

POLICY UPDATE

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CO₂ emission standards for new passenger cars and vans in the European Union

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On March 28, 2023, the European Union adopted a ground-breaking amendment to the EU light-duty vehicles (LDV) CO₂ standards. With this amendment, **the EU will be the first major region worldwide to introduce a 100% CO₂ emission reduction target for all cars and vans newly registered from 2035 onwards** (Figure 1). In addition, the current CO₂ reduction target for 2030 was strengthened to -55% for cars and -50% for vans, compared to a 2021 baseline. Like the current regulation, it will apply to the member states of the European Economic Area (EEA), which includes the 27 EU member states and, pending adoption by the EEA Joint Committee, to the EEA European Free Trade Association (EFTA) states.¹

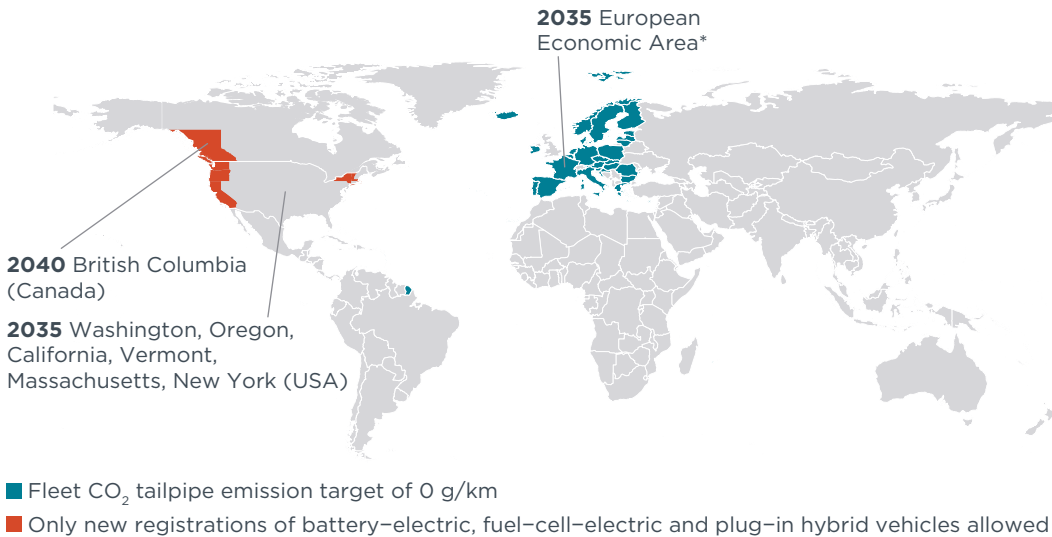


Figure 1. Regions worldwide having binding targets for 100% zero or near-zero tailpipe CO₂-emission light-duty vehicle fleets.

**Pending adoption by EEA European Free Trade Association member states Iceland, Liechtenstein and Norway.*

¹ The EEA European Free Trade Association states are Iceland, Liechtenstein, and Norway. The current CO₂ standards are not applied in Liechtenstein.

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POLICY BACKGROUND

The adopted amendment, hereafter referred to as the new regulation, is part of the European Commission's Fit-for-55 package, a series of regulations intended to reduce the EU greenhouse gas emissions by at least 55% in 2030, compared to 1990 levels. This is to ensure that the EU is on its path for achieving climate neutrality by 2050, as required by the European Climate Law.

The existing light-duty vehicles CO₂ emission performance standards, (EU) 2019/631, hereafter referred to as the current regulation, sets binding CO₂ reduction targets for 2025 and 2030. The proposal for revising and amending the current regulation was presented by the European Commission on July 14, 2021.² In June 2022, the European Parliament and the Council of the European Union concluded drafting amendments to the proposal for the subsequent Parliament-Council negotiations, also known as the Trilogue.

An agreement between the two legislative institutions was reached on October 27, 2022, and a confirmation letter from the Council to the Parliament was subsequently sent on November 16, 2022. On this basis, the regulation text was formally adopted by the Parliament on February 14, 2023. A vote by the Council, the final step in the legislative procedure, was scheduled for March 7, 2023, should have only been a formality.

