



Electrifying the charge ahead

How eTrucks can join
the transition on the road

heliox



Executive Summary

The transition towards electric vehicles and e-mobility is growing steadily across Europe and the rest of the world. Public transport, consumer vehicles and company fleets are all part of this, but in order for the transition to be a success, necessary infrastructure must be put in place, including rapid chargers. The purpose of this research report is to understand the state of truck fleet electrification across Europe, particularly how fleet managers are managing the transition, and what they feel are their critical business needs.

Heliox conducted research in partnership with Censuswide of 151 fleet managers and decision makers in four markets: UK, Germany, France and the Netherlands.

Key findings of this research include:

- ✓ Over one third of respondents (38%) said between 26-50% of their fleet is electric.
- ✓ The top three motivations for investing in truck electrification are: competitor pressures (38%), environmental concerns (37%), and rising fuel prices (36%).
- ✓ The top three biggest challenges of moving to e-mobility are: lack of infrastructure (27%), investment in training staff in new skills (25%) and battery issues such as lifespan, efficiency and durability (24%).
- ✓ The top ways respondents wanted to improve public charging were: reducing the cost of charging (41%), increasing the number of public charging facilities (41%) and improving the speed of charging (38%).
- ✓ Over a third of respondents (35%) said their company is not aware of support programs for e-mobility transitions in their region.
- ✓ Over half of respondents (55%) said their company had not taken advantage of e-mobility subsidy programs.
- ✓ Nearly half of respondents (43%) said that trucks were the last to join the e-mobility transition due to lack of publicly available charging infrastructure.
- ✓ Over a third (37%) cited financial feasibility of eTrucks as the reasoning behind this.

Over one third of the respondents say that



38%

26 - 50%
of their fleet is electric



35%

Their company is not aware of support programs for e-mobility transitions in their region.



37%

Cited financial feasibility of e-trucks as the reasoning behind this.

Over half of respondents



55%

Their company is not aware of support programs for e-mobility transitions in their region.

Nearly half of respondents



43%

Trucks were the last to join the e-mobility transition due to lack of publicly available charging infrastructure

★ Top motivations for investing

38%

Competitor pressures

37%

Environmental concerns

36%

Rising fuel prices

★ Top challenges of moving to e-mobility

27%

Lack of infrastructure

25%

Training staff in new skills

24%

Battery issues

★ Top ways respondents wanted to improve public

41%

Reducing the cost of charging

41%

Increasing the public charging

38%

Improving the speed of charging

During the research phase, Heliox also conducted six interviews with experts in the industry, three of which were research associations T&E, Avere and Fraunhofer and three of which were truck experts Simon Loos, Albert Heijn and Cure. The interviews with research associations were based on questions about the current state of the infrastructure and how it is expected to evolve in the next 5 to 10 years. In the discussions with current Heliox partners, clients went on to explain their current electric truck infrastructure, how they plan to keep up with the transition and what are the main challenges that they are still facing.

Key findings of the interviews include:

- ✓ We will see a first wave of electrification in the smaller truck segment for urban and regional transport (3.5 tons, 12 tons, etc.) and only then in the heavier, larger ones for long-haul distances.
- ✓ Super-fast charge infrastructure for cars is a good backbone to support urban trucks and the pressure towards zero emissions in cities plus fuel cost will be factors to push the adoption of N1 eTrucks.
- ✓ Researchers agree that depot charging will be the dominant charging location at first. Depending on the purpose of the truck, public charging or charging at the customer's premises will then be added.
- ✓ At the moment, there are CO² standards for trucks that call for a 30% reduction in the existing fleet by 2030. But the ultimate goal is to be completely climate-neutral by 2050. To achieve this, no new combustion vehicles should be newly registered by 2035 at the latest.
- ✓ To the questions "What should happen in the next years for a quicker development of the public eTruck charging infrastructure?" researchers agree that we need:
 - More ambitious regulations and climate goals: to achieve zero CO² emissions in heavy goods transport by 2050, mandatory targets for truck charging infrastructure along the trans-European networks, throughout Europe from 2025.
 - A final decision on the European level for the Alternative Fuels Infrastructure Regulation (AFIR).
 - Direct intervention from truck and large fleet manufacturers.
 - The reduction of costs related to public charging from the utilities (electricity cost and cost of electrical grid connection).
- ✓ The arrival of MCS chargers will be a boost for long-haul trucks. It is the biggest opportunity for the long-haul transit across Europe and is already being developed. First chargers are expected to be installed by 2024-2025.
- ✓ Infrastructure and eTruck production need to be considered simultaneously and aligned with the MCS timeline to launch more battery trucks and therefore reduce the CPO.
- ✓ Current challenges and scale up opportunities are:
 - The availability of chargers along the road.
 - Charging protocols need to be improved so that charging can be done reliably at any time.
 - The grid development plan must be adapted to cater for the increased electricity demand.
 - The cost balance between battery performance and charging infrastructure.



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Foreword

In Europe, we are currently seeing the continued spread of e-mobility across consumer and business vehicles. At Heliox, we are particularly fascinated by the motivations, challenges and opportunities driving this transition and how the transition is impacting our partners, in particular in the trucking space.

We set out to research fleet managers across Europe, and have in-depth conversations with some of our longest standing partners in order to better understand the current state of the industry and how it is truly impacting those operating within it.

Our research focused on learning more about the current motivations for fleet managers to electrify their truck fleets, what their biggest challenges are, and how these can be counteracted. A clear thread quickly became apparent: without the appropriate

infrastructure in place, the electrification of truck fleets will be much more difficult. To ensure challenges faced by fleet managers are resolved in line with government timelines, collective action is needed. This is only attainable through cooperation from everyone involved in the switching process. From the OEMs and charging providers to the transport companies and contractors, there must be total alignment in our end goal – decarbonisation.

We want to ensure we understand the best ways we can support our partners and those in the industry, by tailoring our services to their needs. We hope this research and the conversations with our partners sheds light on the state of the industry and provides useful insight to those equally passionate about the e-mobility transition.



Jasper Konings

Director Commercial Vehicles and Fleets.



The Opportunity of Truck Electrification



The current state of the industry

The opportunities that lie within e-mobility have been known for some time. From consumer adoption to government subsidies, the prevalence of e-mobility has grown over the last decade.

While consumer adoption has risen exponentially over the last few years, there is still room for growth when it comes to the electrification of business fleets. Many businesses have made strides in this sector, however there are more opportunities ahead for the industry to develop its offerings to ensure businesses are fully equipped for adoption.

