

Guide to Depot Charging of Electric Heavy Goods Vehicles



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Introduction

Electric heavy goods vehicles for decarbonization

All freight and logistics organizations, suppliers and customers are required to decarbonize. For fleet operators, this means replacing diesel heavy goods vehicles (HGVs), which currently contribute around a fifth of the UK's CO₂ emissions. The UK government has therefore introduced end-of-sale dates for new diesel HGVs, being 2035 (below 26 tonnes) and 2040 (above 26 tonnes).

Low-emission vehicles based on a limited supply of alternative fuels are a short-term interim solution.

The leading zero-emission vehicles are battery-electric HGVs, referred to in this guide as eHGVs. Alongside decarbonization of the UK's energy supply sector, these will provide zero-emission fleet operations.

Major vehicle original equipment manufacturers (OEMs) have launched first-generation electric HGV products in all gross vehicle weight (GVW) classes and are expanding production. In general, forecasts expect that all HGVs operating in the UK will be electric before 2050.

Hydrogen is often mentioned and solutions are still being developed, but are outside the scope of this guidance. It is yet to be seen if major vehicle OEMs will launch hydrogen HGV products or if widespread supply of green hydrogen (i.e. hydrogen produced using zero-carbon energy) will become available within the time frames required.

Importance of planning

Owning and operating eHGVs and their associated charging infrastructure are not the same as owning and operating diesel HGVs and their associated refuelling infrastructure. The economic calculations for eHGVs are different. Therefore, in these early days for eHGVs, as freight and logistics industry familiarity grows, fleet operators need careful planning to avoid financial and operational pitfalls.

It is never too early to start long-term planning. A gradual introduction of eHGVs into fleets and charging infrastructure into depots, with a reinforced electricity network connection, will be easier to achieve than an overnight conversion. This means a plan to cover the transition from the first eHGV to a full fleet (which would typically cover a period of around 5-15 years), and early dialogue with suppliers and distribution network operators. It is predicted that between 80 % and 90 % of eHGV charging will take place at depots, so depot-based charging infrastructure is integral to this planning.

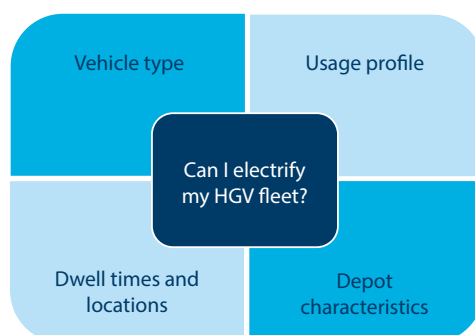
Through robust planning, the whole-life costs for owning and operating eHGVs and their associated charging infrastructure will be lower than owning and operating diesel HGVs and their associated refueling infrastructure.

The landscape is changing, but fleet operators cannot delay plans and decisions to wait and see. On one hand, some costs will reduce with time, but on the other hand, some investments will rise or need to be amortized over shorter periods, while financial incentives will only be available to early adopters.

If you haven't started planning, now is the time to do it.

Introduction

Key considerations



Intended readership

This guidance introduces the main aspects of depot electrification, as well as exploring the key technical and financial aspects in detail. It is a reference to help all organizations concerned with fleet electrification.

For large fleet operators already implementing fleet electrification, this guidance should confirm their current activities and help internal stakeholders across departments gain a wider understanding of the electrification transition.

For medium-sized fleet operators yet to embark on fleet electrification, this guidance provides initial signposting and raises awareness. It also signals the new knowledge a fleet operator must gain for this transition.

For consultants already providing electrification advice to fleet operators, this guidance should act as a baseline reference.

Document map

Section	Description
1 Overview	Provides an introduction to all areas.
1.1 Tackling the climate emergency	Introduction to the pressing need for decarbonization of HGVs, the role of eHGVs and wider decarbonization options to be considered.
1.2 The eHGV market	Overview of the developing market for eHGVs, comparative vehicle costs and example models from vehicle suppliers.
1.3 Zero-emissions strategy and business case	Importance of a decarbonization strategy alongside a broader business strategy and recognition that sizable investments involved require a robust business case underpinned by detailed analysis.
1.4 Stakeholders	Introduction to the wide range of stakeholder organizations involved in fleet electrification, for example, vehicle and equipment suppliers, customers, other operators, local authorities, energy suppliers and network operators, data/technology suppliers.
1.5 Policies and standards	Introduction to end-of-sale dates for non-zero emission HGVs, grants, demonstration programmes and standards.

Introduction

Document map cont.

Section	Description
1.6 UK charging landscape	Introduction to charging infrastructure locations and initial considerations, covering private depot-based and publicly accessible.
2 Charging solutions	Covers technical aspects in more detail.
2.1 Approach	High-level overview of all factors (technical and financial) to consider for depot electrification.
2.2 Priority operations for electrification	Explanation about the types of fleet operations, journeys, locations, timing and predictability/repeatability which are most suited to electrification.
2.3 Site power and space	Explanation about the energy supply physical constraints, contracts and physical site space for depot electrification.
2.4 Technology advances, compatibility, standards and interoperability	Overview of standards for charging site and equipment.
2.5 Operational considerations	Overview of available time for charging, infrastructure availability and third-party/destination charging.
3 Financial considerations	Covers financial aspects in more detail.
3.1 Caution	Reminder that each fleet is unique and careful planning is required by each fleet operator.
3.2 Total opportunity of ownership	Introduction to the different economic calculations for eHGV ownership compared with diesel HGV ownership.
3.3 CAPEX	Explanation and breakdown of the capital investments fleet operators face.
3.4 Minimizing CAPEX investment	Explanation of actions fleet operators can take to reduce capital investments.
3.5 OPEX	Explanation and breakdown of the operating costs fleet operators face.
3.6 Minimizing OPEX costs	Explanation of actions fleet operators can take to reduce operating costs.
3.7 Future cost-reduction pathways	Overview of likely trends towards lower costs.
3.8 Charging providers	Explanation of alternative charging infrastructure ownership options.
3.9 Financial incentives	Introduction to the various opportunities for fleet operators to access finance.
Appendix A - Glossary	An overview of key terms used within the book.
Appendix B - Further reading	Useful resources offering additional information on fleet electrification, including publications, websites, events and networking groups.

Section 1

Overview

1.1 Tackling the climate emergency

Climate change is, globally, the most pressing environmental challenge facing all businesses, governments and individuals. In the UK, the government has set regulations for minimizing greenhouse gas (GHG) emissions as part of an ambitious net-zero-by-2050 commitment. The UK has set legally binding carbon budgets, of 78 % overall cut in emissions levels (from 1990) by 2037.

Effective action to achieve these targets and secure a sustainable future is urgently needed. As global warming increases, so do the risks of extreme weather-related disasters and the collapse of vital habitats. Now is absolutely the time for delivery of climate ambition, not just for the environment, but for businesses, large and small, to capitalize on the opportunities that arise from our transition to greener, more sustainable and more energy-efficient systems of production and consumption without reliance on fossil fuels.

If you're in business, your supply chain partners and their customers, end consumers, regulators, investors and a host of other stakeholders are all increasingly looking for carbon emission reductions from sound and sustainable environmental practices as a prerequisite of engaging with any organization. Businesses will no longer get away with just saying the right things. They will need to be able to demonstrate tangible (and independently verifiable) achievements.

In the UK, HGVs contribute around a fifth of all road transport GHG emissions. For now at least, there is no single solution for reducing the sector's emissions, which predominantly stem from the burning of about 8 billion litres of diesel fuel annually. However, the good news is that a variety of approaches are available and a mix of all of them will be required to suit varying duty cycles and operational demands.

The main focus of this guide is to showcase the opportunities and challenges associated with making the switch to eHGVs, specifically battery-electric HGVs, which are very likely to become the dominant powertrain technology in the sector and, over the course of the next two or three decades, largely displace the diesel-powered trucks we use today.

1.1.1 Switching to eHGVs

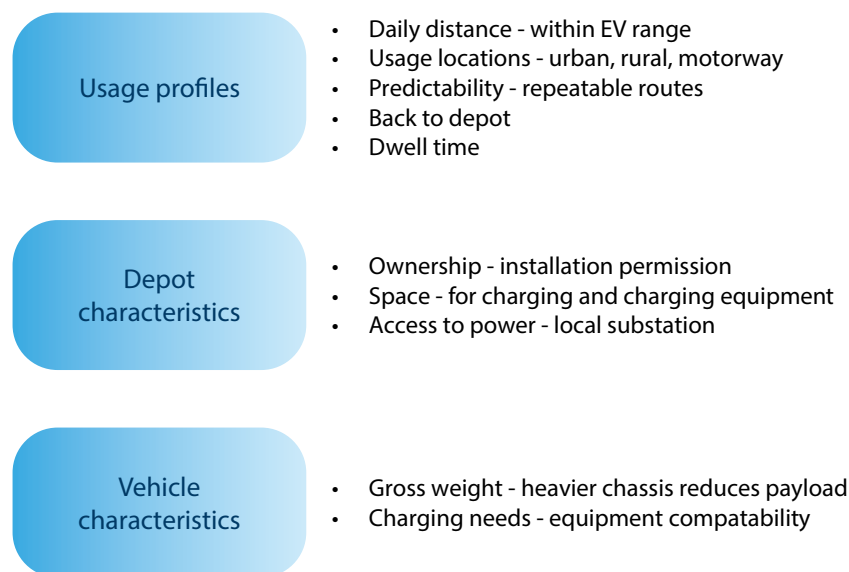
Between now and 2050, diesel, gas and other non-zero emission HGVs must be replaced by zero-emission alternatives so the UK can meet its net zero goals in the most cost-effective and sustainable way, and deliver substantial improvements in its air quality and public health. There is widespread agreement among the major manufacturers and expert industry stakeholders that eHGVs will play a dominant role. New entrants and established players are bringing innovative new concepts to market. Business models, battery technologies and charging infrastructure options are also improving at break-neck speed.

Based on the average carbon intensity of UK grid electricity and its downward trend, and fully accounting for emissions from vehicle and battery production, new eHGVs entering service today will typically reduce overall GHG emissions by between 70 % and 80 % over their lifetime. The savings will get closer to 90-100 % as more fully renewable electricity is supplied and used, both in the UK and around the globe.