However, shortly before the scheduled vote, Germany, the EU's largest member state, threatened to turn down the regulation, despite having signed off on the Trilogue agreement. The purpose of Germany's withdrawal was to force the Commission to take action on a non-binding recital concerning the use of CO₂ neutral fuels in combustion engine vehicles after 2035.

To avoid a rejection of the proposal and, thereby, a reopening of the file, the Council presidency canceled the scheduled vote. After the Commission committed to developing a solution for enabling the registration of vehicles running on CO₂-neutral fuels, **the new regulation was adopted by the Council on March 28, 2023.**

This briefing paper analyzes and summarizes new elements and changes introduced by the Fit-for-55 CO₂ standards regulation for cars and vans.

CO₂ REDUCTION TARGETS FOR CARS AND VANS

The new regulation sets more ambitious fleet average CO₂ emission targets for new passenger cars and vans for 2030 and requires zero tailpipe CO₂ emissions by 2035.

PASSENGER CARS (CATEGORY M1 VEHICLES)

Compared to the current regulation, **the 2030 reduction target for new cars was strengthened from -37.5% to -55%, relative to a 2021 baseline. For 2035, a 100% reduction target was introduced.** The 2025 target in the current regulation of -15% was not further strengthened, and no annual or intermediate targets between 2025 and 2030 were introduced.

² European Commission, "COM/2021/556 Final, Proposal for a Regulation of the European Parliament and of the Council Amending Regulation (EU) 2019/631 as Regards Strengthening the CO₂ Emission Performance Standards for New Passenger Cars and New Light Commercial Vehicles in Line with the Union's Increased Climate Ambition," July 2021, <https://op.europa.eu/en/publication-detail/-/publication/870b365e-eecc-11eb-a71c-01aa75ed71a1/language-en/format-PDF/source-221684139>; European Commission, "Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 Setting CO₂ Emission Performance Standards for New Passenger Cars and for New Light Commercial Vehicles, and Repealing Regulations (EC) No 443/2009 and (EU) No 510/2011 (Text with EEA Relevance)," Pub. L. No. 32019R0631, 111 OJ L 13 (2019), <http://data.europa.eu/eli/reg/2019/631/oj/eng>.

The procedure to translate percentage reduction targets to absolute fleet target values remains unchanged. The transition from the old type-approval procedure based on the New European Drive Cycle (NEDC) to the Worldwide harmonized Light vehicles Test Procedure (WLTP) required the translation of the 2020 NEDC CO₂ target of 95 g/km into an equivalent WLTP target for 2021. The conversion was based on the ratio of measured WLTP to declared NEDC CO₂ emissions in 2020, which resulted in a 2021 baseline of about 110 g CO₂/km, pending final verification.³ Applying the percentage reduction targets therefore results in **absolute CO₂ targets for passenger cars of about 93 g/km in 2025 and 49 g/km in 2030**, as shown in Figure 2.