Heliox has conducted market research of fleet managers across Europe, and has spoken with leaders within key industries who are managing their fleet transition process in order to better understand the landscape of eTrucks. This report outlines the opportunities for growth within the industry, as well as in what elements of e-mobility fleet managers require the most support. The report aims to demonstrate the opportunities and solutions available to fleet managers and those working within the industry, while also shining light on the current state of the industry, and some of its key players. This features case studies that showcase how e-mobility challenges can be solved through the appropriate solutions.

There are more opportunities ahead for the industry to develop its offerings to ensure businesses are fully equipped for adoption.



The Opportunity of Truck Electrification

Fleet managers are waking up to the importance of electrification and the potential in eTrucks. Due to the geo-political discussions of fossil fuel energy sources, it is clear petrol and diesel will soon become a thing of the past as electrification moves to the forefront.

The possibilities electrification offers to the automotive industry has become more prominent as a result of the strong adoption of Battery Electric Vehicles (BEVs) and Hybrid Electric Vehicles (HEVs) in the personal EV's sector across Europe. Nations such as the Netherlands are leading the next generation of powered vehicles with **24%** of new car sales being electric in 2022, alongside the **eBus market growing across the EU by 50%** in 2021 alone, and now businesses are adopting this mentality through eTrucks. As we explore the figures in more depth, the opportunities of truck electrification will become clear, as well as the potential there is for it to become a fast-paced growth market.

Currently, just 4% fleet managers state that their fleet is 100% electric, and this is no surprise. A large proportion of vehicles still need to be electrified and currently the number of electric vehicles (EVs) in use has

remained stagnant. So far in 2022, we've seen that very few companies have opted to electrify their fleets yet but there is potential for this to change as discussion around the phasing out of petrol and diesel continues.

In 2021, the automotive industry saw a **26.6%** increase in the registration of eTrucks, specifically new medium and heavy commercial vehicles over 3.5 tonnes.

Of the four key EV leading nations identified, Germany is leading the eTruck transition with nearly **800 eTrucks operational in 2021**. As there are only **1,394 eTrucks** registered in Europe and no other country accounts for more than 20% of this, we can see why Germany is amongst the leading nations in the trucking industry despite the physical number of eTrucks remaining low. The only other nation keeping up with Germany is the UK (**333 registered eTrucks**) and the Netherlands (**216 registered eTrucks**). Despite France showing an 88% growth in 2021, they lag behind these nations with only 26 registered eTrucks.

Heliox's research shows that 44% of fleet managers asserted their company is already taking advantage of electromobility subsidy programmes in their region. The desire for electrification is evident, with increasing pressures from external sources leading fleet managers to possess the motivation to divest from diesel powered vehicles.

Battery-electric trucks in 2021 (N2 + N3 classification)



1 Spain 40

2 Portugal 26

3 France 29

4 Luxembourg 32

5 Belgium 24

6 Netherlands 216

7 Ireland 9

8 Denmark 47

9 Sweden 47

10 Finland 16

11 Latvia 3

12 Germany 793

13 Czech Republic 7

14 Austria 48

15 Hungary 1

16 Italy 48

17 Bulgaria 8

Motivations Driving the Demand for Electrification

The e-transition is something on the mind of all fleet managers. While e-fleets are the last road vehicle to join the e-transition, they are becoming more of a priority for companies in the sector for a wide range of reasons.

The main reasons cited by fleet managers for e-transition are:



37%

**Environmental
concerns**



37%

**Cost of
ownership**



38%

**Competitor
pressures**



Environmental Concerns

Unequivocal evidence shows diesel and petrol engines are seriously damaging to the environment and road users need to do more to combat this damage. 37% of fleet managers cite environmental concerns as the top reason behind e-transition. Zero-emissions heavy goods vehicles can immediately eliminate the environmental concerns caused by petrol and diesel engines.



Total Cost of Ownership (TCO)

With no policies in place from government bodies The International Council of Clean Transportation (ICCT) predicts the total cost of owning an eTruck will only fall below diesel trucks at soonest by **2025 in The Netherlands**. France, The UK and Germany all lagged behind with respective timelines of 2025, 2026 and 2029. But with incentives aimed at reducing the TCO of eTrucks in place including the Eurovignette Directive and potential purchase premiums being floated, fleet managers are taking notice of the direction of the industry. Not to mention that countries across Europe have seen petrol and diesel prices skyrocket in the last twelve months. **13 EU countries chose to cut the tax on petrol and diesel** but even with the cuts, fuel is considerably more expensive than it used to be and fleet businesses are bearing the brunt of the price increase. 36% of fleet managers say high fuel prices are the top reason behind electrification in the sector. Owners of petrol and diesel vehicles are also seeing increases in road taxes, insurance prices and maintenance costs. Across Europe, many countries are demonstrating the benefit of transitioning to an electric vehicle, by offering incentives such as tax relief, toll-free transport and charging grants.



Competitor Pressures

38% of respondents assert competitor pressures are the key driving force behind the transition to electric trucks. For example, Albert Heijn already has 15 eTrucks in use operating from two depots, Tesco amongst the first retailers in the UK to operate an eTruck that delivers to over 300 cities, Amazon has five fully electric HGVs in operation. The benefits of going electric are appealing, and as more companies consider the switch it is understandable. The risk of falling behind the competition is always a threat in business.

There are of course other factors that impact on the e-transition, with many fleet managers (31%) citing profit and cost reasons as their top reason for moving to e-fleets. With the transition to e-mobility currently well underway in key European nations such as The Netherlands, United Kingdom, France and Germany, Heliox's research shows that fleet managers are being met with certain challenges that are preventing the speed and agility of their transition.

Challenges behind Transitioning to eTrucks




It is possible to attribute the apparent slow uptake of eTrucks to the challenges that come with transition. Better understanding of the challenges fleet managers face can help organisations find the most effective solutions and achieve 100% electric fleets much more quickly. The key challenges include:

Lack of charging infrastructure

The charging infrastructure necessary for fully electric fleets is not currently in place across Europe. 27% of fleet managers say the lack of infrastructure for trucks is the key challenge behind the transition. Nearly half (43%) of fleet managers also said they believe eTrucks are the last road vehicle to join the energy transition because public charging infrastructure isn't readily available. Public charging and reliable infrastructure are vital changes necessary to improve fleet managers' feelings toward full fleet electrification.

Total number of DC recharging points

> 50 kW in 2021, according to the AFIR categorization.

