2022

Progress Report on the Overall Approach to Climate-Friendly Commercial Vehicles

Towards zero-emission road logistics by means of alternative drivetrains

Federal Ministry
for Digital
and Transport

Contents

Status quo and next steps

At the end of 2020, the Federal Ministry for Digital and Transport (BMDV) published the 'Overall Approach to Climate-Friendly Commercial Vehicles – Towards Zero-Emission Road Logistics by Means of Alternative Drivetrains'. The Overall Approach is an integrated package of measures consisting of vehicle funding, management of the infrastructure deployment and establishment of a targeted regulatory framework. It is being jointly implemented with the actors involved.

This progress report gives an overview of the Ministry's activities and of current developments since publication of the Overall Approach. In addition, it takes a look ahead. The following key messages reflect the current status and identify major next steps:

Cleanroom Talks

For the first time, vehicle manufacturer data shows a significant increase in forecast sales figures for battery- and fuel-cell powered heavy commercial vehicles weighing more than 12 tonnes. According to the forecast, 75 % of all vehicles registered for the first time in 2030 are expected to be emission-free. Therefore, the Federal Ministry for Digital and Transport will substantially advance infrastructure deployment.

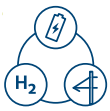
Funding of alternative climate-friendly commercial vehicles

In 2021, the Federal Ministry for Digital and Transport published the Funding Guidelines for the Purchase of Commercial Vehicles with Alternative Climate-Friendly Drivetrains and the Deployment of Refuelling and Charging Infrastructure (KsNI) as a core measure. For the first time in Europe, 80 % of the additional investment costs for climate-friendly commercial vehicles and the associated infrastructure are being funded. The programme is effective: In the second call, the number of applications for funding has quadrupled.

Task Forces, Use Cases and studies

The Federal Ministry for Digital and Transport plans infrastructure deployment in Task Forces with relevant actors and identifies challenges as well as first problem-solving approaches.

The Use Cases facilitated the establishment of suitable combinations of drivetrain technology and refuelling and charging infrastructure. They show that there are appropriate solutions for the use of climate-friendly commercial vehicles for the individual needs of each user.

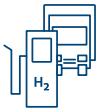


Innovation Clusters

The central Innovation Cluster for high power charging for battery electric heavy goods vehicles along the A2 motorway ('HoLa') has been launched. The results of this project will feed into the charging infrastructure roll-out planning for electric heavy commercial vehicles.

Charging Infrastructure Masterplan II

For the first time, the Charging Infrastructure Masterplan II names concrete measures for the deployment of charging infrastructure for heavy commercial vehicles, including deadlines and responsibilities. This creates planning certainty for the sector. One core measure is the planned tender for an initial charging network for battery electric heavy goods vehicles.



Hydrogen fuel cell technology: Vehicles and infrastructure

In addition to R&D activities for vehicle- and infrastructure-related technology development and the establishment of hydrogen regions, the Ministry supports the upgrading of the hydrogen refuelling infrastructure for commercial vehicles.

Regulatory framework

In 2023, the Ministry will introduce a heavy goods vehicles toll based on CO_2 emissions. The introduction is a key regulatory measure to incentivize zero-emission vehicles.

The EU's Alternative Fuels Infrastructure Regulation (AFIR) draft creates for the first time a framework for minimum infrastructure deployment targets for electric commercial vehicles. Member States will be required to ensure the deployment of a basic network of charging and hydrogen refuelling infrastructure. In future, commercial vehicles with alternative drivetrains can be used and charged or refuelled across borders.

Outlook

In principle, the integrated package of measures consisting of vehicle funding, management of the infrastructure deployment and establishment of a targeted regulatory framework is continuing. The measures will be implemented in cooperation with the relevant actors also in future.

Based on the market development, outcome of the Cleanroom Talks and requirements of the AFIR draft, the Federal Ministry for Digital and Transport is preparing the tender for an initial charging network for heavy goods vehicles in the third quarter of 2023 as a key element of the Charging Infrastructure Masterplan II. In addition, a basic network of publicly accessible hydrogen refuelling infrastructure for commercial vehicles is being deployed in Germany.

1. Introduction: motivation and objective of the progress report

In November 2020, the Federal Ministry for Digital and Transport (BMDV) published the 'Overall Approach to Climate-Friendly Commercial Vehicles – Towards Zero Emissions Road Logistics by Means of Alternative Drivetrains' based on the 2030 Climate Action Programme. The objective is for electric vehicles and vehicles running on electricity-based fuels to account for one third of vehicle mileage in heavy road haulage by 2030. The Overall Approach addresses the key requirements of vehicle users and suppliers to be met by alternative drivetrains and the associated infrastructure for climate-friendly commercial vehicles. Moreover, an integrated package of measures consisting of vehicle funding, management of the refuelling and charging infrastructure deployment and establishment of a targeted regulatory framework was presented. This is intended in particular to create investment and planning security for vehicle manufacturers and users who are confronted with market risks and increased investment requirements. All in all, the Overall Approach aims to show options for a rapid market ramp-up of climate-friendly commercial vehicles, whose availability on the market is currently rising sharply. Initiated measures such as capital grants for the procurement of commercial vehicles with alternative drivetrains are accelerating the market ramp-up of these vehicles. This development is supported by regulatory framework conditions, such as the CO_2 fleet limit values at European level. The prospect of an increasing number of climate-friendly commercial vehicles requires adequate infrastructure.
The Alternative Fuels Infrastructure Regulation (AFIR) draft contains for the first time binding minimum targets for an area-wide deployment of refuelling and charging infrastructure, including for commercial vehicles, in the EU Member States. This multitude of dynamic developments requires targeted action by all actors. With its progress report, the Federal Ministry for Digital and Transport would like to provide information on the status of implementation of the measures as well as on current developments and upcoming tasks.