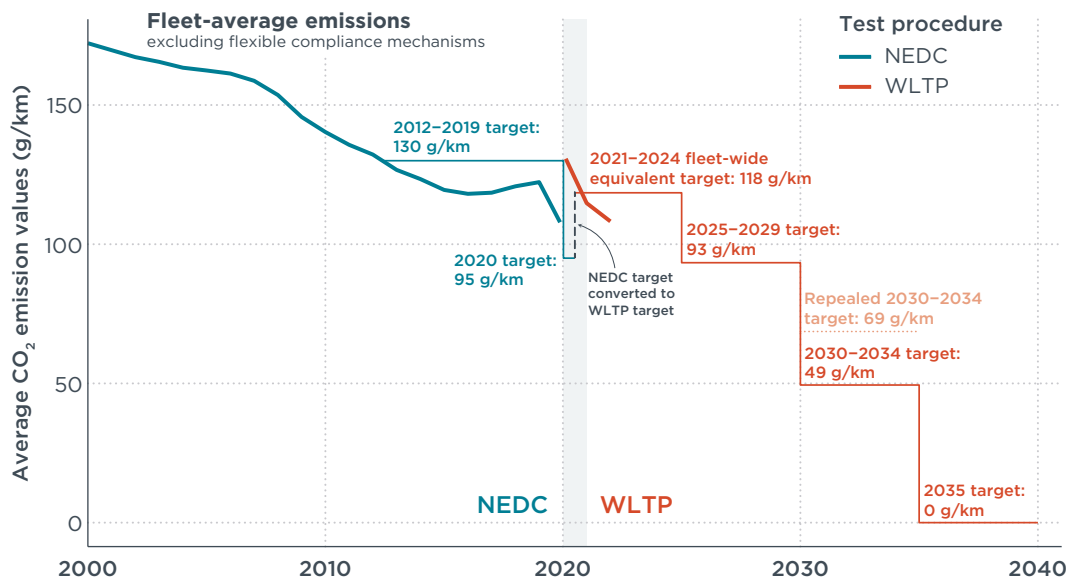


Figure 2. Fleet CO₂ targets and historic fleet average CO₂ emissions of new passenger cars (category M1 vehicles). The fleet average CO₂ emissions are shown without considering flexible compliance mechanisms manufacturers can use when their fleet exceeds the target value. The equivalent 2021-2024 fleet-wide target is based on the declared and not the measured WLTP CO₂ emissions and is therefore, at 118 g/km, higher than the 2021 baseline value of 110 g/km.

VANS (LIGHT COMMERCIAL VEHICLES, CATEGORY N1)

Compared to the current regulation, **the 2030 reduction target for vans was strengthened from -31% to -50%, compared to a 2021 baseline. As for cars, a 100% reduction target for 2035 was introduced.** The 2025 reduction target of -15% remains unchanged.

Using the preliminary 2021 baseline value of about 180 g/km, **the absolute CO₂ targets equate to about 153 g/km in 2025 and 90 g/km in 2030**, as shown in Figure 3.

³ Joint Research Centre of the European Commission, "Determination of Parameters for the Definition of 2025/2030 CO₂ Emission Targets.," <https://circabc.europa.eu/ui/group/4cf23472-88e0-4a52-9dfb-544e8c4c7631/library/c2445223-7ca6-4775-8e7e-3014f87573c9/details>.

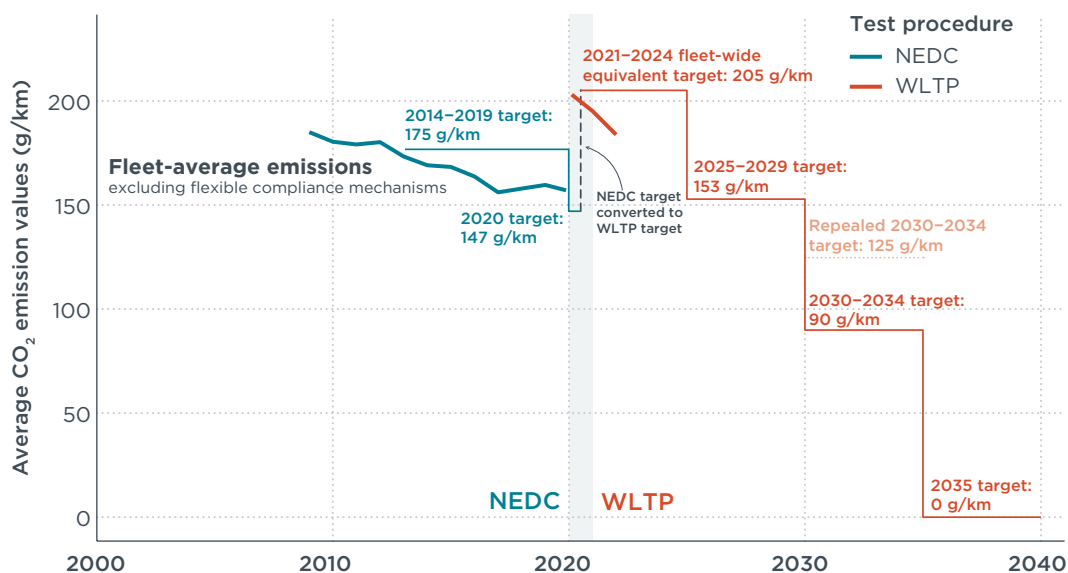


Figure 3. Fleet CO₂ targets and historic fleet average CO₂ emissions of new vans (category N1 vehicles). The fleet average CO₂ emissions are shown without considering flexible compliance mechanisms manufacturers can use when their fleet exceeds the target value. The equivalent 2021-2024 fleet wide-target for vans is based on the declared and not the measured WLTP CO₂ emissions and is therefore, at 205 g/km, higher than the 2021 baseline value of 180 g/km.

