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Between Orientation and Optimization: The Status Quo and Perspectives of Battery-Electric Trucks in the Transport Industry.

ELV-Live Synthesis Report: Empirical Analysis of the Introduction of Battery-Electric Trucks – A Comparison of Pioneer Companies and the Industry as a Whole.

Supporting research on the use of battery-powered heavy-duty vehicles in day-to-day logistics operations – ELV-Live (Grant Number 16EM6003-1)

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List of Abbreviations

Abbreviation	Meaning
BALM	Federal Office for Logistics and Mobility (Bundesamt für Logistik und Mobilität)
BGL	Federal Association of Road Freight Transport, Logistics, and Waste Management e. V. (Bundesverband Güterkraftverkehr Logistik und Entsorgung e. V.)
BMUKN	Federal Ministry for the Environment, Climate Action, Nature Conservation, and Nuclear Safety (Bundesministerium für Umwelt, Klimaschutz, Naturschutz und nukleare Sicherheit)
B0	Survey 0 (StratES Industry Survey, 2021)
B1	Survey 1 (Pioneer Companies with Electric Trucks, 2024)
B2	Survey 2 (Representative Industry Survey, 2025)
B3	Survey 3 (Pioneer companies with electric trucks, 2025/26)
CO_2	Carbon dioxide
dena	German Energy Agency (Deutsche Energie-Agentur)
DSLV	Federal Association of Freight Forwarding and Logistics e. V. (Bundesverband Spedition und Logistik e. V.)
E-truck	Battery-electric truck
eFuels	Synthetic electricity-based fuels
ELV-Live	Project Acronym for Supporting research on the use of battery-powered heavy-duty vehicles in day-to-day logistics operations
EU	European Union
HVO	Hydrotreated Vegetable Oil
SMEs	Small and medium-sized enterprises
KsNI	Funding program for the Promotion of Climate-Friendly Commercial Vehicles and Infrastructure (Richtlinie zur Förderung klimaschonender Nutzfahrzeuge und Infrastruktur)
kW	kilowatt
kWh	kilowatt-hour
NOW	National Organisation for Sustainable Mobility (Nationale Organisation für den Wandel in der Mobilität GmbH)
OC-truck	Overhead-catenary truck
PV	Photovoltaics
StratES	Research Project “Strategies for the Electrification of Road Freight Transport”
TCO	Total Cost of Ownership

Summary

Background and Methodological Framework

The decarbonization of heavy-duty road freight transport faces the challenge of transitioning from the pioneering phase to widespread industry adoption. To determine the actual maturity level of battery-electric trucks (e-trucks) and identify existing market barriers, the **ELV-Live** project conducted three large-scale, standardized surveys, cross-referenced the results, and compared them with an earlier survey of transportation companies from 2021:

Survey 1 (early 2024): Pioneer companies in the early adoption phase of e-trucks.

Survey 2 (Summer 2025): A representative survey of transportation companies, regardless of their experience with e-trucks.

Survey 3 (Winter 2025/26): Follow-up survey of pioneer companies after at least 12 months of continuous practical testing of electric trucks.

Survey 0 (Spring 2021): Baseline survey of transportation companies, regardless of their prior experience with alternative powertrains and fuels.

The samples exhibit structural differences: While the pioneer groups (B1/B3) are characterized by large-scale operations (up to 49% large companies), the overall sample (B2), with an SME share of over 90%, reflects the fragmented structure of the German transportation industry. In all groups, heavy-duty commercial vehicles weighing over 16/18 metric tons dominate the fleets. The operational profiles demonstrate a high degree of operational flexibility: The majority of the surveyed companies operate in local, regional, and long-haul transport simultaneously.

Key Findings of the Synthesis

1. The “Experience Gap”: Hypothetical Scepticism vs. Actual Satisfaction

The systematic comparison reveals a very large perception gap between companies with no operational experience (95% of the entire industry in Group B2 do not own any electric trucks) and active users (Groups B1/B3, which together are already testing over 300 electric trucks in real-world operations).

Satisfaction Cascade: The longer electric trucks are in use, the more positive the assessment becomes. While 88% of pioneers in B1 were already satisfied, overall satisfaction rises to 93% in B3 following long-term testing (with the proportion of those who are “very satisfied” increasing from 28% to 47%). 42% of long-term users report that their assessment has continued to improve as the duration of use has increased.

Technical reliability: Across the industry as a whole (B2), only 9% expect electric trucks to be more reliable than diesel vehicles, while 37% expect them to be less reliable. Practical experience, however, paints a much more positive picture: 74% of early adopters in B1 attest to the high reliability of electric trucks, despite the fact that these are the first production models, which were initially prone to defects. In B3, 39% confirm that electric trucks are less prone to breakdowns or significantly less prone to breakdowns than conventional trucks (25% report more frequent problems).

Driver and Dispatcher Acceptance: While 59% of inexperienced stakeholders (B2) believe that electric trucks are unpopular among drivers (57% expect resistance from dispatchers), driver acceptance, driving comfort, and the positive driving experience actually rank among the top satisfaction factors for electric truck users (B1/B3).

2. Shift in Challenges Throughout the Usage Cycle

The longitudinal comparison of early adopters shows that problem areas shift as the level of maturity increases. In the initial phase (B1), frustration was primarily caused by vehicle-related issues such as inaccurate range estimates or isolated vehicle breakdowns. Among long-term users (B3), however, procedural and systemic barriers come to the fore. The biggest drawbacks cited here are restrictions on route planning, the lack of public charging infrastructure, and insufficient grid connection capacity.

3. Operational Reality: Depot Charging Has Been a Strong Anchor So Far

The empirical data from the industry partners provide in-depth insights into current charging infrastructure usage and the conditions at depots. Despite the currently high rate of depot charging, the expansion of public charging infrastructure remains highly relevant for the development of long-distance transport.

Charging Structure: Charging on company premises (depot charging) currently dominates day-to-day logistics operations and covers, on average, **82.5%** of the total energy demand of electric fleets. Public charging at dedicated truck charging stations is currently marginal in real-world operations, accounting for just 4.1%.

Infrastructure Gap: 86% of the pioneers (B3) have their own depot and operate an installed charging capacity there averaging 629 kW, with an average of 5.2 electric trucks in their fleet. Across the broader market (B2), while 68% of all surveyed companies own their own depot, **83% have not yet made any investments in charging infrastructure**, and 73% do not currently plan to do so.

4. Cost-Effectiveness and the TCO Perception Gap

The willingness to make follow-up investments correlates directly with practical experience gained: Among the pioneers (B3), **72%** plan to actually purchase additional electric trucks (53% in the earlier survey, B1). In the industry as a whole (B2), by contrast, **only 18%** plan to purchase electric trucks weighing more than 18 metric tons by 2030.

The cause likely also lies in a distorted perception of cost-effectiveness: 57% of B2 companies generally assume a higher TCO (Total Cost of Ownership). At the same time, **61% of these sceptical companies** admit to **never** having **conducted their own TCO calculation or cost-effectiveness comparison**. Successful pioneers strategically secure their TCO advantages: About two-thirds of B3 companies use on-site electricity generation (e.g., PV systems) and thus achieve an average grid electricity price of **23.77 ct/kWh**. In contrast, across the entire industry (B2), more than half (54%) are completely unaware of their own grid electricity prices.

5. Setting the Technological Course Through 2030

With regard to future propulsion and fuel alternatives for heavy-duty commercial vehicles, a clear trend toward consolidation is emerging across all three study groups:

Battery-electric trucks (e-trucks) are rated by both pioneers and the industry as a whole as the dominant technology for the year 2030 by a very wide margin.

Hydrogen-based propulsion concepts (fuel cells and hydrogen internal combustion engines) have seen the sharpest decline in relevance over the period under review. While they were still rated as the most promising option by the industry as a whole in 2021, these expectations have declined significantly by 2025 and now rank only at the low level of biofuels, e-fuels, and natural gas.

