

Electrification of Logistics

Opportunities, Challenges, and Strategies for an
Industry in Transition

WHITEPAPER



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Foreword

Climate-neutral by 2050: How Electric Trucks Are Driving Europe's Green Transformation

Climate-neutral by 2050: This is the ambitious goal that the European Union has set to combat global climate change. With road freight transport accounting for 77 % of all freight traffic within the EU, it's clear that this sector is key to these efforts. Traditional trucks contribute significantly to CO₂ emissions, which makes their electrification crucial to meeting climate targets. However, this transition faces a critical challenge known as the "chasm" – the gap between early adopters and the early majority.

This whitepaper will show you how switching to electric trucks can lead to significant cost savings, compliance with stringent environmental regulations, and an improved corporate image. However, the transition is not without its challenges: financing, driver skepticism, the still-growing charging infrastructure, and technical requirements like range and charging cycles are just a few of the issues we'll explore.

Our goal is to provide you not only with the information and analyses that you need, but also with concrete suggestions for making your logistics processes future-proof and sustainable. This whitepaper is an essential tool for anyone in the logistics industry who wants to embrace the challenges and opportunities of e-mobility.

Learn how you can benefit from electrifying your truck fleet – and seize the opportunity to establish yourself as an innovation driver in your industry while also making an important contribution to environmental protection.

Dynamics and Change in Logistics: Trends and Statistics on Truck Electrification

To illustrate the momentousness and urgency of these changes, we will present current data, figures, and facts related to the logistics industry and truck electrification.

Europe's E-Truck Market: Some Growth, but Room for Improvement

Due to increasing pressure to reduce CO₂ emissions, we are seeing a positive trend in the registration of electric trucks (e-trucks). In 2023, there was a striking increase in e-truck registrations in the European Union. According to the latest data from the European Automobile Manufacturers' Association (ACEA), registrations of e-trucks rose by an impressive 234.1 %, totaling 5,279 units. The Netherlands

and Germany were leaders in this growth, with increases of 889.7 % and 169.8 % respectively. Sales in these countries made up over 60 % of all e-truck sales in the EU. The market share of e-trucks climbed from 0.8 % in 2022 to 1.5 % in 2023. While this is a significant step forward, it also shows that there is still a long way to go before widespread market penetration is achieved.

Why Road Freight Transport Remains Crucial for Europe's Economy

The growing share of road freight transport within the EU contrasts with the original goal of shifting more freight transport to rail and inland waterways. In 2021, only about 17 % of freight in the EU was

transported by rail and 6 % by inland waterways. This clearly shows that road freight transport continues to dominate and significantly contributes to CO₂ emissions.



Growing Market, Growing Pressure on Logistics

Along with the continuous increase in road freight transport, the number of trucks is also rising. In Germany alone, the number of trucks has increased by over one million in the last ten years. As of January 1, 2022, about 530,000 heavy trucks with a permissible total weight of over 3.5 tons were registered in Germany, accounting for about 15 % of the 3.55 million registered trucks of all sizes.

Another problem exacerbated by the growing logistics market is the shortage of parking spaces. Currently, Germany lacks about 40,000 truck parking spaces at rest stops. This severely limits drivers' ability to comply with legally required break times and overnight stays. With the increasing number of electric trucks, which not only require fixed parking spaces but also additional charging infrastructure, this problem will further intensify.

EU Legislation: The Driving Force Behind Europe's Focus on E-Trucks

To meet the requirements of the Paris Agreement, the European Union has significantly tightened its CO₂ emission standards for heavy commercial vehicles. The latest amendments, ratified by the Council of the European Union in May 2024, set stricter emission targets for 2030, 2035, and 2040. The target for 2030 has been raised from a 30 % reduction to a 45 % reduction compared to 2019 emission levels; the 2035 target is a 65 % reduction, and the 2040 target is a 90 % reduction. Political pressure and hefty fines for non-compliance with fleet limits are propelling the transition forward. In the past, generous subsidies played a crucial role in incentivizing alternative drives. Even though these subsidies have since been discontinued, their reintroduction remains a key component in the successful transformation of the logistics sector.

To achieve Germany's goal of reducing greenhouse gases, the federal government is focusing on the electrification of vehicle fleets. Initially, the focus was on the passenger car sector, so the purchase of electric vehicles was incentivized, and the necessary charging infrastructure was expanded. Now, the need to expand the charging infrastructure for electric commercial vehicles is also being explicitly addressed.