CONSIDERATION OF SYNTHETIC CO₂-NEUTRAL FUELS

The new regulation contains a non-binding recital, requesting the European Commission produce a proposal for allowing the registration of vehicles after 2035 that can operate solely on CO₂-neutral fuels, and therefore have non-zero tailpipe CO₂ emissions. The recital can be interpreted to mean that the utilization of CO₂-neutral fuels is restricted to vehicles that do not fall within the scope of the CO₂ standards, that is, special-purpose vehicles like ambulances and armored vehicles.

However, following last-minute pressure, the European Commission is now tasked with creating **a new category for vehicles running exclusively on synthetically produced CO₂-neutral fuels of non-biological origin, also referred to as electro-fuels or e-fuels**, in the EU type-approval regulation. Later in 2023, the European Commission is required to come forward with **a Delegated Act that would allow the registration of vehicles of this category, despite having non-zero tailpipe CO₂ emissions**. For this purpose, the delegated act could allow offsetting the tailpipe CO₂ emissions for the CO₂ captured in the fuel and thereby declare the vehicle's CO₂ performance as zero if no other source contributes to tailpipe CO₂ emissions. Alternately, the vehicles of this category could be exempted from the coverage of the CO₂ standards. The European Parliament and the Council of the European Union still have the possibility of intervening and rejecting the Delegated Act. At this time, it is therefore unclear whether there will be an exception for some combustion engine vehicles under the 2035 zero CO₂ emission target.

Despite potentially enabling the CO₂ neutral operation of combustion engine vehicles, **creating an exception for vehicles operating on e-fuels entails numerous disadvantages**. First, it needs to be ensured that these vehicles cannot operate on fossil fuels, or blends thereof, to avoid undermining the 2035 100% CO₂ reduction target. However, on-board sensors for detecting pure e-fuels are not yet available and their development will be challenging considering that e-fuels and their fossil equivalent have very similar properties by design. At the same time, the incentive for consumers to tamper with the sensors and inducement algorithms will be high considering the

substantially higher cost of synthetic fuels. Furthermore, over four times more electric energy is required per kilometer travelled when operating on e-fuels instead of using the energy directly in a battery electric vehicle.⁴ This reduces the amount of renewable electric energy being available for other sectors. In addition, if e-fuel production is relocated to regions outside of Europe, to reduce production cost and strain on local energy generation, new energy import dependencies are created.

INCENTIVES FOR ELECTRIC VEHICLES

In the current regulation, the sale of new passenger cars with CO₂ emissions of less than 50 g/km (NEDC) in the period 2020 to 2022 was incentivized by the super-credit flexible compliance mechanism. This mechanism allowed manufacturers to apply a multiplier on the number of vehicles with CO₂ emissions below this threshold and thus reduce their average CO₂ emissions by a total of up to 7.5 g CO₂/km over these three years.⁵

From 2025 onwards, the zero- and low-emission vehicle (ZLEV) factor mechanism, first introduced in the current CO₂ standards in 2019, will come into effect to foster the market penetration of low CO₂ emission vehicles. ZLEVs include battery electric vehicles and vehicles with CO₂ emissions of 50 g/km (WLTP) or less. The ZLEV mechanism sets a ZLEV share threshold. In each year where a manufacturer's ZLEV share exceeds the threshold, the manufacturer's CO₂ target is increased by the same number of percentage points, up to a maximum of 5 %.

In the new CO₂ standards regulation, **the ZLEV threshold for 2025–2029 was raised from 15% to 25% for cars and from 15% to 17% for vans**. This adjustment is a reaction to the fast-growing share of ZLEV_{specific} vehicles,⁶ which increased for passenger vehicles by at least 4.5 percentage points per year since 2019 and exceeded 20% in 2022, as shown in Figure 4. The second phase of the ZLEV factor mechanism from 2030 to 2034, defined in the current CO₂ standards, was removed by the new regulation. This means, **incentives for electric vehicles in the EU CO₂ standards will end in 2030**.

4 Stephanie Searle, "E-Fuels Won't Save the Internal Combustion Engine," *ICCT Staff Blog* (blog), June 23, 2020, <https://theicct.org/e-fuels-wont-save-the-internal-combustion-engine/>.

