

Proposal COM(2023) 88 of 14 February 2023 for a **Regulation** amending Regulation (EU) 2019/1242 as regards strengthening the CO₂ emission performance standards for new heavy-duty vehicles

CO₂ EMISSION TARGETS FOR LORRIES, VANS AND BUSES

cepPolicyBrief No. 13/2023

LONG VERSION

A. KEY ELEMENTS OF THE EU PROPOSAL	3
1 Context	3
2 Targets	3
3 Scope	4
4 CO₂ emission targets for heavy-duty vehicles (HDVs)	4
4.1 General CO ₂ emission targets for the entire EU HDV-fleet	4
4.2 Specific CO ₂ emission targets for the HDV-fleets of individual manufacturers	4
5 Determining CO₂ emissions	5
5.1 VECTO estimation of CO ₂ emissions	5
5.2 Determining manufacturer-specific CO ₂ emissions	5
6 Bonus for zero and low emission HDVs (ZLEVs)	5
7 Emission debts (“borrowing”) and emission credits (“banking”)	6
8 Transfers of vehicles between manufacturers.....	6
9 Excess emissions and financial penalties	6
10 Zero emission urban buses.....	7
10.1 Zero carbon emissions target	7
10.2 Public procurement	7
B. LEGAL AND POLITICAL CONTEXT	7
1 Legislative Procedure	7
2 Options for Influencing the Political Process	7
3 Formalities.....	8

C. ASSESSMENT	8
1 Economic Impact Assessment	8
1.1 Fundamental considerations	8
1.1.1 Changing geopolitical, economic and climate policy environment	8
1.1.2 Criteria for proper CO ₂ regulation	9
1.2 Scope 9	
1.3 Definition of “zero emission” HDVs	9
1.4 CO ₂ emission targets for HDVs	10
1.4.1 Fundamental shortcomings of the regulatory approach.....	10
1.4.2 Tighter CO ₂ emission targets for lorry types already regulated	11
1.4.3 Requirements for newly regulated lorry types.....	12
1.4.4 Requirements for coaches.....	12
1.4.5 Requirements for HDV trailers	12
1.5 Bonus for zero and low emission HDVs	12
1.6 Flexibilities	13
1.6.1 Emission debts (“borrowing”) and emission credits (“banking”)	13
1.6.2 Transfer of vehicles between manufacturers.....	13
1.7 Exceeding manufacturer-specific CO ₂ emission targets and penalties.....	13
1.8 Zero-emission urban buses.....	13
1.8.1 100% quota for new zero-emission vehicles	13
1.8.2 Alternative proposals for reducing emissions from urban buses	14
1.8.3 Public procurement	14
2 Legal Assessment	15
2.1 Legislative Competency	15
2.2 Subsidiarity	15
D. CONCLUSION	16

A. Key elements of the EU Proposal

1 Context

- ▶ The EU has committed to reducing its emissions of greenhouse gases (GHG) by 55% by 2030, as compared with 1990, and to net zero by 2050 (“climate neutrality”) [“EU climate targets”; Regulation (EU) 2021/1119, cf. [cepPolicyBrief 3/2020](#)].
- ▶ In the EU, the trend in GHG emissions from heavy-duty vehicles (HDVs) – lorries, vans and their trailers, as well as buses and coaches – is upwards, and they currently cause [p. 1]
 - over 6% of all GHG emissions – especially CO₂;
 - over 25% of GHG emissions from road transport.
- ▶ GHG emissions from road transport
 - must be reduced by Member States within the framework of their binding national climate targets [Effort Sharing Regulation (EU) 2018/842, see [cepPolicyBrief 9/2022](#)];
 - will in future be subject to the newly created separate EU emissions trading system for road transport and buildings (EU ETS 2), which will cap and gradually reduce the CO₂ emissions from both of these sectors together from 2027 [EU ETS Directive 2003/87/EC, see [cepPolicyBrief 5/2022](#)].
- ▶ Currently, the EU targets for reducing CO₂ emissions from HDVs are as follows:
 - Since 2019, lorry manufacturers have had to estimate the CO₂ emissions and fuel consumption of their “new” types of lorry – i.e. newly registered in the EU – using the simulation tool VECTO [Vehicle Energy Consumption Calculation Tool; Regulation (EU) 2017/2400] and register it with the Commission which then publishes this VECTO data [Regulation EU(2017) 956, see [cepPolicyBrief 27/2017](#)].
 - New lorries over 16 t with axle configurations of 4x2 or 6x4 must meet targets for reducing their CO₂ emissions [Regulation (EU) 2019/1242; see [cepPolicyBrief 29/2018](#)]. These fleet-wide CO₂ limits or “CO₂ emission targets” are established
 - both for the entire EU fleet
 - and for the fleets of the individual lorry manufacturers.
 - EU-wide, the CO₂ emissions of new lorries estimated with VECTO, compared to the average CO₂ emissions in the “reporting period” 2019 (“reference CO₂ emissions”), must
 - decrease by 15% by 2025;
 - decrease “provisionally” by 30% by 2030.
 - As there were still “major uncertainties” in 2019 about “more advanced technologies” for CO₂ reduction that would only be available in the future, it was decided at that time that the EU-wide CO₂ target for 2030 would only be finalised after a review in 2022 [Regulation (EU) 2019/1242, Art. 13].
 - Member States have to align tolls for certain HDVs – lorries, trailers and buses – with their CO₂ emissions by 25 March 2024 at the latest [Directive (EU) 2022/362, see [cepPolicyBrief 24/2017](#)].
- ▶ The automotive sector [Commission Proposal COM(2023) 88, p. 1 f.]
 - accounts for over 7% of gross domestic product (GDP) in the EU and employs around 14.6 million people in manufacturing, sales and maintenance, as well as in construction, transport and transport services;
 - is one of the world's biggest producers of automobiles and a technological leader;
 - achieves significantly higher value added per unit produced for HDVs than for passenger cars.