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While some trailblazing businesses are already exploiting the cost-effectiveness and wider commercial opportunities that eHGVs provide (the total opportunities of ownership, or TOO), many others are not yet ready to make the switch. Vehicle concerns include capital costs, daily driving range, downtime whilst recharging and possible payload loss. Infrastructure concerns include the hurdles to be overcome to install depot-based charging infrastructure (the main focus of this guide) and (for some) the availability of suitable on-the-go public charging sites.

Figure 1.1 Profiles and characteristics



1.1.2 Other near-term decarbonization opportunities for fleets

It is not yet possible to say that all existing HGV operations and duties can be replaced with eHGVs. Where the battery and/or charging technologies have not yet evolved quite far enough, or the business case for investment still doesn't quite stack up, dramatic cuts in fossil fuel use by fleet operators can still be achieved in the near-term, in two key ways:

1. improving truck and logistics operational efficiency; and
2. adopting low-carbon fuels.

1.1.2.1 Improving efficiency of your existing operations

Optimizing your organizational efficiency reduces your financial costs and your emissions. Focus areas should typically include driver behaviour and training, tyre management, vehicle maintenance, planning of routes and loads, and aerodynamics.

Section 1 – Overview

1.1.2.2 Using low-carbon fuels

Low-carbon fuels, such as biodiesel, biomethane, and hydrotreated or hydrogenated vegetable oil (HVO), can contribute to reducing GHG emissions from the conventional vehicles already in use and the decarbonization of new combustion vehicles that will continue to be purchased whilst battery-electric vehicle technologies and markets mature. Sustainable low-carbon fuels thus offer a valuable complimentary pathway to decarbonizing diesel HGVs during the shift to zero tailpipe emission technologies. A vehicle burning such a fuel will, however, still release air pollutant emissions, at levels dependent on the vehicle type, fuel, European standard and driving operation (speed, load etc.).

For some operators, these fuels can offer an effective route to reducing fleet GHG emissions in the near-term. However, the availability and cost risks related to increasing competition from other sectors for low-carbon fuels and feedstocks put a constraint on the capacity to use these fuels at scale in the HGV sector. Consequently, the faster HGV fleet managers make the switch to electric, the greater the contribution renewable fuels can make.

1.2 The eHGV market

Battery-electric vehicles (powered directly by externally supplied electricity) are the most advanced zero tailpipe emission technology being developed for HGVs. Several national and multi-national HGV fleets have also pledged to adopt eHGVs. As a result, eHGV availability and uptake is expected to increase rapidly in the coming decade, starting with rigid and some articulated trucks. Across the EU, the current expectation is that around 60 % of all new trucks sold will be battery-electric by 2030¹.

The number of new zero-emission HGVs entering the UK fleet is growing rapidly. eHGVs dominate zero-emission HGV purchases, with just a handful of hydrogen-powered fuel cell vehicles currently being trialled. Due to the greater technical maturity of eHGVs, their higher energy efficiency and lower operating costs, this situation looks set to continue for the foreseeable future.

The early years of this decade have seen the development and commercialization of an ever-expanding range of battery-electric trucks, across all vehicle segments and in all major developed markets, including the UK. Established truck makers such as Mercedes-Benz, Iveco, DAF, Renault, Scania, MAN and Volvo are focused on bringing many more battery-powered vehicles to the mass market within the next few years.

As well as reducing emissions in line with environmental, social and governance (ESG) strategies, and new Scope 3 emissions reporting to comply with policy and regulation, an important motivation for fleets to consider switching to eHGVs is to save money through lower operating costs (total costs of ownership, or TCO). Ongoing improvements in battery technology and investment by manufacturers mean that the viability of eHGVs is increasing, even for the heaviest vehicles. eHGVs are currently more expensive to purchase than conventional diesel HGVs but are cheaper to maintain, have lower running costs and promise potentially longer life, all contributing to lower overall ownership costs. They also present companies with a wealth of less tangible benefits such as improved brand image, raised levels of driver satisfaction, health, well-being, recruitment and retention, better chances of winning new contracts and attracting investors, and favourable financing terms.

¹ Market development of climate-friendly technologies in heavy-duty road freight transport in Germany and Europe, NOW-GmbH, 2023.

Section 1 – Overview

Independent studies point towards eHGVs achieving widespread TCO parity with diesel trucks for almost all applications by the early 2030s^{2,3}. This guide will showcase many of the significant efforts underway to reduce the costs and complexities involved in providing sufficient charge points for HGV depots and other logistics hubs. Back-to-base operations of up to 400 km a day are likely to provide the primary initial market for eHGVs.

In 2023, there were 2,291⁴ new eHGVs (defined as battery-electric vehicles with gross weight over 3.5 tonnes) registered in the UK, more than twice as many as in 2022, accounting for almost 5 % of all new sales. eHGVs now look well set for similar growth to the rapidly maturing electric car market. Volvo, for example, is targeting half of its global total truck sales to be electric by 2030.

Figure 1.2 Characteristics of HGV operations

Vehicle class	GVW/payload	Example daily distance	Common usage locations
Vans 	3.5 T/1.4 T payload	200 km	Urban and rural
Small – medium rigids 	7.5 T/18 T curtainsided	400 km	Urban, rural and motorway
Large rigids 	26 T 6x2 – 32 T 8x4	500 km	Urban, rural and motorway
Small artics 	26 T – 40 T 4x2	550 km	Urban, rural and motorway
Large artics 	< = 44 T 6x2	650 km	Motorway

² <https://www.transportenvironment.org/te-united-kingdom/articles/e-trucks-its-time-for-the-uk-to-make-the-switch>

³ <https://theicct.org/publication/total-cost-ownership-trucks-europe-nov23/>

⁴ Veh1103 <https://www.gov.uk/government/statistical-data-sets/vehicle-licensing-statistics-data-tables#plug-in-vehicles>

Section 1 – Overview

1.2.1 Examples of eHGVs available now

The Freight Carbon Zero website (see Appendix B) maintains an up-to-date list of all the eHGVs currently available around the world or soon to be so. At the time of drafting this guide in mid-2024, notable examples of products available in the UK from some of the long-established manufacturers were:

- (a) **DAF:** Offers a range of eHGV types and sizes, applicable to urban, regional, long-haul or municipal operations – CF Electric (rigid or tractor), LF Electric (rigid), XD (rigid), XF Electric (rigid) and the XB (rigid). The range spans gross vehicle weights from 12 to 37 tonnes and offers single-charge driving ranges of 150 to 500 km depending on the battery options selected.
- (b) **Mercedes-Benz:** Offers the eActros as a rigid or tractor unit and with batteries ranging from 300 to 600 kWh capacity. Gross weights from 19 to 42 tonnes and single-charge ranges of up to 500 km.
- (c) **Renault:** Offers a range of eHGVs, including the C E-Tech (rigid or tractor) aimed at the construction sector, the D E-Tech (rigid) and the T E-Tech (rigid or tractor). Gross weights from 16 to 44 tonnes and single-charge ranges from 250 to 560 km.
- (d) **Scania:** Offers L, P, R and S-Series eHGVs in rigid and/or tractor unit configuration. Gross weights from 19 to 42 tonnes and ranges of up to 350 km.
- (e) **Volvo:** Offers a range of eHGV options, including the FE Electric (rigid), the FMX Electric (rigid), FL Electric (rigid), FM Electric (rigid or tractor) and FH Electric (rigid or tractor). Gross weights from 18 to 44 tonnes and single-charge ranges from 250 to 450 km.

Notable examples at the lower end of the HGV weight range (3.5 to 7.5 tonnes) include the Ford E-Transit (3.5 to 4.25 tonnes, up to 300 km range), the Maxus eDeliver 9 (3.5 to 4.05 tonne, up to 350 km range) and the Iveco eDaily (3.5 to 7.2 tonne, up to 400 km range).

1.3 Zero-emissions strategy and business case

A decarbonized transport strategy is more than simply a long-term goal-setting exercise.

For the fleet manager, it involves the current HGV fleet, and whether size or type are likely to change in the future. Data available from telematics or fuel cards helps to understand the daily distance of each vehicle. Telematics data is also useful to gather information on journey patterns, for example, consistency of route and daily distance.

Some telematics suppliers advise fleet operators on a transition to eHGVs, comparing daily distances with eHGV model ranges. Alternatively, fleet managers can make basic comparisons themselves or employ independent consultants who offer this service. Major OEMs also provide customer advice in this area. With correct eHGV choices, the expected charging profiles can be determined with depot charging and potential opportunity charging. These will help to forecast the energy usage and vehicle availability for charging (dwell times).

Energy usage and vehicle availability determine the depot charging infrastructure needed. The speed of fleet transition will signal the depot electrification priority, and the business case will also be informed by analysis of different energy supply tariffs.

It is unlikely that fleets will fully transition to eHGVs overnight, therefore consideration of future models and their needs will help when planning the necessary vehicle charging and electricity network infrastructure. Multiple civil engineering works will be disruptive and costly.

Suppliers, customers and internal departments should be engaged during this business case process. Collaboration will be essential to learn from others' experience and new partnerships with manufacturers, developers and installers are likely to emerge.

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1.4 Stakeholders

The role of the HGV fleet manager is changing, as are the skill sets needed for success in a rapidly changing business and technological environment. Building relationships with a much wider set of stakeholders, joining appropriate support and advice networks, and collaborating with like-minded supply chain partners and other businesses are all key parts of this change.

This includes maintaining your understanding of vehicle availability, capability and price options. It means staying up-to-date with how the technologies and policy frameworks are developing, and building relationships with your preferred OEMs. Use these to explore different ownership and financing models and take advantage of opportunities to trial the latest vehicles and familiarize yourself, your drivers and your business with their operational characteristics and how best to optimize your operations around them.

