POLICY UPDATE

APRIL 2019

CO_2 STANDARDS FOR HEAVY-DUTY VEHICLES IN THE EUROPEAN UNION

ICCT **POLICY UPDATES** SUMMARIZE REGULATORY AND OTHER DEVELOPMENTS RELATED TO CLEAN TRANSPORTATION WORLDWIDE.

On February 19, 2019, representatives of the European Commission, the European Parliament, and the European Council agreed on a compromise[1] for setting carbon dioxide (CO_2) emission standards for new heavy-duty vehicles (HDVs) for the first time in the European Union (EU). The targets will reduce the average CO_2 emissions from the highest emitting HDV segments by 15% in 2025 and by 30% in 2030, both relative to a baseline determined from 2019 and 2020 data. The baseline value will be defined based on the certified CO_2 emissions of new trucks collected under a separate monitoring and reporting regulation,[2] which entered into force in January 2019.

POLICY BACKGROUND

The legislative process began with the Commission's proposal,[3] released on May 17, 2018. The targets proposed by the Commission aimed to reduce the average CO_2 emissions from new HDVs by 15% in 2025 and by 30% in 2030, both relative to a 2019 baseline, and included incentives for zero- and low-emission vehicles (ZLEVs) in the form of super-credits. The proposal was quickly taken up by Parliament and Council, who proposed amendments and reached their respective positions in late 2018.

In a plenary vote on November 14, 2018, Parliament voted to strengthen the Commission's proposal by requiring a 20% CO_2 reduction in 2025 and a 35% reduction in 2030, and by eliminating the super-credit system for ZLEVs, proposing instead a sales mandate. Council, however, voted on December 20, 2018—despite resistance from Germany, who was the only member state to abstain—to support the Commission's proposal proposing only a few minor amendments.

1 European Parliament, "Provisional Agreement Resulting from Interinstitutional Negotiations. Proposal for a Regulation of the European Parliament and of the Council on the CO_2 Emission Performance Standards for New Heavy-Duty Vehicles," February 19, 2019, http://www.europarl.europa.eu/RegData/commissions/envi/inag/2019/02-22/ENVI_AG(2019)636151_EN.pdf.

2 European Union, "Regulation (EU) 2018/956 of the European Parliament and of the Council of 28 June 2018 on the Monitoring and Reporting of CO_2 Emissions from and Fuel Consumption of New Heavy-Duty Vehicles," *Official Journal of the European Union* L 173 (July 9, 2018), https://eur-lex.europa.eu/eli/reg/2018/956/oj.

3 Felipe Rodríguez, *The European Commission's proposed CO_2 standards for heavy-duty vehicles*, (ICCT: Washington, DC, 2018), https://www.theicct.org/publications/european-commissions-proposed-co2-standards-heavy-duty-vehicles.

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THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

Interinstitutional negotiations, so called trilogues, started in early January 2019 and culminated in February 19, 2019, with Commission, Parliament, and Council reaching an agreement. The deal maintained the Commission's CO_2 reduction targets, shifted the baselining period by 6 months (July 2019 to June 2020), removed buses from the ZLEV incentives, limited the ZLEV super-credits scheme until 2024, and introduced a ZLEV benchmark, the world's first for HDVs, from 2025 onwards.

Since then, the compromise text was ratified by Council's Committee of Permanent Representatives (COREPER I) on February 22, 2019, and by Parliament's Committee for Environment, Public Health and Food Safety (ENVI) on February 27, 2019. The pending adoption by Parliament and Council is regarded as a formality.

KEY ELEMENTS OF THE HDV CO_2 STANDARDS

SCOPE

As shown in Table 1, the regulation sets CO_2 emissions limits for delivery vehicles belonging to groups 4, 5, 9, and 10 as defined in the CO_2 certification regulation[4] (see Table 1). The vehicle groups correspond to rigid and tractor trucks with a GVW exceeding 16 tonnes, and with 4x2 and 6x2 axle configurations.

Table 1. HDV classification for the purpose of CO_2 emissions certification.

Axle type	Chassis configuration	Gross vehicle weight (tonnes)	Vehicle groups	Date of certification requirement
4x2	Rigid	>3.5 – <7.5	0	Not considered by the certification regulation
	Rigid/Tractor	7.5 – 10	1	January 1, 2020 for all new registrations.
	Rigid/Tractor	>10 – 12	2	
	Rigid/Tractor	>12 – 16	3	
	Rigid	>16	4	January 1, 2019 for new produced vehicles. July 1, 2019 for all new registrations.
	Tractor	>16	5	
4x4	Rigid	7.5 – 16	6	Not considered by the certification regulation
	Rigid	>16	7	
	Tractor	>16	8	
6x2	Rigid	all weights	9	January 1, 2019 for new produced vehicles. July 1, 2019 for all new registrations.
	Tractor	all weights	10	
6x4	Rigid	all weights	11	July 1, 2020 for new registrations.
	Tractor	all weights	12	
6x6	Rigid	all weights	13	Not considered by the certification regulation
	Tractor	all weights	14	
8x2	Rigid	all weights	15	
8x4	Rigid	all weights	16	July 1, 2020 for new registrations.
8x6/8	Rigid	all weights	17	Not considered by the certification regulation

Note: Only the highlighted vehicle groups form part of the scope of the HDV CO_2 standards.