	 50 - 150 kW	 150 - 350 kW	 > 350 kW
Germany	5,232	6,929	759
Spain	2,429	431	93
Italy	2,074	825	211
France	1,801	1,375	491
Sweeden	1,275	1,036	161
Netherlands	1,122	1,662	84
Austria	1,099	761	102
EU total	5,903	2,559	429



Battery issues

24% of fleet managers consider concerns about eTruck batteries and how they perform the biggest challenge to transition. Issues include concerns about efficiency, lifespan and optimal functioning. It is important to look to future-proof technologies that can serve many purposes to combat the issues many are experiencing with batteries currently. One future solution is in vehicle to grid (V2G) charging infrastructure. This grid balancing technology will become an essential part of building chargers of the future and will soon become standard.

Other challenges are also considerations for fleet managers looking at transitioning to e-fleets. Over a third (35%) of managers highlighted their company not being aware of any support programmes for e-mobility in their region, which could make the transition seem unaffordable and unachievable. Surprisingly 1% of respondents claim they do not see any challenges to 100% e-mobility.



Investment for skills training and resource planning

25% of fleet managers cite the necessary investment to train new skills and adapt resource planning as the biggest challenge for transitioning to eTrucks. Understandably such a significant shift in operations, different vehicles and new infrastructure requires specific training and planning, something businesses have to factor into their costs.

How Far is Government Support Taking Fleet Managers?

20 countries in the EU have subsidy programmes to support the purchase of EVs. Accessing these incentives is a vital step for organisations looking to make the most of the available funding and take the necessary steps towards electrification. Almost two fifths (39%) of fleet managers say their company has not yet taken advantage of the electromobility schemes available in their region. 16% confirmed they also had not taken advantage but would consider it in the future.

In Germany, over 50% of fleet managers are aware of the subsidies their government offers and the near majority of them (60%) take advantage of this purchase grant. Germany's '[Umweltbonus](#)' (environmental bonus) program offers grants for the purchase or lease of electric cars or vans, which helps save businesses and consumers up to [€9,000](#) on EV purchases. The country is also leading the way when it comes to tax reliefs for EVs, and toll-free options for eTrucks, while also funding 80% of infrastructure costs or extra

costs for electric trucks. Recently, the UK also launched its first [Zero Emission Road Freight \(ZERFT\)](#) funding program with a budget of £140 million aimed at innovation projects which decarbonise heavy goods vehicles (HGVs) for 40-44t battery electric trucks. [AanZET](#), The Netherlands eTruck funding project which has a budget of € 25 million in 2022 was exhausted quickly with the demand of e-mobility fast charging ahead but it's encouraging to see the government allocating up to € 80,000 depending on the size of the eTruck. It's evident that electromobility subsidies such as these have an undeniable influence over the adoption of any vehicles, much less eTrucks as Germany is now leading the eTruck transition with its 793 registered trucks.

But the influence governments intend to have over eTruck adoption is only viable if fleet managers are made aware of the incentive

programs offered. In the Netherlands, the second largest eTruck nation in Europe, 45% of fleet managers don't know if their companies were aware of local subsidies with a further 26% fully in the dark. In the Netherlands, fleet managers are entitled to a number of incentives under the Netherlands Enterprise Agency (RVO) grant. For example, fully electric vehicles are free of paying Motor Vehicle Tax (MVT) till 2024, with discounts in the following year. As budgeting for change is something on the mind of all fleet managers, having the awareness of a reduced liability such as MVT is crucial in their decision to start their e-transition. Government support is crucial to accelerating the growth of this market and despite having plans in place to create this uptick in adoption, fleet managers expect governments to continue this encouragement.

The Gap in The Market, Who What Where Why

What

While there are not currently huge leaps forward in e-fleet transition, more businesses are making steps towards a fully electric fleet. Their expectations are quite reserved, as only 12% of fleet managers expect their fleet to be 100% electric by 2030. However, 74% expect this to be the case by 2040. In order for the eTruck market to increase in pace, fleet managers have expressed a need for development in wholly owned charging but also public charging options. Fleet managers are striving for wholly owned charging infrastructure with mobile and depot charging options also being considered, however 45% still expect some form of public charging to become available. A further 30% want public charging to be more accessible to help their e-transition occur more smoothly.

To successfully transition to a fully electric fleet, businesses need the right infrastructure in place and this includes the provision

of charging depots. In the UK 75% of fleet managers own charging depots, while 22% don't and 2.5% don't but are considering it. For France, 47% of fleet managers own charging depots, 36% don't, and 18% don't but are considering it. For Germany, 45% of fleet managers own charging depots, 49% don't, and 5% don't but are considering it. For the Netherlands, just 23% of fleet managers own charging depots, 36% don't, but 39% don't but are considering it.

The demand for charging depots may relate directly to needs becoming apparent as more areas in European countries strive for a zero-emission future. Fleet managers recognise the need for electrification but finding their way there within budget and with the available resources is not always straightforward.

Who and Where

Different European countries have different benchmarks for vehicle electrification, too, and this influences how fleet managers perceive the future of e-transition.

Out of the four key EV nation's surveyed, fleet managers in the Netherlands and Germany were found to be at the forefront of truck electrification, while the UK and France appear to be lagging behind. Close to half (47%) of fleet managers in both Germany and the Netherlands have fleets that are up to 75% electric. In France, half of all fleet managers have up to 50% of their fleets electric while a third of UK fleet managers only have 26-50% of their fleets electric.

Despite these figures, fleet managers paint a different picture as we advance, with French fleet managers expecting demand for eTrucks to ramp up. They believe they can reach 100% electrification by 2031-35, making them the first European nation to achieve this goal. The reality may not match expectations, but it shows a true commitment to transition in the region. Forecasts from fleet managers in other regions differ significantly, with more conservative estimates on electrification and the timescales involved:

Percentage of the country that expects to be 100% electric by 2036-40

Netherlands

52%

Germany

37%

UK

31%

Why

Many European cities and municipalities are forging ahead with [zero-emission zones](#), making it vital for fleet-based businesses to take steps to electrify their fleet. In the Netherlands, fourteen Dutch municipalities have committed to zero-emission zones by 2025. This is a significant step forward from the more common low-emission zones (LEZ), which see cities banning diesel and the most polluting vehicles. The UK also has areas committing to zero-emissions, with former transport secretary Grant Shapps calling for

at least one city centre to become a zero-emissions zone. Councilors in York have put their city forward, which would see only bikes and electric vehicles allowed within certain boundaries. Other cities, including Madrid, Oslo and Paris, have committed to the aforementioned low-emission zones, with older diesel vehicles banned in Paris in 2019. London is also moving towards ultra-low emissions, and these steps show fleet managers the pressing importance of truck electrification.



Case Study

Albert Heijn

The Company

Albert Heijn is the largest supermarket chain in the Netherlands. The long-established company, which grew out of a small grocery store in Oostzaan in 1887 opened by Albert Heijn, has several types of stores, including smaller supermarkets, convenience stores, XL hypermarkets and a delivery service. Together, they account for a market share of 34.8% in the Dutch supermarket industry.