2 Targets

- ▶ The proposed amendments to Regulation (EU) 2019/1242 aim to [COM(2023) 88, p. 2]
 - reduce CO₂ emissions from HDVs cost-effectively in line with the stricter EU climate goals;
 - reduce the EU's dependence on fossil fuel imports;
 - for the benefit of transport companies and users – mostly small and medium-sized enterprises (SMEs) –
 - increase the choice of “affordable” zero-emission HDVs,
 - reduce total cost of ownership through “significant energy savings”;
 - incentivise investment in zero-emission technologies to strengthen the EU's leadership role.
- ▶ In parallel, the Commission has proposed stricter air pollutant emission limits for HDVs (EURO VI standard) [EURO 7 standard; COM(2022) 586, see [cepPolicyBrief 5/2023](#)].
- ▶ So far, in the ongoing legislative procedure relating to Commission proposal COM(2023) 88, the report of the Transport Committee and the draft reports of the lead Environment Committee and the Industry Committee of the European Parliament have been submitted:

- Transport and Tourism Committee (TRAN): Report dated 19 September 2023 (“TRAN Report”);
- Environment, Public Health and Food Safety Committee (ENVI): Draft Report dated 25 May 2023 (“ENVI Draft Report”);
- Industry, Research and Energy Committee (ITRE): Draft Report dated 15 June 2023 (“ITRE Draft Report”).

3 Scope

- ▶ The scope extends to all lorry types and vans as well as to buses and HDV-trailers. Included are [amended Art. 2 (1) in conjunction with Regulation (EU) 2018/858, Art. 4 and Annex I]
 - heavy motor vehicles i.e.
 - lorries in categories N2 (3.5 t – 12 t) and N3 (> 12 t);
 - heavy vans in category N1, insofar as they are not subject to the CO₂ emission standards for cars and light commercial vehicles due to their weight [Regulation (EU) 2019/631];
 - buses in categories M2 (< 5 t) and M3 (> 5 t);
 - trailers in categories O3 (3.5 t – 10 t) and O4 (> 10 t).
- ▶ Excluded are vehicles
 - for civil protection, fire services, police, armed services and urgent medical care [amended Art. 2 (4) and (5)];
 - for special purposes, off-road vehicles and vocational vehicles – e.g. garbage trucks, road sweepers, concrete mixers and cranes [new Art. 3a].
- ▶ The ENVI draft report [Amendment 32] and the ITRE draft report [Amendment 9], on the other hand, leave out the exemption for vocational vehicles. In return, however, the ITRE draft report significantly softens the CO₂ reduction targets (“reduction factors”, see below Table 1) for vocational vehicles [Amendment 17].

4 CO₂ emission targets for heavy-duty vehicles (HDVs)

4.1 General CO₂ emission targets for the entire EU HDV-fleet

- ▶ The average CO₂ emissions of the EU fleet of new heavy motor vehicles must be reduced [new Art. 3a in conjunction with Annex I No. 4]
 - for lorries with a 4x2 axle configuration (> 16 t) or a 6x4 axle configuration [vehicle subgroups 4-UD, 4-RD, 4-LH, 5-RD, 5-LH, 9-RD, 9-LH, 10-RD, 10-LH] (“currently regulated lorries”) in the reporting periods
 - by 15% in 2025-2029;
 - by 45% in 2030-2034 [ENVI draft report, Amendment 33: 65%; TRAN report, Amendment 54: 35%];
 - by 65% in 2035-2039 [ENVI draft report, Amendment 34: 95%; TRAN report, Amendment 55: 50%; ITRE draft report, Amendment 10: 75%];
 - by 90% from 2040 [ENVI draft report, Amendment 35: 100%; TRAN report, Amendment 56: 75%];
 as compared to the reporting period of 2019 in each case;
 - for the other lorry and coach vehicle groups
 - by 45% in 2030-2034 [ENVI draft report, Amendment 33: 65%; TRAN report, Amendment 54: 35%];
 - by 65% in 2035-2039 [ENVI draft report, Amendment 34: 95%; TRAN report, Amendment 55: 50%; ITRE draft report, Amendment 10: 75%];
 - by 90% from 2040 [ENVI draft report, Amendment 35: 100%; TRAN report, Amendment 56: 75%];
 as compared to the reporting period of 2025 in each case.
- ▶ CO₂ emissions caused by the use of new HDV-trailers must be reduced from 2030 [new Art. 3a (3) in conjunction with Annex I No. 4]
 - by 15% for semi-trailers;
 - by 7.5% for other trailers;
 as compared to the reporting period of 2025 in each case.

4.2 Specific CO₂ emission targets for the HDV-fleets of individual manufacturers

- ▶ For each reporting period from 2025 onwards, a “specific CO₂ emissions target” is determined for each manufacturer for the preceding reporting period [amended Art. 6 in conjunction with Annex I No. 4.1].

- ▶ The manufacturer-specific CO₂ emission target depends on [Annex I No. 4]
 - the reference CO₂ emissions,
 - the respective reduction factor for the reporting period,
 - the typical mileage (km) and the
 - payload (t) of all new lorries of a manufacturer of the respective lorry subgroups or
 - average number of passengers of all new buses of a manufacturer of the respective bus subgroups, as appropriate.

Table 1: Reduction factors for the manufacturer-specific CO₂ emission targets

Vehicle type	Reporting period of the years			
	2025 – 2029	2030 – 2034	2035 – 2039	from 2040
Currently regulated lorries ¹	15%	43% [30% ³ , 64% ²]	64% [50% ³ , 74% ⁴ , 95% ²]	90% [75% ³ , 100% ²]
Vocational vehicles	–	– [25% ⁴ , 64% ²]	– [40% ⁴ , 95% ²]	– [90% ⁴ , 100% ²]
Other lorries	–	43% [30% ³ , 64% ²]	64% [50% ³ , 74% ³ , 95% ²]	90% [75% ³ , 100% ²]
Coaches	–	43% [15% ³ , 64% ²]	64% [50% ³ , 74% ³ , 95% ²]	90% [75% ³ , 100% ²]
Semi-trailers	–	15%	15%	15%
Other trailers	–	7.5%	7.5%	7.5%

¹ Vehicle subgroups 4-UD, 4-RD, 4-LH, 5-RD, 5-LH, 9-RD, 9-LH, 10-RD, 10-LH

² ENVI draft report [Amendment 61]

³ TRAN report [Amendment 84]

⁴ ITRE draft report [Amendment 17]

5 Determining CO₂ emissions

5.1 VECTO estimation of CO₂ emissions

- ▶ The VECTO estimates for the respective reference period are used to determine “reference CO₂ emissions” [Annex I No. 3] – measured in grams per tonne-kilometre (g/tkm) for lorries and in grams per passenger-kilometre (g/pkm) for buses – which are the basis for determining both EU-wide and manufacturer-specific CO₂ emission targets [Annex I No. 4].
- ▶ VECTO is used to estimate CO₂ emissions and fuel consumption [Annex I No. 2.1]
 - for lorry subgroups depending on their typical mission profile and payload (t);
 - for bus subgroups depending on their typical mission profile and average number of passengers.

