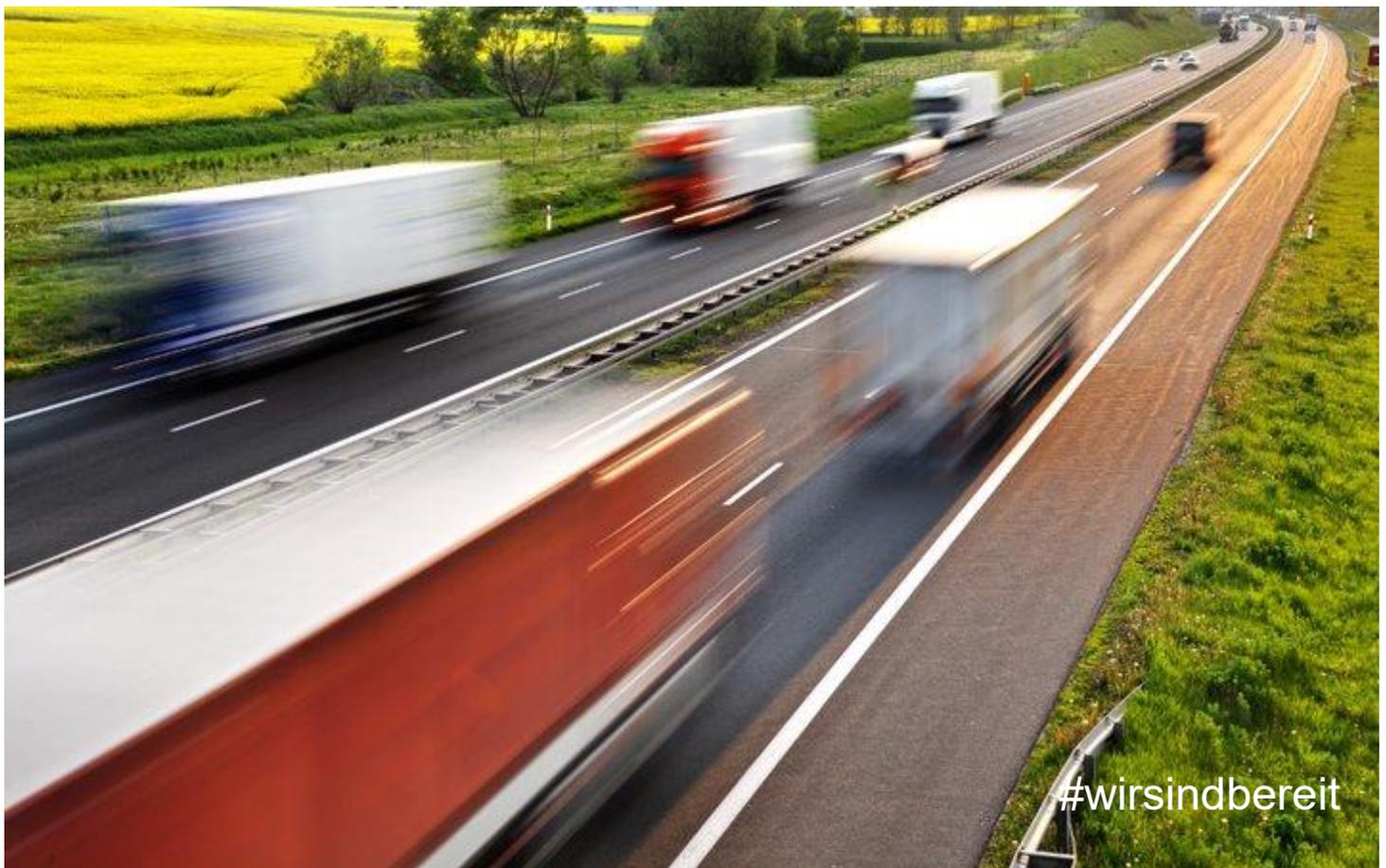


Next steps to Green Transport in Europe

# CO<sub>2</sub>-Emission Standards for Heavy Duty Vehicles

VDA Position  
September 2022



#wirsindbereit

# We are ready

We are driving forward the transformation of the automobile with innovation, passion and engineering skills.