The objective

Not only does Albert Heijn prioritise the quality of its products and services, but it's environmental footprint is also close to its heart. For this purpose, the retailer has a vision that includes a promise for future generations: "leaving behind a better world". This vision guides the mission statement to which all of their business activities are committed. It applies not least to the entire logistics function, including the delivery service. Therefore, the goal is to accelerate to zero emissions. Albert Heijn welcomes the introduction of zero-emission zones in the Netherlands for more climate-friendly traffic. Albert Heijn has many shops and home deliveries inside Dutch cities where zero-emission zones will go into effect starting from 2025. Therefore the company is strategically taking a front-runner position and challenges itself and its partners with higher ambitions towards more climate-friendly transport.

The challenge

Albert Heijn uses Third Party Logistics (3PLs) to manage its delivery process. This requires strong coordination to push for change throughout the industry in order to reach zero emission. Delivering to more than 1,000 supermarkets in the Netherlands and Belgium requires a variety of different vehicles, especially since most of the supermarkets are located in city centers. Albert Heijn's transport department has a key role in this process:

"[We are] supporting and coordinating everything from the ideation stage of electric trucks in our business all the way through to the implementation and execution stage."

Alannah van't Hoenderdaal, Consultant Transport Expertise at Albert Heijn Transport

There are around 1,000 trucks in daily use that need to be converted to climate-neutral vehicles. For this to happen eTrucks must not only be procured, but route planning must also be adapted and suitable charging infrastructure must be made available.

The biggest challenges Albert Heijn are still facing revolve around the interoperability of chargers and vehicles as well as the availability of grid connection for the peak load. Charging protocols needed to be improved and technical characteristics such as range of the vehicle voltage system, position of power inlet, type of connector etc. Needed to be standardized so that charging can be done reliably at any time.

The goals

Currently, 15 electric vehicles are already in use, operating from two depots. However, Albert Heijn plans to continue to learn how to operate an electric delivery service and optimize the utilization of the charging stations. To solve the bigger challenges around its mission, Albert Heijn has set interim goals: From the end of 2022, both home grocery delivery and store supply in the center of Den Haag will be 100% electric. Rotterdam (Q1 2023), Utrecht (H2 2023) and Amsterdam (H2 2023) will follow. This will provide quieter and cleaner transport in customers and residents neighborhoods with the same ease. Albert Heijn also plans to switch all transport completely to biofuels by 2024.

The solution - charging infrastructure

Currently, Albert Heijn charges their eTrucks at the distribution centres. These trucks are charged between 20 to 25 minutes, slashing the time usually required for other eTrucks such as truck-trailer combinations (that can take up to 40 minutes) to charge. Charging at 300 kW suits Albert Heijn's operation to sufficiently charge the electric truck's batteries in between routes thereby making the operation more efficient.

"We are going to drive (electric) in the city centers of the biggest cities in the Netherlands."

Alannah van 't Hoenderdaal
Consultant Transport
Expertise at Albert Heijn
Transport





Guidelines to electrifying businesses





Guidelines to electrifying businesses

The transition to 100% electric fleets is a turning point for our society and full of innovation opportunities. It won't happen all at once. Nonetheless, it is possible to start today with the existing infrastructure and solutions.

The first phase of the transition, already underway, involves the shift of trucks for urban and regional deliveries. Vans that are used for the last-mile deliveries for example can use AC and DC chargers at existing charging infrastructures used by passenger cars. On the other hand, Medium-Duty-Vehicles (MDV) and Light-Duty-Vehicles (LDV) used for regional distribution with a daily route less than 150 km are already being charged at depots or destinations. The last phase is the transition from heavy goods vehicles involved in long-haul transit, for which the industry is currently developing the Megawatt technology. However, Combined Charging Systems (CCS) at rest areas are already a sufficient starting point.

The installation of the first Megawatt Charging System (MCS) for trucks will be a boost for electric long-haul transportation and is already generating public attention. It is a big step towards the consolidation of e-mobility in the trucking sector. The biggest obstacle yet is the infrastructure across Europe. The initial construction of appropriate charging points will depend on the actions of truck manufacturers and fleet companies. However, it's absolutely necessary to consider electrification and infrastructure at the same time, whether it's on a local, regional or long-haul scale. Through current use cases and eTruck corridor projects, we've seen that the transition is already possible in this field.

This section acts as a five step guideline to fleet electrification, demonstrating the solutions available to fleet managers. Based on expert interviews from experienced stakeholders out of industry and science, this section identifies the most important aspects to consider while electrifying fleets.

1. Type of trucks

The European vehicle classification divides commercial vehicles into three "N" categorizations. The key factors are the carriage of goods and the maximum mass each vehicle type can transport. This is important when considering the operational needs and the charging infrastructure needed.

Looking closer at the EU definition for the vehicles for the carriage of goods, there is a further [subdivision for N1 trucks](#). "This classification is based on the Reference Mass, defined as the mass of the vehicle in running order less the uniform mass of the driver of 75 kg, and increased by a uniform mass of 100kg."

The majority of active eTrucks nowadays are mainly N1 trucks, for short-haul journeys and deliveries. These ones are easy to manage using advanced car fast chargers. As we look ahead, this technology will keep evolving in order for eTrucks to be competitive, especially in regard to battery energy density, efficiency and charging speed. The next big shift that the industry needs to make in the next few years is the introduction of N2 trucks on the roads to complete the transition to electromobility.



Vehicles for the carriage of goods such as pick-up trucks or vans with a maximum mass of 3.5 tonnes
Used for: Last Mile Delivery (Food Logistics/ Retail, Package)



Commercial trucks for the carriage of goods with a mass between 3.5 and 12 tonnes
Used for: Last Mile Delivery (Box trucks), firetrucks



Commercial trucks for the carriage of goods with a mass exceeding 12 tonnes
Used for: Long-haul trucks, refuse trucks, construction machinery (mobile cranes, cement mixers, tractors)

Heavy-duty transporters will mostly benefit from eTrucks

Even if eTrucks are still more expensive at the moment of acquisition, the low energy and maintenance cost will reduce the total cost of ownership. This means the battery and truck will pay for themselves in just a few years after purchase. [Studies, recently from BCG](#) show that this might already be the case by 2025.

"The more and longer I drive, the sooner electric trucks will outcompete their fossil fuel counterparts because electric charging will be cheaper than diesel."

Fabian Sperka, Vehicles Policy Manager at Transport & Environment.