5.2 Determining manufacturer-specific CO₂ emissions

- ▶ The actual manufacturer-specific CO₂ emissions of each manufacturer’s fleet of new lorries (g/tkm) and buses (g/pkm) will be determined for the reporting period [amended Art. 4, Annex I No. 2.7].
- ▶ The manufacturer-specific CO₂ emissions [Annex I No. 2.7] are dependent on the average CO₂ emissions as well as the typical mileage (km) and
 - the payload (t) of all the manufacturer’s new lorries or
 - the average number of passengers on the manufacturer’s buses.

6 Bonus for zero and low emission HDVs (ZLEVs)

- ▶ “Zero-emission” and “low-emission” HDVs (“zero and low emission vehicles”, ZLEVs) will also count towards emissions reduction (“ZLEV bonus factor”) in order to provide an incentive for their introduction [Regulation (EU) 2019/1242, Recital 26; amended Art. 4 and Art. 5].
- ▶ For the purposes of this Regulation
 - “zero emission vehicles” means heavy duty vehicles below 5g CO₂/tkm for lorries or 5g CO₂/pkm for buses [amended Art. 3 No. 11; ENVI draft report (Amendments 29 and 30) and ITRE draft report (Amendment 8): below 1g CO₂/tkm and 1g CO₂/pkm];
 - “low-emission vehicles” means heavy-duty vehicles with CO₂ emissions below 50% of the reference value for the vehicle subgroup to which they belong [amended Art. 3 No. 12].

- ▶ The ZLEV bonus factor will be determined for each manufacturer in each reporting period up to the reporting period for 2029 – in the subsequent year in each case [amended Art. 5].
- ▶ In determining the ZLEV bonus factor [Annex I No. 2.3], zero and low-emission
 - currently regulated lorries are counted multiple times towards emission reductions depending on their CO₂ emissions:
 - zero emission HDVs count as 2.0 vehicles;
 - low-emission HDVs count as up to 2.0 vehicles;
 - HDVs in the other vehicle subgroups are counted once.
- ▶ In order to avoid a “weakening” of the CO₂ targets [Regulation (EU) 2019/1242, Recital 28; amended Art. 5 (4)],
 - the ZLEV bonus factor can reduce the manufacturer-specific CO₂ emissions by a maximum of 2%;
 - the contribution to this factor from zero emission lorries – excluding currently regulated lorries – can reduce manufacturer-specific CO₂ emissions by a maximum of 1.5%.
- ▶ If the number of zero or low emission currently regulated lorries as a proportion of all new HDVs is less than 0.75%, the ZLEV factor is set at 1 [Annex I No. 2.3.2].

7 Emission debts (“borrowing”) and emission credits (“banking”)

- ▶ In order to take account of “fluctuations” in the composition and CO₂ emissions of a manufacturer’s HDV fleet [Recital 31], manufacturers can balance failures to meet their annual, manufacturer-specific CO₂ targets against over-compliance in other years [Art. 7, Annex I No. 5.1].
- ▶ For underperformance in the period 2025-2039, the manufacturer will acquire “emission debts” (“borrowing”); these must not, however, exceed a total of 5% of the manufacturer-specific CO₂ emission targets multiplied by the number of HDVs in the said reporting period.
- ▶ For over-compliance in the period 2019-2039, the manufacturer acquires “emission credits” (“banking”).

8 Transfers of vehicles between manufacturers

- ▶ For the purposes of calculating average manufacturer-specific CO₂ emissions, individual vehicles may be transferred between manufacturers [new Art. 6a], as follows:
 - unlimited if the transferring and the receiving manufacturer belong to the same affiliated group [Art. 3, new paragraph];
 - up to 5% of the receiving manufacturer's new HDVs in a given reporting period for non-affiliated manufacturers.
- ▶ Following a positive assessment by the Commission of the participating manufacturers' applications, the CO₂ emissions of the transferred vehicles will be taken into account with the receiving instead of the transferring manufacturer for the calculation of the average manufacturer-specific CO₂ emissions.

9 Excess emissions and financial penalties

- ▶ “Excess emissions” by a manufacturer are subject to a penalty where [amended Art. 8 (2); Annex I No. 6]:
 - in any of the reporting periods 2025–2028, 2030-2033 and 2035-2038, the sum of the emission debts minus the sum of the emission credits exceeds 5% of its manufacturer-specific CO₂ emission target [amended Art. 7 (1)];
 - in any of the reporting periods 2029, 2034, 2039 and 2040, the sum of the emission debts exceeds the sum of the emission credits;
 - as from the 2041 reporting period, the average manufacturer-specific CO₂ emissions exceed the annual manufacturer-specific CO₂ targets.
- ▶ The penalty for excess emissions of 1 g/tkm per vehicle is € 4,250 [Art. 8 (1)].

10 Zero emission urban buses

10.1 Zero carbon emissions target

- ▶ New “heavy urban buses” (vehicle subgroups 31-LF, 31-L1, 31-DD, 33-LF, 33-L1, 33-DD, 35-FE, 39-FE, 31-L2 and 33-L2) must be 100% zero emissions from 2030 (“100% quota”) [new Art. 3b (1) in conjunction with Annex I No. 4.2 and 4.3].
- ▶ Member States can exempt a “limited share” of heavy urban buses registered in each reporting period from this obligation if it is demonstrated to be in the public interest to register a non-zero emission vehicle for a purpose which cannot be equally served by a zero emission vehicle [new Art. 3b (2); exemption left out of ENVI draft report (Amendment 37)]
 - due to the socio-economic cost-benefit ratio and
 - in view of the specific terrain structure (“morphologies”) and weather conditions.