Overhead-catenary trucks (OC-trucks) and **plug-in hybrids** effectively no longer play a role in companies' assessments or remain at a low level.

Conclusion on the Industry's Market Take-off

The empirical synthesis demonstrates that battery-electric heavy-duty trucks have successfully passed the technological testing phase in road freight transport. However, further market ramp-up will depend on whether the experiences of pioneer companies can be rapidly transferred to the industry as a whole and whether the existing information and infrastructure gaps across the transport sector can be bridged. While the pioneers are taking advantage of toll-related cost benefits and stabilizing their operational processes through depot charging, the level of knowledge regarding electric trucks across the industry as a whole could be improved; in some cases, this leads to misconceptions. A targeted transformation therefore requires the removal of bureaucratic hurdles to network expansion, as well as a manufacturer-neutral information campaign addressing the economic realities of electric fleets. Furthermore, it is becoming clear that the expansion of the charging infrastructure is crucial for tapping into user groups and use cases – particularly with regard to long-haul transport – beyond the pioneering applications.

1 Introduction and Methodology

1.1 Background and Objectives

By combining the results of three survey waves, this report bridges the gap between isolated case studies and the broader transportation industry to derive concrete insights for shaping the market's continued ramp-up.

The decarbonization of road freight transport is entering a crucial phase of market ramp-up. In light of ambitious national and European climate protection goals, zero-emission powertrains – above all battery-electric trucks (e-trucks) – are increasingly becoming the focus of operational practice. Driven by regulatory frameworks such as CO_2-based differentiation of truck tolls and the EU fleet targets for vehicle manufacturers, transportation companies face the challenge of fundamentally realigning their fleet strategies. This transformation process is taking place in a market environment characterized by high dynamism and, at the same time, lingering uncertainties.

This is where the ELV-Live research project comes in. The project's goal is to scientifically monitor the real-world deployment of battery-electric heavy-duty commercial vehicles in routine logistics operations and to evaluate it from various methodological perspectives. This synthesis report on the empirical surveys is part of a broader spectrum of project activities that complement one another.

Quantitative operational data analysis: At the technical level, real-world vehicle operational data (such as energy consumption, charging cycles, and range under real-world conditions) are analysed in detail to objectively validate the technical performance of the vehicles (Le Corguillé et al., 2025) .

Qualitative case studies: In addition, in-depth analyses of individual industry partners – ableit methodologically more exploratory and anecdotal in nature – provide valuable, context-specific insights into the operational processes of transportation companies and the resulting challenges during the transition phase (Dolinga & Hacker, 2025a ; Dolinga & Hacker, 2025b ; Dolinga & Hacker, 2025c).

While the operational data reflect the technical reality and the case studies depict isolated practical examples, scientific and political discourse has thus far lacked reliable, comprehensive data on the structural prerequisites and strategic barriers to electrification – for example, with regard to the level of knowledge among transportation companies or operational requirements (including depot facilities and electricity prices).

To close this data gap and paint a comprehensive, representative picture of the industry's development, three waves of empirical surveys were conducted as part of the accompanying research. These are methodologically closely interlinked and shed light on market developments from two complementary perspectives.

The **Pioneer Perspective (Longitudinal Analysis B1 and B3):** By repeatedly surveying early adopters at two different points in time (Survey 1 in early 2024 and Survey 3 in late 2025/early 2026), the learning curve of companies with real-world experience operating electric trucks is traced over time (Göckeler et al., 2025; Schreiber, Hacker et al., 2026) .

The **industry perspective (cross-sectional analysis B2):** Taking place between the two waves of early adopters (summer 2025), Survey 2 reflects a representative snapshot of sentiment across the entire transport industry – regardless of whether the participating transportation companies have

already gained their own experience with alternative powertrains or not (Schreiber, Göckeler & Hacker, 2026) .

In addition, the **industry perspective** is illustrated by another survey of the transportation sector from 2021 **(B0)**, specifically to capture temporal effects in technology assessments and to depict a point in time when no production models with alternative powertrains were yet available on the market (Göckeler et al., 2022) .

The primary objective of this synthesis report is to consolidate the three quantitative data sources, interpret them in the context of the project's other findings, and, where appropriate, also place them in the context of the earlier industry survey (B0) from the predecessor project StratES. The focus is on an in-depth analysis of the so-called "experience gap": By systematically comparing the hypothetical expectations of the broader transportation industry (B2) with the actual operational experiences of the pioneer companies (B1 and B3) that have matured over time, the report provides empirically sound guidance. This synthesis thus serves as an empirically sound foundation for the transportation industry, as well as for policy and infrastructure stakeholders, to shape the transition from the pioneering phase to the industry ramp-up as successfully as possible, taking into account the identified opportunities and challenges.

1.2 Study Design and Recruitment

In total, the ELV-Live project conducted three standardized surveys of logistics companies over a two-year period (January 2024 to January 2026).

The first (B1) and third surveys (B3) targeted companies that were already operating electric trucks. The second survey (B2), however, focused on a meaningful sample of the transportation industry that is representative of Germany in terms of company size. The use of electric trucks was not a criterion for participation in this survey.

The goal of surveying companies with electric trucks in operation was to gain insights into practical use, the associated challenges, and recommendations for action over time. In the subsequent survey (B3), particular emphasis was placed on long-term experiences with electric truck use (at least one year) and initial experiences with long-haul electric trucks with a range of more than 500 kilometres. The survey of the transportation industry in the second survey (B2) aimed to representatively capture the industry's overall level of knowledge and perspective on the development of electric trucks, independent of previous practical experience, thereby enabling the results to be contextualized within the broader market.

In addition, another survey (B0) of the entire industry from 2021 is available; it was conducted by the Öko-Institut as part of the predecessor project StratES and is used below for comparison regarding selected issues (Göckeler et al., 2022) .

Table 1-1: The surveys of transportation companies included

	Survey 0 (B0)	Survey 1 (B1)	Survey 2 (B2)	Survey 3 (B3)
Target group	*Sample of logistics companies*	Transportation companies with electric trucks	Representative sample of logistics companies	Transportation companies with electric trucks
Survey Method	*Online*	Online	Online and by phone	Online
Recruitment	*Newsletters from BGL and DSLV*	Newsletters, press releases, sales	Company database (market research institute)	Newsletters, press releases, sales
Sample size	*250*	51	204	57
Survey period	*March 2021 – May 2021*	01/2024 – 01/2025	07/2025 – 08/2025	11/2025 – 01/2026
Project	*StratES*	ELV-Live	ELV-Live	ELV-Live
Reference	*(Göckeler et al., 2022)*	(Göckeler et al., 2025)	(Schreiber, Göckeler & Hacker, 2026)	(Schreiber, Hacker et al., 2026)

Source: own presentation

1.3 Limitations

The empirical basis of this synthesis is grounded in a thorough longitudinal and cross-sectional analysis; however, due to the specific sample structure and methodological variance in the data collection, a critical interpretation of the data is warranted.

The available data from three surveys conducted as part of the ELV-Live project, as well as a supplementary industry survey from the predecessor project StratES, provide a solid foundation for an empirically based analysis of the current state and future prospects of electric truck procurement in the transportation industry. At the same time, the collected data are subject to relevant limitations that restrict their interpretive power.

In general, the datasets are characterized by a relatively small absolute number of cases. This number is particularly low for the pioneer companies, at 50 to 60 cases each, meaning that detailed conclusions for subgroups are not possible or, given the small sample size, would not be reliable.

Thanks to the two rounds of surveys of pioneer companies, as well as the reference to the earlier industry survey conducted as part of the StratES project, longitudinal analyses are also available and will be discussed below. However, it should be noted that the composition of the samples differs considerably in some cases between the two survey time points. Furthermore, even in the survey of pioneer companies – despite the close temporal proximity of the two survey waves and the fact that respondents were contacted again – only a minority participated in both surveys.