Detailed information in German on the implementation of the Overall Approach can be found on the website www.klimafreundliche-nutzfahrzeuge.de.

2. Activities of the Federal Ministry for Digital and Transport and current developments

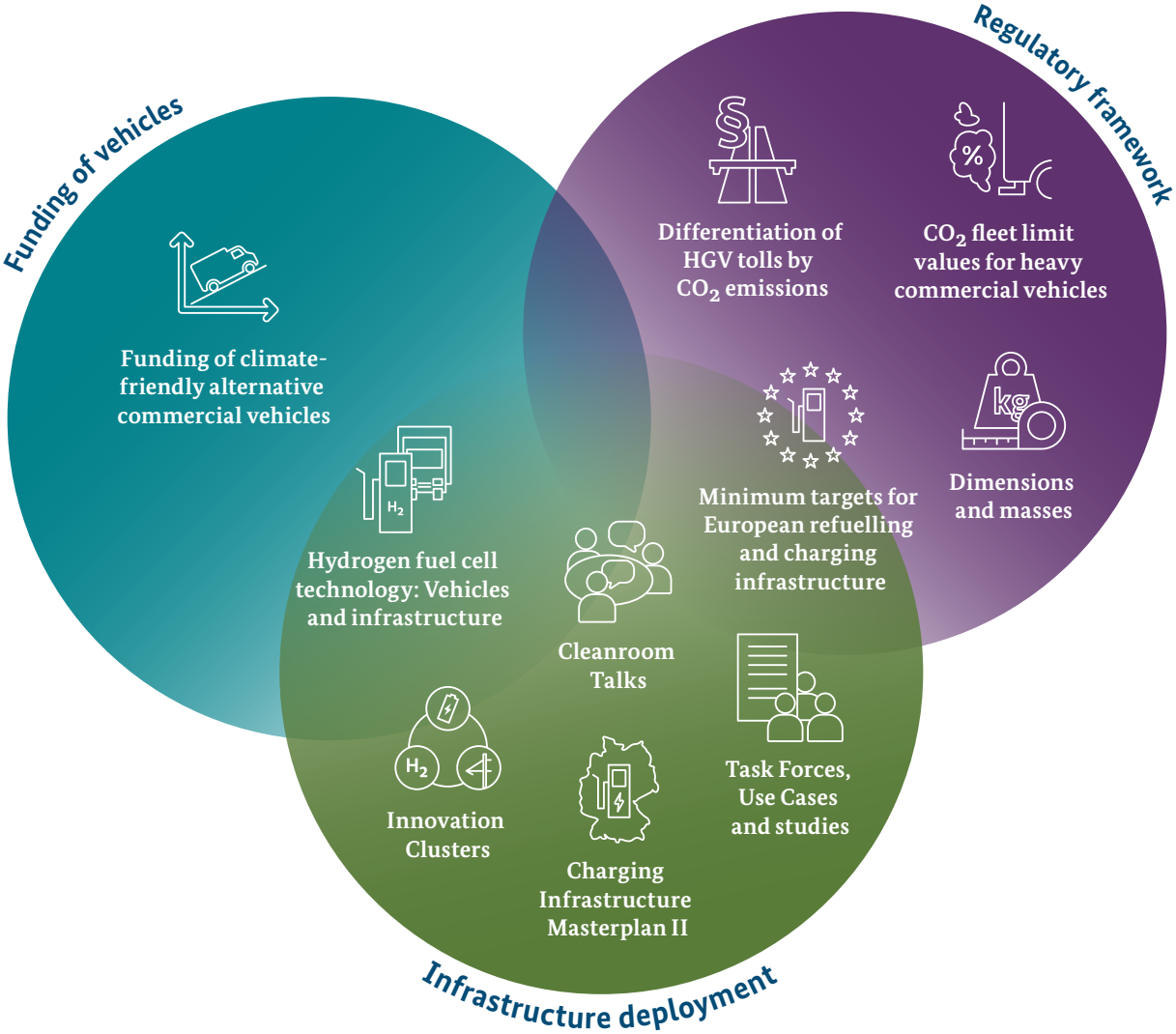


Figure 1: Activities of the Federal Ministry for Digital and Transport and current developments

The Federal Ministry for Digital and Transport is implementing the Overall Approach to Climate-Friendly Commercial Vehicles. The three action areas vehicle funding, management of the refuelling and charging infrastructure deployment and establishment of a targeted regulatory framework comprise various activities. Figure 1 gives an overview of these activities, followed by a brief description.