For the first time, the government's "Master Plan Charging Infrastructure II" addressed the rapid improvements in charging infrastructure for heavy trucks in a separate chapter. To support the ramp-up of electric heavy commercial vehicles, an adequate charging network is needed to ensure long-distance mobility, high charging capacities, and suitable spaces for trucks. The development of an initial charging network along key long-distance routes is a concrete measure of the master plan and was expected to be tendered in the third quarter of 2023 in cooperation with Autobahn GmbH. As of the third quarter of 2024, this charging network has yet to be tendered. As part of Master Plan II, a public tender for the construction and operation of fast-charging stations for trucks at unmanned rest areas along the federal autobahn is expected to be launched in late summer 2024.

The Growing E-Truck Ecosystem

In addition to subsidy measures and a nationwide charging infrastructure, a holistic ecosystem is essential if we want to successfully electrify the logistics industry. A mobility ecosystem is a complex network of actors, resources, technologies, and institutions that work together to provide, optimize, and continuously develop mobility services. It incorporates individual components such as vehicles, infrastructure, energy sources, services, and regulatory mechanisms; interactions within this system significantly influence people's movement as well as the social, economic, and environmental aspects of mobility.

A well-functioning mobility ecosystem is important because it ensures efficient, sustainable, and comprehensive mobility offerings. By optimizing the integration of a variety of elements, the ecosystem can help to improve traffic flow, reduce environmental impact, and meet user needs. It also enables the development of new mobility solutions that meet the changing needs of society.

The existing mobility ecosystems are designed for conventional vehicles. However, e-trucks have specific requirements for charging infrastructure, energy supply, and technological integration. To ensure their smooth operation and fully realize the potential of e-mobility in freight transport, it will be necessary to create an ecosystem tailored to e-trucks. Although all major manufacturers have already introduced e-trucks, it is now crucial that key players such as governments, local authorities, energy providers, charging station operators, and logistics and transport companies work together to develop and expand the necessary infrastructure. These key players play a vital role in creating an ecosystem that makes it possible to seamlessly deploy e-trucks and fully exploit the potential of e-mobility in freight transport.

Currently, charging stations for e-trucks are rare, but forecasts predict massive expansion in the coming years. Aral is a pioneer in this area in Germany and (2024) already operates more than 20 charging stations for electric trucks, with a capacity of 300 kW each. Furthermore, new locations are planned to expand the infrastructure and meet the needs of electric large vehicles.

Insights from the Logistics Industry: Top 5 Challenges in the Transition to E-Trucks

Making the switch to e-trucks poses numerous challenges, ranging from financing to driver skepticism to public charging infrastructure. These challenges were identified during numerous interviews that MHP carried out with numerous players in the logistics sector. Here are the five greatest challenges that the logistics sector must overcome to successfully manage the transition to e-mobility.

1: Financing

Financing e-trucks is a significant challenge for many companies, especially since the funding programs for such vehicles have been discontinued. Although there is still some support for the construction of charging infrastructure, the discontinuation of direct vehicle subsidies through the “Climate-friendly Commercial Vehicles and Infrastructure” (KsNI) program significantly increased the financial burden on companies. This situation makes the widespread adoption of e-trucks difficult and challenges logistics companies to explore alternative financing models and develop efficient operational strategies.

2: Driver skepticism

Recruiting drivers for e-trucks can be a challenge. While experienced drivers tend to be enthusiastic, inexperienced drivers are often uncertain and reluctant to adopt new technologies. MHP’s interviews revealed that attitudes toward e-mobility are highly individual; there is no across-the-board skepticism. Companies aim to build driver confidence by demonstrating real-world use cases, while also emphasizing the need for open dialogue so they can adapt the technology to meet drivers’ needs. The transition to e-mobility requires both technical and cultural adjustments.

3: Public charging infrastructure

The availability of public charging infrastructure for e-trucks is crucial for the logistics sector. Depending on their charging speed and the availability of charging locations, e-trucks can, in most cases, only be charged at logistics companies’ depots due to the lack of widespread public charging infrastructure. This limits their use to predefined routes with a maximum range of 150 km. For widespread integration of e-trucks in the logistics industry to be possible, nationwide public charging infrastructure is needed.