The surveys covered a wide range of identical topic areas. However, the specific questions differed in some cases. This applies, for example, to the formation of categories (e.g., number of employees, vehicle categories) or the listing of technologies (e.g., biofuels or further differentiation of biofuels into subcategories). In some cases, the wording of the questions varied even when the content was the same. Nevertheless, where the authors deem it professionally justifiable, a comparison of the responses is provided below. Minor ambiguities (e.g., in defining company size by number of employees) are not explicitly noted. In addition, for percentage figures, the categories “don’t know” and “no response” were excluded from the population, as these categories were not consistently available as options in the surveys. Percentage figures in this synthesis may therefore differ slightly from those reported in the publications on the individual surveys.

The discrepancies from the original data can often be explained by referring to the publications already available on the individual surveys:

Survey 0 (entire industry, StratES project):

- Göckeler, Katharina; Hacker, Florian; Ziegler, Lukas; Heinzelmann, Jonas; Lesemann, Leonie; Bernecker, Tobias (2022): Anforderungen der Logistikbranche an einen Umstieg auf klimaschonende Fahrzeugtechnologien. Ergebnisbericht einer standardisierten Befragung. Zweiter Teilbericht des Forschungs- und Dialogvorhabens StratES. Berlin, Heilbronn: Öko-Institut, Hochschule Heilbronn

Survey 1 (pioneer companies, ELV-Live project):

- Göckeler, Katharina; Hacker, Florian; Dolinga, Theresa; Le Corguillé, Juliette (2025): Akzeptanz von E-Lkw bei Early-Adoptern. Ergebnisse einer Online-Befragung von Transportunternehmen im Projekt ELV-Live.

Survey 2 (Entire Industry, ELV-Live Project):

- Schreiber, Jonathan; Göckeler, Katharina; Hacker, Florian (2025). Akzeptanz von E-Lkw in der Logistikbranche. Ergebnisse einer standardisierten Befragung. Öko-Institut e.V., Berlin.
- Schreiber, Jonathan; Göckeler, Katharina; Hacker, Florian (2026). Acceptance of electric trucks in Germany: Results of a standardized survey. Öko-Institut e.V., Berlin.

Survey 3 (Pioneer Companies, ELV-Live Project):

- Schreiber, Jonathan; Hacker, Florian; Reiche, Mareike; Göckeler, Katharina (2026). Akzeptanz von E-Lkw nach längerer Praxiserprobung. Ergebnisse einer Online-Befragung von Transportunternehmen im Projekt ELV-Live. Öko-Institut e.V., Berlin.

1.4 Additional related market surveys

Complementary empirical analyses underscore the growing importance of battery-electric propulsion and confirm the need to address specific barriers.

Like the Öko-Institut, other research organizations are also addressing the decarbonization of road freight transport and empirically analysing the perspectives and strategies of key market players (primarily vehicle manufacturers and the transportation industry).

For example, surveys conducted by the German Energy Agency (dena) among members of the DSLV Bundesverband Spedition und Logistik e. V. – an association dominated by larger companies – show that battery-electric propulsion is the preferred alternative propulsion system there. Among the 131 companies surveyed in 2024, three-quarters of respondents were very open or open to investing in battery-electric vehicles (Goering, 2024). An exploratory survey conducted by dena among DSLV members in 2025 concluded that more than half of the logistics companies surveyed plan to invest in battery-electric vehicles over the next seven years (Goering & Blume, 2025). A key driver for electrification was the savings on tolls. Respondents viewed charging at depots as a key focus area for the future.

NOW GmbH examined the market development of electric trucks in road freight transport through “cleanroom” discussions with commercial vehicle manufacturers. A 2022 study concluded that manufacturers are focusing their strategy for zero-emission powertrains on batteries and hydrogen (NOW GmbH, 2023). A 2024 publication on renewed “cleanroom” discussions with commercial vehicle manufacturers projects that electric trucks will account for 48 percent of new registrations in Germany by 2030 (NOW GmbH, 2024).

In 2024, the Fraunhofer Institute for Systems and Innovation Research ISI conducted a survey and interviews to examine the requirements of German logistics companies for charging battery-electric trucks. It is noteworthy that the researchers succeeded in recruiting even smaller companies to participate in the survey. While the surveyed companies were, on average, neutral toward the potential integration of electric trucks into their fleets, smaller companies tended to have a more negative attitude (Scherrer et al., 2024).

In 2025, the Öko-Institut, Fraunhofer ISI, and Aproxima GmbH jointly evaluated the “Funding Program on the Promotion of Light and Heavy Commercial Vehicles with Alternative, Climate-Friendly Powertrains and Associated Refueling and Charging Infrastructure for Electrically Powered Commercial Vehicles (pure battery electric vehicles, externally chargeable hybrid electric vehicles, and fuel cell vehicles)” (KsNI). A key component of this evaluation was a survey of 462 KsNI grant recipients. With regard to the choice of alternative powertrains in road freight transport, it was notable that over 90 percent of the funded vehicles were battery-electric (Mottschall et al., 2025).

2 Sample Characteristics and Their Classification

2.1 Companies and Respondents

Compared to a representative sample of the transportation industry, the group of e-truck pioneers is characterized by a significantly higher proportion of medium-sized and large companies.

When recruiting the sample for Survey 2 (transportation industry), the aim was to achieve the highest possible representativeness for companies active in “road freight transport” (NACE code 49.41). The sample was based on a proportion of companies with fewer than 50 employees that is typical for the industry (75% in total). Companies with more than 250 employees make up only a small proportion (8%) of this sample.

The surveys of electric truck pioneers (B1 and B3) were conducted without quota sampling, based exclusively on the criterion of electric truck use. It is striking that the surveyed companies differ significantly from those in Survey 2 and present an almost opposite picture. Specifically, 94% (B1) and 74% (B3) of the companies have 50 or more employees, while small companies using electric trucks represent only a minority in these samples.

In the earlier industry survey (B0), no quota system was applied during data collection. Nevertheless, with 53% of companies having fewer than 50 employees, the sample is closer to the results of the latest industry survey in the ELV-Live project than to the sample of pioneer companies; however, small companies with fewer than 10 employees are also significantly underrepresented.

Table 2-1: Representativeness of the Survey Samples

Employees per company	*B0 Industry StratES (2021)[1] **	B1 Pioneers ELV-Live	B2 Industry ELV Live	B3 Pioneers ELV-Live	Companies by BALM (2020)[2] *	Companies in the BGL (2020)[1]	Companies in the DSLV (2015)[1]
1 to 9	*16%*	**4%**	**33%**	**7%**	46.7%	95%	17%
10 to 49	*37%*	**2%**	**42%**	**19%**	44.1%		36%
50 to 99	*19%*	**45%**	**10%**	**41%**	9.2%	5%	20%
100 to 199	*11%*		**5%**				13%
200 to 249	*17%*		**2%**				14%
Over 250		**49%**	**8%**	**33%**			

Source: Öko-Institut e.V., based on:
1. (Göckeler et al., 2022)
2.(Bundesamt für Güterverkehr [BAG], 2020)
* Companies in the freight forwarding, logistics, warehousing, and cargo handling sectors.

In all surveys, freight forwarders operating on their own account and pure carriers each represent the majority of companies.

By contrast, the differences by type of company are less pronounced. In all surveys, the proportion of freight forwarders operating on their own account (ranging from 31% to 51%) is very high, followed by pure carriers (16% to 41%) and plant-based transport companies (11% to 33%), while freight forwarders without their own vehicles play virtually no role in Surveys 1 and 3 – since the surveys explicitly asked about the use of electric trucks, for which owning one's own vehicles is a prerequisite – they are represented in a significant proportion (15%) in Survey 2. Given the high proportion of smaller companies in Survey 2, the significantly higher proportion of pure freight carriers (41%) in this sample also appears plausible and typical for the industry. In the earlier industry survey (B0), pure freight carriers were represented less frequently (25%) compared to the second industry survey (B2), while freight forwarders operating on their own account were represented somewhat more strongly (59%).