2.1 Cleanroom Talks

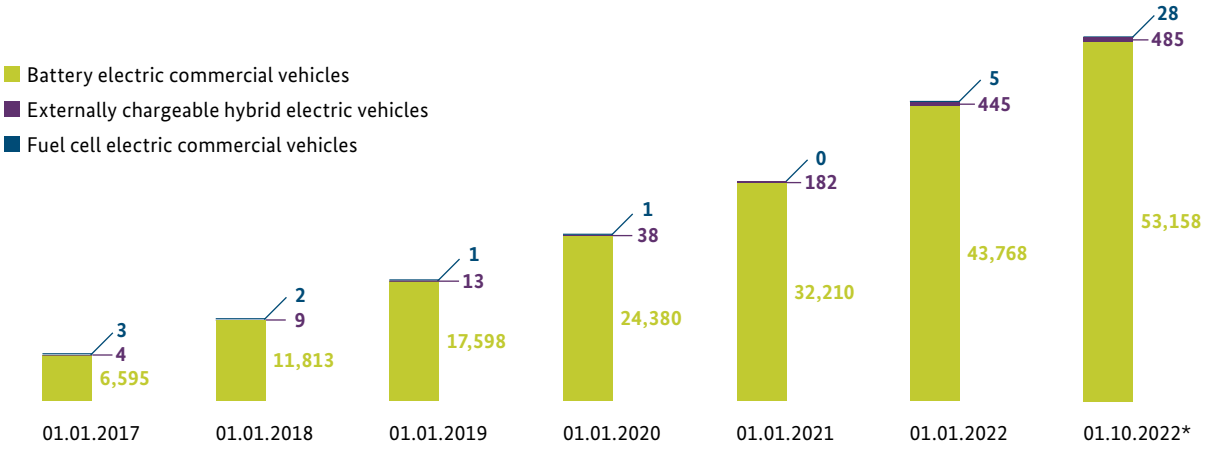
Reliable information on the planned number of battery and fuel cell electric commercial vehicles is required in order to plan and deploy the charging and refuelling infrastructure in a forward-looking and demand-oriented way. The Federal Ministry for Digital and Transport has held individual talks with various commercial vehicle manufacturers in a format that complies with antitrust law (Cleanroom Talks) in order to learn about planned sales figures as well as opinions on drivers and obstacles of the various technologies.

For the first time, vehicle manufacturer data shows a significant increase in forecast sales figures for battery- and fuel-cell powered heavy commercial vehicles weighing more than 12 tonnes. In 2030, 75 % of all vehicles registered for the first time are expected to be emission-free. Therefore, the Federal Ministry for Digital and Transport will substantially advance infrastructure deployment.

The participating commercial vehicle manufacturers represent over 90 % of the current market share in Germany for heavy commercial vehicles with a maximum permissible weight of more than 12 tonnes. The majority of commercial vehicle manufacturers has provided information on planned sales figures for the year 2030. According to this, in 2030, battery electric heavy commercial vehicles are expected to account for 56 % (57,800 new vehicle registrations) in Germany, fuel cell electric heavy commercial vehicles for 17 % (17,200 new vehicle registrations), heavy commercial vehicles with hydrogen internal combustion engines for 1 % (1,250 new vehicle registrations) and heavy commercial vehicles with a fossil fuel-powered combustion engines for 26 % (26,500 new vehicle registrations). The results of the Cleanroom Talks will be published at the end of 2022.

Current market developments support the lessons learned from the Cleanroom Talks: Vehicle manufacturers have embarked on the transformation pathway in the zero-emission commercial vehicle segment. Compared to 2021, the vehicle numbers for climate-friendly commercial vehicles increased by around 18 percent. What is new is that now also the first heavy commercial vehicles with climate-friendly drivetrains are coming onto the market. Figure 2 shows the development of the number of electric vehicles in the EC categories N1 to N3 between 2017 and 2022. While vehicle numbers are currently still at a low level, based on the forecast sales figures, they are expected to continue to rise.

Development of the number of commercial vehicles with climate-friendly drivetrains in EC categories N1 to N3 between 2017 and 2022



* Unadjusted figures

Figure 2: Development of the number of commercial vehicles in EC categories N1 to N3 between 2017 and 2022

2.2 Funding of alternative climate-friendly commercial vehicles

At the moment, the high investment costs for climate-friendly vehicles compared to diesel heavy goods vehicles are an obstacle for companies to purchase them. The funding guidelines for the purchase of light and heavy commercial vehicles with alternative climate-friendly drivetrains and the deployment of refuelling and charging infrastructure (KsNI) make alternative drivetrains more economically competitive. At the same time, companies receive support when purchasing climate-friendly vehicles.

In 2021, the Federal Ministry for Digital and Transport published the Funding Guidelines for the Purchase of Commercial Vehicles with Alternative Climate-Friendly Drivetrains and the Deployment of Refuelling and Charging Infrastructure (KsNI) as a core measure. For the first time in Europe, 80 % of the additional investment costs for climate-friendly commercial vehicles and the associated infrastructure are funded. The programme is effective: In the second call, the number of applications for funding has quadrupled.

The demand for climate-friendly commercial vehicles is strong: In the first call for applications, around 180 million euros of funding was approved, 150 million euros of which for commercial vehicles.