4: Range and charging cycles

An e-truck’s range has a significant impact on how practical and usable it is. In an interview with MHP, a leading transportation company in Austria, points out that the limited range makes it difficult to use them everywhere, especially in urban areas. Moreover, a well-known postal company pointed out that comparing e-trucks to diesel trucks is unfair, as diesel technology has been perfected over the course of a century, while battery technology is still in its infancy and needs a quantum leap to catch up. According to truck drivers, vehicle range is indeed important, but the suitability is determined by the specific use case – an e-truck must be able to effectively replace a diesel.

5: Alternatives to the secondary market

The secondary market for e-trucks is still in its early stages and faces a variety of challenges. In its conversation with MHP, the Austrian transport company emphasized that the residual value and resellability of e-trucks and batteries are unclear, which dampens interest in the secondary market. Companies wonder what will happen to the e-trucks after their initial use. Currently, they are frequently exported to Africa. However, in the future, the batteries could be replaced instead. These uncertainties underscore the need for thoroughly evaluating the situation and developing a strategy to ensure a trouble-free segue to the sustainable reuse of these vehicles.



Cost Efficiency and Sustainability: The Double Benefit of Electric Trucks

Choosing e-trucks offers businesses a multitude of advantages that have a positive effect on both their finances and their environmental footprint:

- **Reduce operating costs:** E-trucks lead to a significant reduction in operating costs compared to traditional diesel trucks. This is due to lower energy consumption, lower electricity prices, and lower maintenance requirements. Additionally, battery-electric vehicles are not subject to tolls, which further reduces operating costs.
- **Meet sustainability goals:** Switching to e-trucks helps companies meet stringent environmental standards and reduce their CO₂ emissions. This is crucial for meeting future regulatory requirements and strengthening the company's image as a responsible player in the market.
- **Increase operational efficiency:** E-trucks offer better energy efficiency. Technological advancements such as regenerative braking further reduce operating costs.
- **Increase acceptance in urban areas:** With the increasing number of emission restrictions in urban areas, e-trucks provide the opportunity to operate in environmentally regulated zones without restrictions. This makes them particularly valuable for inner-city distribution. An additional advantage is that e-trucks significantly reduce noise pollution, which improves the quality of life in urban environments.

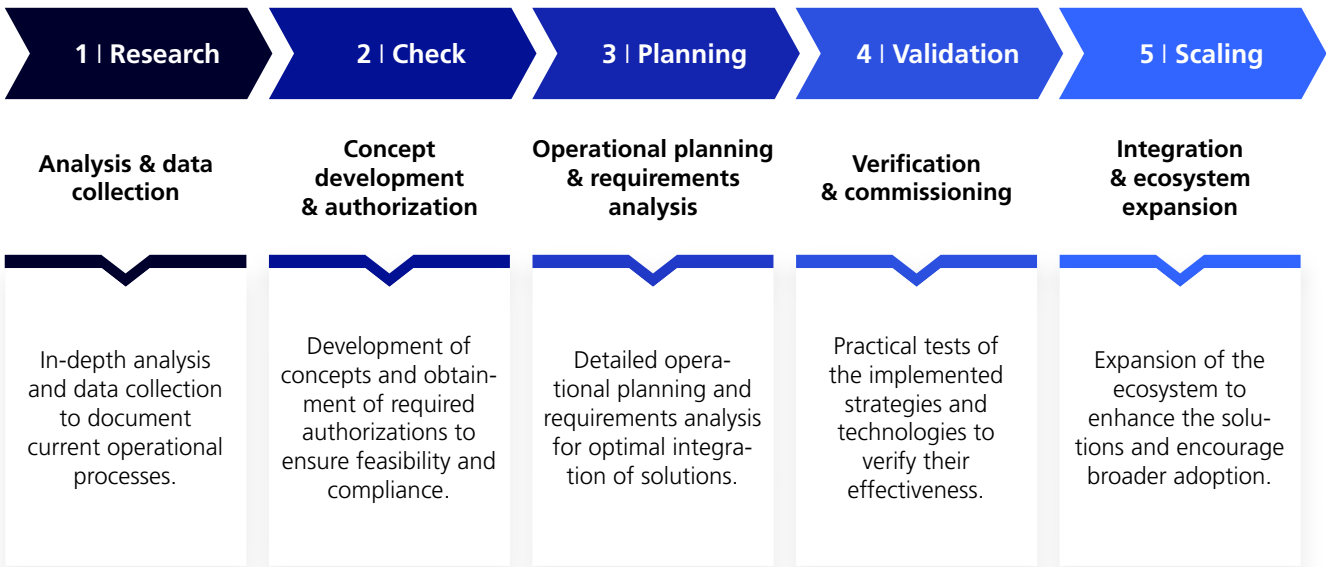
By adopting e-trucks, companies not only position themselves as pioneers in technological development but also enhance their competitiveness through increased efficiency and improved compliance with environmental standards.