10.2 Public procurement

- ▶ Contracting authorities and contracting entities must base the award of public contracts for the procurement or use of new heavy urban buses on the most economically advantageous tender, taking into account [new Art. 3c (1) and (2)]
 - the best price-quality ratio and
 - the contribution to security of supply, evaluated according to the following criteria, among others:
 - proportion of products or tenders from third countries [Regulation (EU) No 952/2013];
 - restrictive or competition-distorting measures by third countries regarding urban buses or the interoperability between charging and refuelling infrastructure and vehicles;
 - availability of essential spare parts for the functioning of the equipment subject to the tender;
 - commitment by the tenderer that changes in its supply chain will not adversely affect the performance of the contract and certification or documentation that the tenderer's supply chain can meet the security of supply requirements.
- ▶ The tenderer's contribution to security of supply must receive a weighting of 15% to 40% in the award criteria [new Art. 3c para. 3].
- ▶ The ENVI draft report
 - leaves out the obligation to rely on the most economically advantageous tender- taking into account the best price-quality ratio – and adds the contribution to sustainability as a further award criterion alongside the contribution to security of supply [Amendment 37];
 - stipulates that
 - the tenderer's contribution to sustainability must receive a weighting of 15% to 40% in the award criteria [Amendment 41];
 - the share of products or tenders from third countries may not exceed 50% of the tender value [Amendment 42].
- ▶ The TRAN report removes the new Art. 3c because the requirements on public procurement are “unclear and disproportionate” [Amendment 57].
- ▶ The ITRE draft report adds environmental, social and labour market aspects as further award criteria in addition to the contribution to security of supply [Amendment 12].

B. Legal and political context

1 Legislative Procedure

14 February 2023	Adoption by the Commission
Open	Adoption by the European Parliament and the Council, publication in the Official Journal of the European Union, entry into force

2 Options for Influencing the Political Process

Directorates General: DG Climate

Committees of the European Parliament: ENVI, Rapporteur: Yannick Jadot (Greens/FEA, FR);

Federal Ministries:	Environment, Nature Conservation, Nuclear Safety and Consumer Protection (lead)
Committees of the German Bundestag:	Environment, Nature Conservation, Nuclear Safety and Consumer Protection (lead)
Decision-making mode in the Council:	Qualified majority (acceptance by 55% of Member States which make up 65% of the EU population)

3 Formalities

Legal competence:	Art. 192 TFEU (Environmental protection)
Form of legislative competence:	Shared competence (Art. 4 (2) TFEU)
Procedure:	Art. 294 TFEU (ordinary legislative procedure)

C. Assessment

1 Economic Impact Assessment

Basically, in view of the policy-based EU climate targets, the likely increase in transport-related CO₂ emissions; the intensely cross-border nature of road haulage and the need to establish uniform EU-wide rules, the regulation of CO₂ emissions from lorries, vans and buses and their trailers (HDVs) at EU level is appropriate. For the assessment of the individual Commission proposals to change the CO₂ emission targets for HDVs, it is necessary to consider the changing geopolitical, economic and climate policy environment for manufacturers and users of HDVs and society as a whole, as well as a wide range of other criteria.

1.1 Fundamental considerations

1.1.1 Changing geopolitical, economic and climate policy environment

The importance of security of supply, access to “critical raw materials” [Proposed Regulation COM(2023) 160, see [cepPolicyBrief 8/2023](#)], resilience to crises and adaptability to rapidly changing circumstances [“Resilience”; see [cepAdhoc 3/2023](#)] in general¹, as well as the systemic relevance of the transport sector in particular, have been highlighted both by the Covid 19 crisis, with its disruptions in international supply chains and supply shortages, and by the geopolitical disruptions triggered by war in Ukraine, shortages of natural gas and energy price increases.

In global competition, especially regarding e-buses and battery production, the European automotive industry is coming up against the considerable cost advantages enjoyed by the competition in China², which also has unrestricted access to many raw materials required for the mobility transition whereas, in this respect, the EU automotive industry would suffer from geopolitical tensions with China. It is not yet possible to say for certain, to what extent the subsidies under the US “Inflation Reduction Act”³ will give manufacturers of zero-emission HDVs there decisive cost advantages, or whether European manufacturers will also be able to participate in the subsidies.⁴

In addition, the climate policy environment for the transport sector in the EU has also changed significantly, especially in the wake of the “European Green Deal” including the comprehensive “Fit for 55” reforms [see [cepPolicyBrief 6/2022](#)]. For example, fossil fuels will be subject to a rising CO₂ price in the future due to the introduction of a CO₂ emissions-based component in the toll for HDVs [Eurovignette Directive 1999/62; see [cepPolicyBrief 24/2017](#)] and the EU ETS 2 for the road transport and building sectors. The proposed stricter EURO 7 emission standards for lorries and buses [COM(2022) 586, see [cepPolicyBrief 5/2023](#)] would increase the purchase price of conventional diesel vehicles, making alternative propulsion systems more competitive. The

¹ Marcu, A. et. al. (2023), Review of Decarbonization Policies for Heavy-Duty Transport: In search for a new analytical framework. [ERCST Report](#) of 11 May 2023 [hereinafter: ERCST Report HDV].

² Frotcom Blog of 17 March 2023, [Electric Buses: China's success story](#). Burow, D. (2022), [LFP: Vorteil für China im Batteriemarkt](#), TableChina Standpunkt of 31 March 2022.

³ US-Congress (2022), H.R.5376 – Inflation Reduction Act of 2022, [117th Congress Public Law 169](#).

⁴ POLITICO, 22 May 2023, [U.S. pumps the brakes on EU clean car deal](#).

charging and refuelling infrastructure for battery-electric and hydrogen (H₂) powered vehicles is also to be expanded, at least on the main routes of the trans-European transport network (TEN-T core network). While all this supports an initial ramp-up of electric HDVs for the “mobility transition”, it is no guarantee that the supply of e-vehicles desired by policymakers will meet with a corresponding demand.

1.1.2 Criteria for proper CO₂ regulation

Against the background of huge changes in the geopolitical, economic and climate policy environment of the European transport sector, the proposed changes to the CO₂ emission targets for HDVs are assessed according to the following criteria:

- **Climate policy effectiveness**

Regulatory measures to reduce CO₂ emissions should first be suitable for achieving this goal in the first place. Climate policy effectiveness varies, however, among the different instruments – bans, subsidies, CO₂ pricing through tolls and emissions trading.

- **Economic efficiency**

Since the path to climate neutrality in road transport is associated with high investment costs and sometimes also with state subsidies, economic efficiency must be highly targeted. Decarbonisation at the least cost should therefore be pursued and e.g. “subsidy orgies” should be avoided.

- **Resilience through security of supply, technology neutrality and space for market innovation**

In order to make the transport sector as crisis-resistant as possible, in addition to ensuring security of supply – in terms of production, spare parts, fuels as well as refuelling and charging infrastructure –, the adaptability of the players – especially vehicle manufacturers and transport companies – to changing market conditions is crucial.⁵ Regulation must therefore guarantee technology neutrality and sufficient room for market innovation.