5 The super-credits multiplier was 2 in 2020, 1.67 in 2021, and 1.33 in 2022.

6 ZLEV_{specific} is the number of zero- and low-emission vehicles with CO₂ emissions of 50 g/km or less, weighted according to their CO₂ emission value. A vehicle with CO₂ emissions of 0 g/km is counted as one ZLEV_{specific} whereas a vehicle with 50 g/km is counted as 0.3 (passenger cars) and 0 (vans) ZLEV_{specific}. For vehicles between 0 and 50 g/km, the ZLEV_{specific} is determined by linear interpolation between these two values.

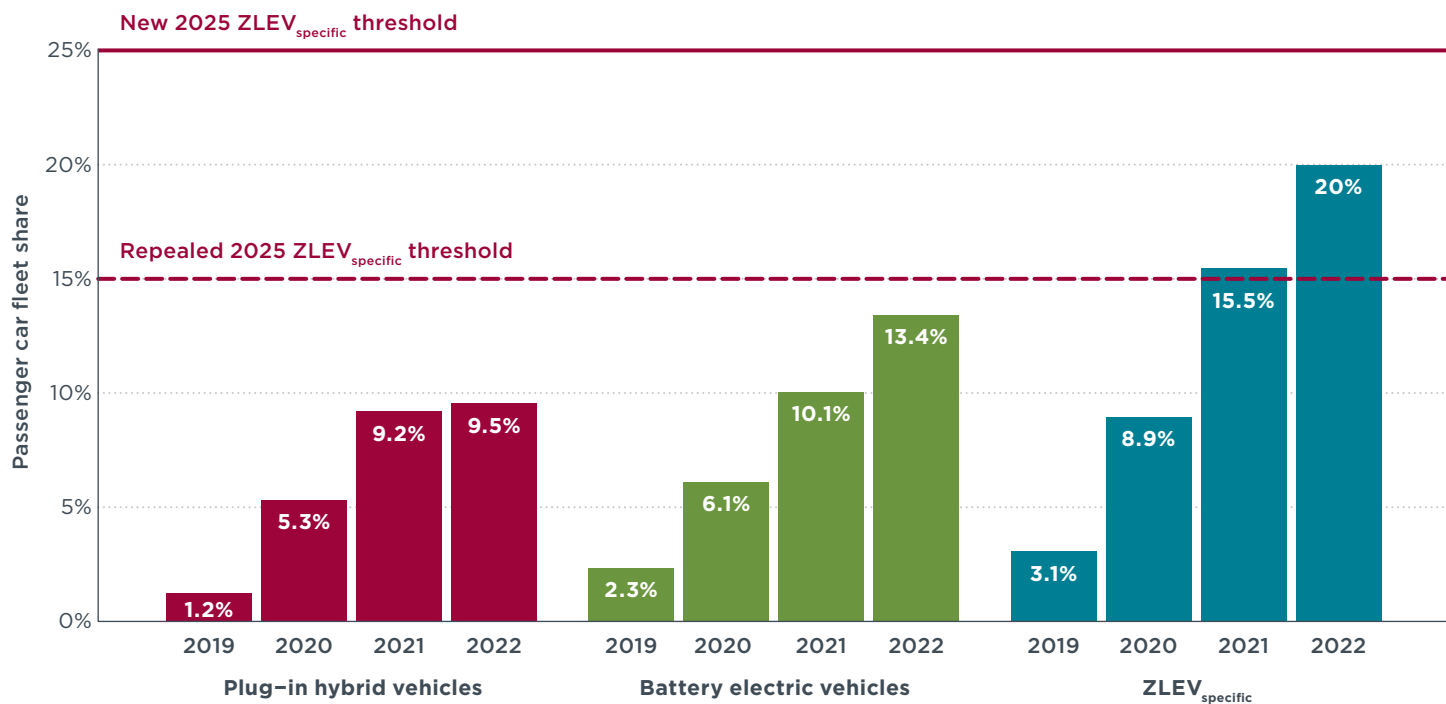


Figure 4. Evolution of the passenger car fleet share of plug-in hybrid vehicles and battery electric vehicles, and the equivalent ZLEV_{specific} share between 2019 and 2022 in the European Economic Area.

