for UK business. Around 200 organisations are engaged from diverse backgrounds including automotive and fuel supply chains, vehicle users, academics, environment groups and others. LowCVP members have the opportunity to:

- Connect : With privileged access to information, you'll gain insight into low carbon vehicle policy development and into the policy process.
- Collaborate : You'll benefit from many opportunities to work – and network - with key UK and EU government, industry, NGO and other stakeholders.
- Influence : You'll be able to initiate proposals and help to shape future low carbon vehicle policy, programmes and regulations.

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Cenex was established in 2005 as the UK's first Centre of Excellence for Low Carbon and Fuel Cell technologies. Today Cenex operates as an independent not-for-profit consultancy specialising in the delivery of projects, supporting innovation and market development, focused on low carbon vehicles and associated energy infrastructure.

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