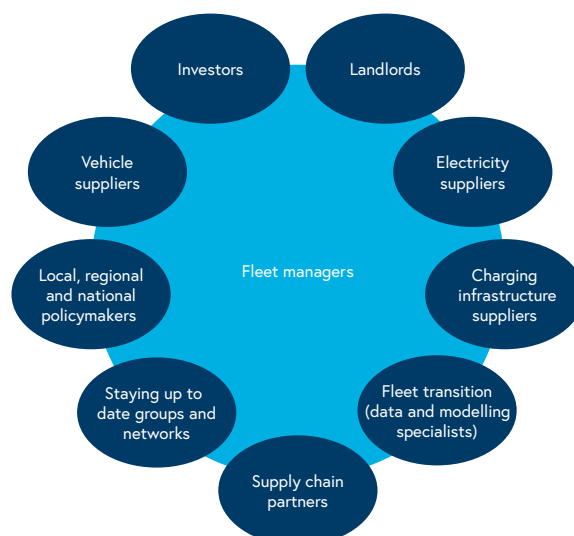
Optimizing your operations involves exploring different ways of meeting your customers' needs to make the best use of the new vehicle technologies. Speak to them and your local authority about alternative delivery schedules, for example. Look for opportunities to collaborate with other local operators and to strengthen your organizational culture and focus on sustainability.

Perhaps the most fundamental change in fleet management activities, however, is around the integration of transport and logistics with the energy system. Working out where and when to recharge, what chargers to use and how to minimize energy costs, will mean engaging with a new set of stakeholders. These may include your local electricity distribution network operator (DNO), charge point installers, charging as a service (CaaS) providers, specialist eHGV fleet optimization companies and, if you do not own your depot site, your landlord.

It will be vital to understand your future energy needs and variations across a typical day and week, to define the types and quantity of chargers you'll require. Talk to charge point providers and your local DNO (who can be identified through the ENA's DNO search tool⁵) to work out how to balance network connection upgrades with options for on-site energy storage, smart charging and/or on-site renewable generation.

The subsequent sections of this guide cover all aspects of this transport and energy systems integration opportunity and the stakeholders involved are shown in Figure 1.3.

Figure 1.3 Fleet managers and stakeholders



⁵ <https://www.energynetworks.org/customers/find-my-network-operator>

Section 1 – Overview

1.5 Policies and standards

The UK government has announced end-of-sale dates for new, non-zero-emission HGVs: 2035 for HGVs less than or equal to 26 tonnes, and 2040 for heavier HGVs. No intermediate sales obligations on HGV manufacturers have yet been announced, but a scheme similar in principle to the zero-emission vehicle (ZEV) mandate framework for cars and vans⁶ is actively being considered. Under that scheme, 80 % of new cars and 70 % of new vans sold in Great Britain must now be zero-emission by 2030, increasing to 100 % by 2035. Under retained EU law, manufacturers of 4 × 2 and 6 × 2 rigid and articulated lorries above 16 tonnes are required to reduce their emissions by 15 % in 2025 and 30 % in 2030 relative to 2019.

The plug-in truck grant scheme⁷ is available to reduce the up-front purchase costs of qualifying eHGVs by up to £25,000, while weight allowances (of up to two additional tonnes) have also been introduced to offset some, or all, of the extra weight of current e-HGV batteries.

Backed by up to £200 million of UK government funding, the zero-emission HGV and infrastructure demonstrator programme (ZEHID)⁸ will develop an evidence base on the operational, GHG emission, and economic performance of hundreds of long-haul articulated 40 to 44 tonne battery-electric and hydrogen fuel-cell HGVs in real-world fleets. The programme will also fund, and kick-start, the roll-out of charging and refuelling infrastructure for such vehicles as part of the demonstrations.

Running alongside ZEHID, BSI has published Flex Standards 2071, for publicly accessible eHGV charging sites, and 2072, for zero-emission vehicle workshops. International standards are constantly evolving, not least for the Megawatt Charging System (MCS), which is still in development.

1.6 UK charging landscape

Locations where eHGVs can charge include depots, destinations, multimodal hubs and truck stops/motorway service areas (MSAs). Planning for depot-based charging infrastructure is a priority area for operators.

Fleet managers should begin to explore opportunities for integrating eHGVs into their day-to-day operations, and investigate how to accommodate charging infrastructure at their depots. Determining vehicle and infrastructure costs will be critical for developing the business case for adopting zero-emission trucks. Early engagement with your host DNO will mean the journey will be easier, especially if you know the final capacity that will be required and by when.

Charging infrastructure for your depot-based fleet is likely to be the most difficult hurdle to overcome. There is a growing range of cost-effective charging solutions available to support depot-based fleets. Due to infrastructure deployment costs, preparing now for full electrification in the future is likely to be a more cost-effective strategy than incrementally adding 'just-enough' charging infrastructure as your electric fleet gradually grows. Once the long-term total energy usage is known, a connection surgery with the DNO will explore all network connection options, and plan to minimize upgrade iterations and civil works, thus keeping total cost down and ensuring relevant capacity will be available at the depot when required by the fleet operator.

The additional energy requirements for a depot will depend on many factors, including quantity of vehicles using the site, daily distance, schedules of use and downtime.

⁶ <https://www.gov.uk/government/news/pathway-for-zero-emission-vehicle-transition-by-2035-becomes-law>

⁷ <https://www.gov.uk/plug-in-vehicle-grants/trucks>

⁸ <https://www.gov.uk/government/news/government-invests-200-million-to-drive-innovation-and-get-more-zero-emission-trucks-on-our-roads>

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Depot electrification may require an increased connection to your local electricity network (grid). However, this can be minimized, deferred or avoided by using smart charging technology, on-site renewable energy generation and storage. Smart charging enables vehicle charging scheduling and prioritization, balancing energy demand within the available capacity.

Changes to the way some network upgrade costs are allocated to end users, introduced in April 2023, have reduced the cost to end users of many new and reinforced connections. Fleet operators must be proactive when dealing with energy network operators to achieve connections to suit their needs. Further details can be found in Section 2.

As well as the publicly-accessible eHGV infrastructure being installed as part of the ZEHID programme, the private sector is also investing. Milence, for example, is a joint venture set up by many of the major European truck manufacturers to roll out, at scale and at pace, a continent-wide network of charging sites. The first such EU sites have recently been opened and Milence is actively working to install sites across the UK.

Figure 1.4 Freight electrification considerations

Usage profile	Routes	Rural
		Urban
		Motorway
	Return to depot	Yes
		No - use public chargers
	Predictability	High confidence
		High uncertainty
	Average daily distance	<EV range
>EV range		
Depot characteristics	Ownership	Permission
		No permission
	Power	Unlimited
		Limited
	Space	Separate space
		Dockside
Vehicle type	3.5 T	200 km
	7.5 - 18 T	400 km
	26 - 32 T	500 km
	>32 T	>550 km
	Dwell time	<1 hour
1 - 7 hours		Fast charging
>8 hours		Overnight charging

Easier to electrify

Currently harder to electrify

Section 2

Charging solutions

2.1 Approach

Each case to electrify a depot is unique but includes a consideration of similar factors:

- (a) nature of eHGV usage by the business;
- (b) proximity and access to suitable, publicly available charging facilities;
- (c) space at depot;
- (d) capital expenditure (CAPEX) and access to finance;
- (e) property ownership/leasehold restrictions;
- (f) service offers/partnerships with potential third-party users;
- (g) distribution network connection capacity; and
- (h) integration with locally distributed (renewable) generation and storage.

A fleet operator's starting point for planning fleet electrification, and the related depot electrification, is the fleet's operation profiles described in terms of driving distances, loads, dwell times and schedules.

2.2 Priority operations for electrification

2.2.1 Predictable journeys

The simplest routes to electrify are those with high or fixed predictability, with low to medium distance, operating on a return-to-base cycle so that the eHGV can be recharged in its home depot. Where the distance exceeds the eHGV's battery range, charging facilities at delivery destination(s) and in public places can offer the opportunity for an intermediate charge.

At the outset, most fleets' charging requirements are likely to be ad hoc, and small-scale charging installations may be feasible without the need to upgrade the depot's power supply.

The more predictable and regular a work cycle is, the easier it is to electrify. For example, Royal Mail lorries going from the main hub to a local sorting office follow the same route at the same time every day. When and where they can be charged is easy to control as both the start and end point is owned by Royal Mail. However, once it becomes less predictable, for example, lorries rented temporarily to carry additional parcels at Christmas, eHGV charging becomes more difficult to accommodate.

As journeys become less predictable with groupage loads, sub-contracting, or one trip only destinations (for example, specialist vehicles for wide loads, building sites and other unique use cases), the considerations and barriers to electrification increase considerably. Some applications cannot yet be electrified.

Electrifying predictable return-to-base, range-limited routes first also enables drivers to get used to eHGVs and build confidence in the range and use of charging facilities. Drivers should be involved in discussions about which routes to use eHGVs on from an early stage and be trained in how driving styles can maximize range.

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Table 2.1 Electrification feasibility factors

Easier to electrify	Harder to electrify
Known, regular, predictable routes	Different routes every journey - building sites, unusual loads, sub-contract work
Shorter distances	Longer distances
Trunking	Tramping
Known end customers	Anonymous or variable end customers
Freight hubs, interchanges, large-scale complexes	Small locations, rural locations
Temperate weather	Extreme temperatures
Predictable journey times	Delays in delivery slot
	24-hour operations (hot seating)

2.2.2 Load considerations

Other considerations for the feasibility of electrification include the weight and nature of the load. Heavier loads reduce the range of the vehicle on a single charge.

Aggressive topography and weather conditions can also reduce the range of the vehicle.

Refrigerated lorries also require a standard 16 A mains connection when not in use to maintain temperature, but this is outside of the scope of this guidance.

2.2.3 Freight hubs

As eHGVs become more widespread, an increasing shift to purpose-built freight consolidation centres and hubs could be imagined, where the focus is on enabling the vehicles to unload and charge whilst the onward journey is made using smaller, zero-emission shuttle vehicles. However, this requires a high penetration of eHGVs and a willingness in the industry to work together and fund such investment.

The design and positioning of freight hubs is a complex area with a number of challenges and barriers to success, including securing sufficient space in urban areas, ease of access, availability of power for charging, coordinating use of space and power between multiple users, and securing sufficient throughput to make them financially viable.

Electrification is expected to grow fastest in last-mile applications, followed by middle-mile applications, then long-haul applications. However, the introduction of freight consolidation hubs also provides an opportunity to introduce charging infrastructure to support eHGV use for middle-mile and long-haul applications. This highlights the importance of understanding the expected driving range.