Considering the fast increase in the ZLEV_{specific} share, the ZLEV threshold of 25% is unlikely to substantially accelerate the market uptake of electric vehicles. Instead, it will likely only weaken the CO₂ reduction targets, as shown in Figure 5. While the fleet average 2025–2029 CO₂ target for passenger cars will be about 93 g/km, it will increase up to about 98 g/km when all manufacturers reach a ZLEV_{specific} share of 30%.

The CO₂ standards do not cap or define a separate target for CO₂ emissions of internal combustion engine vehicles. Therefore, **the maximum average CO₂ emissions of combustion engine vehicles for meeting the fleet average CO₂ target increases exponentially with increasing share of electric vehicles**, as shown in Figure 5 for the years 2025–2029 on the left and 2030–2034 on the right. This effect is amplified by the ZLEV credits, which allows manufacturers to put combustion engine vehicles on the market with disproportionately high CO₂ emissions.

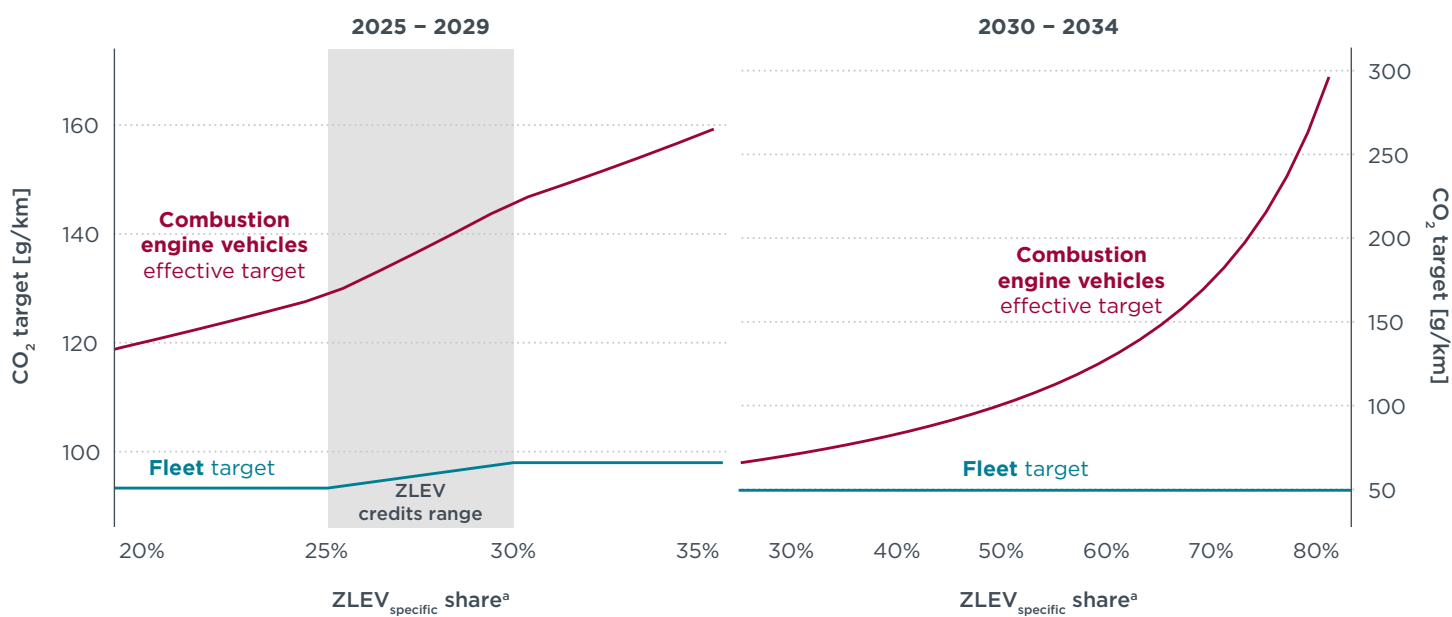


Figure 5. The effect of electric vehicle share and zero- and low emission vehicle (ZLEV) credits on passenger car fleet CO₂ targets and the resulting effective CO₂ target for the remaining combustion engine vehicles for 2025-2029 and 2030-2034. The electric vehicle share is expressed as ZLEV_{specific}, with zero CO₂ emission vehicles counted as one ZLEV_{specific} and, linearly ramping down with increasing CO₂ emission values to 0.3 ZLEV_{specific} for vehicles with 50 g CO₂/km.

