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

POLICY UPDATE

JULY 2022

U.S. light-duty vehicle greenhouse gas standards for model years 2023–2026 and corporate average fuel economy standards for model years 2024–2026

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INTRODUCTION

On December 30, 2021, the U.S. Environmental Protection Agency (EPA) finalized federal greenhouse gas (GHG) emissions standards for passenger cars and light trucks for model years (MY) 2023 through 2026.[1] On March 31, 2022, the U.S. Department of Transportation's National Highway Traffic Safety Administration (NHTSA) issued the final rule of the corporate average fuel economy (CAFE) standards for MYs 2024–2026 for passenger cars and light trucks.[2] These rules revise the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks that were issued by NHTSA and EPA in March 2020.[3] Although the EPA and NHTSA issued separate rules for GHG and fuel economy standards, the final rules remain coordinated. The rates of annual improvement of fleet average GHG emissions and fuel economy are different under the two rules, but the levels of stringency in the two standards are roughly the same in 2026.

STANDARDS

REGULATORY SCOPE

The EPA and NHTSA rules regulate passenger vehicles with a gross vehicle weight of up to 8,500 lb and medium-duty SUVs and passenger vans up to 10,000 lb

1 Revised 2023 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions Standards, 86 Fed, Reg. 74434 (Dec 30, 2021), https://www.govinfo.gov/content/pkg/FR-2021-12-30/pdf/2021-27854.pdf

2 National Highway Traffic Safety Administration, Corporate average fuel economy standards for MY 2024-2026 passenger cars and light trucks, Final rule, (March 31, 2022) https://www.nhtsa.gov/sites/nhtsa.gov/files/2022-04/Final-Rule-Preamble_CAFE-MY-2024-2026.pdf

3 International Council on Clean Transportation, "The safe rule is fundamentally flawed [press statement]," (March 31, 2020), https://theicct.org/the-safe-rule-is-fundamentally-flawed/

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produced for sale in the United States. These regulations set standards for GHG emissions, measured in gram per mile (g/mile) of travel, or fuel economy, measured in miles per gallon (mpg) of fuel consumed, based on the U.S. federal test procedure, which is weighted by 55% city driving and 45% highway driving. The EPA GHG emissions regulation also sets standards for nitrous oxide (N_2O) and methane (CH_4) emissions and includes additional provisions for the non-CO_2 GHG emissions of hydrofluorocarbons (HFCs) from vehicle air conditioning systems. Both EPA and NHTSA include the indirect impact of air conditioning operation on GHG emissions and fuel consumption.

Different from the previous rules that were issued jointly, NHTSA and EPA issued separate rules primarily because of the difference in statutory authority. EPA does not have the same lead-time requirements as NHTSA and is thus able to amend standards for MY 2023 in addition to MYs 2024–2026.

DESIGN

The overall designs of the GHG emission and fuel economy standards are consistent with previous standards.

- The standards are corporate average standards, which means the standards apply to the average GHG or fuel economy levels achieved by each corporation's vehicle fleet produced for sale in the United States.
- The programs each set separate standards for each model year and a manufacturer will need to comply with separate standards for passenger cars and light trucks. NHTSA also sets CAFE standards for passenger vehicles produced domestically.
- The standards set separate numerical targets according to vehicle size or "footprint" (i.e., the area defined by the wheelbase and average track width) for passenger cars and light trucks. The system uses piecewise linear functions between vehicle footprint and the test-cycle GHG emissions or fuel economy rate. The targets are sales-weighted based on each manufacturer's production to determine the overall standards that the manufacturer must meet for its passenger cars and light trucks.[4] Manufacturers with U.S. annual sales of fewer than 5,000 vehicles, called small volume manufacturers (SVMs) can petition EPA to develop their alternative standards. Similarly, manufacturers with fewer than 10,000 vehicle sales worldwide can seek exemption from NHTSA.

Table 1 summarizes the equation and parameters for defining GHG target of passenger cars and light trucks for vehicles within the minimum and maximum footprint.[5] It is a set of piecewise linear functions that gradually and continually ramp down from the MY 2022 targets established in the SAFE rule. Figure 1 and Figure 2 presents the GHG targets of passenger cars and light trucks, respectively, for each model year and footprint based on the equations from Table 1.