The German Association of the Automotive Industry (VDA) represents more than 600 companies in the whole German automotive sector – car-, truck-, trailer- and body-manufacturer as well as numerous suppliers.

VDA recognizes the importance of further steps for CO<sub>2</sub>-reduction by considering potentials to optimize heavy duty vehicles and is going to contribute to the Fit for 55 targets and to reach carbon neutrality in the transport sector.

## Disclaimer

The VDA positions are recommendations that may be freely adopted by anyone. Users are responsible for correct implementation of the recommendations as required on a case-by-case basis.

The recommendations take into account the prevailing technology at the time of publication. Use of the VDA positions does not absolve anyone from responsibility for his/her own actions, and all users act at their own risk. Liability of VDA and those involved in drafting of VDA positions is excluded.

# Table of contents

1	Executive Summary	4
2	Principles and Objectives	5
3	Pathway and achievable targets	6
4	Enablers and Incentive mechanisms	7
5	Specific Items to be considered	7
5.1	General	7
5.2	Lorries	8
5.3	Buses and Coaches	8
5.4	Trailers	8
5.5	Credit / Debit system	9
5.6	Pooling	9
5.7	ZEV mandates	9

# 1 Executive Summary

Vehicle manufacturers are committed to swiftly reducing CO<sub>2</sub>-emissions by bringing an increasingly wide range of zero-emission vehicles to the market. Heavy duty vehicles are going to contribute to the Fit for 55 targets in 2030 and carbon neutrality in 2050 in the most cost-effective manner, supporting competitiveness, employment, and transport operators.

The German truck-, bus- and trailer-manufacturers as well as their suppliers fully support ambitious goals and a definite timescale to foster the implementation of zero-emission solutions into the European market.

Therefore, following recommendations should be considered:

- I. Zero-emission vehicle (ZEV) technologies, including battery electric, hydrogen fuel cell and hydrogen engines, will be essential in meeting the CO<sub>2</sub>-targets in the transport sector.**
- II. The review of the existing CO<sub>2</sub>-emissions reduction targets should now focus on a fixed ambition level for 2030. Due to market readiness of technologies and lead time requirements, the current target for 2025 should not be changed.**
- III. Target levels for 2035 and 2040 may be set now but should be reviewed again in due time.**
- IV. In all cases the view of the status of the enabling conditions, especially the charging and refuelling infrastructure network is essential. The full ecosystem for zero-emission heavy duty vehicles needs to be in place, notably a sufficiently dense network of electric charging and hydrogen fuelling stations, as a prerequisite for ambitious standards.**
- V. Regulatory mechanisms and assistance measures that incentivises zero- and low-emission vehicles (ZLEVs) will support accelerated deployment of those vehicles. Transport operators must be enabled to invest in the new vehicles and accelerate fleet renewal**
- VI. VDA supports the inclusion of additional motor vehicle categories in the CO<sub>2</sub>-emission standards regulation where a CO<sub>2</sub>-certification framework is already in place and provided that the specificities of the different vehicle segments are fully accounted for. Adding new vehicle categories implies that new, individual baselines for these vehicles will need to be determined. The current credit and debit system is to be improved further and extended beyond 2030.**
- VII. In addition, the implementation of certain trailers commonly used for transport of goods in a CO<sub>2</sub>-certification process is supported. Nevertheless, setting of CO<sub>2</sub>-targets for trailers needs to be evaluated after a monitoring phase. The including of all viable technological options for the definition of a trailers CO<sub>2</sub>-reduction target is premature as long VECTO simulation does not cover these.**

## 2 Principles and Objectives

CO<sub>2</sub>-emission standards for heavy-duty vehicles have been in force since 2019 when regulation (EU) 2019/1242 was first enacted including a clear statement that key elements of the emission standards regulation shall be reviewed by the end of 2022. To contribute to the Fit for 55 targets and climate neutrality by 2050 policies should enable the most cost-effective solutions for manufacturers and the transport industry.