Eligible for funding

- Public companies, bodies and institutions, local authority companies, registered associations

Funding categories

- Battery electric and fuel cell electric commercial vehicles (N1-N3) as well as externally chargeable hybrid electric vehicles (N3)
- Refuelling and charging infrastructure required for operations
- Feasibility studies

Funding rate

- Vehicles: 80 % of the technology-related additional investment costs
- Infrastructure: 80 % of the project-related eligible expenditure
- Feasibility studies: 50 % of the project-related eligible expenditure

Figure 3: Overview of the KsNI funding guidelines

The evaluations show that about two thirds of the funded vehicles have a battery electric drivetrain and just under one third have a fuel cell electric drivetrain. It is also noteworthy that the majority of funded vehicles belong to EC category N3. In particular, applications for EC category N2 were less frequent and, consequently, less funding was granted. This clearly shows that there is supply and, in particular, demand not only for light and medium electric commercial vehicles, but also for heavy electric commercial vehicles.

Compared to the first call from 2021, the number of applications in the second funding call has increased significantly: By 24 August 2022, around 1,670 applications for commercial vehicles and around 1,090 applications for charging and hydrogen refuelling infrastructure were received in the second call for applications for funding under the KsNI guidelines and the simultaneous special call for applications for funding for special vehicles.

Number of funded commercial vehicles in the first call for applications

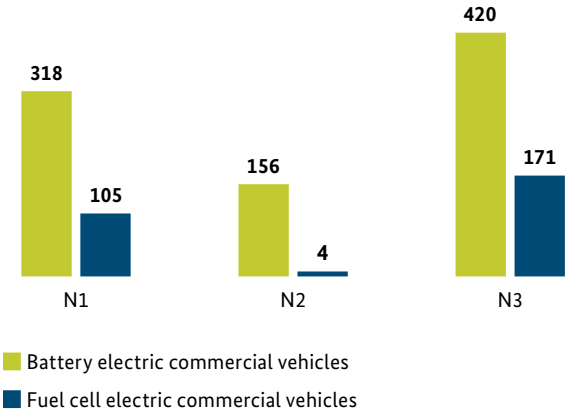


Figure 4: Number of funded commercial vehicles in the first call for applications under the KsNI guidelines

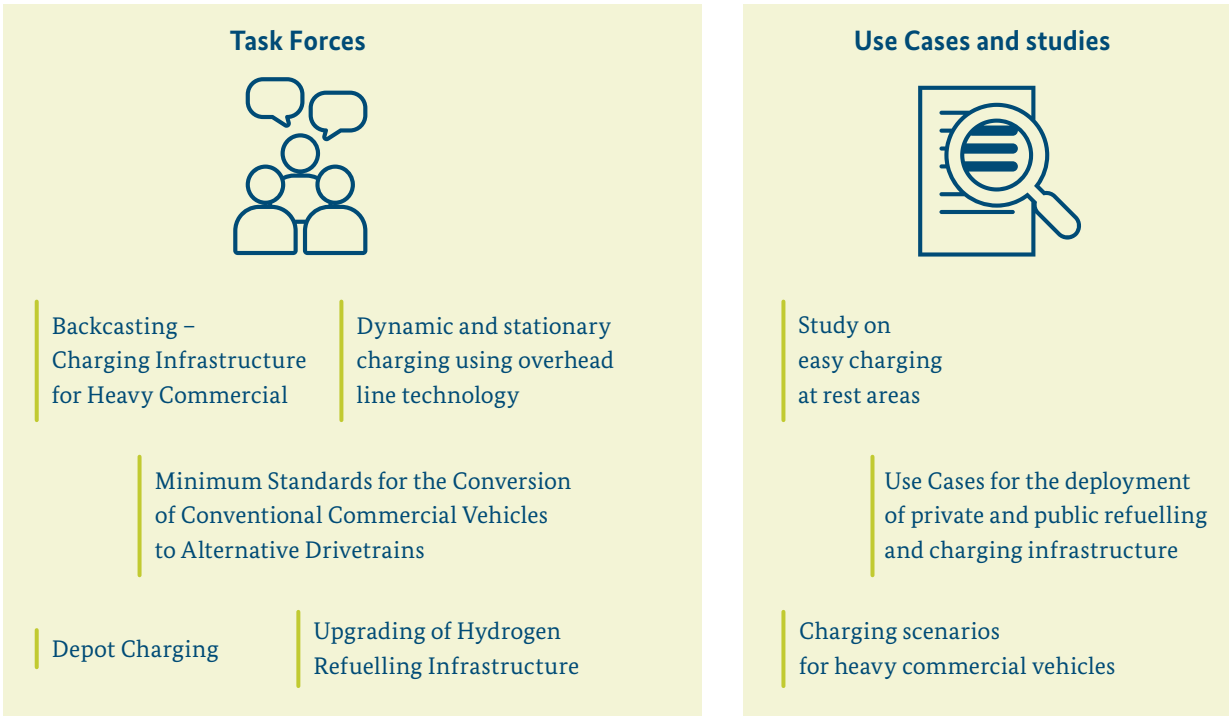


Figure 5: Overview of Task Forces, Use Cases and studies

2.3 Task Forces, Use Cases and studies

To identify open action areas, in particular to prepare the infrastructure deployment for battery electric drivetrains, fuel cell electric drive trains ad hoc Task Forces have been initiated by the Federal Ministry for Digital and Transport. In addition, Use Cases have been developed and further studies carried out dealing with specific issues for planning the type and scope of the deployment of alternative infrastructures. Since publication of the Overall Approach to Climate-Friendly Commercial Vehicles, five Task Forces and various studies have been set up or are currently being undertaken.