4 Note that manufacturers do not need to meet the footprint targets for each vehicle. Instead, the sales-weighed actual fuel consumption or GHG must meet the sales-weighted footprint targets. Also note that the standard will differ for each manufacturer based on the actual production of different size vehicles.

5 The minimum and maximum footprints are considered in the compliance target equation for each light-duty vehicle types (passenger cars and light trucks). The minimum footprints are 41 square feet for both cars and light trucks, and the maximum footprints are 56 square feet for cars and 74 square feet for light trucks for MY 2023-2026. For vehicles with footprints lower than the minimum or higher than the maximum, the CO_2 standards are level off as flat line from the minimum footprint down or maximum footprint up.

Table 1. Parameters for GHG emission targets, MYs 2023–2026

GHG emission target = min (B, max(A, C x Footprint+ D))					
		A (g/mile)	B (g/mile)	C (g/mi/ft²)	D (g/mile)
Passenger car	2023	145.6	199.1	3.56	-0.4
	2024	138.6	189.5	3.39	-0.4
	2025	130.5	179.4	3.26	-3.2
	2026	114.3	160.9	3.11	-13.1
Light truck	2023	181.1	312.1	3.97	18.4
	2024	172.1	296.5	3.77	17.4
	2025	159.3	277.4	3.58	12.5
	2026	141.8	254.4	3.41	1.9