In the three main surveys, the responses were predominantly provided by decision-makers within the companies. Key groups include members of executive management, fleet or logistics management, and sustainability officers. Thus, the following responses reflect the views of individuals within the companies who have a direct influence on the procurement of transport vehicles or are responsible for it.

2.2 Fleet Composition and Vehicle Deployment

Heavy trucks weighing >16 or >18 metric tons make up the majority of vehicles in corporate fleets and are examined in greater detail.

In all three surveys, heavy trucks with a gross vehicle weight rating of over 16 or 18 metric tons[1] – which are also the focus of the subsequent survey – constitute the clear majority of commercial vehicles in the total fleet. While these account for between 52% and 57% of the fleets among electric truck users (B1 and B3), they make up as much as 88% of the representative industry sample (B2). In the earlier industry survey B0, the share was even higher, at over 90%.

Taking into account the differences in company size and recruitment methods across the three surveys, it is also understandable that the proportion of companies with fewer than 10 vehicles – at 55% in the representative sample – is significantly higher than in the survey of electric truck users (14% / 18%). By contrast, fleets with more than 50 vehicles are significantly less common in this sample (9% compared to 51% and 33%, respectively).

The majority of companies operate their fleets across the entire spectrum, from local to long-haul transport.

With regard to the use of heavy trucks (>16/18 metric tons), the overall picture reveals more similarities than differences between the pioneer companies and the industry as a whole. In both groups, the use of these vehicles in both local and regional transport is cited in 70% to 80% of cases. Long-haul transport also falls within this range for the industry as a whole (72%). For the pioneer companies, this was broken down into domestic and international long-haul transport. However, the responses – at 49% and 23%, respectively – also fit consistently into the overall picture that most companies have a broad spectrum of applications and do not focus clearly on a specific distance category. Another commonality across all surveys is that, for the majority of companies (60 to 78%), transportation services are carried out, at least in part, by contracted subcontractors.

2.3 Electric Trucks: Procurement and Fleet

Compared to the pioneer companies, only 5% of the representative sample have electric trucks in practical use – but 61% have considered procuring electric trucks.

Given the selection criteria used in surveying pioneer companies, it stands to reason that all companies from Surveys 1 and 3 already have electric trucks in operation. In the representative sample of the transportation industry in Survey 2, however, this is the case for only 3 percent of companies in the >18 metric tons vehicle segment – a figure significantly closer to the current market average than that of the pioneer companies. Overall, only about 5% of the representative sample – across all size categories – has electric trucks in operation. Within this group, three companies stand out with more than 10 electric trucks in the segment of vehicles weighing over 18 metric tons. 82% of the companies in the B2 industry survey state that they have not gained any experience with alternative powertrains or advanced fuel alternatives (e.g., HVO) in practice, even in the past. Among companies that have already tested alternatives, natural gas and electric trucks are mentioned most frequently. Overall, a majority (61%) in this group has at least considered the procurement of electric trucks, even if this has not yet been implemented in most cases.

[1] In the surveys, the lower limit of the heaviest truck class was defined differently as either 16 or 18 metric tons. Therefore, both limits are listed in the text to refer to the heaviest truck class.

Over the survey period, the number of electric trucks in pioneer companies has increased slightly – but generally remains in the single digits.

Among the pioneer companies surveyed, it can be observed that the proportion of companies shifted between the two survey periods from a majority that had only one electric truck in operation to a majority of companies with 2 to 5 electric trucks in the >16/18-metric-ton class, which indicates an increase in procurement. This is consistent with the findings from the first survey, in which 53% of the pioneering companies surveyed indicated plans to purchase additional electric trucks, although about three-quarters of the companies specified a maximum of 5 additional electric trucks as their procurement target.

With regard to the duration of practical experience, significant differences can be observed between the two surveys, B1 and B3, of the pioneer companies. While in the first survey, 84% had less than 12 months of practical experience with electric trucks and 58% had as little as 6 months, the final survey (B3) required that all companies be able to demonstrate at least 12 months of electric truck operation in their assessment.

Table 2-2: Percentage of companies with electric trucks in the >16/18 metric ton vehicle class in their fleets

Number of electric trucks in the fleet	Survey 1 Pioneers	Survey 2 Industry	Survey 3 Pioneers
1	41%	0.5%	24%
2–5	39%	1.5%	57%
6–10	14%	0%	14%
>10	6%	1.5%	5%

Source: own presentation

Vehicle leasing is the preferred option for transportation companies when procuring and financing electric trucks.

When procuring electric trucks, purchasing vehicles outright without financing plays a minor role among pioneer companies. Purchasing vehicles with financing and vehicle leasing were used in nearly two-thirds of cases. It should be noted that a large portion of the vehicles – especially in the early market phase – were procured with government subsidies (KsNI-Richtlinie, 2021). The companies in the representative sample also indicate – in response to this question, which in this context has so far been largely hypothetical – that the majority would acquire electric trucks through leasing or purchase with financing. For these companies – presumably also given the significantly higher proportion of small businesses in the sample – purchase without financing is an option for only one-tenth of the respondents.

3 Practical Experience Versus Expectations

3.1 Vehicle Deployment

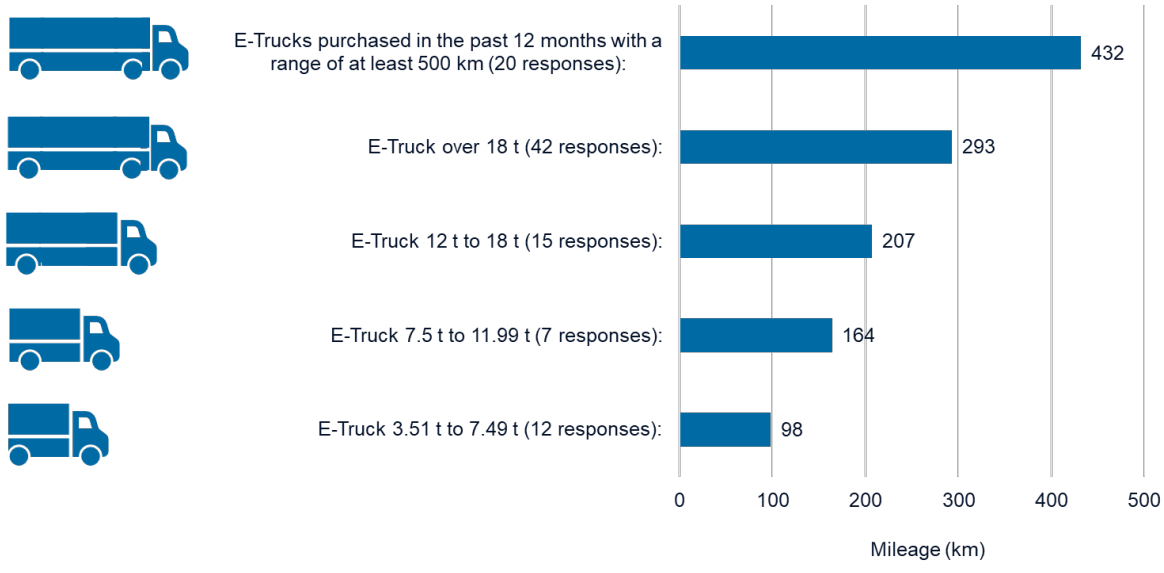
The use of electric trucks is shifting toward long-haul transport – with the introduction of electric trucks with a range of more than 500 kilometres, there has been a major leap in average daily mileage.

> *"The range even exceeds the manufacturers' projections. [The] vehicles are perfectly suited for everyday use and, in regular operation, comparable to diesel vehicles." (Transportation company with electric trucks, B3)*

As was already evident from individual examples during the support provided to the case study partners in the ELV-Live project (Hacker et al., 2026), electric trucks – even the first production models – are already being used intensively in day-to-day logistics operations. The two surveys of pioneer companies reveal a trend over time: for trucks weighing more than 16 or 18 metric tons, the focus of use has shifted from the initial emphasis on local and regional transport to regional and long-distance transport, driven by the increasing use of electric trucks with longer ranges (>500 kilometres). In the most recent survey (B3), 70% of the companies already reported that they are using electric trucks with a range of more than 500 kilometres in regional and national long-haul transport.