2. Energy consumption and operational needs

To help infrastructure providers and fleet managers anticipate the concrete charging needs, knowing the potential energy consumption of the trucks for a certain distance will prove useful. A lighter truck driving in cities or short journeys of less than 150 km, will not require the same charging infrastructure nor power as a truck driving through Europe. After careful analysis, we have divided different energy requirements into four different categories depending on the operation:

1. A **distribution only operation**, with trucks delivering freight that don't require additional power consumers (like tail lifts or cranes for example), consume around 1 kWh/km. Essentially, light goods vehicles that are being used in last-mile delivery fall in this category.
2. A **full service distribution operation**, with trucks using power consumers like tail lifts, consumes 1.5 kWh/km. Light and 2-axles heavy goods vehicles with heavier freights fall under this category.
3. The **general highway operation**, with long-haul and heavyweight trucks averaging around 85 km/h, require 2 kWh/km of energy. Typically, heavy goods vehicles with long-distance deliveries suit this category.

4. The **waste collection operations**, with waste trucks that have high additional power consumers, consumes 3 kWh/km.

Depending on the level of operation, businesses requires testing to allocate the specific applicable power consumption. This is important because power consumption in practice can vary from the estimations. The anticipated distance, the weight, the calculated route as well as external factors such as weather changes or congestion for example will all have an impact on the final consumption.

How many kilometers can a long-haul truck driver complete before planning the mandatory break of at least 45 minutes (after four and a half hours of driving)? How many shifts need to be covered by one waste collection truck and how much distance does it have to cover? What is the optimal delivery tour for a distribution truck before the truck needs a charging stop at the destination or back at the depot? These questions will help evaluate and narrow down the actual infrastructure need for each segment: depot charging, public (opportunity) charging or destination charging.

3. Charging infrastructure

The acceptance for EVs has grown exponentially in the minds of consumers, therefore the technology has matured and different charging sites and strategies are already operational or in development. If short-haul commercial vehicles can use fast car chargers, then the equivalent infrastructure for long-haul heavy duty trucks is yet to be developed. While examining the possibilities for its new charging needs, operators need to consider several factors such as investment, infrastructure, operations, space, and energy cost. The table illustrates the time and energy required for different charging operations.

Depot Charging (overnight)	Public Charging (overnight)	Public Charging (opportunity charging)	Destination Charging
8 –10 hours	12 hours*	45 minutes	45 minutes
Power needed: 50 - 100 kW per outlet	Power needed: 50 - 100 kW per outlet	Maximum power needed: 400 - 800 kW per outlet	Maximum power needed: 400 - 800 kW per outlet

- ✓ **Home / Depot charging:** These chargers are located at a private or public hub, where eTrucks park and charge overnight. They are widely used to charge trucks that drive one shift per day. After a night of charging, the battery is fully charged and ready to cover the required distance of the businesses. It is also the cheapest option for eTruck operators because energy costs at the depot are lower than in a public charging station. Depot charging is usually referred to as a slow charging method with an AC or DC output between 50 and 100 kW. Therefore, overnight charging is the most frequently used infrastructure for fleet operators when beginning the e-transition. It is the most economical solution for vehicles with a range of up to 150-200 kilometers.
- ✓ **Destination charging:** When truck drivers have to do several shifts or when the battery is not large enough to cover the daily journey, they need to charge at the location of the customer while unloading and loading for example. The main benefit for operators are that trucks can drive longer routes whilst investing in overall smaller batteries. For some use cases it can be used in combination with the overnight charging. This offer a greater flexibility and reduces the initial capital expenditure. Vehicles will charge with an output between 400 to 800 kW.
- ✓ **Public / Highway charging:** The “on the road” charging strategy heavily relies on public charging infrastructure such as gas stations, rest areas or charging hubs along the highway. The 100% public charging method is more suitable for operators with long-haul operations that need to drive more than 300 kilometers per day. They can charge during their 45 minute break after 4,5 hours driving. Here eTrucks require short-time charging solutions with at least 400 kW and 800 kW in the future. They can also use slow chargers on public areas overnight during their mandatory break after 9 hours driving. Businesses will reduce their infrastructure costs but the main consideration will be the added cost of energy at public or private charging station and the availability on the calculated route.

*Mandatory rest time - Max 9 hours driving within 24 hours

Destination charging

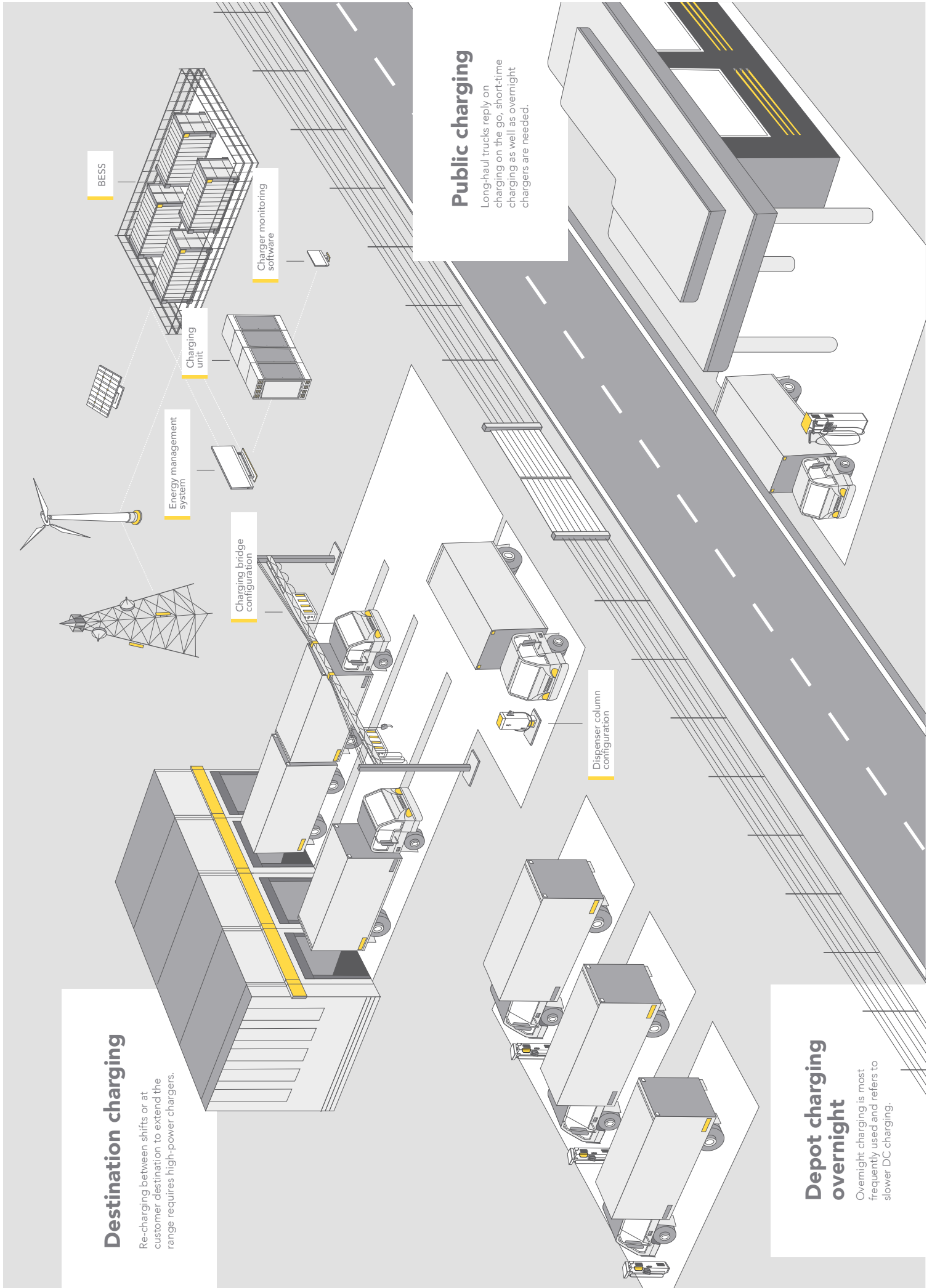
Re-charging between shifts or at customer destination to extend the range requires high-power chargers.