4 European Commission, "Regulation (EU) 2017/2400 of 12 December 2017 Implementing Regulation (EC) No 595/2009 of the European Parliament and of the Council as Regards the Determination of the CO_2 Emissions and Fuel Consumption of Heavy-Duty Vehicles and Amending Directive 2007/46/EC of the European Parliament and of the Council and Commission Regulation (EU) No 582/2011," *Official Journal of the European Union* L 349 (December 12, 2017), http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:L:2017:349:TOC.

For the CO_2 standards, regulated vehicle groups are divided in sub-groups to account for the different use profiles, such as urban, regional, or long-haul. The sub-group segmentation is based on the cabin type and engine power, as summarized in Table 2.

Table 2. Vehicle sub-groups for the purpose of CO_2 standards.

Group description	Vehicle group	Vehicle sub-group[a]	Cabin type	Engine power	MPW[b]
Rigid, 4x2 axle, GVW > 16 t	4	4-UD	All	< 170 kW	0.099
		4-RD	Day cab	≥ 170 kW	0.154
			Sleeper cab	≥ 170 kW and < 265 kW	
		4-LH	Sleeper cab	≥ 265 kW	0.453
Tractor, 4x2 axle, GVW > 16 t	5	5-RD	Day cab	All	0.498
			Sleeper cab	< 265 kW	
		5-LH	Sleeper cab	≥ 265 kW	1.000
Rigid, 6x2 axle	9	9-RD	Day cab	All	0.286
		9-LH	Sleeper cab		0.901
Tractor, 6x2 axle	10	10-RD	Day cab	All	0.434
		10-LH	Sleeper cab		0.922

a: UD: Urban Delivery. RD: Regional Delivery. LH: Long-haul
b: MPW: Mileage and payload weighting factor.

Vehicles not used for the delivery of goods, referred to as vocational vehicles, are excluded from the scope of the CO_2 standards. However, neither the CO_2 certification regulation nor the CO_2 standards provide technical criteria to categorize vocational vehicles. As part of the passed amendments, the Commission must now develop a procedure for identifying vehicles that are certified as vocational but are not registered as such.

METRIC

The CO_2 standards follow a tank-to-wheel approach, addressing only the tailpipe CO_2 emissions of the regulated vehicle groups. For each manufacturer, the CO_2 emissions are regulated on a fleet-wide basis through a metric dubbed *average specific CO_2 emissions,* expressed in gCO_2/t-km. The approach for calculating the average specific CO_2 emissions of a manufacturer is shown in Figure 1. Further details on this can be found in a related policy update[5] describing the Commission's original proposal.

5 Rodríguez, *The European Commission's Proposed CO_2 Standards for Heavy-Duty Vehicles*

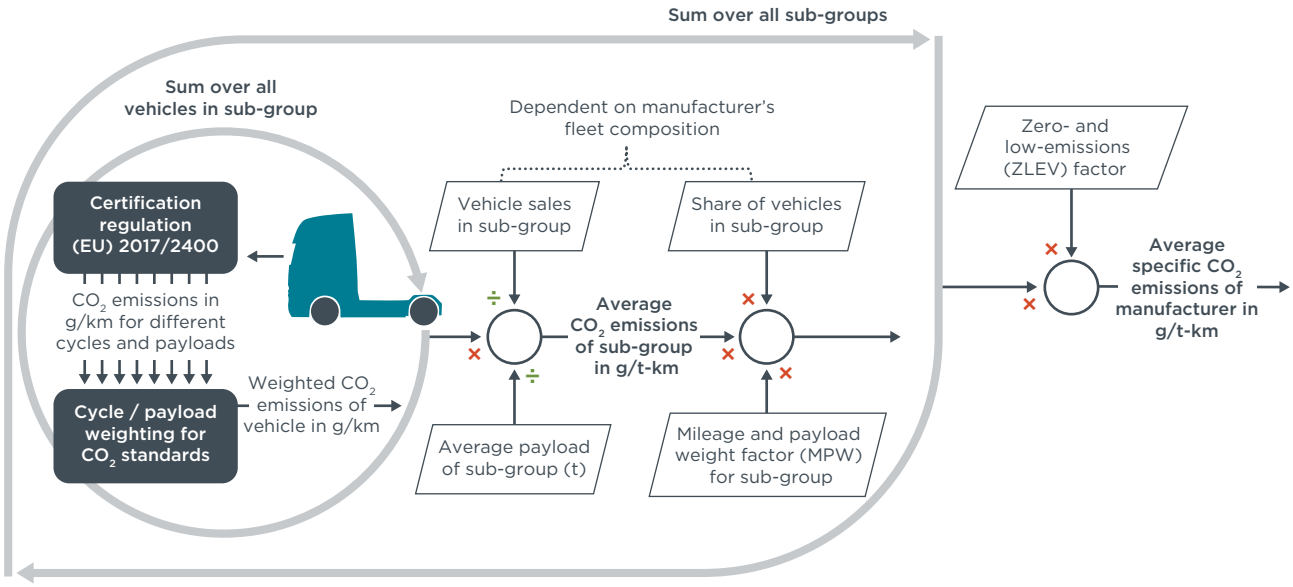

Figure 1. Calculation of the average specific CO_2 emissions of a manufacturer in a given year.