This trend is also clearly evident in the reported average daily mileage. While this figure rises steadily with increasing vehicle size, it experiences its greatest jump – from 293 to 432 kilometres – with the market introduction of electric trucks suitable for long-haul transport.

Figure 3-1: Average Daily Mileage of Electric Trucks by Size Class (B3)



Source: own illustration

3.2 Satisfaction, Technical Reliability, and Driver Acceptance

There is an exceptionally high level of satisfaction with electric trucks in day-to-day logistics operations – with satisfaction rising from 88% to 93% as practical experience increases.

> *"The vehicle is very, very quiet. The driver is really very satisfied. There's almost no maintenance required. No need to check the engine oil, etc." (Transportation company with electric trucks, B3)*

Electric trucks in the >16/18-metric-ton class have only been available as production models for a few years. Nevertheless, a very high level of satisfaction was already expressed in the first survey wave after just a few months of use (B1: 88% satisfied, of which 28% were very satisfied), which has improved even further over time (B3 – after at least one year of use: 93% satisfied, of whom 47% were very satisfied). These high satisfaction rates are particularly noteworthy because, especially in the early phase of product introduction, there were still reports of, among other things, extended time in the shop, long wait times for spare parts, or faulty communication between the vehicle and the charging infrastructure. The feedback from the follow-up survey of pioneer companies – in which 42% of the companies stated that their assessment of the technology had improved over the course of their usage to date – fits coherently into the overall picture and also aligns with the impressions gathered during on-site visits to the case study partners in the project (Hacker et al., 2026).

Experience Gap I: Very high technical reliability of electric trucks in practical use – coupled with high scepticism among transportation companies without practical experience with electric trucks.

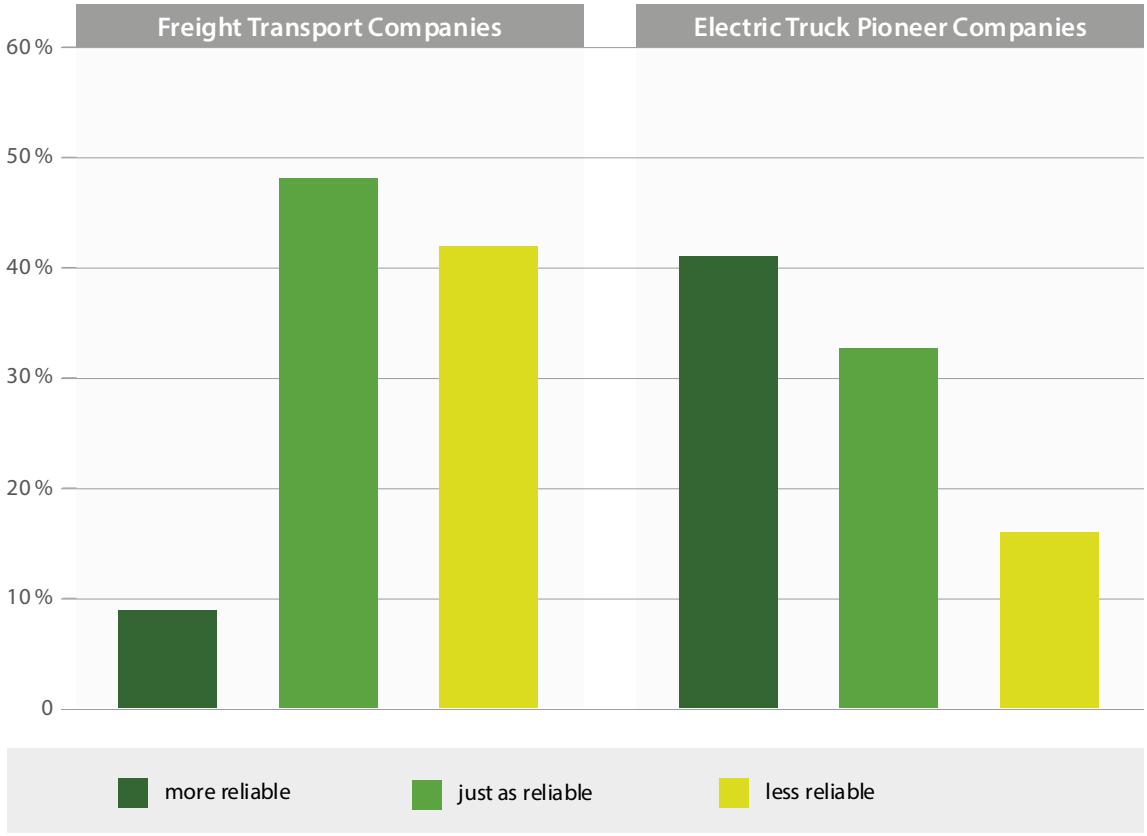
> *"The vehicles are at a very advanced stage of development, highly efficient, and run reliably." (Transportation company with electric trucks, B3)*

As early as the 2021 survey of the transportation industry (B0) (Göckeler et al., 2022), the transportation companies surveyed cited vehicle reliability by far as the top criterion (relevant for 98%) in vehicle procurement. In this regard, and given the high level of satisfaction with electric trucks, a high degree of technical reliability can be assumed. This is also clearly confirmed in the survey of pioneer companies. In the very first survey (B1), 74% reported that the electric trucks they use tend to be more technically reliable in day-to-day logistics operations than comparable diesel trucks. Even after more than a year, the follow-up survey (B3) paints a very similar picture – only about 25% perceive electric trucks as having more frequent technical problems compared to diesel trucks, while three-quarters of the companies observe similar or even higher reliability in electric trucks.

> *"Acquisition costs are too high, reliability is too low, and range is too short" (transport companies without electric trucks, B2)*

In stark contrast, however, is the assessment of the representative sample of transportation companies that have so far gained practical experience with electric trucks only in exceptional cases. In this group, only 9% of companies believe that electric trucks are more reliable in practice.

Figure 3-2: Technical Reliability of Electric Trucks Compared with Diesel Trucks: Expectations versus Experience. Comparison of survey results from transport companies (B2) and electric truck pioneer companies (B3).



Source: own illustration

Experience Gap II: Driving comfort ensures high acceptance among drivers – transport companies without electric trucks, however, expect high levels of resistance from drivers.

> *"A comfortable driving experience for drivers without noise" (transport companies with electric trucks, B3)*

In response to an open-ended question about reasons for satisfaction, the pioneer companies most frequently cite aspects related to driving comfort (including low noise levels, cleanliness, and dynamic handling) and driver acceptance, in addition to issues surrounding technical reliability. They report an extremely positive response from drivers and a significant improvement in working conditions. In some cases, clear advantages in recruiting drivers are also noted. This feedback is clearly confirmed by statements made in personal interviews with drivers at the project's case study part (Hacker et al., 2026).

Here, too, there is a clear discrepancy compared to the representative survey of the transportation industry (B2), which lacked relevant practical experience with electric trucks. For example, 59% of this group believe that electric trucks are less popular among drivers, while only 10% assume that

the vehicles are more popular. Among dispatchers, the assessment is even more one-sided – only 3% expect electric trucks to be preferred. While the personal interviews with the case study partners also indicate that electric trucks tend to be rated less positively by dispatchers than by drivers, in practice a clearly positive picture emerges in favour of electric trucks (Hacker et al., 2026).

Other reasons for satisfaction include: cost-effectiveness, environmental benefits, image, range, and battery charging.

> *"We'll produce less CO_2 in the future. This improves our planning, reduces costs in the long term, and makes our company future-proof." (Transportation company with electric trucks, B3)*

As further specific aspects of satisfaction with electric trucks in practical use, the pioneer companies also frequently cited – at both survey time points – cost-effectiveness, environmental benefits, customer satisfaction, and image benefits, as well as the associated strategic benefits for the company, the reliable and sufficient range of the vehicles, and satisfaction with battery charging and charging management.