- **Comprehensive balancing of energy efficiency and CO₂ emissions**

In order to ensure that the measures to decarbonise HDVs are effective, their CO₂ emissions must be appropriately accounted for. Consequently, beyond the regulation of tailpipe emissions, all CO₂ emissions generated in the production and use of vehicles should be taken into account (“well-to-wheel” approach).

- **Impact on society as a whole**

EU regulation should also adequately consider the overall societal impacts of decarbonising HDVs – such as the effects on consumer prices, security of supply, public budgets, the competitiveness of the automotive industry and on value creation and jobs at manufacturers and suppliers.

- **Stable regulatory environment**

Overall, the decarbonisation of HDVs should avoid piecemeal overregulation, which would lead to a lack of adaptability of the sector. In addition, achievable CO₂ emission targets are needed to avoid short-term readjustments, or even fundamental changes, to the regulatory approach and to give vehicle manufacturers and transport companies planning security.

1.2 Scope

The inclusion of other types of HDVs in addition to the lorry types already included in the scope of the CO₂ emission targets is appropriate in view of the emission reductions in road transport that are required to achieve the EU climate targets. The exemptions are also justified on the basis of special requirements for the operational profiles of the vehicles concerned. However, if, as called for by the ENVI and ITRE draft reports, vocational vehicles were to be removed from the list of exemptions, it would be imperative to set much lower CO₂ reduction targets for vocational vehicles compared to the other vehicle groups.

1.3 Definition of “zero emission” HDVs

While the Commission's proposal to define “zero emission” HDVs based on the 5g CO₂ threshold – per tonne-kilometre or per passenger-kilometre – could be considered generous, the counter-proposal of a 1g CO₂

⁵ ERCST HDV Report.

threshold, in the ENVI and ITRE draft reports, is far too low. Such a low threshold would mean that dual-fuel diesel engines, which run on hydrogen and require some diesel as ignition fuel, could not be classified as zero emission according to the current stage of development. A technically feasible intermediate value closer to 5g CO₂ should therefore be found.

1.4 CO₂ emission targets for HDVs

1.4.1 Fundamental shortcomings of the regulatory approach

In principle, from an ordoliberal point of view, the regulatory approach chosen by the EU, to set CO₂ emission targets for HDVs, should be rejected. Because mandates and bans, which give rise to fines in the event of infringement, should not be used where market-based tools are available for achieving a target. From 2027, the separate EU emissions trading system for the road transport and buildings sectors (EU ETS 2) [EU ETS Directive 2003/87/EC, see [cepPolicyBrief 5/2022](#)], which has now been adopted, will in principle provide a much more effective alternative that is less restrictive of the freedom of choice of market participants. Thus – unlike the CO₂ emission targets proposed here – the EU ETS 2 can include both new and old vehicles in the efforts to protect the climate as well as reliably restrict CO₂ emissions by capping the overall number of allowances (“cap”) in the EU ETS 2 EU-wide and, by way of the trade in allowances (“trade”), efficiently reduce them where the cost of doing so is lowest. Including the road transport sector in the emissions trading system means that the actual fuel consumption and thus the actual CO₂ emissions of an individual vehicle are imputed directly to it by way of higher fuel prices. This direct pricing of CO₂ emissions automatically ensures a demand for and supply of vehicles and fuels that are more fuel-efficient and have lower CO₂ emissions. As CO₂ pricing is based on the actual fuel consumption and CO₂ output of all vehicles, there is an incentive for using and driving them in a way which is more fuel efficient and thus produces less CO₂, as well as for the relocation of some freight transport onto ships or railways.

In contrast, CO₂ emission targets for HDVs with internal combustion engines only target the potential fuel efficiency of newly registered HDVs and have no influence on their actual use and actual CO₂ emissions. CO₂ emission targets therefore provide no guarantee that CO₂ emissions from road haulage will be reduced to the desired degree because, firstly, they provide no incentive for fuel-efficient driving, and, secondly, higher mileage is likely in the event that transport costs fall due to more efficient HDVs (“rebound effect”).

Moreover, stringent CO₂ emission targets can essentially only be achieved through higher market penetration of battery-electric or fuel cell vehicles. CO₂ emission targets, however, only influence the supply of new vehicles but not the demand. Insufficient demand means that fewer new vehicles will be put on the road, so that many transport services within the EU will use a CO₂-intensive vehicle fleet for longer than planned, thus slowing down the decarbonisation of the sector. Slowing down fleet renewal in this way would also be associated with higher air pollutant emissions than would occur if the fleet were renewed in the usual way through the purchase of new EURO VI vehicles [see [cepPolicyBrief 5/2023](#)]. Lack of demand may, on the one hand, be due to a high purchase price for battery-electric or H₂-powered HDVs, and, on the other, due to uncertainty about the future price of electricity or hydrogen or about the expansion of the corresponding charging and refuelling infrastructure. Vehicle manufacturers rightly point out that there is in any case a high level of cost awareness in the commercial vehicle industry. Thus, zero carbon emission lorries and buses will only be bought in large numbers when battery-electric or H₂-powered vehicles can be operated more cost-effectively than those with combustion engines.⁶ This would require, among other things, a correspondingly high CO₂ price for fuels, or the heavily subsidised promotion of low or zero carbon HDVs, which would, however, place a heavy burden on public budgets. Even if parity with diesel vehicles in terms of total cost of ownership (TOC) were to be achieved in the future, it is often difficult or impossible for the many small and medium-sized transport companies, which make up the majority in the transport industry, to pre-finance the more expensive acquisition through loans.

The lack of technology neutrality limits the ability of HDV providers and users to adapt to changing circumstances and crises. Since no one can see into the future, “putting all your eggs in one basket” in the choice of permissible propulsion technologies is not an appropriate strategy to minimise risks and ensure resilient road freight and public passenger transport. It also overlooks the different situations in the export markets of the EU car industry. For example, many countries will not have the same conditions in terms of financial resources, transmission networks and storage facilities for renewable electricity that would allow full electrification of HDVs. This aspect

⁶ VDA press release of 14 February 2023, [Emission-free heavy goods traffic needs dense network of charging and hydrogen filling stations as well as incentives instead of bans](#).

is often forgotten in the public discussion on a rapid elimination of the combustion engine in the EU by way of strict regulatory requirements. If improvements to internal combustion technology make little difference when it comes to meeting strict CO₂ emission targets, manufacturers will withdraw from the development of HDVs with more efficient internal combustion engine in Europe and gradually relocate R&D departments and production facilities to the vicinity of the sales markets that will continue to exist in many developing and emerging countries well beyond the 2030s. Those who will suffer most will be the many supplier companies and research facilities, along with their employees and the regions affected by the job losses. This "forced" migration of value creation and employment is economic nonsense because, with a future for internal combustion engines in the EU, the world market could continue to be partly served from Europe.