An important detail of the calculation approach is the use of mileage and payload weighting factors (MPWs). The MPWs are used to reflect the difference in freight activity between the vehicle sub-groups. The numerical values of the MPWs can be found in Table 2.

BASELINE

The CO_2 standards mandate relative fleet-averaged reductions against a fixed baseline, which is common to all manufacturers. The baseline emissions are defined for each vehicle sub-group based on data resulting from the monitoring and reporting regulation[6] from July 1, 2019 to June 30, 2020. Compared to the original proposal by the Commission, the baselining period is shifted six months to take into account that only vehicles produced after January 1, 2019 or registered after July 1, 2019[7] must be certified under the CO_2 certification regulation[8] (see Table 1).

TARGETS AND IMPLEMENTATION TIMELINE

The standard implementation timeline is divided in two periods with different stringencies:

- For the reporting periods from 2025 to 2029: A relative reduction of 15% from the baseline.
- For the reporting periods from 2030 onwards: A relative reduction of 30% from the baseline. The reduction target from 2030 onwards will be subject to review in 2022.

For a given year, the reporting period includes vehicles registered from July 1 of the given year to June 30 of the next year.

Compared to the Commission's original proposal, the language of the 2030 reduction target changed during negotiation. In the originally proposed text, the

6 European Union, "Regulation (EU) 2018/956 of the European Parliament and of the Council of 28 June 2018."

7 That is, vehicles produced before January 1, 2019 and registered before July 1, 2019 do not need to be certified for CO_2 emissions. This phase-in provision would have reduced the number of vehicles in the baselining period.

8 European Commission, "Regulation (EU) 2017/2400 of 12 December 2017."

2022 review could have only resulted in a higher stringency. The negotiated deal opens the possibility for reducing the ambition level for 2030.

For a given year, the emissions targets are specific to each manufacturer and are dependent on the composition of the manufacturer's fleet and on the baseline CO_2 emissions of each vehicle sub-group. Further details on the calculation of a manufacturer's CO_2 target can be found in a related policy update[9] describing the original proposal by the Commission.

INCENTIVES FOR ZERO- AND LOW-EMISSION VEHICLES

One of the most contentious topics in the negotiations were the incentives for accelerating the development and deployment of zero- and low-emission heavy-duty vehicles (ZEVs and LEVs). While the Commission proposed a super-credit system, Parliament's position included a sales benchmark of 5% in 2025 and 20% in 2030. Manufacturer's surpassing the benchmark would have been rewarded with a more lenient CO_2 reduction target. Conversely, a more stringent CO_2 target would apply if the benchmark were not met. In its position, Council supported the Commission's super-credit system; however, it proposed provisions to facilitate the development of a benchmark system in the future.

The final tripartite agreement is a combination of both systems. From 2019 to 2024, the super-credit scheme proposed by the Commission is maintained. From 2025 onwards, a bonus-only benchmark applies; that is, failing to meet the sales threshold has no negative consequences. The benchmark is set at 2%. The incentives are implemented via the ZLEV factor, which multiplies the average CO_2 emissions of a manufacturer (see Figure 1). The calculation of the ZLEV factor during the super-credit and benchmark phases is detailed below. The ZLEV factor is capped at a minimum of 0.97. That is, the ZLEV incentives can only reduce the average emissions of a manufacturer by a maximum of 3%.

Contrary to the Commission's original proposal, the final incentives for ZLEVs are limited to vehicles in category N; that is, buses are excluded. In the regulated categories, both ZEVs and LEVs count towards the incentives. In the unregulated truck categories, only ZEVs are part of the incentive's scope (see Table 1).

The definition of LEVs in the final deal differs from the Commission's proposal. The Commission proposed a fixed CO_2 emissions threshold of 350 gCO_2/km, below which a truck would be categorized as LEV. In the final regulation, the LEV threshold depends on the vehicle sub-group to which the truck belongs, and the respective baseline CO_2 emissions. A truck would be categorized as LEV if its CO_2 emissions are less than half of the baseline CO_2 emissions of the respective sub-group. Effectively, the final deal relaxed the LEV requirements.[10]

Super-credits phase (2019 – 2024)

In the super-credits phase, ZLEVs are counted as more than one vehicle in the calculation of the average CO_2 emissions of a manufacturer. ZEVs, which are certified with 0 gCO_2/km, are double counted in the averaging set. LEVs are counted as up to 2 vehicles, depending on their CO_2 emissions. For example, as shown in Figure 2, a LEV with CO_2 emissions 75% lower than the sub-group's baseline would count as 1.5 vehicles.