Criticized aspects include: fluctuations in range, charging infrastructure and grid capacity, technical failures, and technical vehicle limitations.

> *"Because of the toll exemption, we try to drive as long a route as possible with the electric truck. The reduction in range during winter is problematic." (Transportation company with electric trucks, B3)*

Dissatisfaction with electric trucks remains at a very low level among pioneer companies (12% in B1, 7% in B3). The few companies that express dissatisfaction cite, as the most common points of criticism in their specific use cases, challenges with range and its dependence on weather conditions, as well as associated restrictions in operational planning; difficulties with charging infrastructure and grid capacity; technical failures and a lack of spare parts supply; and inadequate vehicle equipment and technical limitations of the vehicles (e.g., reduced payload).

4 Motivation for Procuring Electric Trucks

4.1 Drivers

For pioneering companies, the drivers of electric truck procurement are shifting from range and regional operational capability toward cost-effectiveness, sustainability, and improved framework conditions.

> *We first need to gain experience with the first vehicle (reliability, operating costs). Without subsidies, economical deployment is not possible given the current investment costs for an electric truck. (Transport company with electric trucks, B1)*

The initial survey of pioneer companies (B1) is heavily influenced by the electric truck models primarily available at the start of the project – with a maximum range of 400 kilometres and a focus on regional transport.

Overall, the reasons cited for the purchase are diverse and primarily relate to the vehicle's expanded range of applications – thanks to a range of up to 400 kilometres – its cost-effectiveness and reliability, as well as the companies' self-imposed sustainability goals. At that time, toll discounts still played a minor role for the surveyed companies, given that the vehicles were primarily used for regional transport.

> *"Minor technical issues at this point, economic benefits from toll savings. Challenges with charging infrastructure and charging management" (Transport company with electric trucks, B3)*

In the second survey of the pioneer companies (B3) conducted at the end of the project, the drivers cited reveal an increasing focus on long-haul transport and a shift toward further electrification of the fleet, as well as an increasingly positive development of relevant framework conditions. Sustainability goals and the environmental benefits of electric trucks, cost advantages over diesel trucks – particularly due to toll savings and the ability to use self-generated electricity, which enables independence from energy imports and price fluctuations – are cited as high-priority drivers. The increasing availability of charging infrastructure, market and customer demands, and regulations (especially environmental zones) are also cited as relevant incentives for the transition. As mentioned earlier, the technical reliability of electric trucks, high driver acceptance and comfort, as well as goals for fleet modernization and optimization, represent further incentives for the procurement of electric trucks.

Companies without practical experience are primarily exploring electric trucks out of general interest and to assess feasibility – often without any immediate intention to purchase.

> *"Keep up with the times, see if it's suitable, and possibly save costs" (Transport company without electric trucks, B2)*

The picture is even less clear-cut among the representative sample with no relevant practical experience with electric trucks. In this group, 39% state that they have not yet considered the topic of electric truck procurement at all. Otherwise, in addition to general interest in the topic and curiosity, it is primarily feasibility and potential use cases that motivate companies to explore electric trucks. Other factors driving engagement with the topic include cost considerations, a forward-looking approach, companies' climate and environmental goals, interest in the technology, customer requirements, truck tolls, political framework conditions, as well as information from manufacturers and funding opportunities.

4.2 Barriers

Pioneering Companies: Despite growing practical experience and recognized operational cost advantages, investment costs and infrastructure remain key barriers to further electrification.

> *"Acquisition costs must come down" (Transport company with electric trucks, B3)*

Among the pioneer companies, a nuanced tension has emerged over the course of the project between the perceived economic benefits of operation and the high investment barriers involved in procuring electric trucks. While, particularly in the later stages of the project, operational cost advantages – such as lower energy costs, toll benefits, and the use of self-generated electricity –

were increasingly cited as drivers for electrification, the high acquisition and investment costs for vehicles and charging infrastructure remained key obstacles. At the start of the project, the lack of public charging infrastructure was also a dominant issue, cited by 90% of companies as a major obstacle. Added to this was a lack of workshop and service expertise for electric powertrains, while traditional reservations regarding range or payload already played a comparatively minor role at that time. As practical experience grows, the barriers are shifting more toward issues of economic viability under uncertain conditions – such as high investment risks, challenges with grid connection, and uncertainties regarding political and regulatory reliability. Limitations in vehicle availability, delivery times, and organizational implementation also remain relevant challenges, even as technical reliability and driver acceptance are increasingly viewed positively.

Industry as a whole: A lack of practical experience leads to uncertainty regarding the economic viability, operational readiness, and technological maturity of electric trucks.

> *"The driving ranges for trucks are currently still insufficient, and the acquisition costs are too high. Charging options for trucks [are lacking]. Maintenance costs cannot yet be estimated!" (Transportation company without electric trucks, B2)*

In the representative sample of companies with no significant practical experience with electric trucks, the picture of the barriers is much more diffuse. A large proportion of the companies have not yet examined the topic in depth. Accordingly, their perceptions are primarily shaped by fundamental uncertainties and reservations. The most important barriers cited are insufficient range, lack of cost-effectiveness, and the lack of charging infrastructure. In addition, there are doubts regarding suitable application profiles, technological maturity, and feasibility within their own operations. Particularly striking is the discrepancy in the assessment of cost-effectiveness: While pioneering companies increasingly view cost advantages as a key driver, 57% of companies without practical experience assume a higher Total Cost of Ownership (TCO) compared to diesel trucks – yet the majority of this group (61%) has not yet conducted an in-depth TCO comparison.

5 Charging Infrastructure and Energy

The findings on charging infrastructure and energy supply highlight the central importance of charging for the cost-effectiveness and scaling of electric truck deployment, thereby directly tying in with the drivers and barriers to electrification described earlier. Significant differences are evident between the pioneer companies with practical experience and the representative sample without widespread electric truck deployment. While the pioneer companies have already gained concrete operational and expansion experience and are increasingly entering a phase of optimization, the majority of companies in the representative sample have not yet addressed the issue in detail. At the same time, these companies (B2) identify charging infrastructure as the main hurdle (50%) – even ahead of the cost of electric trucks (39%) – for the electrification of their fleets. This impression is also supported by the 2021 survey of the entire industry (B0) – at that time as well, charging infrastructure availability was rated as the most important criterion for fleet conversion.

5.1 Depot Charging

Charging at the depot is of central importance to pioneering companies and particularly attractive from an economic standpoint; however, it has not yet been examined in detail across the broader spectrum of companies.

> *"For now, I have to use the savings on electricity costs to recoup the costs of my depot electrification" (Transport company with electric trucks, B3)*

In the early market phase – with limited public charging infrastructure, a focus on regional transport applications, and high electricity costs at public charging stations – charging at the depot plays a particularly important role.

Against this backdrop, it is hardly surprising that a very high proportion (86%) of the pioneer companies (B3) have one or more of their own charging stations, and that, in this early market phase, on-site charging clearly dominates electric truck operations: About 82% of electricity consumption occurs at their own locations, while public charging has so far played only a minor role. In addition, about two-thirds of the companies have their own electricity generation capacity, which underscores the early and strategic nature of their electrification efforts. At the same time, this allows the companies to benefit, on average, from comparatively low electricity costs at their depots (23.77 ct/kWh), although there is a wide range among individual companies (13 to nearly 36 ct/kWh). The installed charging capacity of the depot charging infrastructure averages 629 kW, with an average of 5.2 electric trucks in the fleet. Despite existing expansion plans for additional charging points (among two-thirds of the pioneer companies), the companies view high investment costs, lengthy grid connection procedures, and bureaucratic requirements in particular as key obstacles to the further expansion of the depot charging infrastructure.