The Federal Ministry for Digital and Transport plans infrastructure deployment in Task Forces with relevant actors and identifies challenges as well as first problem-solving approaches.

In the Task Forces, the relevant actors such as vehicle manufacturers, users, infrastructure operators and energy companies are invited to work on the topics. In addition, the Task Forces are a place and an opportunity for interested actors to network.

In an initial Task Force on **Minimum Standards for the Conversion of Conventional Commercial Vehicles to Alternative Drivetrains**, the Federal Ministry for Digital and Transport brought together the relevant actors in the conversion in-

dustry. The findings with regard to the funding of the retrofitting of commercial vehicles are published in the outcome report together with recommendations for action.

All other Task Forces deal with the deployment of infrastructure for heavy commercial vehicles. The findings are incorporated into the measures for the network of hydrogen refuelling points and for the charging infrastructure (Charging Infrastructure Masterplan II). The **Backcasting – Charging Infrastructure for Heavy Commercial Vehicles** Task Force analysed central tasks with regard to the deployment of public charging infrastructure for battery electric heavy commercial vehicles. Together with the actors, planning, permission and implementation lead times as well as potential critical pathways and barriers to implementation were identified. Challenges include the need to take into account the lack of available plots of land at private and public charging locations and the additional electricity demand when planning the deployment of charging infrastructure. In total, a need for action in the various thematic areas has been identified in more than 30 cases. They are the basis for the ongoing work of the Federal Ministry for Digital and Transport, together with the National Coordination Centre for Charging Infrastructure (NLL) and the National Organization for Hydrogen and Fuel Cell Technology (NOW). Some projects, for example the identification of requirements to determine location sizes, have been included in the Charging Infrastructure Masterplan II.

In the **Dynamic and Stationary Charging using Overhead Line Technologies** Task Force, a vision of an optimal use of overhead line technology in terms of technology, environment and costs has been developed together with the participants, which can serve as a model for future planned activities. The interactive vision consolidates the available information in four thematic fields: route network, charging options, energy network as well as operation and further potentials. In a second step, needs for action were identified and guiding questions were formulated on this basis that are necessary for the implementation of this vision and can serve as guidance for further steps.

The **Upgrading of Hydrogen Refuelling Infrastructure** Task Force aims to identify central tasks for the deployment of hydrogen refuelling infrastructure in line with the vehicle ramp up for heavy commercial vehicles with fuel cell drivetrains. The required planning lead times, potential critical paths and implementation barriers are analysed. An interactive graphic has already been produced showing the main processes involved in deploying a hydrogen refuelling point: planning, approval, construction, acceptance and operation. The obstacles and solutions that were identified and developed during this process have been compiled.

The challenges of deploying charging infrastructure at depots and at non-public transhipment points are being addressed by the **Depot Charging** Task Force. A 'Guide to Depot Charging' will be drawn up, which in future will serve as a source of support and information for users when deploying charging infrastructure at depots in non-public environments. Based on the findings of the Task Force, funding programmes for the deployment of charging infrastructure at depots and in the non-public area can also be developed. The results are expected to be published in 2022.

Use Cases for the deployment of private and public refuelling and charging infrastructure

An important part of the implementation of the Overall Approach to Climate-Friendly Commercial Vehicles is the identification of appropriate

combinations of drivetrain technology and refuelling and charging infrastructure (Use Cases). The aim of these Use Cases is to gain knowledge on where, in what form and to what extent refuelling and charging infrastructure for the considered technologies needs to be deployed.

The Use Cases facilitated the establishment of suitable combinations of drivetrain technology and refuelling and charging infrastructure. They show that there are individual solutions for the use of climate-friendly commercial vehicles for each user.

The result of the analysis is that there are solutions for the use of climate-friendly alternative drivetrain technologies that meet the needs of every individual company. Companies can use feasibility studies within the framework of the KsNI funding guidelines to identify their Use Cases, transfer them to business operations and thus determine specific procurement options.

Charging scenarios for heavy commercial vehicles

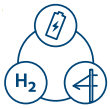
In addition, the National Centre for Charging Infrastructure has developed a graphic with an overview of typical charging scenarios for battery electric commercial vehicles which depicts the different charging scenarios depending on the vehicle's access options. Thus, a distinction can be made between publicly and non-publicly accessible charging locations. In the latter case, stationary and mobile charging points on own or third-party company premises – unlike publicly-accessible transhipment points or different kinds of public charging hubs – can only be accessed by a restricted group of people. The charging scenarios are the foundation for continuing the planning work related to charging infrastructure deployment.

Study on easy charging at rest areas and the design of the grid connection for charging hubs for electric heavy goods vehicles

The 'Einfach laden an Rastanlagen' grid study, which was carried out by the NLL, aims to identify essential criteria and aspects with regard to the grid that need to be taken into account when choosing, assessing and planning charging hubs along the motorway network. Depending on the required charging capacities, different grid connections (medium voltage grid, high voltage grid) must be provided. This requires long lead times during planning and, due to the long service lives of installations, careful choices. A key finding of the study is that for the timely deployment of a public charging network along motorways in Germany, high voltage grid operators in particular need to be involved in the planning process.