This transition requires a fundamental shift in the powertrain technologies used in road transport, away from diesel as the dominant energy carrier to low- and especially zero-emission vehicles. Therefore, sufficient lead-time for regulatory changes is essential both for manufacturers and the transport industry, to ensure feasibility and maximise utilisation of existing investments.

The availability of battery-electric vehicles is expanding rapidly in the next years. All manufacturers supported by suppliers have started the series production of battery-electric trucks and buses. Various battery-electric truck and city-bus models are available today. Furthermore, several manufacturers have announced the start of series production of fuel-cell electric vehicles (FCEV) from 2024. It is expected that hydrogen powered-trucks will become widely available during the second half of this decade (2025 – 2027). The European Automobile Manufacturers' Association (ACEA) presented an overview on zero and low-emission heavy-duty vehicles on the market. In addition, several companies in Europe are offering "retrofit solutions" based on customer demands for a zero-emission propulsion.

This review as an important opportunity to assess the effectiveness of the regulation, adjust different elements, expand its scope and most importantly to ensure a full alignment with other important regulations (i.e., Alternative Fuels Infrastructure Regulation/AFIR, Renewable Energy Directive/RED, Clean Vehicle Directive/CVD, Emissions Trading System/ETS). Everyone should be aware that the sole definition of new CO<sub>2</sub>-targets for heavy duty vehicles does not guarantee the climate neutrality of the transport sector.

Rapid technological developments are currently under way on zero-emission powertrain technologies, so that the main challenge will be in creating an enabling framework that facilitate a swift market uptake.

The regulatory design of CO<sub>2</sub>-regulation should provide a flexible framework for industry and its customers to choose the best technology options, including zero emission vehicles (ZEV) and low emission vehicles (LEV) (together, ZLEVs). ZLEV technologies include battery electric vehicles (BEV), fuel cell electric vehicles (FCEVs) and engines powered by hydrogen or other low-carbon fuels (including carbon-neutral fuels).

### 3 Pathway and achievable targets

The market adoption of low- and especially zero-emission vehicles largely depends on transport operators and their ability to invest in and profitably operate them. But targets must be technically, economically, and socially feasible. European truck manufacturers estimates that by 2025, approximately 40,000 battery electric medium- and heavy-duty vehicles and by 2030 at least 270,000 of these vehicles all over Europe must be in operation. In addition, at least 60,000 hydrogen-powered trucks will have to be in operation by 2030.

The 2025 target should not be changed since ZEV technologies are not expected to be in the market in sufficient volumes and due to the very short lead time for introducing changes.

The existing 30% reduction target in 2030 requires a substantial fraction of the market to be ZEVs. To achieve that penetration, mature ZEV technologies plus favourable total cost of ownership (TCO) and utility compared to conventional vehicles are necessary.

But recent studies demonstrate that several critical conditions need to be fulfilled to meet these TCO for battery electric trucks. Further analysis indicates that the fulfilment of those conditions, including cost and especially infrastructure, is uncertain.

Hydrogen fuel cells and hydrogen engines are alternative technologies that can contribute to meeting the CO<sub>2</sub>-reduction targets. These technologies similarly require critical conditions such as cost reduction and refuelling infrastructure to be in place.

The transformation and market uptake of new powertrain vehicles does not only rely on the availability of the vehicles themselves, but also on a comprehensive framework of enabling conditions. Independent from the technology measures are needed to support infrastructure roll-out and incentivise vehicle purchase. Any tightening of the 2030 target and introduction of more stringent post-2030 targets would require a higher share of ZEVs, implying greater uncertainty and would need additional intervention to ensure enabling conditions are in place.

Competitive TCO, fast ramp-up of necessary European-wide charging and refuelling infrastructure as well as the deployment of ZEVs are essential to be considered as a bundle.