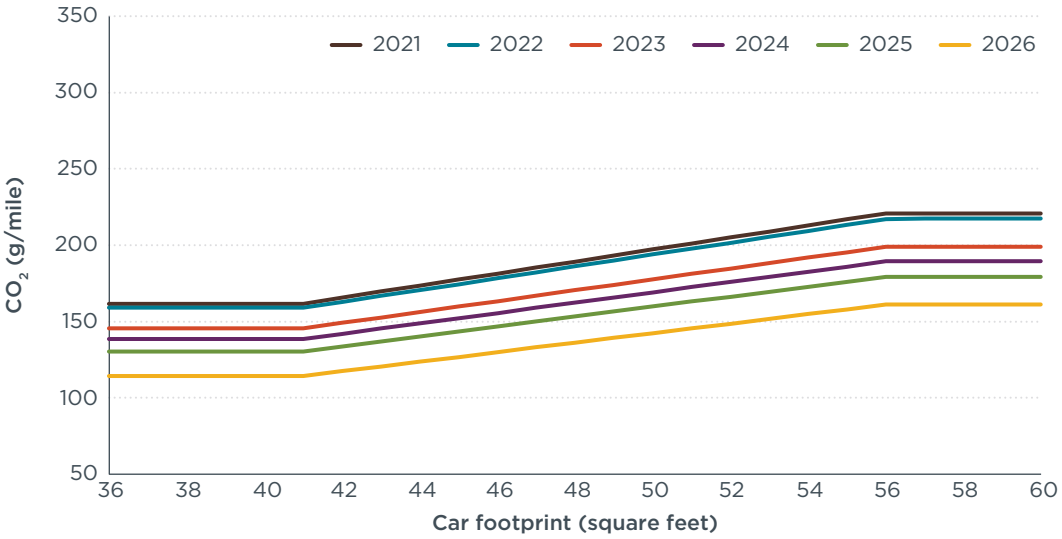

Figure 1. Passenger car GHG standard curve

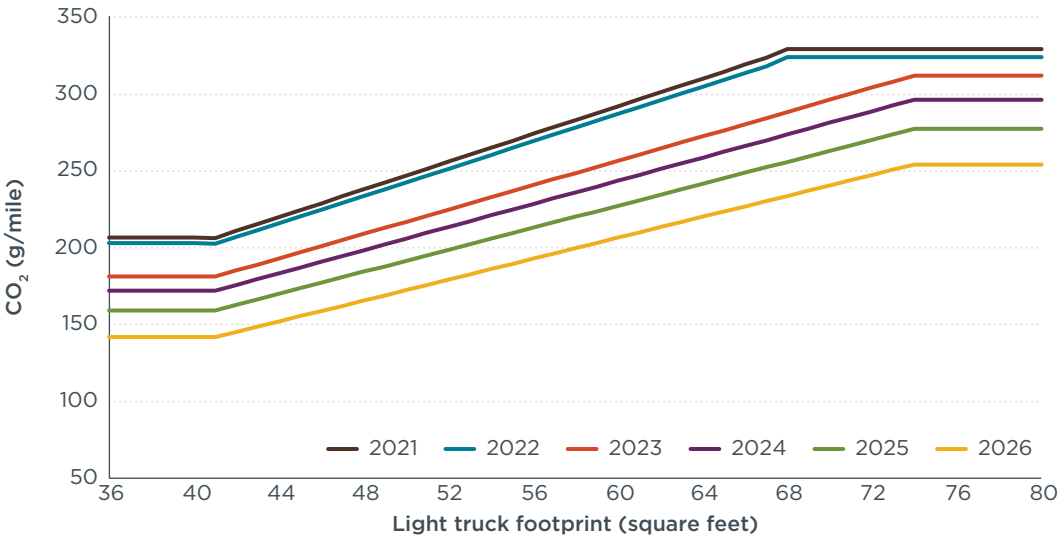

Figure 2. Light truck GHG standard curve

Table 2 summarizes the equation and parameters for defining fuel economy targets of passenger cars and light trucks. This general shape allows for different sized vehicles to have different standards in the sloped portion but constrains the largest vehicles at the upper bend and incentivizes vehicles below the lower bend. Figure 3 and Figure 4 presents the GHG targets of passenger cars and light trucks, respectively, for each model year and footprint based on the equations from Table 2.

Table 2. Parameters for the fuel economy targets, MYs 2024-2026

Fuel economy target = $\frac{1}{\min(\max(c \times \text{Footprint} + d, \frac{1}{a}), \frac{2}{b})}$					
		a (mpg)	b (mpg)	c (gal/mi/ft²)	d (gal/mile)
Passenger car	2024	55.44	41.48	0.000405	0.00144
	2025	60.26	45.08	0.000372	0.00133
	2026	66.95	50.09	0.000335	0.00120
Light truck	2024	44.48	26.74	0.000452	0.00395
	2025	48.35	29.07	0.000416	0.00364
	2026	53.73	32.30	0.000374	0.00327