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2.2.4 Depots and destinations

Figure 2.1 Examples of different HGV operations (image reproduced with permission from Gridserve)⁹



There are a number of different options when it comes to delivery models, including:

- (a) depot to depot where the eHGV driving range on a single charge is sufficient to cover the full distance between departing and returning to depot, and all operations in between;
- (b) depot to destination where the eHGV driving range is sufficient to reach the destination and the eHGV will dwell at the destination for sufficient time to recharge sufficient energy for the return journey;
- (c) depot to on-the-go (non-stop journey) where the eHGV driving range is not sufficient to reach the destination, or sufficient charging is not available at the destination, therefore an additional stop must be scheduled at public charging facilities; and
- (d) multimodal interchanges (charging at ports, airports etc.) where the eHGV requires additional charging to meet the required driving distance and will dwell at the transport hub for sufficient time to recharge for the next stage of its journey.

⁹ https://www.gridserve.com/wp-content/uploads/2024/02/ElectricFreightwayIntroductionAndApproach_v1.1.pdf

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First, fleet operators need to decide which existing roles and routes to prioritize for electrification, and which need adaptation for electrification, before considering the charging infrastructure options. Operators will need to be open minded about potential fleet operations changes according to the current capability of eHGVs, including vehicle range and payload capacity, and future potential capabilities.

Fleet operators should also consider locations for additional hubs, investigate public charging stations close to routes, and seek access agreements with third-parties such as customers, suppliers and partners to maximize access to recharging facilities.

2.2.4.1 Depot charging

Depot charging involves charging eHGVs at a central location, typically a dedicated depot, or facility. This approach is well-suited to fleet operators with a fixed base of operations, providing the following advantages:

- (a) overnight charging when the eHGVs are not in use enables vehicles to start the next day with a fully charged battery;
- (b) lower charging costs since overnight energy rates are usually lower than daytime rates and bulk procurement arrangements can be made with energy suppliers based on this routine;
- (c) convenient routine maintenance and inspections while eHGVs are parked at the depot, ensuring optimal condition for the next day's operations;
- (d) predictable scheduling enables fleet managers to use smart charging technology to control the charging schedule, allowing them to plan and prioritize eHGV availability and optimize charging times within depot electrical capacity limits; and
- (e) infrastructure planning opportunities to set up robust charging infrastructure, which can accommodate multiple eHGVs simultaneously.

The opportunity to open depots up to third-parties to allow access for charging is covered in Section 3.9.10 of this guide. This could enable the depot owner to generate additional income to offset initial installation costs.

2.2.4.2 Journey charging

Journey charging involves charging during a journey, either at specific drop-offs or breakpoints, or using en-route charging infrastructure. This approach relates to long-haul routes or routes with multiple stops, with key considerations:

- (a) strategic stops on planned routes including specific charging stops;
- (b) availability of en-route charging infrastructure at the strategic charging stops along the journey;
- (c) shuttle distance matched to the eHGV range on a single charge;
- (d) multi-drop approach (for example, delivery routes) where charging stops can be incorporated during scheduled driver breaks;
- (e) tramping considerations involving drivers spending nights away from the depot; and
- (f) high-speed charging to minimize downtime during the journey.

Depot charging is critical to the successful operation of eHGVs but journey charging can compliment some operations. The proportion of charging approaches will depend on eHGV capability, route characteristics, the availability of charging infrastructure and the specific operational requirements of the fleet. Some operators may also access opportunities for destination charging (for example, at customer premises) and transport interchange charging (for example, at multimodal hubs).

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2.3 Site power and space

2.3.1 Electricity distribution network connection requirements

It is a challenge to ensure a site has sufficient electrical capacity to charge eHGVs. Fleet operators should engage with colleagues responsible for facilities or property management in addressing this.

Depending on the power supply currently available, there may be a need to increase the site's Agreed Supply Capacity (ASC), so an early discussion with the host DNO is absolutely advisable¹⁰. Using the depot's electricity meter reference¹¹, fleet operators can find out the site's ASC from their DNO. Reconciling the ASC against previous energy supply bills will indicate the available 'headroom' for charging. Calculating the capacity needed in the future will determine if a site's capacity needs to be increased.

DNO websites provide maps, searchable by postcode, which indicate local capacity via a red, amber, green (RAG) status. It is possible that if the RAG status for a site is red, and the future capacity needed is large, then relocating the depot to a green location might be more viable, particularly if a site lease is short duration.

A fleet operator's understanding of how their fleet profile may evolve with eHGV operations is also a factor in determining the future capacity needed, planning the charging infrastructure and associated site power upgrades. It should be noted that 100 % penetration of eHGVs may not be an equivalent fleet since eHGVs are not a like-for-like replacement for diesel.

2.3.2 Network connection capacity and reinforcement

Increasing site power capacity will require an application for a new or reinforced network connection to the local DNO^{12,13}. Independent DNOs (IDNOs) can also be used. Fleet operators should note that each DNO has their own charging infrastructure connections process, and applies fixed energy network charges, i.e. Distribution Use of System (DUoS) and Transmission Network Use of System (TNUoS) costs, which can significantly impact a site's operating costs.

Ramped capacity is also sometimes available to increase capacity progressively over time, for example, 5 years. This allows the DNO to reinforce local infrastructure gradually, ensuring the network remains stable and reliable, avoiding overload, as more consumer and distributed generation connections are integrated to the network. A ramped capacity connection also reduces, or staggers, costs in line with growing penetration of fleet electrification, while at the same time, providing the DNO with visibility of the long-term need. The DNO can then adopt a 'touch once' approach rather than piecemeal works.

To apply for new or reinforced grid connections, depot owners should complete the Installation of Low Carbon Technologies section within the Energy Networks Association (ENA)¹⁴ application form. The Meter Point Administration Number (MPAN) reference and maximum demand information will be required so the DNO can confirm the supply capacity for the premises and suitability of the existing connection

¹⁰ The local DNO can be identified by entering the site's postcode at <https://www.energynetworks.org/operating-the-networks/whos-my-network-operator>.

¹¹ Meter Point Administration Number (MPAN) found on electricity bills.

¹² https://www.energynetworks.org/assets/images/Resource%20library/LCT_DNO%20Contact%20Info%20for%20EV&HP_040220.pdf

¹³ Catapult Energy Systems – *eHGV Charger Connections Guide*, the eHGV charger connections guidance, published as part of the eFREIGHT2030 ZEHID project (see Appendix B).

¹⁴ <https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.energynetworks.org%2Fassets%2Fimages%2FResource%20library%2FEV%2520HP%2520Application%2520Form%2520v9.6.docx&wd>

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arrangements. As part of their licence conditions, DNOs must also check power quality and flicker risks presented by the proposed installation of charging points in the location, as per BS EN 61000 parts 3-2, 3-3, 3-11 and 3-12. The nominated installer will then require a new earthing plan for the site, complying with BS 7671 and the IET *Code of Practice for Electric Vehicle Charging Equipment Installation, 5th Edition*¹⁵. Experiences with simple upgrades, sole-use infrastructure and upstream network upgrades for eHGV charging have been reported by the Electric Freightway ZEHID project¹⁶.

Although unlikely, very large connections may require the regional transmission system operator (TSO)¹⁷. The National Energy System Operator (NESO) provides a Connections Portal¹⁸, supporting applications for the largest connections¹⁹ to the transmission network²⁰. A fleet operator will need technical data (site plan, location etc.) and should understand the service and code compliance requirements before paying the application fee. The TSO's engineers will use Security and Quality of Supply Standard (SQSS) criteria and methods for planning and operating the transmission network, to determine the impact on the network and help the fleet operator with this.

If the location has distributed generation or storage assets, then as part of wider energy plans, fleet operators may also consider applying for an export connection, which will allow the supply of excess energy back to the network. This may be worth considering if, as expected, future eHGV models have bidirectional charging capability to enable excess energy to be exported back to the network, or be used to power buildings or other vehicles for the operator's financial benefit. In this case, the fleet operator should make an export limitation scheme application to their DNO and ensure compliance with power quality standards (G100 and G99 regulations), and meet maximum export capacity and fail-safe requirements. Some DNOs offer a G99 fast track scheme for lower capacity connections.

2.3.3 Energy supply contracts and connection curtailment

It is not always necessary to have a full-capacity network connection available for use 24 hours per day. Fleet operators may find a more efficient or economical connection solution by designing their charging schedule around certain times of day to reduce the need for 24-hour availability.

Where distribution network utilization is high, timed or profiled, connections can reduce the capacity needed in line with demand, offering a more cost-effective grid connection. For example, the DNO UK Power Networks (UKPN) assisted London bus garages to achieve a quicker, cheaper connection by providing an overnight charging connection, and the DNO National Grid Electricity Distribution (NGED) similarly assisted a Cardiff bus depot with a quicker and cheaper connection.

Timed connections are an agreement with the DNO to only use full capacity at certain times of day, typically two or three capacity periods within 24 hours. By sticking to the pre-agreed schedule, you can avoid connection reinforcement costs. This works particularly well if eHGVs only need to charge at night.

Profiled connections offer greater flexibility with up to 48 (half-hourly) capacity periods within 24 hours. Fleet operators interested in a profiled connection will need to prepare an import/export profile to be used as the basis of the DNO's connection offer.

Ramped supply connections increase the available capacity of a network connection over time. These are useful when the demand on a network connection is expected to grow over several years. A fleet operator can match their requirement for a ramped supply connection to their plans for gradual introduction of eHGVs and depot charging infrastructure, and negotiate this requirement with the DNO.

¹⁵ <https://electrical.theiet.org/guidance-and-codes-of-practice/publications-by-category/electric-vehicles/>

¹⁶ <https://www.hitachizeroarbon.com/wp-content/uploads/sites/11/2024/10/Electric-Freightway-report-2-Demonstration-design-and-implementation.pdf>

¹⁷ National Grid Electricity Transmission in England & Wales, Scottish and Southern Electricity Networks (SSEN) Transmission in the north of Scotland, and Scottish Power Energy Networks (SPEN) Transmission in the south of Scotland.

¹⁸ <https://www.neso.energy/industry-information/connections-portal>

¹⁹ Greater than 20 MW, although some DNOs can cater for up to 90 MW connections.

²⁰ 275kV and above in England and Wales, and 132kV and above in Scotland.

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2.3.4 Smart charging to reduce reinforcement requirements

Smart charging is a modulation of the timing and power of charging when an eHGV is connected to a charger, as well as prioritization between chargers. Coordinating charging between multiple chargers with smart charging will help load management by utilizing spare site capacity when otherwise not in use and potentially remain within the existing ASC, avoiding a need for network connection reinforcement.