The road transport sector is at the beginning of its transformation to climate neutrality. A definition of a general 100%-reduction target or a phase-out date for internal combustion engines for all heavy duty vehicle groups should be decided at later stage when enabling conditions are more predictable. Fossil-free fuels must be part of the decarbonization pathway of the road transport sector for certain applications. Lessons-learned from the car industry and existing huge difficulties to build-up suitable charging infrastructure all over Europe should be considered before banning technologies.

## 4 Enablers and Incentive mechanisms

Additional regulatory mechanisms to encourage take-up of ZLEVs can provide additional incentives to deploy those vehicles and allow flexibility to OEMs to adapt their portfolios to achieve compliance. These mechanisms need to be clearly defined regarding phase-in and phase-out. They should not distort the market and should consider the technology readiness of ZLEV.

Market adoption of zero-emission vehicles also depends on a supportive regulatory framework that effectively incentivizes fleet renewal and favours zero-emission vehicles by shifting key cost factors and facilitating TCO-parity. Despite the anticipated technology improvements, the total costs of ownership and especially the upfront investments costs of zero-emission vehicles will remain higher than for conventional vehicles.

### A successful transition to climate neutrality requires simultaneously:

- I. **A dense network of charging and refuelling infrastructure suitable for heavy-duty vehicles**
- II. **A coherent policy framework which enables and drives the transition to climate neutrality and ensures affordability and competitive TCOs**

It is strongly recommended to keep the status of both under permanent review and to use the experience gained during this decade.

Policymakers need to be aware that setting AFIR targets for heavy-duty vehicles now, i.e. ahead of the revision of new HDV CO<sub>2</sub>-standards, effectively predetermines the CO<sub>2</sub>-reductions that can be expected from road transport by the end of this decade.

Additional policy instruments are needed to incentivise transport users to switch to ZLEVs and carbon-neutral fuels. Such instruments include a CO<sub>2</sub> pricing system, purchase subsidies and renewable fuel quotas, CO<sub>2</sub>-based road toll, amendments to weights and dimensions regulation, public procurement and energy taxation

## 5 Specific Items to be considered

Specific items shall be considered with regard to new emission standards in the next decade.

### 5.1 General

The commercial vehicle market is driven by demand and the strong focus of transport operators on the total cost of ownership (TCO). Operators, provider of charging-/H<sub>2</sub>-refueling infrastructure as well as manufacturers need substantial lead times (approx. 7 years) and a predictable and stable regulatory framework to manage the transition and allow the market to adopt new vehicle technologies and infrastructure. This **requires that a sufficient infrastructure of both high-power electric recharging (Megawatt Charging Systems) and high-capacity hydrogen refuelling is in place in time** to support the level of ambition of the regulation on CO<sub>2</sub>-targets. Supporting conditions must ensure that CO<sub>2</sub>-fleet targets are achieved by actual sales to customers.

The ambition levels in 2030 and beyond are highly dependent on the enabling conditions, the market uptake in earlier years etc. where the timeframe 2025 – 2030 is particularly sensitive as the ZEV uptake can only be as fast as the infrastructure roll-out. Therefore, VDA does not support setting intermediate targets before 2030 and recommends another review of the 2035 and 2040 targets and other key elements of the regulation by 2028.

## 5.2 Lorries

Medium lorries contribute compared to heavy lorries relatively low to total CO<sub>2</sub>-emissions of the road transport sector. Therefore, specific circumstances should be considered when setting targets for this vehicle segment.