MHP's Roadmap to Electrification: Our Five-Phase Model for Transforming Your Logistics

As part of our structured approach to supporting our clients, we have developed a comprehensive five-step model. This model is based on detailed data

research and customer consultations and is designed to ensure the seamless and efficient transformation of your logistics processes.

The Five-Phased Process Model



The biggest challenges here are cost control, overcoming the “chasm”, and data integration. Factors that contribute to success include step-by-step electrification, charging optimization, employee training, and close collaboration with

partners to integrate their charging infrastructure. MHP is committed to developing a comprehensive strategy that will guide your company through the entire transformation process and prepare it for a sustainable future.

The E-Mobility Ecosystem Framework

To effectively address the challenges described earlier and bridge the “chasm”, MHP has developed the E-Mobility Ecosystem Framework specifically for electric trucks. This framework uses a clear visual representation to illustrate the ecosystem for e-trucks. It also provides a point of orientation that, like a compass, helps businesses successfully navigate market challenges and gaps. With a pragmatic approach, this framework makes it possible to create customized portfolios along the value chain. Based on this solid foundation, the ecosystem’s expected development for the coming years is further analyzed and presented using the same framework.

The MHP E-Mobility Ecosystem Framework is structurally divided into three basic components: segments, circles and elements. The segments are divided into hardware, software and service, which form the technical and service-oriented basis of the system. In addition, three interlinked circles – energy, charging and vehicle – visualize the key areas of electrification. In addition, specific tasks and priorities within the framework are represented by individual elements of different sizes, ranging from basic requirements to specialized extra functions.

The Segments of the Framework



The Framework's Circles

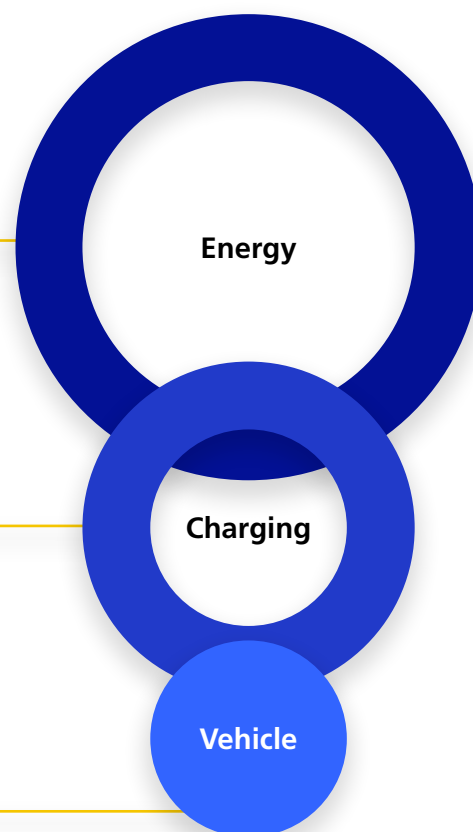
The E-Mobility Ecosystem Framework uses a clear visual representation in the form of concentric circles, along with segmentation, to illustrate the various fields of action in the electrification of truck

fleets. Each circle represents a specific area of focus essential to the transformation process. The circles clarify the framework's structured approach.

The outermost circle addresses all elements related to "energy". This includes the generation and management of the energy needed to operate the electric vehicles.

The middle circle focuses on everything related to "charging", incorporating components and processes necessary to construct and manage an efficient and accessible charging infrastructure.

The innermost circle represents the "vehicle" itself, addressing all aspects directly related to the electric truck. The vehicle serves as a central interface between the other areas, making it an integral part of the overall system.