The fixation on tailpipe emissions ("tank-to-wheel" approach) is consistent with the logic of CO₂ emission targets but leads to inefficient and partly ineffective decarbonisation efforts. If, for example, the rapid electrification of HDVs is targeted but electricity generation from renewable sources lags far behind, the carbon footprint of battery production and the operation of e-vehicles will not be as positive as envisaged. If this means that additional coal or gas has to be used to generate electricity, battery-electric vehicles will not necessarily be more energy-efficient than those with combustion engines. Thus, for example, an efficient combined cycle gas power plant has an efficiency level of about 60%⁷, an electric motor powered by a battery about 64%⁸, so a total of about 38%. This is in the same order of magnitude as the efficiency of a gas engine, which is 35-40%⁹. Although the EU ETS 1 limits all CO₂ emissions from electricity production by capping the number of allowances, [see [cepPolicyBrief 5/2022](#)], an increased demand for electricity – and for battery production – leads to higher allowance prices. In the case of energy-intensive industries, this can lead to a relocation of production to third countries ("carbon leakage"), if carbon leakage protection is not complete. Direct combustion of the natural gas in the HDV would therefore possibly prevent the relocation of industrial value creation. In addition, the carbon footprint of efficient hybrid vehicles using bio-fuels or e-fuels could come close to that of battery-electric or fuel cell vehicles, depending on the electricity mix. Therefore, the pure "tank-to-wheel" approach of CO₂ emission targets should be complemented by measures that take into account the overall climate footprint of the vehicles.

1.4.2 Tighter CO₂ emission targets for lorry types already regulated

The proposed tightening of CO₂ emission targets for 2030 will in fact mean that the target will only be achievable through higher market penetration of zero carbon vehicles, whilst efficiency increases for vehicles with combustion engines will have only a marginal effect. The EU is thus abandoning the principle of technology neutrality, which is of crucial importance especially when it comes to improving the resilience of the transport system. In addition, the way CO₂ emission targets are staggered over time is not appropriate either because it overlooks the fact that the market penetration of new technologies usually develops exponentially and not linearly. Consequently, it makes more sense to keep the CO₂ reduction requirements lower at first and increase them towards the end of the period up to 2040. This has the great advantage that the bulk of the conversions to low-emission drives will not take place until the technology is more mature, advanced and efficient, and the energy supply required for this will be cheaper and lower in CO₂. This will decisively reduce the total cost of ownership (TOC) compared to the near future. Finally, the CO₂ price for fossil fuels will by then be higher and subsidies that might be needed for the conversion could be much lower than they need to be in the near future. In the meantime, there would be room for a substantial contribution to come from efficiency improvements in combustion vehicles through hybridisation, which could also bring advantages to European manufacturers on the world market. These hybrid vehicles can then also be deployed in a climate-neutral way by using alternative fuels, even in other regions of the world. This use of alternative fuels should be counted in an appropriate manner towards CO₂ emission targets in the EU¹⁰ including the use of LNG vehicles, which save around 15% of CO₂ emissions through gas operation alone – and over 30% with additional hybridisation¹¹.

Notwithstanding all this, the modified staggering of CO₂ emission targets maintains planning certainty regarding the necessary refuelling and charging infrastructure for battery-electric and fuel cell vehicles. In addition, the

⁷ RP Energie-Lexikon, [Gas-und-Dampf-Kombikraftwerk](#).

⁸ TÜV Nord, [Wirkungsgrad – Die Nutzbarkeit der Energie](#).

⁹ GazEnergy, 20 June 2019, [Rekord-Wirkungsgrad bei Gasmotoren](#).

¹⁰ Cf. e.g. Bundesministerium für Wirtschaft und Klima (2020), [Anrechnungssystem für erneuerbare Kraftstoffe in EU-Flottenregulierung – Deutsche Zusammenfassung des Gutachtens für das Bundesministerium für Wirtschaft und Energie \(BMW\)](#).

¹¹ Bundesverband Güterverkehr und Logistik – BGL (2021), [Klimaschutz in Logistik und Straßengüterverkehr](#), p. 14.

related costs are reduced because construction measures can be spread over a longer period of time during which the technological direction in which the market is developing becomes clear.

The further tightening of CO₂ emission targets envisaged in the ENVI draft report is diametrically opposed to this line of argument. Above all, phasing out internal combustion vehicles by 2040 by setting a 100% reduction target does not take account of the principle of technology neutrality or the realities of the transport sector. Many niche applications and special requirements of HDVs – such as heavy loads – require the combustion engine option. In addition, there must also be a long-term business case for research and development on improving internal combustion engines in the EU based on sales opportunities in the internal market, to avoid the complete migration of research and development on internal combustion technology. Even if these vehicles are running with alternative zero-emission fuels only by 2050, the goal of climate neutrality can still be achieved.

1.4.3 Requirements for newly regulated lorry types

In addition to what has been said with regard to lorry types that are currently already regulated, the following should be noted with regard to newly regulated lorry groups. As the data from the VECTO estimate for the 2025 reference period will not be available until spring 2027 at the earliest, the CO₂ emission targets to be met from 2030 onwards will not be published until a late stage. In addition, many of the newly regulated lorry subgroups have already made progress in electrification, so that the reference value for 2025 will be lower as compared with that for lorries that are currently already regulated. However, if the same CO₂ emission targets are applied, the newly regulated lorries will have to achieve a greater absolute CO₂ reduction in a short time. This is counter-productive, especially as the current CO₂ emissions of these vehicle groups are only 25% of the total emissions of the HDV fleet in the EU.¹² As with currently regulated vehicles, a lower CO₂ emission target should therefore apply initially and a higher one later – towards the end of the period up to 2040 because this reflects the non-linear dynamics of market diffusion, leaves room for a significant contribution from hybridisation and means that the bulk of zero-emission vehicles can be purchased at a later stage at a lower cost.

1.4.4 Requirements for coaches

As coaches are among the most efficient means of passenger transport, their forced decarbonisation should start later, if at all, because the higher cost burden would hinder a possible increase in the proportion of buses in long-distance and regional transport to the detriment of motorised private transport – thereby hindering the desired “mobility transition”. The advantage of a delayed staggering of CO₂ emission targets is that the technology will be more mature and cost-effective later and the necessary infrastructure is more likely to be already available (see above Section 1.4.2.). For similar reasons as in the case of newly regulated lorry types, the reduction targets should start lower and increase at a greater rate later on. Rather than introducing a quota for zero-emission buses (see below Section 1.8), urban buses should then be subject to the same requirements as coaches.