If new vehicle groups (medium lorries) are included in the CO<sub>2</sub>-certification, various things have to be considered, i.e. individual baselines must be determined for these vehicles; lead time for new vehicles is relatively long - range of 5 - 7 years and ambition levels for these new vehicle groups must be set accordingly. Furthermore, some of the new vehicle groups already have a relatively high proportion of zero-emission vehicles. This should be considered when setting the CO<sub>2</sub> standards. Different market conditions may justify different targets for different subgroups

## 5.3 Buses and Coaches

The industry for bus manufacturing is diverse and several business models exist. Complete buses are manufactured by OEMs but also by some bodybuilders in a multi-stage approach. The last stage vehicle manufacturer is legally responsible for part of the final bus and should hence also be responsible for a possible CO<sub>2</sub>-target for buses and coaches. Even though city buses are more and more propelled with an alternative powertrain (electric or hydrogen), the coach market will get similar challenges for the infrastructure deployment for the shift to zero-emission vehicles as for long-haul lorries. This should be considered for the definition of ambitious CO<sub>2</sub>-targets for buses and coaches.

## 5.4 Trailers

Trailer designs can contribute substantially to higher energy efficiency and CO<sub>2</sub>-reductions of the vehicle combination, including improved aerodynamics, low-rolling-resistance tyres, and weight reduction. The CO<sub>2</sub>-certification of trailers will offer the possibility to certify some of these features but there remain significant open issues. For example, speed-dependent adaptable aero-features, e-axles for propulsion and recuperation, and electrified cooling devices for reefers are currently out of scope. Such solutions should be integrated into the certification to incentivise trailer manufacturers to bring these technologies into the market.

The CO<sub>2</sub>-certification of trailers needs a monitoring phase of at least one year before discussion of CO<sub>2</sub>-targets for trailers. If targets are considered, they should apply to the trailer independently from the towing vehicle for correct assignment of responsibilities and be set at levels that are technically, economically, and socially feasible.

## 5.5 Credit / Debit system

VDA recommends that the current credit and debit system is improved further and extended beyond 2030. Especially excess credits should not be removed after every compliance period. The exact timing and trajectory of the transition to zero-emission vehicles is difficult to predict, not the least because it is highly dependent on the enabling framework, including the roll-out of a dense network of charging and refuelling stations suitable for the different vehicle segments. Significant changes of key factors facilitating the market uptake of zero-emission vehicles can occur between and during each year, especially in the 2025 - 2035 period. It is particularly challenging to match the development and required target compliance, especially when enabling conditions are highly volatile.

## 5.6 Pooling

Pooling can be an instrument that provides flexibility for manufacturers in reaching their CO<sub>2</sub>-reduction targets. It has been successfully implemented in the CO<sub>2</sub>-regulation for light-duty vehicles, but important differences must be considered with respect to the commercial vehicle market. In view of the structure of the commercial vehicle market, i.e. different manufacturers with differing product portfolios across different vehicle segments, a pooling mechanism must most importantly not have negative impacts on competition, disadvantage individual manufacturers and therefore must avoid market distortion. A pooling mechanism for heavy-duty vehicles should be designed according to these requirements and with respect to the design of the compliance conditions.

## 5.7 ZEV mandates

Manufacturers have strong reservations with respect to ZEV mandates since they potentially create significant market distortions. They only address the supply side (vehicle manufacturers) but do not simultaneously also address and with similar ambition levels the demand side (transport operators). The demand side would gain one-sided advantages and could potentially strategically delay investments in zero-emission vehicles which a manufacturer would have to sell to meet the requirements of the ZEV mandate. This carries risks of significant market distortion and could also incentivise transport operators to delay investment decisions for a swift fleet renewal.

More importantly, a ZEV mandate would only focus on zero-emission vehicles while neglecting the CO<sub>2</sub>-reduction potentials of further improvements of conventional vehicles. Those improvements would not be recognized with a ZEV mandate and manufacturers with more fuel-efficient vehicles would effectively be disadvantaged. These improvements are, however, one of the driving forces behind the CO<sub>2</sub>-regulation.

If you notice any errors, omissions or ambiguities in these recommendations, please contact VDA without delay so that these errors can be rectified.

Publisher German Association of the Automotive Industry  
Behrenstraße 35, 10117 Berlin  
[www.vda.de/en](http://www.vda.de/en)

Copyright German Association of the Automotive Industry  
  
Reprint, also in extracts, is only permitted,  
if the source is stated.

Version Version 2.0, Sept 2022