Sites with multiple chargers will most likely involve a back-office charging management software communicating with each charger to support load management and scheduling, and billing if third-party eHGVs are present. Smart charging signals are typically triggered when power is cleanest (lowest carbon intensity) or cheapest (according to a time-of-use tariff), or according to the charging prioritization of each eHGV.

Smart charging is a widely used term by different suppliers. Fleet operators should take care when procuring charging equipment and back-office charging management software, to ensure they are compatible and provide the functionality expected. Not all systems are equivalent.

2.3.5 Load management

A load management system may be able to modify a site's existing energy consumption (for example, from buildings, machinery) and free up capacity at certain times for eHGV charging, potentially remaining within the existing ASC. A load management system typically includes the following:

- (a) Continuous monitoring and measurement of the overall site power consumption with a smart meter, and the power consumed by individual loads (such as chargers) with sub-metering systems, to provide real-time energy usage data.
- (b) Load forecasting algorithms to predict the expected power demand patterns according to the historical data collected from sub-metering systems. The usage patterns help forecast the available capacity for eHGV charging.
- (c) Demand response in situations where the total power demand approaches, or exceeds, the site's ASC, by triggering demand response strategies. Responses include, for example, signalling to a charger to temporarily reduce power or pause/delay charging until the load decreases (known as dynamic load adjustment). This helps balance the total load and prevent overload.
- (d) Prioritizing charging of individual eHGVs or power to other site loads according to the urgency, which might be determined by available dwell time and the energy required.
- (e) Data communication and control between smart meters, loads, and the central management system to exchange information and coordinate control of chargers (usually via wireless connectivity).
- (f) Interaction for users via a user interface, such as a web portal or mobile app, to provide updates on loads and charging sessions, and the possibility to set preferences and manage schedules. Notifications and alerts can also be set up for load or charging status changes.

A site load management system can therefore help manage eHGV charging to optimize available electrical capacity without exceeding the site limits.

2.3.6 Site space

Depot space for charging infrastructure, including the associated power equipment, is another consideration in confirming the suitability of existing locations. The relationship between vehicle charging socket and charger position is critical. The currently prevalent Combined Charging System Combo 2 (CCS2) charging socket can be positioned anywhere on eHGVs, whereas the upcoming MCS charging socket location will be standardized to the front left²¹ of all eHGVs to help with charger positioning at parking bays. Depots will most likely need both CCS2 and MCS chargers for long duration charging (overnight) and short duration charging (during loading/unloading/driver breaks). Consideration should also be given to the need for charging dispensers at some loading docks to meet operational requirements.

²¹ <https://www.charin.global/technology/mcs/>

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Depending on the network connection requirements, site layouts may also need to accommodate additional substation equipment. Future high-power chargers may require supply connections at voltage levels higher than commercial three-phase 415 V supply. Medium-voltage connections (6 kV to 33 kV) will also require additional equipment.

Using battery energy storage systems to mitigate network reinforcement actions or support smart charging will also occupy additional space, so should be part of site layout considerations.

2.4 Technology advances, compatibility, standards and interoperability

Vehicles and charging infrastructure are not produced in isolation. To ensure interoperability and safety, standards exist covering vehicle-to-charge communications (for example, ISO 15118) and charging plug design (for example, IEC 61851). However, current standards focus on electric cars and light van requirements, but the MCS standard for eHGVs is under development by CharIN.

The average age of trucks in use across the EU is 14.2 years, and within the UK is 11 years²². Early generation eHGVs will be sold on to smaller hauliers, and chargers already installed in depots may be sold on with those vehicles. However, as new eHGVs enter the market, new higher-power chargers may be needed to optimize operational capability. Standardization on CCS2 and MCS connectors following CharIN standards will ensure backward compatibility is maintained.

The need for seamless communication between charging solutions, back-office systems, and their interfaces with route and load planning tools, is also an important consideration. While numbers of eHGVs are low, these functions can be handled manually. However, as eHGV quantities increase, a cohesive system enabling all tools to communicate effectively with each other will become vital. This includes the ability to implement, and potentially bill for, reciprocal charging for fleet management and optimization services. Achieving such interoperability is crucial for streamlining the operation of eHGV fleets and ensuring their efficient use.

²² ACEA Vehicles in use, Europe 2023 <https://www.acea.auto/publication/report-vehicles-in-use-europe-2023/>

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Table 2.2 Standards

Standard/guidance	Description
ISO 15118 ^a	Defines the communication interface between an EV and a charger, providing cases, including secure communication, smart charging and Plug & Charge.
PAS 1899 ^b	Provides specifications on accessible public chargers, with some insights for eHGVs on the physical environment surrounding chargers, the information, signals and indicators for users, and accessibility.
Flex 2071	A code of practice on various operational safety issues for installers and designers of publicly accessible charging sites for eHGVs ^c .
Flex 2072	A standard to support fleet managers in identifying and embedding safety principles in inspection and maintenance of hydrogen-fueled and battery-electric heavy-duty vehicles.
IEC 61851 and IEC 62196	Defines safety requirements for the plugs/sockets and maximum power capabilities for DC charging of electric vehicles, including for vehicles and charge points using the Combined Charging System (CCS), typically up to around 1,000 V, 500 A and 360 kW.
IEC 61851-23	Currently under revision to extend DC charging capabilities beyond CCS into MCS territory, potentially up to 1,250 V, 3,000 A and 3 MW.

^a <https://www.iso.org/standard/77845.html>

^b <https://www.bsigroup.com/en-GB/standards/pas-1899/>

^c <https://www.bsigroup.com/en-GB/insights-and-media/insights/brochures/bsi-flex-2071-publicly-accessible-charging-sites-for-battery-electric-hgvs/>

2.5 Operational considerations

2.5.1 Operating hours

Operational planning for electric fleets must adhere to the break and rest requirements in the assimilated working time directive (WTD) (Regulation (EC) 561/2006, as it has effect in the UK). This includes allowing sufficient time to locate and park the vehicle at a charging point. Connecting and disconnecting a vehicle from a charging point is classed as 'duty' which cannot be undertaken during a driver's break or rest periods. This means that the driver cannot remove their vehicle from the charging point or move it to a parking space during their break or rest periods. However, a driver's 45-minute break can be split into two periods, the first being at least 15 minutes and the second at least 30 minutes (which must be completed after 4.5 hours of driving). This approach could be used at the driver's discretion to move the vehicle between the two break periods.

2.5.2 Charging infrastructure availability

The move to eHGVs will increase the interdependency of actors along the route and the need for cooperation and a joined-up approach to planning charging facilities.

Dwell times overall are likely to increase, and vehicles on charge, especially overnight, may not be movable to free up space even once fully charged, causing charger capacity issues.

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One motivation for the MCS standard is the need to recharge vehicles quickly during mandatory driver breaks (as covered by the WTD). Shift patterns and vehicle operating hours, including consideration of driver hot seating, will determine vehicle availability for recharging.

2.5.2.1 Charging at customer depots

Enabling vehicles to charge at customer depots should also be explored to provide opportunity charging facilities. However, existing sites have not been designed with such space requirements in mind. For example, delivery bays at local supermarkets have limited space, so customer parking spaces may need to be converted into eHGV charging bays. However, an urban building site or agricultural establishment would struggle to make the necessary adaptations. Collaboration between fleet operators and customers will be required and included in contracts to establish the requirements of the delivery partner and, critically, how energy is billed in a fair manner, for example, especially for split loads and multiple drops.

Section 3

Financial considerations

3.1 Caution

It must be emphasized that providing precise financial figures is problematic given the evolving landscape, where changes in operating costs, including energy prices, immediately impact the business case for eHGVs.

The diverse nature of fleet operations means that there is no one-size-fits-all financial forecast calculation for eHGV transition. Each fleet operator's financial scenario is inherently unique, contingent on their specific use case(s).

In light of these challenges, fleet operators should approach their financial forecasting with caution and avoid reliance on existing approaches developed for conventional vehicles, instead adapting their financial forecasts to the specific circumstances and variable characteristics of each individual fleet operation.

The use of modelling and data analytics can assist fleet operators to make informed decisions about the right vehicles, the required charging infrastructure at depots and destinations, understand their electricity demand, and any need to use public charging for long distance routes. Therefore, as more data becomes available, financial forecasting should be regarded as an ongoing process to minimize electrification transition costs rather than a one-shot calculation. Flexibility and adaptability will be key to ensuring the economic adoption of eHGVs by fleet operations.

While available data is limited, fleet operators may wish to go ahead with eHGVs potentially in smaller volumes to support the collection of data and meet wider business needs, although this approach may lead to several network connection capacity increases by the DNO, which may ultimately incur greater cost.

3.2 Total opportunity of ownership

Standard TCO calculations do not exist. TCO modeling is inherently and unavoidably based on making a set of assumptions (sometimes little more than best guesses) about future costs and prices, for example, the cost of diesel fuel. While many studies, making a wide range of plausible assumptions, are now pointing to TCO parity for eHGVs in the 2025 to 2035 timeframe, depending on the duty cycle, they tend only to consider the most readily identifiable and tangible items of vehicle expenditure²³ - vehicle purchase, maintenance costs, depreciation, energy costs etc. - but equipment expenditure should also be considered when calculating TCO:

- (a) vehicle charging infrastructure (network connection, power equipment, chargers);
- (b) energy operational efficiency;
- (c) installation (civils, electricals);
- (d) maintenance;
- (e) operations (parts, insurance, licence fees);
- (f) resale values;
- (g) fleet management (tracking, monitoring, optimization); and
- (h) financing (purchase, lease) and incentives.