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9 Rodríguez, *The European Commission's Proposed CO_2 Standards for Heavy-Duty Vehicles*

10 According to ICCT estimates, the baseline CO_2 emissions of the different sub-groups will range between 700 gCO_2/km to 1100 gCO_2/km. Therefore, depending on the sub-group, the maximum CO_2 emissions of LEVs will range between 350 gCO_2/km and 550 gCO_2/km.

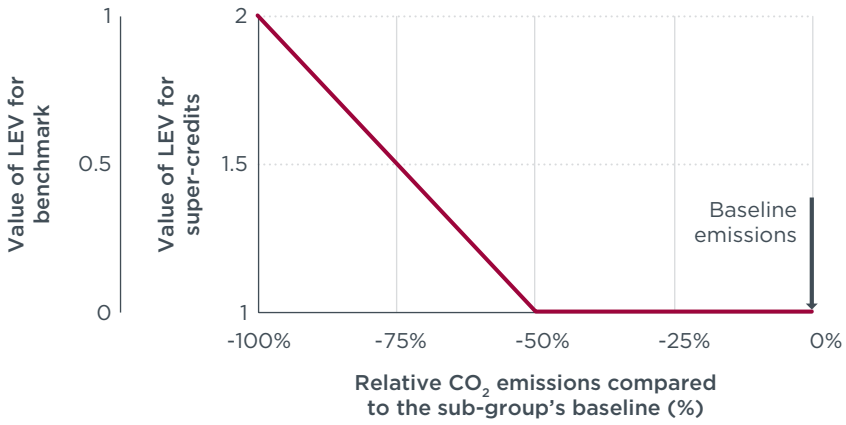

Figure 2. Super-credit multiplier as a function of tailpipe CO_2 emissions.

The calculation of the ZLEV factor in the super-credits phase depends on the share of ZLEVs in a manufacturer's fleet and on the applicable super-credit multiplier for each ZLEV. For a given manufacturer, the ZLEV factor is defined as:

$$\text{ZLEV factor} = \frac{V}{V_{conv} + ZLEV_{in} + ZEV_{out}}$$

Where V is the total number of regulated HDVs, V_{conv} is the total number of regulated HDVs with conventional powertrains, $ZLEV_{in}$ is the resulting number of ZLEV vehicles within the regulated groups after accounting for super-credits, and ZEV_{out} is the resulting number of ZEV vehicles outside of the regulated groups multiplied by 2.

Since the ZLEV factor multiplies the complete average CO_2 emissions of a manufacturer, all ZLEVs are treated equally regardless of their freight activity (MPW) or sales share (see Figure 1). As a result, smaller, easier to electrify trucks, outside of the regulated categories, would receive higher incentives.[11]

ZLEV super-credits can only reduce the average CO_2 emissions of a manufacturer by a maximum of 3%. The contribution of ZEVs outside of the regulated categories is capped at 1.5%, or up to half of the total ZLEV incentives.

Benchmark phase (2025 onwards)

In the benchmark phase, manufacturers are only rewarded by the sale of ZLEVs after a sales benchmark of 2% has been met. If the benchmark is not achieved, there are no negative consequences. ZEVs of both regulated and unregulated truck categories, and LEVs from regulated categories are accounted in the ZLEV sales share of a manufacturer. LEVs are counted between 0 and 1, depending on their CO_2 emissions. For example, a LEV with CO_2 emissions 75% lower than the sub-group's baseline would count as 0.5 in the ZLEV sales share calculation (see Figure 2). The calculation of the ZLEV factor in the benchmark phase is defined as:

$$\text{ZLEV factor} = 1 - (ZLEV_{\text{sales share}} - 2\%)$$

The ZLEV factor is capped at a minimum of 0.97. That is, if a manufacturer's ZLEV sales share is higher than 5%, the CO_2 targets are only relaxed by a maximum of 3%. To ensure a minimum contribution of ZLEVs inside of the regulated categories,

11 Felipe Rodríguez, "Fixing the Broken Super Credits Scheme of the Proposed HDV CO_2 Standards," *ICCT Staff Blog* (blog), December 3, 2018, https://www.theicct.org/blog/staff/fixing-broken-super-credits-scheme-proposed-hdv-co2-standards.

a minimum ZLEV sales share from the regulated segments of 0.75% is required to benefit from the incentives. Otherwise, the ZLEV factor is set to 1, regardless of the number of ZEVs sold outside of the regulated categories.

COMPLIANCE FLEXIBILITIES

Manufacturers must demonstrate compliance on a fleetwide basis. This provides the flexibility to sell high CO_2 emitters as long as their emissions can be offset by the sales of more efficient vehicles. An additional compliance flexibility is offered in the banking and borrowing scheme in which manufacturers are allowed to accumulate CO_2 emissions credits and debts during specific periods of time. The credit/debt accounting, expressed in gCO_2/t-km, is proportional to the number of vehicle registrations under the scope of the regulation produced by the manufacturer. Credits and debts are not transferable between manufacturers.