The representative sample (B2), on the other hand, is still in a significantly earlier phase of the transformation. While many companies do have suitable depot locations in principle – albeit to a lesser extent – 68% have at least one depot of their own; of these, 69% are owned and 27% are leased. However, the vast majority (83%) have not yet invested in charging infrastructure – and 73% do not plan to do so in the foreseeable future. At the same time, there are significant gaps in knowledge regarding their own energy supply and electricity costs: More than half of the companies do not know their own electricity prices at the depot. Furthermore, the reported electricity costs – averaging 29.5 ct/kWh – are significantly higher than those of the pioneer companies and also vary widely. Overall, a wait-and-see attitude still prevails among many companies.

5.2 Public Charging

Public charging currently plays only a supplementary role, but will be of crucial importance in the future for the operation of long-haul electric trucks.

> *"When it comes to bids for the installation of charging points, I would like to see the pass-through model introduced despite all resistance. Furthermore, the charging market must be regulated at the policy level, and operators of public charging infrastructure must be subject to better oversight so that opaque pricing – including roaming and subscription fees – becomes more transparent." (Transportation company with electric trucks, B3)*

Public charging has not yet played a significant role in the deployment of electric trucks by pioneer companies (B3) – only about 8% of electricity sales are made at public charging stations, and only about half of that at dedicated truck charging stations. The low level of usage to date is primarily due to the high costs compared to depot charging, the limited availability of suitable public charging points, and the currently dominant operational structure, which relies heavily on depot-based regional transport. The companies report average public charging costs of around 49 ct/kWh and criticize, in particular, the lack of parking spaces for trucks, the limited reliability and availability of charging points, the lack of reservation options, and low cost transparency. Public charging is thus currently used more as a supplementary backup and less as a regular part of operations.

However, as a detailed analysis within the project on the potential for electrifying long-haul transport based on real long-haul transport profiles shows (Dolinga & Hacker, 2025b), the expansion of public charging infrastructure is of particular relevance for these applications – and thus also for the next market phase, which extends beyond regional transport.

5.3 Challenges and Prospects

Challenges include: infrastructure costs, grid connection, and uncertainties regarding future developments.

> *"There is no infrastructure in our area. Electricity is so scarce here that we can't charge regularly; the power lines just can't handle it." (Transportation company without electric trucks, B2)*

Across both groups, the charging infrastructure emerges as one of the key bottlenecks in the e-truck transformation. Among the pioneer companies, the discussion has increasingly shifted over time from fundamental questions of technical feasibility to challenges in scaling the infrastructure. Particularly relevant factors here include high investment costs for charging points and grid connections, lengthy approval and connection processes, and uncertainties regarding future regulatory and economic conditions. Despite these challenges, many companies are pursuing concrete expansion plans and actively driving forward the electrification of their fleets.

In the representative sample, however, fundamental uncertainties and a lack of practical experience remain at the forefront. In addition to the perceived high costs, there are particular doubts regarding the cost-effectiveness and practical feasibility of charging infrastructure within their own operations. Overall, this reveals a clear difference in maturity: While pioneering companies are already gaining concrete operational and optimization experience and actively further developing infrastructure, a large portion of the remaining companies is still in an early orientation and evaluation phase.

6 Further Procurement Plans, Framework Conditions, and Technology Outlook

6.1 Companies' Further Procurement Plans and Motivation

While many companies are still in an early orientation phase, pioneering companies are already planning further electric truck procurements.

> *"Currently, internal-combustion trucks are being replaced in local distribution operations because their exhaust aftertreatment systems are reaching the end of their service life. I'm curious to see how long my electric trucks will last, since they don't have an exhaust system." (Transportation company with electric trucks, B3)*

The survey results show clear differences between pioneer companies with practical experience using electric trucks and the industry as a whole in terms of specific procurement intentions. While the majority of companies in the representative sample (B2) have generally explored the topic of electric trucks, only about 18% of companies currently plan to procure battery-electric trucks weighing over 18 metric tons by 2030. At the same time, 39% of companies have not yet examined the technology in depth. The industry as a whole thus remains predominantly in an early orientation and evaluation phase.

In contrast, the pioneer companies (B1/B3) have significantly more concrete and dynamic procurement plans. As early as the initial project phase (B1), more than half of the companies were planning further electric truck purchases; by the later stage of the project (B3), this share rose to 72%. At the same time, the 57 companies surveyed purchased a total of approximately 110 additional electric trucks in the twelve months leading up to the third survey alone. While the planned purchases through 2030 remain predominantly gradual and incremental, they indicate a steady progression toward electrification. Over time, the pioneers' motivation is increasingly shifting from initial regional application opportunities toward economic and strategic considerations. In addition to sustainability goals and the environmental benefits of electric trucks, toll advantages, lower operating costs, the use of self-generated electricity, and the increasing technical maturity and reliability of the vehicles play a particularly important role. Furthermore, market and customer requirements, as well as regulatory developments, are increasingly cited as drivers for further electrification.

6.2 Framework Conditions for Further Electrification

Economic and infrastructural conditions are key prerequisites for the further adoption of electric trucks.

> *"The purchase price alone is still too high without government subsidies. Truck body types are more expensive. The entire charging infrastructure needs to be built" (Transport company without electric trucks, B2)*

Across all surveys, it is evident that economic and infrastructural conditions are crucial for the further adoption of electric trucks. However, the perspectives of companies with and without practical experience differ significantly. Companies in the representative sample without relevant electric truck experience (B2) view the expansion of a nationwide high-performance charging network as the most important prerequisite for greater electrification of road freight transport. Equally important are

subsidies for depot charging infrastructure, accelerated permitting procedures, and the reduction of grid connection costs. At the same time, considerable uncertainties remain regarding cost-effectiveness and technological development. For example, more than half of the companies anticipate a higher Total Cost of Ownership (TCO) compared to diesel trucks, even though the majority have not yet conducted in-depth TCO analyses. Furthermore, the assessment expressed by nearly 50% of companies – that the purchase costs for electric trucks will not decrease or may even increase by 2030 – underscores the relatively limited engagement with the technology to date and the resulting knowledge gaps regarding expected technological developments.

Pioneering companies view toll benefits, affordable electricity prices, and the expansion of charging and grid infrastructure as crucial for the further scaling up of electric truck deployment.

> *"Given the high daily mileage, it's very easy to benefit from toll exemptions" (Transport company with electric trucks, B3)*

The pioneering companies assess the situation from a much more practical perspective. For them, the focus is less on fundamental doubts about the technology and more on the need for economically and operationally reliable framework conditions for a broader rollout. By far the most important measure, from the companies' perspective, is the existing toll exemption – or the toll advantage that electric trucks have over diesel trucks. Added to this are low electricity prices, the expansion of public charging infrastructure, and financial support for depot infrastructure and grid connections. At the same time, high acquisition and infrastructure costs, lengthy grid connection processes, and uncertainties regarding the regulatory framework remain key obstacles. Overall, this reveals a clear difference in maturity: While the industry as a whole is still heavily characterized by uncertainty and a lack of information, a large portion of the pioneering companies are already in a phase of concrete scaling and optimization of electric truck deployment.

6.3 Assessment of the Future Prospects for Alternative Powertrains and Fuels

The assessment of promising propulsion technologies in road freight transport has changed significantly in recent years.

> *"We have always been convinced that the future of transportation will be electric. We are confident in this propulsion technology and would like to put more electric trucks into service in the future." (Transportation company with electric trucks, B3)*

The industry's assessment of promising propulsion technologies in road freight transport has changed significantly in recent years. This is particularly evident when compared to the first industry survey (B0) from the predecessor project StratES in 2021 (Göckeler et al., 2022). At that time, hydrogen-based propulsion systems (via fuel cells or hydrogen-powered internal combustion engines) in particular were still considered to have very high future potential. In the current surveys, however, these technology options have lost significant ground in both groups and are now rated at a level similar to that of biofuels, natural gas, or e-fuels.