²³ <https://www.transportenvironment.org/te-united-kingdom/articles/e-trucks-its-time-for-the-uk-to-make-the-switch>

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However, TCO modeling tends to overlook an equally wide (and perhaps just as commercially important) set of less tangible likely benefits. Combining these with the TCO can be described as the total opportunities of ownership (TOO). Under this wider TOO umbrella, operators might, for example, additionally factor into their thinking issues such as how making an early, trailblazing switch to eHGVs can:

- (a) help to build brand image as leading this transition, thus attracting new customers, new recruits, additional sales, new investors and/or more favorable financing terms;
- (b) help to win new contracts by making your fleet more attractive to client procurement teams, to benefit from lower Scope 3 emissions (and, of course, an enhanced brand image for them, too);
- (c) help you to more readily recruit and retain HGV drivers, perhaps from more diverse backgrounds, and offer lower levels of sickness absence through the greater ease (and lower stress) of driving electric²⁴;
- (d) help to build links with your local community, providing a more supportive environment for business expansion and positive engagement with your local authorities; and
- (e) dramatically reduce GHG emissions and eliminate the tailpipe pollutant emissions from your vehicles that don't just adversely impact the health of the communities you drive through, but also the health outcomes of your own drivers and the people who work at or near your depots.

3.3 CAPEX

3.3.1 Equipment

This includes the procurement of necessary EV charging infrastructure, including charging stations, cables, connectors and necessary supplementary hardware. Fleet operators should involve facilities managers and finance managers in these topics at the earliest opportunity.

3.3.1.1 Electric vehicle supply equipment (EVSE)/charging points

Costs can vary considerably based on charging capacity, technology, protection and connectivity. Fleet operators may engage directly with equipment suppliers or with installers who will recommend equipment according to fleet operators' needs. Quotations must be tailored to fleet operators' specific requirements, so fleet operators may prefer to seek third-party advice to review specifications and ensure they are fit for purpose. The number of charging stations required to ensure operational coverage with allowance for unavailability against good utilization also needs careful calculation (see Section 2).

Not all EVSE provides value for money. Some chargers have a lower purchase price but require a high fault level to connect to the supply network, leading to higher capacity costs. Low fault level connection equipment will have a higher purchase price, but may offer lower total cost. The footprint size of EVSE also varies with power rating and between suppliers.

3.3.1.2 Network connection and power equipment

Network connection is a critical consideration, spanning substations to medium-voltage connections (6 kV to 33 kV) and upgrades to interconnects, switchgear, distribution panels and cabling. Site location, available network capacity and reinforcement requirements, and proximity to supply will influence cost. Ofgem's *Access and Forward-Looking Charges Significant Code Review*²⁵ is intended to limit the network connection reinforcement costs. Since fleet electrification can be an ongoing transition, fleet operators may also wish to make initial investments which protect for future expansion.

²⁴ <https://www.cinch.co.uk/news/electric-car-drivers-are-less-stressed>

²⁵ <https://www.ofgem.gov.uk/sites/default/files/2022-05/Access%20SCR%20-%20Final%20Decision.pdf>

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3.3.1.3 On-site energy storage

A wider site energy strategy may encourage fleet operators to opt for on-site energy storage, such as battery, to balance peak demand, either instead of or as well as network connection reinforcement. This can reduce the peak connection requirement and associated supply contract price. The size of the energy storage battery primarily influences the cost, while installation and integration can usually be capitalized with the purchase cost. Fleet operators may prefer to seek third-party advice to compare options for on-site energy storage.

3.3.1.4 On-site renewable generation

As part of a wider site energy strategy, fleet operators may consider implementing local renewable energy generation, such as photovoltaic (solar) or onshore wind, according to sustainability goals and energy cost reduction targets. This generation may operate independently or be integrated with the charging infrastructure. Costs include procurement of generation equipment and associated power conversion equipment, along with installation, which can be capitalized.

3.3.1.5 Software and connectivity

Further to power hardware, the selection and integration of management software platforms, including billing functions, may be procured under CAPEX costs. However, fleet operators may prefer to account for software through a software as a service (SaaS) licence fee subscription and categorize the costs as operating expenditure (OPEX).

3.3.1.6 Site alterations and civils

Fleet operators may require supplementary signage and barriers to enable new vehicle movements, parking locations and charging information in line with site layouts.

Accurate breakdown of the equipment costs for fleet operators' options is important for financial forecasting. Given the developing nature of EV charging solutions, fleet operators will benefit from staying informed about the latest technologies and vendor offerings to improve the accuracy of their CAPEX estimates and inform investment decisions. In all aspects, fleet operators may prefer to seek third-party advice to review requirements and associated CAPEX. Such third-party advice will also include liability and risk identification.

3.3.2 Installation, civils and electricals

Fleet operators may elect to work with a single installer or work with equipment suppliers where installation costs can be capitalized. These costs are not uniform but depend upon power levels, site location and site design.

3.3.2.1 Planning phase

The physical size of equipment, cabinets and cabling, are determined by power supply needs, which influence the scale of civils and installation costs. Commissioning and sign-off costs also relate to demand, therefore fleet operators are encouraged to engage partners as early as possible in planning infrastructure.

3.3.2.2 Location considerations

The site location may incur additional costs associated with specialist installation services. Remote or challenging sites may present logistical difficulties. Complex site designs may lead to more complicated cable runs, influencing installation costs.

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3.3.2.3 Electrical upgrades

Existing power equipment upgrades, and removal and disposal of legacy equipment, also form part of installation costs.

Operators will need installers and electrical contractors for specific electrical infrastructure work. Only installers can provide installation cost estimates.

3.3.3 Asset depreciation

Residual value of charging infrastructure is an immature area. Depreciation schedules vary depending on accounting standards, local rules and taxation benefits. However, fleet operators should not base the depreciation schedule only on the predicted equipment lifetime since the pace of technology development may lead to outdated equipment before predicted end-of-life. Currently, residual values are presenting significantly lower than would be expected in a mature market.

3.4 Minimizing CAPEX investment

Fleet operators are all faced with investment constraints, encouraging efforts to minimize CAPEX investments while still meeting operational needs.

3.4.1 Options

With multiple options for quantity and type of eHGVs, charging requirements and solutions, and adaptations to operating patterns, fleet operators have lots to explore and understand. For example, changes to scheduling might reduce the number of chargers needed, thus avoiding overinvestment in infrastructure with low utilization.

3.4.2 Scalability

With a transitioning fleet and future projects for coming generations of eHGVs capable of higher charging power, fleet operators will benefit from a scalable infrastructure with growth capacity. For example, power equipment planning and network connection investments may accommodate more than an initial minimum number of chargers but suit a subsequently expanded eHGV fleet. While it is important to plan right-sized infrastructure, fleet operators must avoid investments in stranded assets as fleet transition progresses and newer technology comes to market.

3.4.3 Energy efficiency

Fleet operators should note that not all available charging equipment is the same, with wide variability in energy efficiency performance. Some charging and power equipment achieves higher efficiency, reducing overall energy consumption and lowering OPEX costs over time, but often comes at a higher purchase price.

3.4.4 Site selection

In extreme cases, fleet operators may find it financially preferable to relocate their site closer to available network connection capacity, rather than incur high connection costs and long lead times from their DNO, although Ofgem's *Access and Forward-Looking Charges Significant Code Review: Decision and Direction* should now lead to network reinforcement costs socialized among all local beneficiaries²⁶.

²⁶ <https://www.ofgem.gov.uk/publications/access-and-forward-looking-charges-significant-code-review-decision-and-direction>

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3.4.5 Vendor and installer selection

In all cases, fleet operators will have to engage several equipment vendors and/or installers in their procurement activities to understand the variety of quotations and cost breakdowns for current and future infrastructure requirements. SLAs for ongoing maintenance and field support, and penalties for faults and downtimes, will be a critical factor, the cost for which may be capitalized.

3.5 OPEX

eHGV and charging infrastructure OPEX is usually lower than the equivalent for diesel HGVs, thus potentially balancing the higher initial CAPEX investment.

3.5.1 Energy costs

The nature of energy supply contracts can be complex for high consumers, including variable energy consumption costs and standing connection charges. Smart charging techniques can keep energy costs down, limiting charging events to times of low tariffs. Fleet operators may prefer to fix energy costs for periods in advance, much as diesel procurement and bunkering provides fleet operators with fuel cost certainty. However, energy market prices are significantly more dynamic than fuel prices, with large daily spreads. Therefore, in general, fixing energy costs may miss cost-saving opportunities for fleet operators.

3.5.2 Site lease

On leased sites, fleet operators will need to understand landlords' perspectives and impact on lease agreements if installing additional power and charging equipment, while some DNOs will align with the depot lease and others might seek a 99-year lease.

3.5.3 Proactive maintenance and repairs, dilapidations and maintenance

Maintenance and repairs require specific focus by fleet operators to ensure critical reliability of charging infrastructure in the early phase of eHGV adoption (while available alternatives are limited). Regular inspection and proactive maintenance activities, including cleaning, along with firmware and software updates, are typically covered by operation and maintenance (O&M) contracts, including uptime service level agreement (SLA) commitments. Fleet operators may prefer to include multi-year O&M agreements as part of their contract for installation.

Acknowledging the pace of technology evolution, charging infrastructure refurbishment, ahead of end-of-life when upgrades can help meet technical advancements or evolving standards, should be considered. Practices to minimize charging equipment dilapidations and maintenance costs are:

- (a) regular inspections to record condition and prevent minor issues from escalating, at varying levels by trained staff (for example, daily troubleshooting) or by electrical contractors (for example, quarterly, or according to usage or problem resolution);
- (b) proactive maintenance, using data prognostics to predict issues before developing into problems, minimizes downtime and improves resilience;
- (c) equipment quality varies between manufacturers, with compatible maintenance cycles required;
- (d) warranty coverage for charging infrastructure and power equipment should include routine repair and replacement, and cover both lifetime and utilization;
- (e) relationships with EVSE equipment suppliers, installers and third-party service providers, may have advantages in terms of SLA response times and maintenance costs; and
- (f) driver and fleet management education of site rules and charging equipment procedures reduces wear and tear, and mitigates accidental damage.

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3.5.4 Network connectivity

Charging equipment connectivity to enable monitoring and management involves data transfer and storage costs from networking and cloud providers. Fleet operators may benefit from rolling these into existing digital solution costs, such as those related to transport management systems (TMS).

3.5.5 Staff training

All drivers, fleet management personnel, and workshop and maintenance personnel, will require training. Some fleet operators have witnessed service personnel salaries rising due to skills shortages; however, these are likely to level out as eHGV adoption grows. Other business departments will experience changes in work, and fleet operators should consider wider staff training opportunities.

3.5.6 Insurance

Insurance premiums are going up to cover eHGV charging until more risk data is available for the insurance industry. Therefore, experienced insurance providers are likely to provide more acceptable equipment cover. With appropriate staff training, employer's liability insurance should not be impacted.