Public charging

Long-haul trucks rely on charging on the go, short-time charging as well as overnight chargers are needed.

Depot charging overnight

Overnight charging is most frequently used and refers to slower DC charging.



4. Adapt to the evolution of eTrucks

As truck manufacturers start investing in the latest e-mobility technology and integrating this into the trucking segment, fleet managers predict that an improvement of overall truck performance can be achieved (range, load capability and charging speed). As such, rapid car charging infrastructure (DC 150kW+) is a good starting point for urban trucking.

“We are seeing that the today’s electric trucks are adapting to the standards which are currently available. [They sometimes charge] on existing infrastructure on the highways with 350+ kW. It is not the ideal situation, but they find their way.”

Philippe Vangeel, Secretary General at Avere

Electric light-duty vehicles in particular are growing in popularity. Vans under 3.5 tones use AC charging or current chargers designed for cars; a recent [study from Transport & Environment](#) says that “The average electric van is already 25% cheaper per km to own and operate today than the average diesel van.”

The electrification of the truck segment will first occur in the niche of smaller sized-trucks with applications in urban and regional transport. Only once that has occurred can we see heavier and larger vehicles adopt e-mobility with long-distance applications. As charging infrastructure develops, it’s predicted that the size of the battery and the shape and weight of the new generation of trucks will continue to adapt, meeting fleet managers demands. As illustrated in the below graphic, new regional light-and-medium-duty trucks, with daily drives of over 150 kilometers, are already being launched on the market or planned.

For long hauls, the new MCS standard not only enables rapid charging in minutes, but also provides a blueprint for the

desired interoperability between charging infrastructure and vehicles that fleet managers need in the future. Patrick Plötz, Project Manager for high-capacity charging for long-distance trucks (HoLa) at the Fraunhofer Institute strikes a positive balance as he said:

“The manufacturers have already largely agreed: They will be placing the plug on the left side of the vehicle, so I think from the standardization, it all looks pretty good.”

But it’s not only the charging infrastructure that has an impact on the development of trucks. The needs from the wider industry - which have a very specific idea of what is required - are also driving the development of new vehicles. Philippe Vangeel said:

“It was not too long ago, that truck producers said that ‘with the new CO² targets, this transition is going to be difficult, we won’t achieve this’. But their customers countered by denying that lack of optimism by saying ‘No, we want zero-emission trucks.’ [...] We’re also shifting away from traditional trucks, which is seen through the divisions who are producing cars specifically for Amazon for example. Medium range vehicles is really taking up and producers are bringing different products to the market to fulfil a specific demand.”

Planning routes with digital tools also makes it possible to optimize electric transport. Logistic routes, especially in last-mile delivery, can be better planned with modern applications included in electric vehicles. Philippe Vangeel is convinced that digitalization is an important step for electromobility – it doesn’t change the vehicle itself, but the way we optimize it.

5. Bringing together the operation and the charging infrastructure

To understand the viability of each strategy for businesses and fleet managers day-to-day operations, they must connect the dots and define which strategy can be deployed in the short term. By comparing operational needs to the different type of trucks and required charging capacity businesses and fleet managers will have a better overview on the infrastructure that is necessary, guiding their investment decisions. Businesses can only truly make a positive impact on the environment once every aspect of the operation is taken into account.

Outside of their applications, it's safe to assume that slower overnight charging at depots will be the prime charging solution as the technology is already available and can provide enough to fully charge vehicles ahead of their short or long distance journeys. Experts also predict that for each eTruck introduced to the market there will be a new slow charger installed.

When asked what the charging infrastructure landscape will look like the coming years, Patrick Plötz answers:

"We and most studies assume that depot charging will be the dominant charging location for the time being. Depending on the purpose of the truck, public charging or charging at the customer's premises may then be added. Charging at the customer's location naturally raises certain issues, such as billing and so on; this can play a role and therefore take some time. On the road charging or highway charging will certainly come a later too, because the ranges are manageable for the time being and the long-distance infrastructure for fast charging, whether it's CCS overnight or megawatt charging during breaks, has to be built up first."

Fabian Sperka, Vehicles Policy Manager at Transport & Environments adds:

"It becomes more difficult for heavy-duty traffic. And that's actually the decisive factor. You need a power output in the range of 700, 800, 900 kilowatts per individual charging point."

Public charging is overall more expensive than at the hub. For fast charging to become competitive, charge point operators will need to revise the price of energy for fast charging in comparison to battery prices. That said, MSC will boost the eTruck adaptation for long distances. Nonetheless, research shows that depot charging is currently the front-runner solution. The Fraunhofer Institut believes that it will dominate until "on the go" charging is more accessible, at for example gas stations or along the highways. In fact, even when it comes to on the go charging, MSC will have less of an impact compared to CCS.

"We will still need a greater number of CCS as opposed to MCS chargers at rest stops. After all, if trucks are taking breaks overnight, or for at least nine hours, then one CCS charging point will suffice. However, MCS is still beneficial because on-the-way charging points with a small number of MCS can serve a greater number of eTrucks per day in comparison to CCS. This means that depot charging will continue to dominate quite clearly, even for long-distance trucks", Patrick Plötz adds.