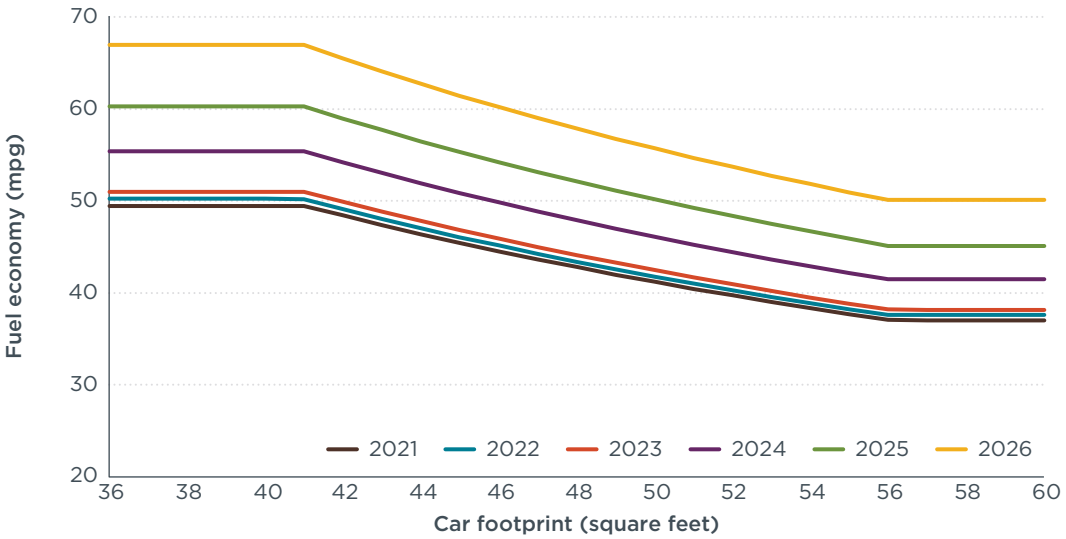

Figure 3. Passenger car corporate fuel economy standards

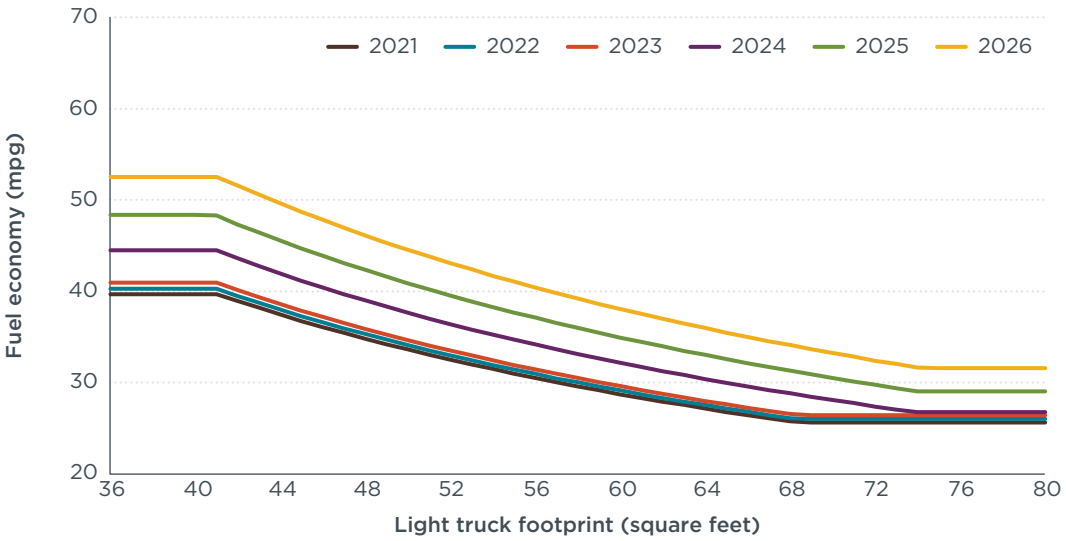

Figure 4. Light truck corporate fuel economy standards

FLEXIBILITIES

GHG STANDARDS

EPA has established mechanisms to help manufacturers manage the transition toward more stringent emission standards. These include several types of flexibilities or incentives in its GHG emission regulations. The final MY 2023–2026 rule updates four types of flexibilities. These are a limited carry-forward extension for credits generated or banked from previous model years in MYs 2017–2018, advanced technology vehicle multiplier credits for MYs 2023–2024 with a cumulative cap, full-size pickup truck incentives in the form of credits for hybrid or other technologies that achieve similar performance for MYs 2023–2024, and an increase in the cap for off-cycle credits. The air conditioning credits remain unchanged.

Flexibilities are based on an EPA calculation of emissions or credits for manufacturers over- or under-compliance. The megagrams (Mg) of credits are determined from the CO_2 emission rate in grams per mile (g/mile), applicable vehicle production volume, and the expected vehicle miles traveled (VMT) for those vehicles. The general form of the equation is:

$$Credits\ (Mg) = \frac{CO_2 \times VMT \times Production}{1{,}000{,}000}$$

The VMT is specified as 195,264 miles for cars and 225,865 for light trucks. To calculate g/mile value from Mg of credits, the equation is reversed.[6]

Credit banking, trading, and transfer

The light-duty vehicle averaging, banking, and trading (ABT) program was first introduced in 2010 to establish how credits may be generated and used. These provisions include credit carry-forward (saving over-compliant credits for future use), credit carry-back (using credits to offset a deficit in meeting fleet standard in prior

6 Detailed information on how credits are applied in GHG standard compliance can be found at U.S. EPA, "The 2021 EPA Automotive Trends Report," https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1013L1O.pdf;

model years), credit transfer (transferring unlimited credits between car and trucks in each manufacturer's fleet within the allowable carry-forward and backward years), and credit trading (trading credit across manufacturers within the allowable years). In previous GHG programs for MYs 2012–2016 and MYs 2017–2025, EPA allowed credits to be carried forward for five years and carried back for three years. In the final MYs 2023–2026 rule, EPA extends the time credits allowed to be carried forward by one year for MY 2017 and MY 2018, meaning they can be used in MY 2023 and MY 2024, respectively. This is due to EPA's recognition of the steep stringency increase from MY 2022 to MY 2023. Other rules related to credit banking, trading, and transfer remain the same as previous regulations.