3.5.7 Regulatory and compliance costs

Third-party safety inspections and compliance reporting will incur new costs.

The nature of charging infrastructure, the business model and regional factors, influence these dynamic OPEX costs, therefore fleet operators may consider undertaking variance analysis to understand their potential margins and ensure forewarning as costs change.

3.6 Minimizing OPEX costs

Fleet operators should typically expect lower OPEX, yet pursue all avenues to further lower OPEX, with the objective to pay back the high initial CAPEX investments as early as possible.

3.6.1 Energy

3.6.1.1 Off-peak (smart) charging

The UK energy supply market is very competitive. Fleet operators have many choices in terms of suppliers and contracts. Multi-tariff supply contracts have significant dynamics, with large daily spreads. The timing of lower tariffs typically coincides with off-peak demand hours on the energy network, therefore fleet operators should consider scheduling the majority of eHGV charging during off-peak hours, typically at night, to benefit from lower tariffs. Fleet operators with on-site energy storage may desynchronize their time of demand from the time of energy import, making use of lower tariffs while still allowing eHGV charging whenever required.

3.6.1.2 Peak load penalties

Energy supply contracts or network connection contracts with limited peak supply may incur penalties for exceeding contract supply limits, therefore fleet operators should schedule eHGV charging to limit the peak load and avoid incurring any penalty.

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3.6.1.3 Dynamic incentives

Some UK energy suppliers and DNOs participate in dynamic activities such as turndown events in which consumers are rewarded for increasing or decreasing consumption at sensitive times. Fleet operators may consider adapting their eHGV charging schedules to synchronize with these events to access financial incentives.

3.6.1.4 Reduced import through renewable generation

As part of a wider site energy strategy, fleet operators may consider local renewable energy generation to reduce imported energy consumption costs (see Section 3.3.1.4).

3.6.2 Driver education and notification

3.6.2.1 Driver training

eHGV driver education and re-education improves driving energy efficiency by understanding the operation of electric propulsion systems with regenerative braking under aggressive and passive driving styles. Energy Saving Trust²⁷ state up to 35 % difference in driving energy efficiency between the best and worst HGV drivers.

3.6.2.2 App and notification systems

Driver feedback in both real-time and summarized information about driving style and driving energy efficiency contributes to ongoing education. With the information available to drivers, fleet operators may consider using a gaming approach, offering incentives to better drivers.

3.6.3 Contract management

3.6.3.1 Energy supply contracts

Energy supply contracts for larger consumers often differentiate standing charges from consumption charges. Unlike fuel supply contracts, long-term energy supply contracts will not necessarily 'lock-in' consumers to favourable tariffs. Fleet operators should consider multi-tariff or fixed tariff agreements according to time of use (import). Lower standing charges may limit peak consumption levels, but power must be managed to comply with contracted limits, thus avoiding any penalties.

3.6.3.2 Infrastructure maintenance contracts

Charging infrastructure maintenance may be included within equipment procurement and installation agreements, but lower cost maintenance contracts may be available from third-parties so operators should investigate multiple providers.

Good maintenance agreements are important due to the implications of long downtimes from equipment failure, which could bring an entire depot to a standstill. Effective maintenance agreements will be crucial to ensure downtimes are kept to a minimum.

3.6.3.3 Billing and payments

Charger metering, billing and payment processing can be made more efficient through automated systems, which reduce the administrative overhead and minimize human errors. However, fleet operators may find an automated system to be poor value for money if their charger utilization is low.

²⁷ James Brown, Freight Fleet Review – Welch's Transport, 2022

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3.6.4 Data and predictive analytics

Data analysis of infrastructure utilization, energy consumption and eHGV performance will help fleet operators to identify overall cost and performance trends, as well as to highlight potential issues. With the leading data platforms, fleet operators may prefer to setup custom key performance indicator (KPI) metrics and summary dashboards to monitor areas of interest.

Predictive analytics using historic patterns for operations according to time of year, driver etc. can help fleet operators to forecast future energy consumption and subsequently optimize both energy consumption and schedules for proactive maintenance. This will be particularly helpful to fleet operators on multi-tariff supply contracts.

3.6.5 Scalability, future proofing

Fleet operators may prefer to envision a long-term complete transition to eHGVs and then plan backwards to ensure incremental investments are scalable and compatible with their long-term charging infrastructure volume and power goals. Where possible, a fleet operator may benefit from selecting scalable infrastructure, adaptable to growing demand. This will require fleet operators to remain informed about charging solutions emerging within the lifetime of their current vehicles and infrastructure.

Actions to reduce operating costs must align with fleet operators' specific operational needs and long-term goals, therefore should be reviewed regularly as new solutions come to market.

3.7 Future cost-reduction pathways

A key objective for eHGV fleet operators is to achieve total cost parity against diesel HGVs. Several technical and market developments promise to reduce the cost of eHGV operations in the coming years.

3.7.1 Lower vehicle cost through battery advances

Battery costs have dropped since EVs became mainstream, with The International Energy Agency (IEA) estimating that battery prices dropped tenfold between 2010 and 2022²⁸. While the battery currently remains the highest single cost component in an eHGV, ongoing battery advances will further reduce the cost of batteries until cost parity with diesel HGVs is reached. It should be noted that cost parity will not equate to price parity while OEMs seek payback for their high investments in electric product development and new assembly plants.

3.7.2 Lower vehicle cost through economies of scale

As battery production volumes grow (predominantly driven by passenger car markets), economies of scale will unlock further cost reduction opportunities to OEMs and battery suppliers. These will eventually be reflected in eHGV prices.

3.7.3 Lower vehicle maintenance costs

Since the powertrain of eHGVs contains fewer parts, and advances in industrial electronics has led to high reliability drive systems, early data indicates that the maintenance effort for eHGVs may be less than that for diesel HGVs, leading to lower lifetime costs.

28 <https://www.iea.org/data-and-statistics/charts/evolution-of-li-ion-battery-price-1995-2019>

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3.7.4 Lower charging infrastructure cost

As the eHGV market grows and demand for infrastructure grows, more eHGV charging infrastructure suppliers will emerge, leading to greater competition. Over time, consolidation and commoditization will occur, but for the medium-term foreseeable future, costs for both equipment and servicing should reduce.

3.7.5 Higher energy efficiency

Ongoing powertrain improvements concerning the efficiency of batteries and electric drives will reduce the overall energy consumption of eHGVs.

Ongoing charging equipment improvements concerning the efficiency of power conversion and storage will reduce the overall energy losses of infrastructure.

3.7.6 Legislative intervention, regulations and incentives

Stricter emissions regulations may contribute towards a narrowing of the cost differential between diesel and eHGVs, owing to higher costs of compliance for diesel vehicles, and increased investment in eHGVs from manufacturers.

Timelines for these cost-down pathways are difficult to predict, and their influence on an individual fleet operators' costs depend on specific operation conditions. However, achieving total cost parity with diesel HGVs is already possible for several applications.

3.8 Charging providers

Fleet operators may elect to explore alternatives to making investments themselves, either in their own charging infrastructure or vehicle fleet, and adopt a leasing model, for example. Existing charge point operators (CPOs) and CaaS or energy as a service (EaaS) providers offer partnering models with relatively flat charging costs, which may interest fleet operators. The options to establish onsite charging facilities can also be compared with accessing public/external charging facilities, both in terms of ease of use, availability and cost.

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Table 3.1 lists the main characteristics and cost differences for fleet operators between the three approaches.

Table 3.1 Charging characteristics and cost differences

Consideration	In-house asset ownership ^a	CaaS/EaaS	Public/open access
Ownership	Fleet operator outright ownership.	Third-party service provider ownership.	CPO, or any of public agencies, CaaS providers etc, with ownership or co-ownership.
Accessibility	Limited to asset owner. Possible access to third-parties.	Target operator.	Open or partially open to several/all operators.
Fleet operator's CAPEX	Substantial. Equipment and infrastructure purchase and upgrades.	None. Set up by CaaS/EaaS provider.	None. Set up by CPO etc.
Fleet operator's OPEX	Full control over energy costs and maintenance/management costs.	Predictable but higher. Bundled service, including consumption and maintenance.	Highest energy costs.
Price predictability	Uncertain. Third-party access at a premium.	Predictable. Subscription or consumption fees.	Varying energy prices.
Fleet operator's scalability	Freedom to expand or modify based on needs.	Scalability options within limits from service agreements.	Limited control over availability and scalability.
Ease of use and charging flexibility	Greatest charging management flexibility.	Depends on service agreement.	Limited control over access and schedules.
Maintenance and repairs	Fleet operator's responsibility.	Included in service agreement.	Operator's responsibility.
Regulatory compliance responsibility	Fleet operator's responsibility.	CaaS provider's responsibility.	Operator's responsibility.
Benefits	Full control over infrastructure, tailored to fleet operator's specific needs.	Avoids CAPEX. Provides confidence in costs and service.	Avoids CAPEX. Scalable. Short-term solution.
Challenges	Substantial CAPEX. Management responsibility.	Higher costs over time.	Standardized, not tailored. Coordination challenges.

^a Leasing or financing options are not included with in-house asset ownership. These will reduce a fleet operator's CAPEX burden. Fleet operators may be aware that vehicle financing providers are actively addressing the charging infrastructure financing market.

According to McKinsey, public charging can cost five to ten times more than in-house charging²⁹. Prices for CaaS/EaaS are not widely available but are typically between those for public charging and in-house charging according to the business model for energy, transaction fees, membership subscriptions etc.

Fleet operators must carefully weigh these considerations for their specific operational needs to make the informed decision. If using CaaS/EaaS, fleet operators should also ensure a robust SLA and relationship management, with contact people for response, service and issue escalation.

²⁹ <https://www.mckinsey.com/industries/public-sector/our-insights/building-the-electric-vehicle-charging-infrastructure-america-needs>

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3.9 Financial incentives

Several financial mechanisms are designed to incentivize uptake of eHGVs, such as grants towards purchase costs of eHGVs and charging infrastructure. Relevant UK national and local government incentives currently include plug-in vehicle grants, the rapid charging fund (RCF) pilot, workplace and small and medium-sized enterprise (SME) infrastructure schemes, interest-free loans and tax discounts.