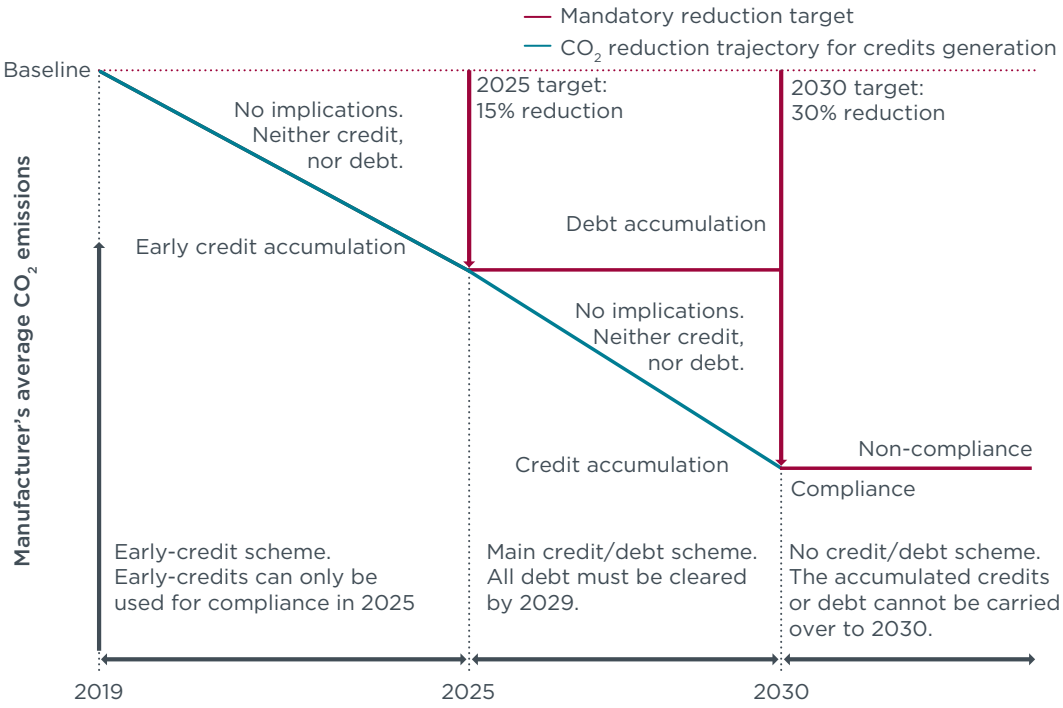

Figure 3. Illustration of the credit/debts scheme for compliance flexibility

The banking and borrowing scheme is illustrated in Figure 3. Starting in 2019 and through 2024, manufacturers are allowed to accumulate early-credits before the introduction of the first mandatory reduction step in 2025. These early-credits are generated once the manufacturer's average CO_2 emissions are below the *CO_2 reduction trajectory* depicted by the blue line in Figure 3. The CO_2 reduction trajectory is defined as a linear function between the baseline CO_2 emissions and the 2025 emissions target. The early-credits accumulated between 2019 and 2024 can only be used for compliance in 2025, and are not valid thereafter. There are no implications if a manufacturer's average CO_2 emissions are above the CO_2 reduction trajectory during this period, meaning no debt is accumulated.

From 2025 to 2029, manufacturers can generate credits if the manufacturer's average CO_2 emissions are below the linear CO_2 reduction trajectory between the 2025 and 2030 emissions targets. During this period, manufacturers accumulate debt if their average CO_2 emissions are above the respective CO_2 target (depicted by the red continuous lines in Figure 3). If the average emissions of a manufacturer lie between the mandatory target and the CO_2 reduction trajectory neither credits

nor debts are generated. Emissions credits can only be used for compliance up to 2029 and any emission debts must be resolved by then. In any case, emissions credits and debts cannot be carried over for 2030.

From 2025 to 2029, the total debt cannot be higher than 5% of the product between a manufacturer's target and the number of vehicles.[12] If the accumulated debt exceeds this threshold, the manufacturer is required to pay a per-vehicle penalty of EUR 4,250 for each gCO_2/t-km of excess emissions. Compared to the Commission's original proposal, the penalty in the final agreement was reduced by 37.5%, or EUR 2,550 per gCO_2/t-km, in this period.

Compliance with the target in 2030 and thereafter is evaluated each year without the application of past credits or accumulated debt. Excess CO_2 emissions above the target would result in immediate financial penalties. From 2030 onwards, the penalty was maintained at the originally proposed level of EUR 6,800 per-vehicle for each gCO_2/t-km of excess emissions. However, extending the credit/debt scheme to the post-2030 period, and of the respective financial penalty, will be reassessed in the 2022 review of the regulation.

OTHER POLICY ELEMENTS

Additional policy elements were introduced or strengthened during negotiations that indirectly impact the stringency and environmental benefits of the CO_2 reduction targets.