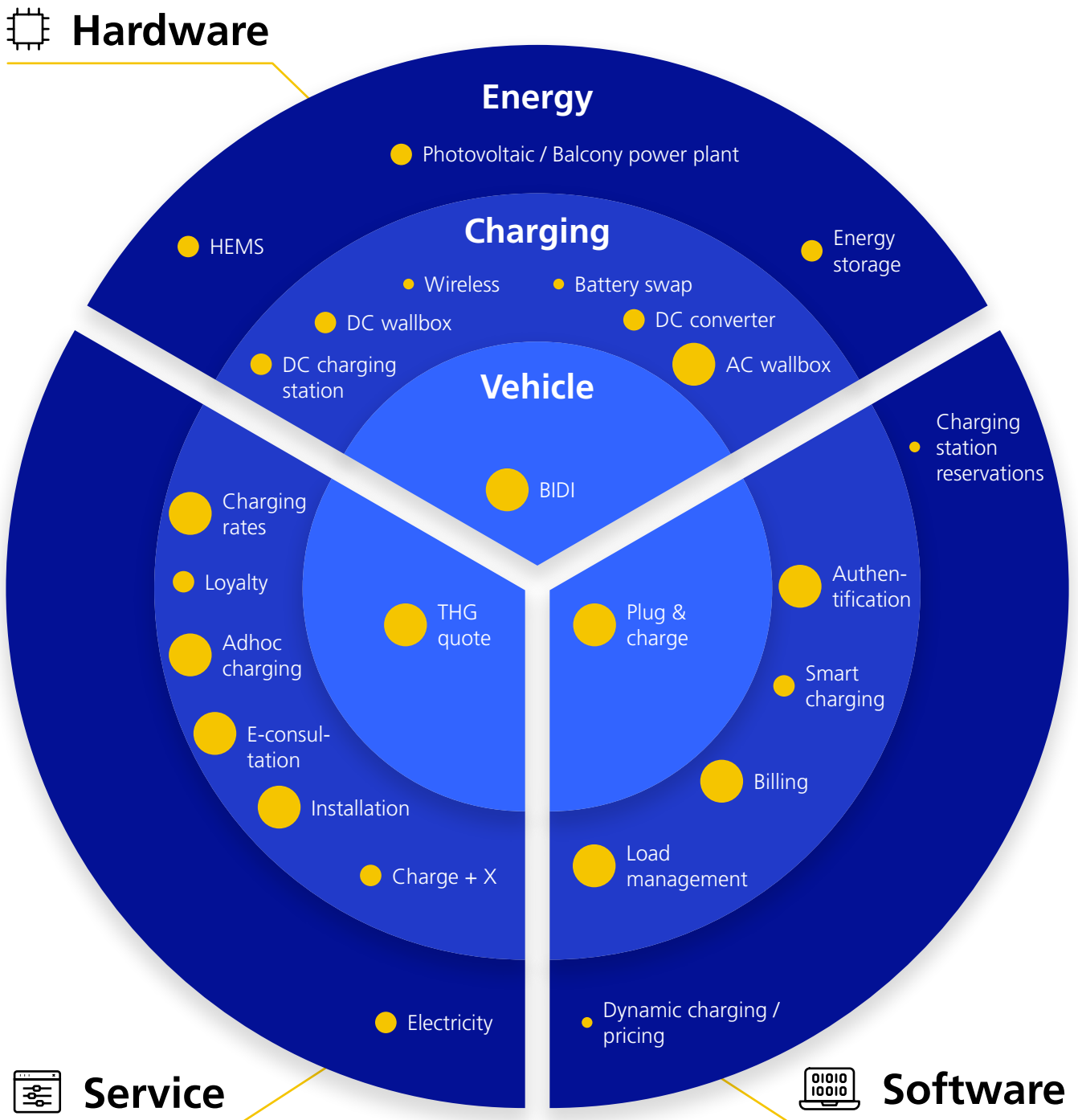


The Framework's Elements

The MHP E-Mobility Ecosystem Framework not only divides the ecosystem into segments and circles, but also into elements that are differentiated by their dot sizes.

- **The large dots (Basis)** represent fundamental components that are essential to avoid falling behind in the market.
- **The medium dots (Priority)** stand for priority components that offer market participants the chance to gain competitive advantages.
- **The small dots (Extra)** indicate additional components through which market participants can differentiate themselves.