^a The combustion engine vehicle target calculation assumes plug-in hybrid vehicles have average CO₂ emissions of 40 g/km and a market share of 10 % in 2025-2029 and 5 % in 2030-2034. Lower plug-in hybrid average CO₂ emissions and lower market shares would reduce the effective combustion engine vehicle targets.

DEROGATIONS FOR LOW-VOLUME MANUFACTURERS

The new CO₂ standards continue to provide derogations for niche manufacturers. Vehicle manufacturers producing between 10,000 and 300,000 vehicles per year can apply for derogations until and including 2028. Derogations for manufacturers producing less than 10,000 passenger cars or 22,000 vans per year will apply until 2035. From 2036 onwards, the 0 g CO₂/km target also applies to these low-volume manufacturers, which is one year later than for large-volume manufacturers.

Manufacturers responsible for less than 1,000 cars or 1,000 vans registered per year do not fall within the scope of the CO₂ standards and will therefore be exempted from the 0 g CO₂/km target.

MITIGATION OF A GROWING REAL-WORLD CO₂ EMISSION GAP

To monitor the real-world CO₂ emissions of the EU light-duty vehicle fleet, all new cars registered since 2021 and vans registered since 2022 are equipped with onboard fuel and energy consumption meters (OBFCM). The current CO₂ standards regulation requires the European Commission to determine annually the average gap between real-world and official type-approval CO₂ emissions, based on the OBFCM data. The current regulation also requires the European Commission to assess, by 2027, the feasibility of a mechanism that could prevent the real-world gap from growing.

The new regulation now requires the European Commission to develop such methodology as soon as sufficient OBFCM data is available, but latest by the end of 2026, including a feasibility assessment and legislative proposal. However, as with

the current regulation, the date when such real-world CO₂ gap mitigation mechanism would enter into force remains at 2030, or 7 years from now and only 5 years before the 100% reduction target.

ECO-INNOVATIONS

To promote the development of technologies that reduce real-world CO₂ emissions but are not adequately reflected in the type-approval CO₂ emissions, manufacturers can apply for eco-innovation credits. These credits apply only to vehicles that have internal combustion engines.⁷ To be considered an eco-innovation, the technology must be novel, must contribute to the vehicle's safety or performance, must not be mandated by other EU laws or measures, and, until the end of 2024, excludes air conditioning system. Furthermore, CO₂ savings from implementation of the technology must exceed a minimum threshold.⁸

Eco-innovation credits reduce the manufacturer's fleet-average CO₂ emissions. Under the current CO₂ standards, the total CO₂ savings from eco-innovation credits were capped at 7 g of CO₂/km per year.

To keep a balance between reducing CO₂ fleet-targets over time and the credits for eco-innovations on a manufacturer's CO₂ performance, **the new CO₂ standards reduce the cap to 6 g/km per year for the period 2025–2029 and to 4 g/km per year for 2030–2034.**

LIFE CYCLE ASSESSMENT

The EU CO₂ standards limit the tank-to-wheel CO₂ emissions, that is, the CO₂ emissions measured at a vehicle's tailpipe, but they do not address the total greenhouse gas emissions of a vehicle over its lifetime.

Considering the relevance of total greenhouse gas emissions in reaching the goal of climate neutrality, the new regulation introduces a life-cycle CO₂ emissions assessment in the CO₂ standards. **By the end of 2025, the European Commission will develop a life cycle assessment methodology which manufacturers can apply from January 2026 onwards to voluntarily report life-cycle CO₂ emissions to the European Commission.** This information will be considered in bi-annual status reports for analyzing the progress toward climate neutrality by 2050.

REVIEW OF THE CO₂ STANDARDS IN 2026

The new regulation requires a **review of the CO₂ standards in 2026** to analyze its effectiveness. The review will be based on a **biannual report** by the Commission prepared for the first time by the end of 2025 that broadly analyses the progress made in the transition to climate-neutral passenger cars and vans.