Verification of the baseline data

The CO_2 reduction targets are defined relative to a fixed baseline. For each regulated category, the numerical value of the baseline will be determined from the data reported by manufacturers under the monitoring and reporting regulation for the period from July 1, 2019 to June 30, 2020.

Using data from the monitoring and reporting regulation as the baseline creates some challenges, as it allows manufacturers to directly influence the baseline through their product portfolios. Furthermore, because 2019 would be the first year for which official data on the CO_2 emissions of HDVs would be publicly available, it will not be possible to assess whether the CO_2 emissions of the baselining period are statistically coherent with historical data.

To address these challenges, and to ensure the robustness and representativeness of the baseline CO_2 emissions, the Commission must develop a validation methodology to determine whether the CO_2 emissions used for determining the baseline have been unduly increased and, if so, how to correct them. The corrected baseline CO_2 must be made public by April 30, 2022.

Real-world CO_2 emissions and energy consumption

Compared to the proposal, the final regulatory text contains additional provisions detailing an approach to monitor and assess the real-world representativeness of the CO_2 certification procedure. The HDV CO_2 standards contain amendments to

12 The accounting of credits, debts, and excess emissions is performed with the same metric as the targets, gCO_2/t-km. Nevertheless, the credits, debts, and excess emissions take into account the number of new vehicles. For example, if a manufacturer, with a regulated fleet size of 10,000 vehicles, exceeds the target by 1 gCO_2/t-km, then it would accumulate have a debt of 10,000 gCO_2/t-km.

the HDV type approval regulation[13] and mandate the introduction of on-board fuel consumption and payload meters.

The technical requirements for the on-board fuel consumption and payload meters must be developed by the Commission by end of 2021. For electrified HDVs, the energy consumed and the distance travelled distributed over the different driving modes (i.e., charge sustaining or charge depleting) must also be collected by on-board meters. The methodology for the transfer of on-board data to the Commission has not been determined. It may include reporting by the manufacturer or the national type-approval authority, as well as direct data transfer from the vehicles.

Once the technical requirements for on-board meters have been defined, the Commissions must assess how to use the data to monitor the deviation between real and certified CO_2 emissions. The deadline to develop this methodology is 2 years and 5 months after the technical requirements for the on-board meters have been finalized, that is by mid-2024 at the latest. To prevent an increase in the CO_2 emissions gap, the Commission must evaluate, by 2027, the introduction of a mechanism to adjust the manufacturer's average CO_2 emissions for 2030.

In-service verification of CO_2 emissions

Type-approval authorities will be responsible for verifying that the certified CO_2 emission recorded in the conformity certificates correspond to those measured during in-service verification tests. The on-road verification test measures the wheel torque, engine speed and fuel consumption of the HDV, and compares the measurements to the CO_2 emissions calculated by the simulation tool. To pass the test, the measured CO_2 emissions can be up to 7.5% higher than the simulated values. The test was introduced in 2019 as an amendment[14] to the CO_2 certification regulation.[15]

Furthermore, type-approval authorities must also verify, using data from on-board meters among others, that there are no strategies to artificially improve the vehicle's performance during the CO_2 certification procedure; the methodology to do so is yet to be defined.

Review clause

The final regulation establishes that, by the end of 2022, the Commission must submit a report on the effectiveness of the CO_2 standards and assess several aspects that were proposed in the negotiation phase but were left out of the final text. Such a review clause already existed in the original Commission's proposal; however, several new elements were added in the final deal. The 2022 review will assess in particular the following points:

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13 Parliament and Council of the European Union, "Regulation (EC) No 595/2009 of the European Parliament and of the Council of 18 June 2009 on Type-Approval of Motor Vehicles and Engines with Respect to Emissions from Heavy Duty Vehicles (Euro VI) and on Access to Vehicle Repair and Maintenance Information and Amending Regulation (EC) No 715/2007 and Directive 2007/46/EC and Repealing Directives 80/1269/EEC, 2005/55/EC and 2005/78/EC (Text with EEA Relevance)," *Official Journal of the European Union* L 188 (July 18, 2009), http://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A32009R0595.

14 European Commission, "Commission Regulation (EU) 2019/318 of 19 February 2019 Amending Regulation (EU) 2017/2400 and Directive 2007/46/EC of the European Parliament and of the Council as Regards the Determination of the CO_2 Emissions and Fuel Consumption of Heavy-Duty Vehicles (Text with EEA Relevance.)," *Official Journal of the European Union* L 58 (February 19, 2019), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32019R0318.