Ecosystem Framework



Elements of MHP's E-Mobility Framework (EMF)

● Basis ● Priority ● Extra

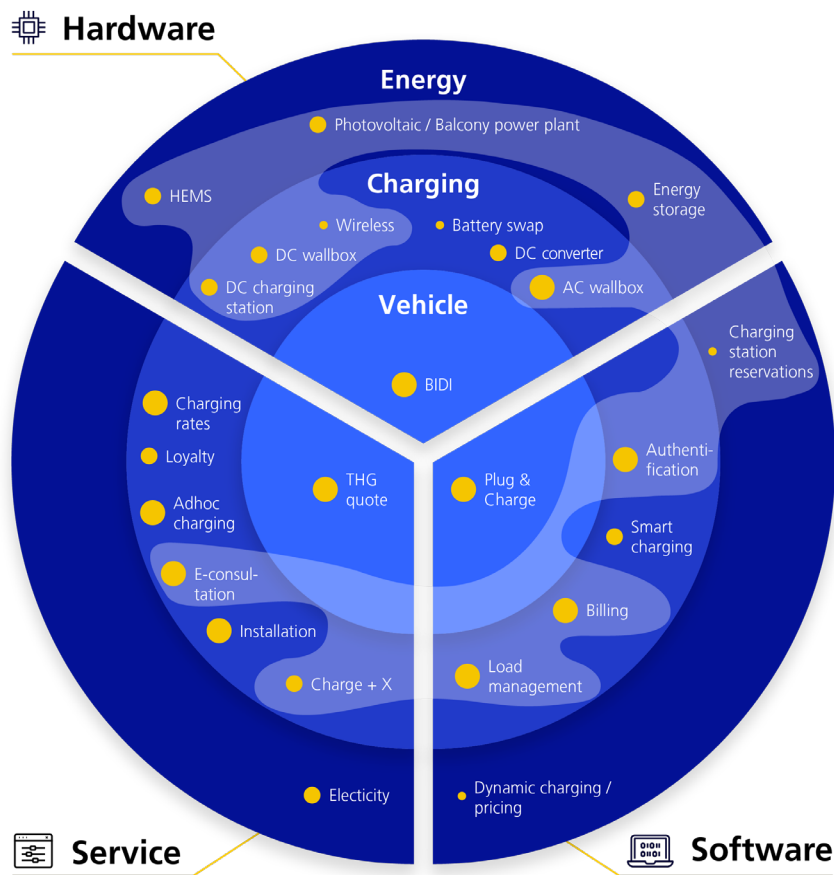
The MHP E-Mobility Ecosystem Framework in Practice

The individual elements of the framework make it possible to visualize the complex ecosystem and map specific company portfolios. With this visualization, companies can perform direct competitive analysis and identify which components are included in the market leader's portfolio. This enables them to identify gaps in their own product portfolio and make strategic decisions to catch up with the competition or, in the best case, build a long-term strategic advantage.

Over the course of a client relationship, MHP helps companies seamlessly integrate electric trucks into existing logistics structures. Our comprehensive framework ensures that the electrification process is systematic and efficient, with careful planning and execution of every detail from initial analysis to full scaling.

The following graphic illustrates an example portfolio of a logistics company that owns around 50 vehicles and intends to electrify 10 % of its fleet.

Example Portfolio for a Logistics Company Planning to Electrify its Fleet





The practical application of the MHP E-Mobility Ecosystem Framework involves a systematic approach to the successful design of truck fleet electrification. The key steps are:

1. Analysis and strategy development

We begin with a detailed analysis of the existing fleets and create an electrification strategy tailored to your specific needs. This includes identifying optimal routes and vehicles for the start of the electrification process and planning the required charging infrastructure.

2. Implementation and training

After planning is complete, the process continues with the implementation of the charging infrastructure and staff training. Our experts ensure that all stakeholders can confidently and efficiently handle the new systems, which promotes quick adoption within the company.

3. Monitoring and adjustment

After the e-fleet is deployed, we monitor performance and continuously adjust processes to take advantage of potential optimizations and achieve maximum efficiency and cost savings.

4. Scaling and ongoing innovation

Once the initial phase is successfully completed, MHP will assist you in scaling your electric truck initiatives. We help you integrate innovative solutions like smart charging and continuously develop your ecosystem.