1.4.5 Requirements for HDV trailers

The required reductions in CO₂ emissions from HDV trailers cannot be achieved using the measures that are ascertainable by VECTO estimates, even with all possible improvements in aerodynamics, rolling resistance and weight. The CO₂ reduction by way of additional measures – such as the recuperation of braking energy in the trailer to support the drive – could only be determined by looking at the entire load train – tractor plus trailer. EU legislators therefore still need to revise the requirements for determining and accounting for emission reductions from trailers accordingly.

1.5 Bonus for zero and low emission HDVs

The bonus for zero and low emission HDVs (ZLEV) is an important incentive to “jump-start” their market penetration. As a considerable number of ZLEVs as a proportion of newly registered HDVs will in any case be required to meet the CO₂ emission targets from 2030 onwards, it makes sense not to continue the bonus scheme beyond the 2029 reporting period. If, however, the CO₂ emission targets for 2030 [see C.1.4.2-4] are not relaxed, the ZLEV bonus should alternatively be maintained until at least 2035 and its impact on the manufacturer-specific CO₂ emission targets [Art. 5 (4)] less strictly limited.

¹² IA, p. 59 f.

1.6 Flexibilities

1.6.1 Emission debts (“borrowing”) and emission credits (“banking”)

Borrowing and banking reduces the inefficiency of CO₂ emission targets and increases the resilience of the transport sector by giving individual manufacturers more flexibility to adapt to changing circumstances. Continuing the provisions in question until 2039 is therefore justified.

1.6.2 Transfer of vehicles between manufacturers

The transfer of vehicles between manufacturers that are connected in a group and, to a limited extent, between manufacturers not connected in a group, mitigates the inefficiency of the CO₂ emission targets by allowing some specialisation within a group or by innovative small companies.

1.7 Exceeding manufacturer-specific CO₂ emission targets and penalties

The problem with penalties for exceeding manufacturer-specific CO₂ emission targets is that the supply side does not have sole control over whether the zero-emission vehicles on offer can also be sold. Therefore, close monitoring by the Commission is necessary to find out the extent to which the necessary charging and refuelling infrastructure keeps pace with the targeted market penetration of zero-emission HDVs and to what extent the CO₂ price is capped or how much the CO₂-dependent toll varies between the individual Member States. If the preconditions for the necessary ramp-up of zero-emission vehicles are insufficient, either the CO₂ emission targets must be relaxed, or penalty payments must be suspended. Furthermore, it has not yet been regulated to what extent bus manufacturers, who supply non-zero-emission buses to regions exempted by the Member States, are liable for any resulting emission exceedances.

1.8 Zero-emission urban buses

Since, in the case of urban buses, the regulatory approach of applying a quota of zero-emission vehicles differs fundamentally from the fleet-wide regulation applied to the other HDVs by means of CO₂ emission targets, the targets for urban buses are examined separately in this section.

1.8.1 100% quota for new zero-emission vehicles

As a requirement for manufacturers, the 100% quota for new zero-emission urban buses is aimed solely at the supply side and overlooks important aspects of demand and the connections with urban mobility: urban buses are the most efficient form of non-rail passenger transport. In addition, new vehicles registered under the EURO VI standard are many times less polluting than older buses. Urban buses already therefore make a significant contribution to reducing both CO₂ and air pollutant emissions as well as traffic volumes. If the population in cities and the surrounding areas is motivated to switch from private motorised transport to a more attractive public transport service, by extending bus routes and increasing the frequency, considerable reductions in CO₂ and air pollutant emissions as well as traffic volume could be achieved even with non-zero-emission buses.

If, from 2030 onwards, however, due to the quota, municipalities and bus operators are only able to use far more expensive, new zero-emission buses when purchasing new vehicles, this will drastically limit the expansion of public bus services for financial reasons. There is even a risk that the available funds will not be sufficient to purchase all new vehicles, needed to maintain the current level of public bus services, as zero-emission buses. In addition, it is to be feared that more climate-damaging existing vehicles with high pollutant emissions will be used longer than usual, thus slowing down fleet renewal. If, instead, even after 2030, cheaper buses with combustion engines – be they gas-powered or hybrid – could still be purchased, more buses could be used with the same budget than battery-electric or fuel cell buses. In addition, the refuelling infrastructure for gas-powered buses could be used for longer and would not have to be abandoned prematurely. It would also be less attractive to increase the acquisition of more affordable diesel buses before 2030.

A 100% quota also has the major disadvantage that the urban bus market becomes a seller's market, in which price competition between producers will diminish if their customers cannot switch to cheaper alternatives. This is especially true if criteria are applied in public procurement that, for example, restrict the purchase of cheaper buses from Chinese production for reasons of strategic autonomy. This would saddle public transport with even higher costs. With a lower quota, on the other hand, producers will not have any certainty of sufficient demand to meet the quota in the event of cost disadvantages.

Overall, therefore, one must ask how sensible it is to fully decarbonise the most efficient form of non-rail passenger transport, without regard to the costs, whilst only gradually electrifying the competing form of motorised private transport. Efficient climate and health protection as well as a mobility transition aimed at more liveable cities, would first target an expansion of public transport services and only then completely decarbonise urban buses in the medium to long term. Efficiency-enhancing hybrid solutions, which are increasingly fuelled by alternative fuels, could also contribute to this if rather rising CO₂ prices in transport gradually make fossil fuels less attractive.

If the EU legislators nevertheless stick to the 100% quota, it will also apply to buses in vehicle subgroups 31-L2 and 33-L2, according to the Commission proposal. These are low-floor buses equipped with seat belts, which are used not only as pure urban buses but also in many regions – especially in Spain and some other countries – for interurban journeys of up to 200 km. These vehicle groups should not therefore fall under the 100% quota but instead under the general CO₂ emission targets for HDVs. Also, the plan to allow a limited proportion of non-zero-emission urban buses means that the manufacturers of these vehicles would be penalised due to the resulting higher fleet emissions. To avoid distortions, the conditions for these exemptions should be clear and narrowly defined. But manufacturers should not then have to include the emissions of these allegedly exempt buses in their bus fleet emissions, otherwise, there is a risk of supply thinning out which would have a negative impact on prices. Nor, however, is dispensing with these exemptions altogether, as envisaged in the ENVI draft report, a sensible solution because the rationale for the exemptions in the Commission's proposal is sound and without them there may be unnecessary disruption to operations and underfunding of public transport.