15 European Commission, "Regulation (EU) 2017/2400 of 12 December 2017."

- The appropriateness of the CO_2 reduction target for 2030 and whether it should remain at 30% or be modified. The 2030 target must be assessed in accordance with the European Union commitments under the Paris Agreement.
- The level of the ZLEV benchmark for 2030 and whether it should remain at 2% or be modified.
- The introduction of binding reduction targets for 2035 and for 2040 onwards.
- The setting of CO_2 reduction targets for other vehicle types including trailers, buses and coaches, and vocational vehicles.
- The possibility of introducing engine CO_2 standards, in particular for vocational vehicles.
- The appropriateness of extending the credit/debt system from 2030 onwards and the corresponding financial penalties for excess CO_2 emissions.
- The possibility of differentiating ZLEVs by their zero-emission driving range and by their freight activity (MPW factors).
- The possibility of developing a methodology to account for the use of synthetic and advanced alternative liquid and gaseous renewable fuels that meet the sustainability criteria set by the RED II directive.[16]
- The feasibility of introducing an open, transparent, and non-discriminatory system to allow manufacturers to group and jointly meet the CO_2 targets (pooling).
- The development of a methodology for the assessment of the full life-cycle CO_2 emissions of HDVs.
- The assessment of the build-out of the necessary recharging and refueling infrastructure.

Publication of manufacturers' performance

As originally proposed, the following performance data for each manufacturer will be made publicly available by the Commission.

- Baseline CO_2 emissions for each sub-group (common to all manufacturers)
- CO_2 emissions target
- Average CO_2 emissions
- ZLEV factor
- The CO_2 reduction trajectory, emission credits, emission debts, and excess emissions.

The first report must be published by April 30, 2021.

16 Parliament and Council of the European Union, "Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the Promotion of the Use of Energy from Renewable Sources (Text with EEA Relevance.)," *Official Journal of the European Union* L 328 (December 11, 2018), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.328.01.0082.01.ENG.

SUMMARY OF REGULATION

The key elements of the regulatory design of the HDV CO_2 standards are summarized in Table 3.

Table 3. Summary of key elements of the HDV CO_2 standards for the EU.

Policy option	Key elements
Scope	• The regulation applies to vehicles belonging to groups 4, 5, 9, and 10 as defined in the certification regulation (see Table 1). • Vehicles that are not intended for the delivery of goods are deemed to be *vocational vehicles* and are exempted from the regulation.
Metric	• The average CO_2 emissions are measured in grams of CO_2 per tonne-kilometer (gCO_2/t-km). • Compliance is determined by comparing a manufacturer's average CO_2 emissions against the manufacturer-specific CO_2 targets. • The manufacturer's average CO_2 emissions depend on the CO_2 emissions of each new HDV, the registration share in each sub-group, and the ZLEV factor.
Baseline	• For each vehicle sub-group, the baseline CO_2 emissions are determined based on the monitored and reported data from July 1, 2019 to June 30, 2020. The baseline emissions of each sub-group are common to all manufacturers.
Targets and timeline	• The CO_2 reduction targets are set relative to the fixed baseline. • For the reporting periods from 2025 to 2029, a reduction of 15% relative to the baseline is mandated. • For the reporting periods from 2030 onwards, a reduction of 30% relative to the baseline is mandated. This reduction target can be reviewed by 2022. • The numerical value of the resulting targets, in gCO_2/t-km, is specific to each manufacturer and is dependent on its fleet composition.
ZLEV incentives	• ZEVs are certified with 0 gCO_2/km. LEVs are defined as those emitting less than half the baseline emissions of the respective subgroup. • From 2019 to 2024, a super-credit scheme is in place. • From 2025 onwards, a ZLEV benchmark applies. • ZEVs of category N, which excludes buses, in vehicle groups outside of the scope of the CO_2 standards can count for the ZLEV incentives. • Total ZLEV incentives can only reduce the average emissions of a manufacturer by a maximum of 3%.
Flexibilities and penalties	• The credits are calculated against a linear trajectory between the baseline and the reduction targets. Debt is calculated against the mandatory target. • From 2019 to 2024, manufacturers can accumulate early-credits that can only be used for compliance in 2025. • In the period 2025 to 2029, manufacturers are allowed to accumulate credits and debt. Emissions debts must be cleared by 2029. Emissions credits cannot be carried over for compliance from 2030 onwards. • At any given time, the total debt of a manufacturer cannot be higher than 5% its 2025 target multiplied by the respective number of vehicles. • Credits and debts are not transferable between manufacturers. • Manufacturers are required to pay a per-vehicle penalty of EUR 4,250 for each gCO_2/t-km of excess emissions in the period 2025-2029, and of EUR 6,800 per gCO_2/t-km from 2030 onwards.

INTERNATIONAL PERSPECTIVE

With this landmark regulation, the European Union will become the sixth major market to regulate tailpipe CO_2 emissions or fuel consumption from trucks. The United States, Canada, China, Japan and India already have HDV CO_2 emissions or fuel consumption standards in place.

Japan[17] established the first mandatory fuel-efficiency standards for HDVs in 2006, targeting CO_2 emissions reductions of 1.2% per year. A second stage, finalized in 2017, incorporates additional technologies such as aerodynamics and tires, and targets 13%-14% reductions on average for trucks and buses and 3.7% for tractors.

China[18] has issued three stages of progressively more stringent fuel-consumption standards. The first stage was implemented in 2012 and covers three segments—tractors, straight trucks, and coach buses. The second stage went into effect in 2014, incorporated city buses and dump trucks, and tightened the limits by up to 14.5%. The Stage 3 standards tighten fuel-consumption limits by an additional 12.5%-15.9% and will begin to take effect in July 2019.