2.4 Innovation Clusters

The purpose of Innovation Clusters is to clarify outstanding technological issues. In addition, climate-friendly commercial vehicles with the necessary infrastructure are being tested in real-world logistics operations on a larger corridor.



The central Innovation Cluster for high power charging for battery-electric heavy goods vehicles along the A2 motorway ('HoLa') has been launched. The results of this project will feed into the charging infrastructure roll-out planning for electric heavy commercial vehicles.

The 'HoLa' project is an important technology and trialling project of the Ministry within the framework of the implementation of the Overall Approach to Climate-Friendly Commercial Vehicles. It is intended to deliver essential findings on operating electric commercial vehicles in long-distance transport. The transport profiles of battery electric heavy goods vehicles in long-distance transport present special challenges. Among others, the following questions arise: Which charging systems are suitable? How can the power supply of the locations be guaranteed? How can battery electric heavy goods vehicles be charged sufficiently quickly within the statutory break times of 45 minutes between two driving periods? The goals of the 'HoLa' project are the planning, construction and operation of high power charging infrastructure in the power range of up to one megawatt along a demonstration route on the A2 motorway between Berlin and the Ruhr region. Furthermore, research questions regarding the nationwide expansion of high power charging parks for heavy goods vehicles in Germany are to be answered.

The implementation of further Innovation Clusters to test the combination of dynamic and stationary charging and a complementary network of hydrogen refuelling stations is currently being examined.

2.5 Charging Infrastructure Masterplan II

The increasing market share of battery electric commercial vehicles requires that a demand-based charging infrastructure network be established ahead of the vehicle ramp-up. The Federal Government's Charging Infrastructure Masterplan II defines the measures and vision for the deployment of public charging infrastructure by 2030. One focus is on measures for heavy commercial vehicles. Battery electric heavy goods vehicles in long-distance transport require a specific charging infrastructure with particularly high charging capacities. The results of the 'Backcasting – Charging Infrastructure for Heavy Commercial Vehicles' Task Force have been incorporated into the definition of the measures.

For the first time, the Charging Infrastructure Masterplan II names concrete measures for the deployment of charging infrastructure for heavy commercial vehicles, including deadlines and responsibilities. This creates planning certainty for the sector. One core measure is the planned tender for an initial charging network for battery electric heavy goods vehicles.

Before tendering the initial charging network, a user journey is being developed. Based on the Use Cases already created, the National Centre for Charging Infrastructure (NLL) is developing a use-oriented vision for charging heavy commercial vehicles within the framework of the user journey together with actors from industry and science. The analysis of charging infrastructure requirements and related expansion planning is also performed in advance. This is intended to

determine the expected electricity demand until at least 2035. A further measure within the framework of the Charging Infrastructure Masterplan II is the development of suitable funding and support measures for the charging infrastructure of commercial vehicles beyond the initial network.

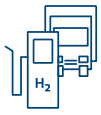
In addition, various important measures from the Masterplan for the deployment of passenger car charging infrastructure are also essential for heavy goods vehicles charging infrastructure. These include evolving the 'StandortTOOL' and holding the Cleanroom Talks with the industry. Additional measures include the development of a strategy on how to meet space requirements along the motorways, enable grid operators to develop the electricity grid in a forward-looking manner and accelerate application procedures for grid connections.

In October 2022, the Interministerial Steering Group on Charging Infrastructure (ISLa) was set up to coordinate the implementation of the measures from the Charging Infrastructure Masterplan II between all ministries.

2.6 Hydrogen fuel cell technology: Vehicles and infrastructure

Currently, twelve public hydrogen refuelling stations for heavy commercial vehicles are in operation. In the framework of the National Hydrogen and Fuel Cell Technology Innovation Programme (NIP) of the Federal Ministry for Digital and Transport (BMDV), a call for applications focussing on the upgrading of the public refuelling network for heavy commercial vehicles and buses was closed at the beginning of 2022. A budget of 60 million euros was earmarked to support the deployment of hydrogen refuelling stations exactly where the first fuel cell powered heavy goods vehicles will be operating. Application numbers show a high demand for additional refuelling stations for commercial vehicles. The 15 refuelling stations chosen during the application process are currently being approved. There will be more calls in future.

With the call for refuse collection vehicles and sweepers with fuel cell drivetrain in the context of the National Hydrogen and Fuel Cell Technology Innovation Programme, between 2021 and 2022, a total of 168 vehicles were approved for operation in municipal companies, some of which are already in use. Since publication of the KsNI funding guidelines, applications for fuel cell powered electric heavy goods can be submitted on this basis. From the end of 2022, the first heavy commercial vehicles with fuel cell drivetrains running at 350 or 700 bar will be in operation in Germany.



In addition to R&D activities for vehicle- and infrastructure-related technology development and the establishment of hydrogen regions, the Ministry supports the upgrading of the hydrogen refuelling infrastructure for commercial vehicles.

From a joint expression of interest procedure for a Hydrogen IPCEI (Important Project of Common European Interest) in 2021, the Federal Ministry for Economic Affairs and Climate Action (BMWK) and the Federal Ministry for Digital and Transport (BMDV) have chosen a number of large-scale hydrogen projects. One project from the transport sector includes the development, manufacture and trialling of hydrogen fuel cell powered heavy

goods electric vehicles. It lays the groundwork for the European market ramp-up of hydrogen-based mobility.