A collaboration with MHP gives you access to industry-leading consulting and technology, as well as a partner dedicated to your long-term success. We work closely with you to design an optimum electrification strategy and position you as an innovative leader in the logistics industry. Use our expertise to achieve your sustainability goals while simultaneously increasing operational efficiency.

Concrete Recommendations for Logistics Companies

To make electrifying your truck fleet successful and efficient, we offer comprehensive support as part of our e-consulting services. These recommendations are based on our proven strategic framework and are tailored specifically to your particular customer portfolio.

Driver training and high-voltage management

- Driver training: Intensive training programs for drivers are essential to ensure safety and efficiency when dealing with electric trucks. These training programs should include safe handling of high-voltage technologies, optimizing driving behavior to maximize battery life, and handling emergencies.
- High-voltage safety training: Special training modules on proper handling of high-voltage systems should ensure that all technical staff are trained in dealing with the new technologies and are familiar with emergency procedures.

Reservation systems

- Integration of reservation systems: Logistics companies should pursue direct collaborations with OEMs or charging station operators so they can effectively integrate these reservation systems into their operations. That will make it possible to check availability in real time to plan and book charging sessions efficiently.
- Route and schedule adjustments: The system should be flexible enough to allow for adjustments to routes and schedules based on the current charging situation and the specific supply chain requirements.

Charge + X

- Providing a comprehensive information system: Companies should develop a system that not only provides information about the location and availability of charging stations but also offers detailed information about the facilities available at charging locations. This includes restaurants, waiting areas, showers, Wi-Fi access, and rest areas.
- Optimizing the charging experience: Companies should also ensure that the charging experience for drivers is as pleasant and efficient as possible. All necessary amenities and information should be easily accessible.

In-depth analysis of elements in the portfolio

- Competitive analysis: We recommend a detailed analysis of the competitive landscape to understand where the company stands in the market and how it can differentiate itself.
- Identifying profit pools: It is necessary to analyze the most profitable areas of logistics electrification and develop targeted strategies to exploit this potential.
- Strategic recommendations: Based on the results of the analysis, we provide tailored recommendations to help you achieve operational excellence and strengthen your market position.



In addition to offering comprehensive consulting services for logistics companies, MHP also provides support for OEMs and charging station operators involved in the electrification of trucks. Our expertise spans a wide range of industries and thematic areas, allowing us to offer customized solutions for every

phase of electrification and beyond. Regardless of your position in the value chain, MHP can provide strategic insights and practical recommendations for successfully implementing your electrification strategy and future-proofing your business.

Outlook

Electrification of E-Truck Fleets is the Key to the Future

We are at a crucial turning point: the electrification of our truck fleets is essential to reach environmental policy goals and shape our future sustainably. Political support and legal provisions are key drivers behind electrification. Successful management of the transformation will take a holistic approach that integrates technical innovations, cultural adaptations, and practical solutions. A well-functioning, optimized ecosystem that links vehicles, infrastructure, energy sources, and services is essential.

Companies that make the switch to electric trucks early on can position themselves as innovation leaders while also making a significant contribution to protecting the environment. With this proactive approach, companies will benefit not only from

lower operating costs but also from a boost to their brand image, as they demonstrate their commitment to sustainable business practices. Use our insights and recommendations to future-proof and sustainably design your logistics processes – and establish yourself as a responsible market player.

MHP is here to help you successfully navigate the challenges of e-mobility and make the most of the opportunities it offers. Let us help you to make emission-free logistics a reality and actively shape the future of mobility. Together, we can successfully position your company in the market.

Publisher

MHP Management and IT Consulting GmbH

ENABLING YOU TO SHAPE A BETTER TOMORROW

As a technology and business partner, MHP has been digitizing the processes and products of its roughly 300 mobility and manufacturing sector customers worldwide for 28 years and providing support for their IT transformations along the entire value chain. MHP believes that digitalization is one of the most effective levers on the path to a better tomorrow. This is why MHP provides both operational and strategic consulting in areas such as customer experience and workforce transformation, supply chain and cloud solutions, platforms and ecosystems, big data and AI, as well as Industry 4.0 and intelligent products. The subsidiary of Porsche AG operates internationally, with headquarters in Germany and subsidiaries in the USA, UK, Romania, and China. Around 5,000 MHP employees are united by their pursuit of excellence and sustainable success.

It is this aspiration that continues to drive MHP – today and in the future.

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