The U.S. Phase 1 and Phase 2[19] greenhouse gas (GHG) standards for HDVs incorporate a large set of technologies and include separate standards for engines and trailers. The highest fuel-consuming segment, tractor-trailers, will see reductions of approximately 50% in 2027 with respect to the Phase 1 baseline. Canada's[20] GHG standards for HDVs closely align with the U.S. national standards.

In 2017, India[21] finalized its first fuel-efficiency standards for commercial HDVs. Phase 1 goes into effect in 2018, and Phase 2, in 2021. The target reductions are about 11% on average.

Figure 4[22] shows the relative stringency of the different tractor-trailer efficiency standards with respect to the baseline defined when the standards were introduced.

17 Ben Sharpe, *Second-phase fuel economy standards for on-road heavy-duty vehicles in Japan* (ICCT: Washington, DC, 2019), https://www.theicct.org/publications/second-phase-fuel-economy-standards-road-heavy-duty-vehicles-japan.

18 Oscar Delgado, *Stage 3 China fuel consumption standard for commercial heavy-duty vehicles* (ICCT: Washington, DC, 2016), http://www.theicct.org/publications/stage-3-china-fuel-consumption-standard-commercial-heavy-duty-vehicles.

19 Ben Sharpe et al., *United States efficiency and greenhouse gas emission regulations for model year 2018-2027 heavy-duty vehicles, engines, and trailers* (ICCT: Washington, DC, 2016), http://www.theicct.org/US-phase2-HDV-efficiency-GHG-regulations-FRM.

20 Ben Sharpe, *Final second-phase greenhouse gas emissions standards for heavy-duty engines and vehicles in Canada* (ICCT: Washington, DC, 2018), https://www.theicct.org/publications/second-ghg-standards-hdv-Canada.

21 Mehul Garg and Ben Sharpe, *Fuel Consumption Standards for Heavy-Duty Vehicles in India* (ICCT: Washington, DC, 2017), https://www.theicct.org/publications/fuel-consumption-stds-hdvs-india-update-201712.

22 The figure attempts to show the efficiency targets around the world in a single diagram by relating the reduction requirements to a fixed baseline. Note, however, that the technology baselines, testing methodologies, test cycles, allowed payloads, and evaluated metrics are country-specific. The figure is presented for illustrative purposes and does not capture all the underlying details that are common or different across regions.

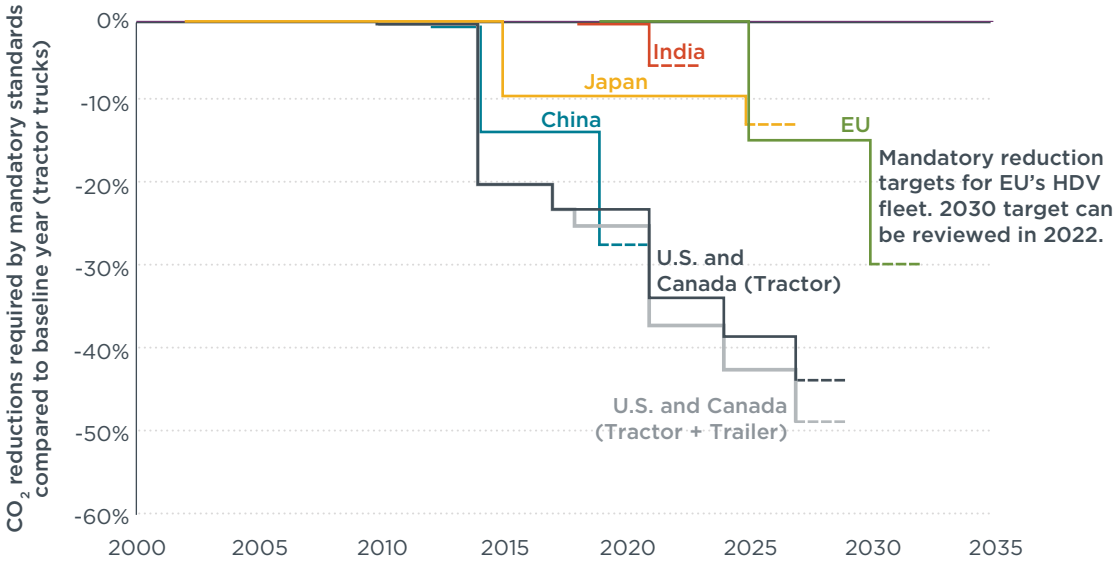

Figure 4. Tractor-truck standards around the world relative to the baseline in the first phase of the standards.

NEXT STEPS

The regulation must still be formally adopted by the European Parliament and the European Council. This final step is regarded as a formality, and no further modifications or delays are anticipated.

The agreement is scheduled to go through a plenary vote in Parliament in April 17, 2019, followed by Council's formal adoption, which is likely to take during the Environment Council meeting in June 26, 2019. The regulation would then be published in the Official Journal of the European Union in the second half of 2019.