A particular feature is the storage of hydrogen on board in liquid form (LH_2). The project was approved under state aid law by the EU Commission as part of the IPCEI 'Hy2Tech' wave in July 2022. Other projects aim to set up 60 hydrogen refuelling stations along trans-European transport network (TEN-T) corridors or upgrade the 20 existing hydrogen refuelling stations for use by light and medium commercial vehicles. These locations will form an initial basic network of public hydrogen refuelling infrastructure for commercial vehicles in Germany.

To support the market ramp-up of hydrogen technology in particular in the field of standardization of components and processes, the Ministry is planning a hydrogen innovation and technology centre. This centre is intended to give undertakings of any mode of transport an analysis, trialling and development facility which has not been available on the market to date. A thematic focus will be on light and heavy commercial vehicles as well as refuelling technology.

2.7 Differentiation of heavy goods vehicles toll based on CO_2 emissions

A heavy goods vehicle toll based on CO_2 emissions will provide a key incentive for switching to climate-friendly commercial vehicles. Introducing a heavy goods vehicles toll scheme based on CO_2 is therefore an essential measure to meeting the climate change goal in the transport sector. As it focuses on emission reductions regardless of the drivetrain, the instrument is technology-neutral.

On 24 March 2022, Directive (EU) 2022/362 amending Directive 1999/62/EC (Eurovignette or Infrastructure Charging Directive), which regulates, among other things, the levying of road user charges, entered into force. The amended Eurovignette Directive stipulates a differentiation of the heavy goods vehicles toll based on CO_2 emissions by 25 March 2024 as well as the inclusion of all heavy goods vehicles with a maximum authorized mass of more than 3.5 tonnes in the tolling scheme by 25 March 2027. The Federal Ministry for Digital and Transport is currently examining various options for the actual implementation of a differentiation based on CO_2 emissions in accordance with the Eurovignette Directive. Pursuant to the coalition agreement, the Federal Government will introduce a differentiation for heavy goods vehicle tolling based on CO_2 emissions starting in 2023, include road haulage operations above 3.5 tonnes and introduce a CO_2 surcharge on condition that double burdening through the CO_2 price is ruled out. Corresponding instruments are currently being examined.

In 2023, the Ministry will introduce a heavy goods vehicles toll based on CO_2 emissions. The introduction is a key regulatory measure to incentivize zero-emission vehicles.

2.8 Minimum targets for a European refuelling and charging infrastructure

To facilitate the market ramp-up of low-emission or zero-emission commercial vehicles, an infrastructure in line with requirements is needed. Binding targets for infrastructure deployment

will result from the EU's Alternative Fuels Infrastructure Regulation (AFIR). The legislative process is expected to be completed in the first half of 2023. Among other things, the draft regulation contains distance-based targets for charging infrastructure for light and heavy commercial vehicles. Member States will be required to ensure the deployment of charging pools for heavy commercial vehicles along the TEN transport network by the end of 2030. The maximum distances between locations and the minimum charging capacity are specified. Binding requirements are also envisaged for the deployment of hydrogen refuelling stations for heavy commercial vehicles. The provisions of the AFIR will also include technical standards for the respective technology options. Once the Regulation has entered into force, it will be directly applicable in all EU Member States. This will provide a reliable, Europe-wide regulatory framework to enable cross-border traffic with alternative drivetrains. The AFIR thus complements the amendment to the Regulation setting CO_2 emission performance standards for new heavy-duty vehicles.

The EU's Alternative Fuels Infrastructure Regulation (AFIR) draft creates for the first time a framework for minimum infrastructure deployment targets for electric commercial vehicles. Member States will be required to ensure the deployment of a basic network of charging and hydrogen refuelling infrastructure. In future, commercial vehicles with alternative drivetrains can be used and charged or refuelled across borders.

2.9 Additional regulatory developments

A targeted regulatory framework is intended to ensure investment security and the competitiveness of climate-friendly vehicles for the actors. In addition to the aforementioned initiatives, other legal acts important for the market ramp-up of zero- and low-emission commercial vehicles are subject to European legislation.

CO_2 fleet limit values for heavy commercial vehicles

Regulation (EU) 2019/1242 setting CO_2 emission performance standards for new heavy-duty vehicles provides an incentive on the vehicle side to bring corresponding zero- or low-emission commercial vehicles onto the market. It is aimed at vehicle manufacturers and its scope currently extends to new heavy commercial vehicles of EC categories N2 and N3. The current EU Regulation stipulates that, from 2025, CO_2 emissions for Union-wide fleets of new heavy commercial vehicles are to be reduced by 15 % from 2025 and by 30 % from 2030. If these reduction levels are missed, penalty payments will be imposed on vehicle manufacturers. An amendment of this Regulation was announced by the European Commission for the end of 2022. In view of the now more stringent climate targets, it can be assumed that the proposal will involve an increase in the level of ambition.

Dimensions and masses

Additional lengths and masses resulting from battery and fuel cell electric drivetrains in commercial vehicles can lead to restrictions in loading capacity compared to diesel heavy goods vehicles. The amendments to Directive 96/53/EC are the

basis for increased masses and dimensions of more energy-efficient vehicles and it was necessary to transpose them into national law. The corresponding requirements were implemented with an amending regulation to the German Road Vehicles Registration and Licensing Regulations (StVZO).