Multiplier incentives for advanced technology vehicles

Incentives for battery electric vehicles (BEVs), plug-in hybrid vehicles (PHEVs), fuel cell vehicles (FCVs), and natural gas vehicles (NGVs) were established in 2012. The multiplier counts each of these vehicles as more than one vehicle produced in the manufacturers' compliance calculation due to their significant GHG performance compared to internal combustion engine vehicles.[7]

The multiplier is 1.5 for BEVs and FCVs, and 1.3 for PHEVs, and is applicable for only MYs 2023–2024 under the EPA MYs 2023–2026 final rule. The multiplier credits are capped at 10 g/mile cumulative for MY 2023 and MY 2024. This means that after the manufacturer reaches the cap any time between MY 2023 and MY 2024, the multiplier becomes 1 and has no further effect on credit calculations. Manufacturers can choose to split the 10 g/mile flexibility between the two model years in any way. EPA noted that the multiplier is a flexibility to address lead time concerns in early model years and did not intend for the multipliers to be an ongoing incentive. In addition, EPA also removes natural gas vehicle multiplier credit established by SAFE rule for MYs 2023–2026.

Full-size pickup truck incentives

In the standards, EPA reinstates the full-size pickup truck credits for strong hybrids and similar performance-based vehicles that were implemented under the 2012 rule for MYs 2017–2025 but removed under the 2020 SAFE rule. Under the 2012 regulation, full-size pickup trucks were eligible for 10 g/mile CO_2 credit in MYs 2017–2021 for mild hybrid technology or technologies that reduce CO_2 emissions by at least 15 percent, plus 20 g/mile credit in MYs 2017–2025 for strong hybrid technology or technologies that reduce CO_2 emissions by at least 20 percent. However, EPA only reinstated the temporary credits for MYs 2023–2024 strong hybrid and 20% better performance vehicles, using the same minimum percentage production threshold used in the 2012 rule, which is 10% for both MY 2023 and MY 2024.

EPA also prevents manufacturers from double-counting the full-size pick-up truck performance-based credit and advanced technology incentives. For example, an electric full-size pickup truck that has low (PHEV) to no (BEV) tailpipe emission will not generate both an advanced technology multiplier and 20% better performance credit. If a manufacturer chooses to use the advanced technology multiplier credits, it can accrue the pickup truck credit once the multiplier credit cap is reached and there are still more qualifying vehicles.

7 Detailed methods and calculation for advanced technology multiplier credit can be found at Light-Duty Vehicle Greenhouse gas emissions and Corporate Average Fuel Economy Standards; Final Rule, 75 Fed. Reg 25479 (May 7, 2010) https://www.govinfo.gov/content/pkg/FR-2010-05-07/pdf/2010-8159.pdf

Off-cycle credits

Off-cycle credits recognize and incentivize technologies that provide real-world emission reductions which are not captured in the two-cycle (city and highway) laboratory tests used in EPA GHG compliance verification. For MYs 2023–2026, the off-cycle maximum credits for each manufacturer from a list of preapproved technologies increase from 10 g/mile combined car and truck fleet average per year to 15 g/mile. The cap means that even though it is possible for a manufacturer to achieve more than 15 g/mile credit from the technology menu, the cumulative menu-based credits for the manufacturers' fleet may not exceed 15 g/mile. Table 3 shows the list of off-cycle technologies and associated credits for cars and light trucks. As shown in the table, EPA also revises the definitions of certain technologies (passive cabin ventilation, and active engine and transmission warm-up) so that manufacturers would be able to take advantage of the updated cap.

Table 3. Off-cycle technologies and credits for car and light trucks

Technology	Credit for cars (g/miles)	Credit for trucks (g/mile)
High efficiency alternative (at 73%; scalable)	1.0	1.0
High efficiency exterior lighting (at 100W)	1.0	1.0
Waste heat recovery (at 100W; scalable)	0.7	0.7
Solar roof panels (for 75W; battery charging only)	3.3	3.3
Solar roof panels (for 75W, active cabin ventilation plus battery charging	2.5	2.5
Active aerodynamic improvement (scalable)	0.6	1.0
Engine idle start-stop with heater circulation system	2.5	4.4
Engine idle start-stop without heater circulation system	1.5	2.9
Active transmission warm-up (no longer allow systems that capture heat from coolant circulating in the engine block)	1.5	3.2
Active engine warm-up (no longer allow systems that capture heat from coolant circulating in the engine block)	1.5	3.2
Solar/thermal control	Up to 3.0	Up to 4.3
Glass or glazing	Up to 2.9	Up to 3.9
Active seat ventilation	1.0	1.3
Solar reflective paint	0.4	0.5
Passive cabin ventilation (only methods that create convective airflow)	1.7	2.3
Active cabin ventilation	2.1	2.8