1.8.2 Alternative proposals for reducing emissions from urban buses

The best alternative would be to dispense with a quota altogether and thus avoid imposing unnecessary burdens on the mobility transition due to high costs. Inclusion in the CO₂ emission targets for HDVs would in itself provide sufficient incentive to decarbonise urban buses – including accelerated electrification. Instead of forcing an abrupt complete conversion to expensive e-buses in the case of new vehicles, this offers the opportunity to expand urban bus fleets and to decarbonise them gradually and with more cost-efficient measures using various technological approaches, e.g. hybrid buses or e-buses with range extension based on combustion engines¹³.

However, if the 100% quota is non-negotiable, it would make sense to postpone it by 10 years until 2040 because the further expansion of renewable energies for power generation and foreseeable advances in battery and fuel cell technology – including more cost-effective availability of green hydrogen – are likely to result in a further reduction in costs compared to 2030. And, in line with the “well-to-wheel” approach, urban buses powered by alternative fuels should also contribute to meeting the quota because the availability and competitiveness of alternative fuels may also improve by then. Freedom of choice should be retained about how to operate urban buses with zero emissions.

1.8.3 Public procurement

The fact that public procurement must now give due consideration to security of supply in addition to economic efficiency is in principle a sensible response to the changed geopolitical situation. The technology-neutrality of the Commission's proposal is positive because achieving security of supply may be helped both by savings in fossil fuels due to more efficient combustion engines or the admixture of alternative fuels, and by the avoidance of new dependencies in the purchase and operation of e-vehicles. Unfortunately, this technology-neutral approach will expire if the application of the 100% quota fails to take alternative fuels into account. Overall, however, requirements should be made clearer, operational and proportionate, otherwise, this approach will tend to be counterproductive. The fact that the ENVI draft report pushes economic efficiency considerations to one side is fatal because it leaves less scope for strained public budgets to accept cheaper offers in order to expand public transport. Moreover, the quota introduced here, limiting the proportion of supply that is permitted to come from third countries to a maximum of 50%, could trigger trade conflicts.

¹³ Daimler Truck has brought a similar concept onto the market with the ["eCitaro Fuel Cell"](#) bus but with range extension using a fuel cell. While green hydrogen remains expensive, deploying the combustion-engine variant in the EU and third countries could be a cheaper way to start using lower-emission buses, which can also run carbon-free with biofuels or e-fuels.

2 Legal Assessment

2.1 Legislative Competency

Unproblematic. The EU is empowered to issue environmental measures to protect the climate (Art. 192 TFEU). In addition, EU-wide CO₂ emission targets for lorries, vans and buses serve to ensure the functioning of the internal market [Art. 114 TFEU].

2.2 Subsidiarity

Unproblematic. Climate change is a cross-border problem which at least justifies action at EU – and preferably on a global – level. In addition, EU-wide standard rules on CO₂ emission targets, which are necessary for the functioning of the internal market, can only be adopted at EU level.

D. Conclusion

Basically, in view of the policy-based EU climate targets, the likely increase in transport-related CO₂ emissions, the intensely cross-border nature of road haulage and the need to establish uniform EU-wide rules, the regulation of CO₂ emissions from lorries, vans and buses and their trailers (HDVs) at EU level is appropriate. Nevertheless, from an ordoliberal point of view, the regulatory approach to set CO₂ emission targets for HDVs, should be rejected because mandates and bans should not be used where market-based tools are available for achieving a target. From 2027, the separate EU emissions trading system for the road transport and buildings sectors (EU ETS 2), which has now been adopted, will provide a much more effective alternative that is less restrictive of the freedom of choice of market participants. Thus – unlike the CO₂ emission targets – the EU ETS 2 can include both new and old vehicles in the efforts to protect the climate, reliably restrict CO₂ emissions by capping the number of allowances (“cap”) and, by way of the trade in allowances (“trade”), efficiently reduce them where the cost of doing so is lowest.

By contrast, the proposed tightening of CO₂ emission targets for 2030 will in fact mean that the target will only be achievable through higher market penetration of zero carbon vehicles, whilst efficiency increases in combustion engines or the use of alternative fuels will have only a marginal effect. Lack of technology neutrality prevents producers and users from adapting to changing circumstances and crises (resilience) and from using efficiency-enhancing hybrid solutions for decarbonisation. The ENVI proposal of a ban on combustion engines should therefore be firmly rejected. Instead, CO₂ emission targets should start lower in 2030 and only be tightened later. This will allow the transition to e-vehicles to take place predominantly when the technology is more mature and efficient by which time the energy provided will be lower in CO₂ and cheaper. Alternative fuels should count towards the achievement of the target.

The CO₂ emission targets for newly regulated lorries and vans are too strict as, due to the progress already made in the electrification of many of these vehicle groups, the reduction requirements will start from a lower absolute level and would have to be achieved in a shorter time.

As coaches are among the most efficient means of passenger transport, their forced decarbonisation should start later in order to avoid stifling their increased use. CO₂ emission targets should then also start lower and only be tightened later.

In the case of trailers, the CO₂ emission target cannot be achieved solely by means of the measures covered by VECTO. The CO₂ reduction achieved by recuperation of the braking energy in the trailer to support the drive cannot be captured. The requirements for determining and accounting for emission reductions from trailers therefore still need to be revised accordingly.

A rapid 100% decarbonisation (100% quota) of urban and regional buses – as the most efficient form of non-rail passenger transport – without regard to the cost is inappropriate because, in view of the cost, it will hinder the expansion of local public transport, which in itself would save more CO₂ by replacing car journeys with conventional buses. Without a 100% quota, efficiency-enhancing hybrid solutions will also be able to contribute to decarbonisation in the EU and in export markets, especially if they are increasingly able to use alternative fuels.

“Borrowing” and “banking” and the transfer of vehicles between manufacturers reduces the inefficiency of CO₂ emission targets. Penalties for exceeding these limits are problematic as manufacturers do not have sole control over whether there will be a demand for zero-emission vehicles. Therefore, the extent to which the necessary charging and refuelling infrastructure and the CO₂ price keep pace with the desired market penetration of zero-emission HDVs should be taken into account. Manufacturer-specific CO₂ emission targets should be adjusted accordingly, or penalties suspended.