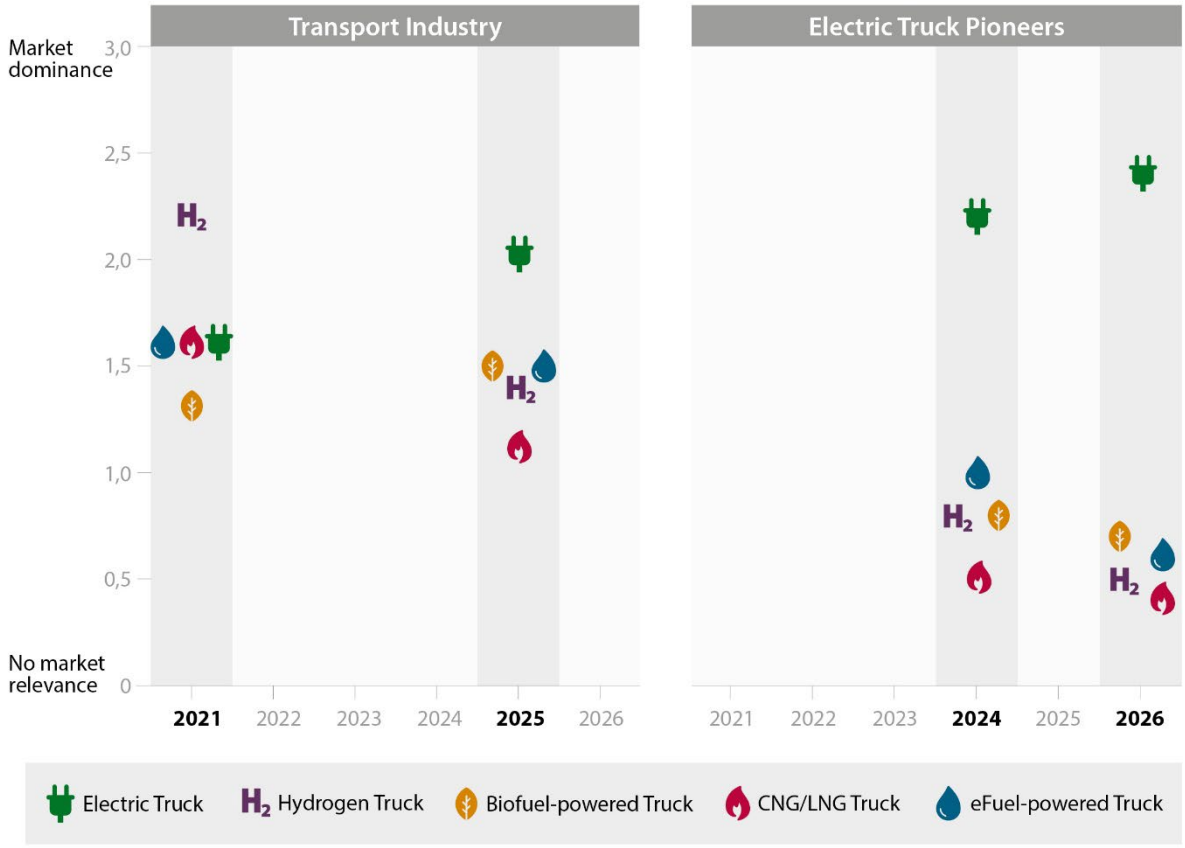
While battery-electric trucks are emerging over time as the top future technology from a corporate perspective, hydrogen-based powertrains are experiencing the sharpest decline—other fuel and powertrain alternatives remain at a low level.

> *"High-quality hydrogen from green sources, which is very expensive to produce […], is far too valuable to be used as an energy source in simple transport vehicles. Hydrogen should primarily be used for high-value processes and goods in industry […]." (Transport company with electric trucks, B1)*

In contrast, battery-electric trucks (e-trucks) are now widely regarded as having by far the greatest future potential. This applies both to the industry as a whole and, even more so, to the pioneering companies with their own practical experience. Experience gained from real-world vehicle operation appears to be having a clearly positive influence on the assessment of the technology. In particular, high technical reliability, driver acceptance, and increasing suitability for regional and long-haul transport are contributing to this development. While electricity-based fuels, biofuels, and natural gas continue to be viewed as possible supplements, their potential is considered significantly lower than that of battery-electric powertrains. In this regard, the pioneering companies assess the relevance of alternative fuels in the future market as significantly lower than does the industry as a whole.

At the same time, the surveys show that other alternative propulsion technologies, such as plug-in hybrid or overhead-catenary trucks, have lost significant importance over time and – particularly with regard to overhead-catenatry trucks – will play no role in the market by 2030, according to the companies surveyed.

Figure 6-1: Assessment of the market relevance of alternative truck powertrains and fuels for 2030. Results from four survey waves (2021–2026) of the transportation industry and electric truck pioneer companies.*



*The market relevance index reflects the distribution of responses across the possible categories (from 0: "not used" to 3: "used as standard"). The technologies were surveyed with varying levels of detail in the surveys (including hydrogen and biofuels). In the chart above, where a more detailed survey was conducted, average values were calculated for the subcategories. Overhead-catenary trucks were not included in all surveys, and plug-in hybrid trucks received very low ratings and play a minor role in the market – therefore, these two technologies were omitted from the chart.

Source: own illustration

Overall, the results suggest that, from the transportation industry's perspective, battery-electric trucks are increasingly establishing themselves as the dominant technological option for decarbonizing road freight transport. At the same time, further market ramp-up remains closely tied to economic conditions, the expansion of the charging infrastructure, and regulatory certainty.

7 Conclusion

The synthesis of the three standardized survey waves (B1 through B3) in the ELV-Live project, combined with the quantitative analysis of operational data, provides a clear and empirically sound picture of the current state of maturity of electric mobility in heavy-duty road freight transport. The analyses document a deep perception gap between the industry as a whole, which is characterized by scepticism (B2), and the mature practical reality of the pioneering companies (B1, B3).

While the representative sample from the transportation industry – in which 95% of companies still have no practical experience of their own with battery-electric trucks (e-trucks) – expresses

significant reservations regarding technical reliability, driver acceptance, and operational constraints, the real-world user data refute these concerns in actual operation.

High overall satisfaction: In the first survey (B1), 88% of the pioneers already reported being satisfied or very satisfied. After a longer period of practical testing lasting at least 12 months (B3), this figure rose to 93%. In addition, 42% of long-term users report that their assessment has continued to improve over the course of use.

Technical reliability: While across the industry as a whole (B2) only 9% of companies expect electric trucks to be more reliable than diesel vehicles (42% expect them to be less reliable), the pioneers paint a different picture. In B1, 74% rated reliability in real-world operation as high ("somewhat/completely true"). In B3, 41% of early adopters confirm that electric trucks cause problems less often or significantly less often than conventional trucks, and 33% see no differences; only 26% report more frequent problems.

Driver acceptance and dispatch: 59% of companies with no experience with electric trucks (B2) assume that the vehicles are unpopular with drivers, and 57% expect resistance from dispatchers. In real-world practice, driver acceptance, driving comfort, and a positive driving experience rank at the top of the satisfaction factors in both pioneer waves (B1 and B3).

Technological Dominance: A clear technological direction is emerging for the future of heavy-duty commercial vehicles. Across all three waves, battery-electric propulsion (e-trucks) is by far assigned the greatest market potential for the year 2030. Alternative options such as hydrogen fuel cells have lost a great deal of significance over the period under review and are now perceived by the industry to be on par with biofuels, while overhead-catenary trucks (OC-trucks) have virtually disappeared from view.

At the same time, the longitudinal comparison of early adopters illustrates that as vehicles mature and mileage increases – heavy trucks over 18 metric tons average 293 kilometres, while new long-haul trucks already average 432 kilometres per day – the challenges shift. While vehicle-related aspects such as inaccurate range displays or temporary vehicle breakdowns were the focus in the initial phase (B1), external, procedural, and infrastructural barriers come to the fore among long-term users (B3). The main points of criticism cited are the charging infrastructure, restrictions in route planning, and bottlenecks in grid connection capacity.

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