The review will take into account the market development of zero- and low-emission vehicles regarding energy efficiency, technological developments, and affordability for both new and second-hand vehicles. The review will also assess the progress made in the build-up of private and public charging station infrastructure. Furthermore, as a key criterion, the review will evaluate how equitable the transition occurs, how it affects the job market, and how it can be supported financially to

⁷ No eco-innovations for plug-in hybrid vehicles have been approved until now. A corresponding procedure is under development at the European Commission.

⁸ Uwe Tietge, Peter Mock, and Jan Dornoff, "Overview and Evaluation of Eco-Innovations in European Passenger Car CO₂ Standards" (Berlin: ICCT, 2018), <https://theicct.org/publication/overview-and-evaluation-of-eco-innovations-in-european-passenger-car-co2-standards/>.

counteract unfavorable developments. Additionally, the effect of measures to decarbonize the vehicle stock, the life-cycle emissions of new vehicles, and the impact of the transition on air quality will be taken into account.

Based on the review, the European Commission will assess if a revision of the 100% CO₂ reduction target for 2035 is necessary and evaluate the impact of introducing energy efficiency requirements for zero-emissions vehicles.

OTHER ELEMENTS OF THE REGULATION

Mass utility parameter. Since the first CO₂ standards were implemented in 2009, vehicle mass has been used as a utility parameter to adjust manufacturer-specific CO₂ targets. This mechanism was carried over to the current CO₂ standards and was not altered in the new regulation.

Excess emission premium. To penalize manufacturers that do not meet their emission targets, an additional premium per gram CO₂ exceedance and per vehicle registered is imposed each calendar year in which the target is not met. This mechanism was first introduced in April 2009 as part of the first EU CO₂ standards for passenger cars,⁹ was subsequently carried over to the CO₂ standards for vans, and is included in the current 2019 CO₂ standards.¹⁰ In the 2009 regulation, the excess premium was set at €95 per gram of CO₂ exceedance. The new regulation carries over this value unchanged. This means the same penalty will be applied unaltered for 26 years until the 100% CO₂ reduction target is reached in 2035.

Review of the fuel efficiency labeling directive. As part of the current CO₂ standards, the European Commission was required to review the vehicle energy efficiency labeling directive 1999/94/EC by the end of 2020 to ensure that consumers are comprehensively informed about a vehicle's fuel consumption and pollutant emissions. However, the labeling directive has not been updated since, and no label has been introduced for vans.

With the new regulation, the review of the labeling directive was rescheduled to the end of 2024 and requires that electric energy consumption is also considered. This will ensure that electric vehicles can be rated by their energy consumption and are not automatically rated as best because of not emitting CO₂ at the tailpipe. As in the current CO₂ standards, the introduction of fuel economy labels for vans should be evaluated by the Commission; however, electric energy consumption is not listed as a parameter for these vehicles.

NEXT STEPS

Having been adopted by both Council and Parliament, the new regulation (EU) 2023/851 amending the light-duty vehicle CO₂ standards will enter into force on May 15, 2023.¹¹

9 European Commission, "Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23 April 2009 Setting Emission Performance Standards for New Passenger Cars as Part of the Community's Integrated Approach to Reduce CO₂ Emissions from Light-Duty Vehicles," Pub. L. No. 32009R0443, 140 OJ L 1 (2009), <http://data.europa.eu/eli/reg/2009/443/oj>.

10 European Commission, Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 setting CO₂ emission performance standards for new passenger cars and for new light commercial vehicles, and repealing Regulations (EC) No 443/2009 and (EU) No 510/2011 (Text with EEA relevance).

11 European Commission, Regulation (EU) 2023/851 of the European Parliament and of the Council of 19 April 2023 amending Regulation (EU) 2019/631 as regards strengthening the CO₂ emission performance standards for new passenger cars and new light commercial vehicles in line with the Union's increased climate ambition (Text with EEA relevance), OJ L 110, 25.4 (2023), <https://eur-lex.europa.eu/eli/reg/2023/851/oj>.

Another important element of the Fit-for-55 package is the reduction of CO₂ emissions from heavy-duty vehicles. For this purpose, the European Commission published a legislative proposal in February 2023 to amend the heavy-duty vehicle CO₂ emission standards (EU) 2019/1242. The adoption of this regulation is expected to happen in the first half of 2024.