3.9.1 Plug-in truck grant

The plug-in truck grant, applied by the seller, can provide a 20 % discount to the purchase price of eHGVs up to £25,000. Qualifying eHGVs must:

- (a) be heavier than 12,000 kg;
- (b) have CO₂ emissions of at least 50 % less than the equivalent conventional Euro VI vehicle that can carry the same capacity; and
- (c) be able to travel at least 96 km (60 miles) without any emissions.

The up-to-date list of eligible eHGVs is available at the UK government's website³⁰, and currently includes models from Electra, DAF, Dennis Eagle, Magtec/Iveco, Renault and Volvo.

NOTE: Many further eHGV models are available, but the administrative activities to get models approved, and the limited number of grants available, have led several OEMs to skip gaining this eligibility.

3.9.2 Rapid charging fund (RCF)

The RCF will future-proof electricity network connections at strategic locations so that chargepoint quantities can increase as needed over time.

Provision for eHGV charging demand at motorway service areas was included in the scope of the £70 million RCF pilot, which closed for applications in early 2024. Inclusion for the main fund was recently consulted upon and responses are being analyzed.

3.9.3 Workplace Charging Scheme

Vouchers are currently available covering up to 75 % of the cost of charging equipment purchase and installation for existing workplace sites, for up to 40 sockets with a maximum £350 voucher each, potentially across multiple sites (until 2025). Vouchers can be claimed by customers, installers or manufacturers, and must be used within 180 days of receipt by OZEV-approved installers and equipment manufacturers³¹.

3.9.4 Electric vehicle infrastructure grant (SMEs only)

A grant for SMEs covering up to 75 % of the cost of installing charging equipment and supporting infrastructure (and wider works such as future proofing), up to a £15,000 maximum grant, including up to £350 per plug and £500 per enabled parking space. Potentially, up to five grants across five sites per business (until 2025)³².

3.9.5 Interest-free loan (Scotland and NI only)

A no-interest loan up to £35,000 for a new, or £20,000 for a used, eHGV in Scotland, to be repaid over six years³³, and up to €3,800 in Northern Ireland.

³⁰ <https://www.gov.uk/plug-in-vehicle-grants/trucks>

³¹ <https://www.find-government-grants.service.gov.uk/grants/workplace-charging-scheme-2>

³² <https://www.find-government-grants.service.gov.uk/grants/electric-vehicle-infrastructure-grant-for-staff-and-fleets-1>

³³ <https://www.joinbonnet.com/post/ev-grants-incentives-uk>

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3.9.6 Vehicle Excise Duty (VED) discounts

A discount on the VED premium rate is available for eHGVs (before 2025), typically around £320³⁴.

3.9.7 Local authority clean air zones (CAZs) etc.

At a local level, eHGVs are compatible with most CAZ or low-emission zone (LEZ) rules³⁵. These also include nighttime access and instances where eHGVs may use bus lanes. Fleet operators should seek clarification from local authorities regarding location-specific LEZ rules.

Some CAZ administrators also run operator loan/grant schemes for those looking to upgrade their existing fleets, and this is likely to give preference to those transitioning to zero-emission vehicles.

3.9.8 Enhanced capital allowances (ECAs)

Investment in energy-efficient and low-emission assets, including eHGVs, is incentivized through ECAs. Businesses are eligible for 100 % first-year tax allowance on eHGVs and charging infrastructure³⁶.

3.9.9 Research funding

Companies undertaking research can access various funding mechanisms to support feasibility studies, technology or process developments. Fleet operators can explore opportunities with Innovate UK Business Growth support³⁷.

The UK Department for Transport (DfT), through Innovate UK, is funding innovation in eHGV operation³⁸, including the current ZEHID programme demonstrations³⁹ and its predecessors.

3.9.10 Revenue from external users

Fleet operators may explore further financing and ownership options for charging infrastructure, such as co-ownership with neighbouring businesses to share CAPEX investment, or usage agreements with third-parties, to earn additional revenue.

In the case of additional revenue through third-party access, fleet operators should consider agreements covering factors, including:

- (a) faster charging premiums, reflecting convenience;
- (b) demand-based pricing, rising during peak periods;
- (c) idle penalties, applied for charger blocking when charging sessions complete;
- (d) fixed and variable scheduling, to maximize utilization;
- (e) data sharing, building on shared telematic and TMS data, to manage utilization; and
- (f) membership or subscription services, providing discounted rates or privileges for fixed fees.

³⁴ <https://www.gov.uk/government/publications/introduction-of-vehicle-excise-duty-for-zero-emission-cars-vans-and-motorcycles-from-2025>

³⁵ <https://www.gov.uk/guidance/driving-in-a-clean-air-zone>

³⁶ <https://www.gov.uk/government/publications/ultra-low-emission-vehicles-tax-implications>

³⁷ <https://www.innovateukedge.ukri.org/>

³⁸ <https://www.ukri.org/councils/innovate-uk/>

³⁹ <https://www.gov.uk/government/publications/zero-emission-heavy-goods-vehicles-and-infrastructure-competition-winners/zero-emission-heavy-goods-vehicles-and-infrastructure-competition-winners>

Appendix A

Glossary

Term	Description
ASC	Agreed Supply Capacity
CaaS	Charging as a service
CAPEX	Capital expenditure, i.e. asset investments
CAZ	Clean air zone
CCS2	Combined Charging System Combo 2
Charging	Activity of delivering energy to vehicle's onboard battery
CO ₂	Carbon dioxide
CPO	Charge point operator
Depot charging	Charging taking place at fleet operator's depot
DfT	Department for Transport
Discharging	Activity of drawing energy from vehicle's onboard battery
DNO	Distribution network operator, i.e. regional organization responsible for electricity distribution (as opposed to transmission) infrastructure
DUoS	Distribution Use of System
EaaS	Energy as a service
ECA	Enhanced capital allowance
eHGV	Battery-electric HGV
Electric vehicle infrastructure grant	Financial support for organizations to undertake building and charge point installation work
ENA	Energy Networks Association
Energy network	National or regional organization transmitting or distributing energy (electricity or gas)
ESG	Environmental, social and governance
ESO	Electricity system operator
EVSE	Electric vehicle supply equipment, i.e. a charger
G100	Export Limitation, all energy used on-site
G99	Export to energy network over 16 A per phase (3.86 kW per phase)
GHG emissions	Green house gas emissions
GVW	Gross vehicle weight
HGV	Heavy goods vehicle
HVO	Hydrotreated or hydrogenated vegetable oil
IDNO	Independent distribution network operator
IEA	International Energy Agency
KPI	Key performance indicator
LEZ	Low-emission zone
MCS	Megawatt Charging System
MPAN	Meter Point Administration Number
MSA	Motorway services area
NGED	National Grid Electricity Distribution
O&M	Operation and maintenance
OEM	Original equipment manufacturer, either HGV or EVSE
OPEX	Operating expenditure, i.e. running costs

Appendix A – Glossary

Term	Description
Opportunity charging	Charging taking place when vehicle is briefly stopped, i.e. on route or at destination
Plug-in truck grant	Discount to sales price of qualifying eHGVs
RCF	Rapid charging fund
Scope 2 emissions	CO ₂ emissions during generation of energy consumed
Scope 3 emissions	CO ₂ emissions by suppliers relied upon
SLA	Service level agreement
SME	Small and medium-sized enterprise
SQSS	Security and Quality of Supply Standard
TCO	Total cost of ownership, encapsulating whole-life costs
Telematics	Data system to monitor fleet vehicles
TMS	Transport management system, to plan fleet operations
TNUoS	Transmission Network Use of System
TOO	Total opportunity of ownership
TSO	Transmission system operator
VED	Vehicle Excise Duty, tax for vehicles on public roads
Workplace Charging Scheme	Financial support for organizations to install EV charge points
WTD	Working time directive
ZEHD	Zero-emission HGV and infrastructure demonstrator
ZEV	Zero-emission vehicle

Appendix B

Further reading

B.1 Online resources

- At the time of publication, the Freight Portal provides resources on HGV fleet decarbonization and wider fleet support schemes. thefreightportal.org
- The Freight Carbon Zero website and weekly newsletter covers the latest market and technology development news. www.freightcarbonzero.com

B.2 Networks to join

- The Association of Fleet Professionals www.theafp.co.uk
- The Chartered Institute of Logistics & Transport www.ciltuk.org.uk
- Logistics UK www.logistics.org.uk
- The Road Haulage Association www.rha.uk.net
- Zemo Partnership www.zemo.org.uk

B.3 Events to attend

- Commercial Vehicle Show www.cvshow.com
- Road Transport Expo www.roadtransportexpo.co.uk/rtx2024
- IAA Transportation www.iaa-transportation.com/en

B.4 Reports to read

- Smart Freight Centre – *Guidelines – Charging Infrastructure for Truck Depots* smart-freight-centre-media.s3.amazonaws.com/documents/Guidelines-Charging-Infrastructure-for-Truck-Depots.pdf
- National Grid – *A local authority guide to EVs* www.nationalgrid.co.uk/downloads-view-reciteme/620395
- Green Finance Institute – *Delivering Net Zero: Unlocking Public and Private Capital for Zero-Emission Trucks* www.greenfinanceinstitute.com/wp-content/uploads/2024/06/Delivering-Net-Zero.pdf
- Hitachi Zero Carbon – *Demonstration design and implementation - Electric Freightway Report 2* <https://www.hitachizerocarbon.com/wp-content/uploads/sites/11/2024/10/Electric-Freightway-report-2-Demonstration-design-and-implementation.pdf>
- Catapult Energy Systems – *eHGV Charger Connections Guide* <https://es.catapult.org.uk/news/ehgv-charger-connections-guide-released/>

Guide to Depot Charging of Electric Heavy Goods Vehicles

This guidance introduces the main aspects of depot electrification, as well as exploring the key technical and financial aspects in detail. It is a reference to help all organizations concerned with fleet electrification.

For large fleet operators already underway with fleet electrification, this guidance should confirm their current activities and help internal stakeholders across departments to gain a wider understanding of the electrification transition.

For medium-sized fleet operators yet to embark on fleet electrification, this guidance provides initial signposting and raises awareness. It also signals the new knowledge a fleet operator must gain for this transition.

For consultants already providing electrification advice to fleet operators, this guidance should act as a baseline reference.

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