To summarise, the charging technology needed depends on the size and use of the vehicle. In the future, heavy duty trucks will require a much more powerful output than smaller vehicles for the regional operations. In the transition to e-mobility, fleet operators might also want to consider their business model and look for integrated charging solutions, offering the design, installations, management software and maintenance service all at once.

Case Study

Cure

The Company

Cure Afvalbeheer is a waste management company that is 100% owned by the three municipalities and cities of Eindhoven, Valkenswaard and Geldrop-Mierlo. In this area, there are about 300,000 people for whom the company provides its services. In addition to managing waste problems, Cure advises the municipalities on waste collection, treating, recycling and collecting waste. Cure has 135 employees and uses about 35 trucks to manage communities' waste problems every day.

The objective

Climate policy issues are on the agenda of all European countries with the EU aiming to be climate-neutral by 2050, although some consider it to be more pressing than others. Cure has set itself the goal to reduce their emissions on various levels and to stand up for a future worth living. In particular, the focus is on reducing the CO² emitted by their trucks, in which the businesses plan is for all trucks to be powered by electricity by 2030. In March 2023, there will already be 14 trucks running on electricity.

The challenge

"I think EV battery capacity and how the trucks can be charged go hand in hand. If we want to expand and accelerate the uptake of eTrucks in the Netherlands, the capacity of the batteries and the infrastructure of charging stations in the Netherlands, as well as the speed at which they are being rolled out, can give us an extra boost."

Frans van Strijp, Director of Cure Afvalbeheer

Waste management is typically a somewhat conservative business area that is now starting to ramp up its innovation through new solutions. As they look to introduce new innovations, the right balance must be struck between costs and environmentally friendly measures. eTrucks are very cost-intensive and have not yet been tested enough in this area. Unfortunately, Cure cannot afford to have a day of downtime, as waste is continuously generated and must be managed. As such, there is an uncertainty about how eTrucks will perform on a day-to-day basis in the waste management sector. Above all, the issue of charging infrastructure is one of the biggest challenges, as the vehicles could break down without sufficient charging stations.



The goals

"The trend towards battery-electric trucks has positive and negative things, mainly positive of course for the environment. But also for the noise. It's much quieter. So that's a positive thing. So we can collect in other time areas and that is beneficial, so we can work in two shifts, so we need less trucks as we work in one shift. That all comes together."

Frans van Strijp, Director of Cure Afvalbeheer

Cure is trying to break traditional patterns of working in its industry. Two years ago, together with the cities of Rotterdam, Alkmaar and Zwolle, they purchased an electric truck to lead the way. This was very challenging, as it was difficult to predict whether the vehicle would meet Cure's requirements. The truck has been running very well for 1.5 years now.

In addition to the positive environmental impact, there is also a factor in usage: the truck is much quieter, which is a helpful benefit. It allows Cure to collect waste in other time frames without disturbing people in densely populated residential areas. This desired advantage makes it possible to work in two shifts instead of one and, thus, reduces the need for more trucks.

The solution - charging infrastructure

Cure uses the depot charging stations to run their electric fleet. These waste trucks are able to charge quickly and complete their waste removal tasks quietly and efficiently in residential areas. More importantly, this new charging infrastructure has proven to be positively disruptive in breaking traditional patterns of waste management and has enabled Cure to work in line with national and regional climate policy objectives. By 2030, Cure can be confident that their truck fleets will be 100% electric.



"The trend towards battery-electric trucks has positive and negative things, mainly positive of course for the environment. But also for the noise. It's much quieter. So that's a positive thing. So we can collect in other time areas and that is beneficial, so we can work in two shifts, so we need less trucks as we work in one shift. That all comes together."

Frans van Strijp
Director of Cure Afvalbeheer



The eTruck infrastructure is a European effort





The eTruck infrastructure is a European effort

The challenge for public administrations, truck manufacturers and charging infrastructure providers is to receive the same level of effort across Europe, especially for long-haul routes. If we follow the [Global MoU Policy Tracker](#), the overall progress in EU in terms of regulations, incentives, and infrastructure is still quite limited even though the continent has set the goal to be climate-neutral by 2050. That would mean that by 2030-2035 diesel vehicles shouldn't be introduced or sold on the market.

Hence why we need ambitious targets on a European level. The Alternative Fuels Infrastructure Regulation (AFIR) is a great first step and should be implemented soon so that we can move forward with mandatory goals. The aim is to provide an adequate

public charging network with interoperability throughout Europe as another key focus. This is also one of the main focuses of the European institution Environment & Transport.

It's hopeful that by 2025, wide long-haul infrastructure can be developed through cross industry and national pilot projects – this will be a key step in the European development of e-mobility as it will highlight challenges and opportunities during the implementation of cross-border charging infrastructure. From there, research companies will look closer at the project in order to gather key takeaways for future use cases. Through corresponding projects, truck manufacturers are also obliged to develop new eTruck models and meet the growing needs of the industry.

"It is important that there are binding targets from the government and on a European level. The initial network will drive the demand and simultaneously the need for more infrastructure".

Fabian Sperka, Vehicles Policy Manager at Transport & Environments

On a good track

E-mobility has already arrived in the last-mile delivery market and is proving more than competitive. The strategy taken is currently based on depot charging solutions or destination charging infrastructure, which is a profitable and easy solution because of the shorter routes that match the range of current vehicles. Depot or destination charging solutions are already broadly available and with a range of different properties, it can be adapted to each company's needs in terms of space, output and vehicle in use.

At the same time, the potential behind public fast-charging infrastructure is yet to hit the mark. There's been a positive start thanks to the development of personal EVs as it shows the known value in increasing the use of EVs. With a vast network of charging stations for regional short-haul eTrucks, even the smallest companies without their own charging infrastructure can be on the road in a zero-emission manner. In addition, an intermediate charge can almost double the range of each truck – which is also profitable in terms of time with charging in the MCS standard, that is currently implemented.

In the near future and due to the expanding rapid charging network for long-haul trucks, we will experience a strong increase in e-mobility in the heavy-duty vehicle market. The first models are continuing to evolve and will eventually have sufficient range to master a long-distance driving shift without intermediate charging. In future, if the vehicle is recharged with megawatt chargers during the prescribed break, truck drivers can continue driving seamlessly. To achieve this, the MSC charging infrastructure on truck roads will expand for the benefit of businesses looking to make the e-transition. Equally, rest stops also need a range of CCS chargers that can charge trucks with less power overnight and during prescribed longer resting periods. Right now, the viability of e-mobility for long-distance trucking isn't a case of "if" but rather a question of "when".