As regards the increase of the maximum authorized masses of vehicles and vehicle combinations with alternative or emission-free drivetrains, the generally applicable maximum masses may be exceeded by the additional weight of the alternative or emission-free drivetrain technology by a maximum of 1 or 2 tonnes. The same applies to combined transport operations, provided that the boundary conditions of Directive 96/53/EC are fulfilled (among others container or swap body transport, axle configuration of the vehicle combination).

In the upcoming revision of Directive 96/53/EC, discussions on possible further increases are expected, taking into account in particular the necessary space requirements of hydrogen tanks in terms of vehicle length.

3. Outlook

By 2030, vehicles powered by electricity or electricity-based fuels are to account for around one third of the mileage. To achieve this goal, the vehicle and infrastructure sectors will need to be transformed at considerable pace.

The overview of the activities of the Federal Ministry for Digital and Transport (BMDV) and the actors involved shows that important steps have already been taken to implement the measures of the Overall Approach to Climate-Friendly Commercial Vehicles and thus to achieve the 2030 target. The funding guidelines for the purchase of commercial vehicles with alternative climate-friendly drivetrains and infrastructure are a particularly important factor. The funding reduces additional investment costs for alternative drivetrains. In the initial phase, this measure aims to support the market ramp-up of vehicles with alternative drivetrains by bringing the total cost of ownership (TCO) closer to that of diesel trucks.

The introduction of a CO_2-based heavy goods vehicle tolling scheme is a key regulatory measure to incentivize zero-emission vehicles. It is thus also an essential measure for achieving the climate change goal in the transport sector.

Nevertheless, there is still an urgent need for action, which is intensified by a currently emerging accelerated development. On the one hand, the results of the Cleanroom Talks held with heavy goods vehicle manufacturers in the meantime have made it clear that the range of commercial vehicle models with alternative drivetrains will increase significantly. In 2030, zero-emission heavy commercial vehicles weighing more than 12 tonnes are expected by manufacturers to account for around 3/4 of new vehicle registrations on the market. As plans by the manufacturers and technological developments are becoming more concrete, the Ministry plans to hold annual Cleanroom Talks with the commercial vehicle manufacturers in the future as part of the implementation of the Overall Approach to Climate-Friendly Commercial Vehicles.

On the other hand, the regulatory framework at EU level incentivizes the placing on the market and operation of climate-friendly commercial vehicles through ambitious fleet limit values for commercial vehicle manufacturers. The AFIR draft establishes binding minimum targets for the deployment of alternative infrastructure for commercial vehicles. These developments show that a proactive deployment of infrastructure that is based on requirements and coordinated across borders is essential for the broad introduction of zero-emission heavy goods vehicles.

Consequently, in 2023, the Ministry will work together with the NLL and the NOW to develop and implement essential tasks for the deployment of infrastructure for battery electric heavy goods vehicles. The most important measures are

defined in the Federal Government's Charging Infrastructure Masterplan II. For example, a key goal is to tender an initial nationwide charging network in Germany, if possible in the third quarter of 2023.

Trial projects such as the high power charging of electric commercial vehicles on the A2 motorway as part of the 'HoLa' project will be carried out simultaneously. They will provide important insights with regard to the planning and deployment of megawatt charging. A decision on the implementation of further Innovation Clusters to test the combination of dynamic and stationary charging and a complementary network of hydrogen refuelling stations will be taken in a timely manner.

In addition, the deployment of the first public and private refuelling stations with the currently available technology options has started specifically for the trialling of hydrogen fuel cell powered heavy commercial electric vehicles. Also, the deployment of an initial network of public hydrogen refuelling infrastructure is foreseen for commercial vehicles.

At the same time, manufacturers are driving standardization. By the end of 2023, standards are to be developed for all essential steps along the charging process for battery electric heavy goods vehicles. In the case of fuel cell electric commercial vehicles, further development progress is necessary, especially in standardization and production processes of the fuel cell system. The technological decision on the type of hydrogen storage will also play a key role. In order to accelerate standardization processes on the vehicle and infrastructure sides, the actors need to make a technological decision. There are already existing important standards from the rail sector for dynamic and stationary charging using overhead line technology that can be applied.

The triad of vehicle funding, control of management of the refuelling and charging infrastructure deployment and establishment of a targeted regulatory framework has proven to be suitable. Organizing implementation with relevant actors, for example through collaboration in Task Forces or technology trialling projects, is also a promising pathway. However, given the developments outlined above and the lessons learned, and with a view to the necessary transformation of heavy road haulage to achieve the climate targets in transport, more concurrent work is required. For example, the demand-driven deployment of fast-charging infrastructure is being carried out concurrently with trial projects such as the 'HoLa' project.

In principle, the integrated package of measures consisting of vehicle funding, management of the infrastructure deployment and establishment of a targeted regulatory framework is continuing. The measures will be implemented in cooperation with the relevant actors also in future.

Based on the market development, the outcome of the Cleanroom Talks and the requirements of the AFIR draft, the Ministry will prepare the tender for an initial charging network for heavy goods vehicles in the third quarter of 2023 as a key element of the Charging Infrastructure Masterplan II. In addition, a basic network of publicly accessible hydrogen refuelling infrastructure for commercial vehicles is being deployed in Germany.

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