Case Study

HoLa

The project

The HoLa project (high-performance charging in long-haul trucking) is an innovation cluster for climate-friendly heavy-duty truck drive technologies that was launched by the German Federal Ministry of Transport and Digital Infrastructure (BMVI) in 2021. Heliox is part of the consortium together with 12 other partners. As part of the project, several truck charging stations (CCS that later will be developed to MCS) will be built on one of the main highways (A2) between the Ruhr Area and Berlin to foster the use of eTrucks by freight companies and at logistic sites near to the main transport route.

The objective

The project has a budget of 27 million euros. It has two key objectives: first, to advance the establishment of battery-powered long-distance truck transport. Second, to generate research findings and intensify knowledge transfer between the partners involved. Particular attention is being paid to interoperability between vehicles and charging infrastructure, including cost-effectiveness and standardization. These different moving parts are happening against the backdrop of the climate crisis and the associated changes in the transport sector: the ultimate goal is zero-emission transport, enabling long-distance trucking.

The challenge

In order to establish battery-electric long-haul transport, there are a number of different hurdles to overcome. For example, charging at the customer's premises requires clear rules on how the charging process is billed. In addition, more chargers will be needed for CCS charging, as they can serve fewer vehicles compared to MCS charging, leading to a high demand for CCS chargers.

The grid development plan must also be adapted to cater to the increased electricity demand, as well as the capacity of the substations. This can lead to congestions in some areas, but this falls under the everyday operations of network operators. Electricity requirements in industry are also requested and made available at the same level.

Similar to the private car sector, carriers need to develop confidence that charging technology is available. Unfortunately, this requires more charging technology than is actually necessary. Carriers will also need to stop thinking in diesel terms by removing the necessity around long range deliveries of more than 1000km.


The goals

The HoLa project aims to provide important insights into where collaboration is needed to improve the electrification of trucking corridors.

In terms of sustainability, HoLa also aims to prove that there are climate benefits from development. In principle, the charging stations are often used with renewable energy, which is also due to the fact that this is a condition of public funding, so the project aims to highlight the benefit of renewable energy as a necessary key to future developments.

The solution - charging infrastructure

The HoLa project is optimistic of the different strategies that are being generated by the new charging infrastructure. Current research shows, there is progress thanks to the standardised location of charging plugs on eTrucks as well as eTrucks now being made fit for megawatt charging, signalling a change in the mindset of manufacturers. HoLa can be sure that this collaborative approach to support high-performance charging in long-haul trucking will effectively address the climate crisis and will place the transport sector on the right track to meet zero-emission objectives. The charging infrastructure developed will be the necessary catalyst to facilitate further innovation in the trucking industry.



"I think in all areas, both we can expect the battery-electric truck to clearly play a dominant role in the long run. I can well imagine something like a 50 % share of new registrations in 2030."

Patrick Plötz
Head of Business Unit
Energy Economy at
Fraunhofer ISI



Looking ahead

EVs are commonly seen on the road in 2022, but very few are eTrucks. The demand for change is high, and fleet managers want to make the change but have to consider infrastructure, budget, and the training and investment necessary to prepare their businesses for the transition. Though financial and operational setbacks are factors fleet managers need to consider, the bonus for one key factor is somewhat out of their control: Charging infrastructure. Public charging was identified as a strong tool that fleet managers could leverage in their journey towards electrification but when they are inaccessible, faulty or slow then fleet managers aren't receiving the adequate support needed from governments, municipalities and city planners.

This is further reinforced by the many fleet managers being unaware of the regional or nationwide e-mobility incentives available. These incentives aren't the linchpin to unlocking the value of eTrucks but they operate as a viable support method that encourages the transition towards EVs.

In speaking with industry leaders, it is clear that time is of the essence.

"The technology is there. The question is, of course, how quickly can we get it done, how quickly can we get the infrastructure in place, and what could be possible obstacles?"

It is also clear that industry expects stringent restrictions that help meet climate targets, as shared by Fabian Sperka:

"In order to achieve the climate targets, ambitious CO² standards for trucks are needed to guarantee a sufficient supply of eTrucks."

Fleet managers are all too aware of the impact of HGVs to reduce CO² emission, and it is understandable to see their frustration in not previously accessing government schemes due to lack of public awareness or other reasons. It's also possible to understand how the lack of public charging infrastructure is a concern for businesses reliant upon their fleet. An improved deployment of charging infrastructure and better promotion of electrification subsidy schemes may be the catalysts needed to accelerate e-transition.

eTrucks have now reached a point in the product cycle where its benefits make it a preferred choice of vehicle over traditional diesel alternatives. As we know from our conversations with key leaders in the sector, the ambition for eTrucks remains prevalent across the industry. Crucial elements needed to encourage adoption are largely focused around charging infrastructure that is rapid and allows trucks to travel long distances. eTrucks offer a significant competitive advantage for fleet managers with operational costs being decreasing with its scalability and the demand for change is creating pressure from all sides, with profit margins tightening, government regulations banning older vehicles edging closer and environmental and corporate social responsibility more important than ever before.

The transition to eTrucks won't all happen at once but will come in two phases. The first, already underway, involves the shift of urban and regional deliveries. The second is the transition from heavy goods vehicles involved in long-haul transit. Each has its own challenge and opportunities.

From a technical standpoint, a key factor that will spur the second phase of fleet managers' transition lies in grid power distribution. eTrucks demand high power from the national grids, but at present the grid expansion rate isn't matching the pace of fleet managers' demand. The lack of development is delaying the transition while fleet managers must continue to deal with grid concerns, whether it be inflating prices or reduced availability. However, local energy hubs can help optimise the same national grids eTrucks and other EVs rely on. Currently, the grid is built to support individual companies' energy demands but by implementing an energy hub, the onus of power becomes less centralised. This allows for several companies in one location to receive energy which reduces grid constraints. This can be done by linking together electricity consumption, power generation and load profiles within local industrial estates and companies to complement one another. Development in this sector will jolt the eTruck industry in the right direction, with European nations leading by example.

Fleet managers in the UK are setting themselves up to succeed when it comes to infrastructure, with a significant percentage already owning their own charging depots. However, French fleet managers are most optimistic about the future with a belief in 100% e-fleets arriving in their nation considerably sooner than any other state. Fleet managers and their companies must commit to transition, however the same must be said of governments and lawmakers, ensuring their efforts expand to roll out funding for more infrastructure projects, improve the reliability and accessibility of public charging and boost the awareness of electromobility subsidy programmes to a wider population. These are the reasons why eTrucks are the last road vehicle to join the e-transition and the areas of the industry which need the government's support to ensure it transitions from early adoption to the mainstream market.



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