There are two additional pathways for manufacturers to accrue off-cycle technology credits and exceed the menu-based cap. One pathway allows manufacturers to use five-cycle testing to demonstrate and justify their off-cycle technologies and submit the test data to EPA. The five-cycle tests include three additional tests, designed to address fuel consumption related to aggressive and high-speed driving, air-conditioning use, and cold temperature driving.[8] Since 2008, EPA has been using the five-cycle methodology to label fuel economy on vehicle window stickers to provide consumers with more information. The other pathway allows manufacturers to seek approval from EPA to use alternative methodology other than the menu-based and

8 More information on the five-cycle methodology can be found at Light-Duty Vehicle Greenhouse gas emissions and Corporate Average Fuel Economy Standards; Final Rule, 75 Fed. Reg 25439 (May 7, 2010) and EPA, Dynamometer Drive Schedule, accessed May 1, 2022, https://www.epa.gov/vehicle-and-fuel-emissions-testing/dynamometer-drive-schedules.

five-cycle tests. This pathway is only available if manufacturers can prove that the five-cycle approach is not adequate in representing the benefits of the technology.

Air-conditioning system credits

Air-conditioning (AC) system credits remain the same as previous regulations. Air-conditioning systems contribute to GHG emissions through two mechanisms: the leakage of hydrofluorocarbon refrigerants (AC refrigerant leakage or direct emissions) and additional fuel consumption to provide power to the AC (indirect emissions). Direct emissions can be significantly reduced by using leakage-tight systems or refrigerants with low global warming potentials. Indirect emissions can be reduced by improvement in AC efficiency. The maximum available AC system credits are 18.8g/mile for cars and 24.4 g/mile for trucks. These numbers are further broken down to a maximum of 13.8 g/mile for cars and 17.2 g/mile for trucks for alternative refrigerants, or 6.3 g/mile for leakage-tight methods without the use of alternative refrigerant for cars and 7.8 g/mile for trucks. Maximum credits for improved AC efficiency are 5 and 7.2 g/mile for cars and light trucks, respectively. Table 4 shows the maximum AC system credits that can be generated by a manufacturer for each MY from 2023 to 2026.

Table 4. Maximum AC system credit per manufacturer (g/mile)

	Car	Truck
Direct credit – leakage	6.3	7.8
Direct credit – alternative refrigerant	13.8	17.2
Indirect credit – AC efficiency	5	7.2

FUEL ECONOMY STANDARDS

For the CAFE standards, NHTSA also includes most of the flexibilities described in the EPA GHG standard, although with some minor differences. The regulation maintains statutory flexibility for compliance using credit banking, trading, and transferring with certain restrictions for minimum domestic passenger car standards (MDPCS). Credit is earned from over-compliance by multiplying the number of tenths of a mpg by which a manufacturer exceeds the standards.[9] Credits can be carried forward 5 years and back 3 years, similar to EPA's regulation. However, NHTSA does not adopt EPA's one-year credit life extension for MYs 2017–2018 to MYs 2023–2024. NHTSA's program allows credit transfer of up to 2 mpg per manufacturer fleet and unlimited credit trade.

NHTSA is required by statute to set MDPCS, which are fixed standards established at the time of the rulemaking. The standards are 92% of the projected total passenger standard, accounting for historical offset.[10] The MDPCS standards do not differ by manufacturer and are 44.3 mpg in 2024, 48.2 mpg in 2025, and 53.5 mpg in 2026. By statute, manufacturers cannot use traded or transferred credits to address performance shortfalls for failing to meet the MDPCS. Credit carry-forward and carry-back are allowed.

9 Detailed information on how credits are applied in CAFE standard compliance can be found at International Council on Clean Transportation, "US passenger vehicle CAFE and GHG regulations: The basics," https://theicct.org/stack/us-passenger-vehicle-cafe-and-ghg-regulations-the-basics/

10 Offset is summarized from recent projection errors, e.g. the historical 1.9 percent difference identified for MYs 2011-2018.

Off-cycle technologies and AC efficiency technologies allow manufacturers to earn fuel consumption improvement values (FCIVs), equivalent to EPA credits.[11] This means the off-cycle technology menu-based credit cap is also set at 15 g/mile fleet-wide and the AC efficiency cap is 5 and 7.2 g/mile for car and light trucks, respectively. FCIVs are calculated in gal/mile by dividing the EPA-equivalent credits in g/mile by 8887 CO_2 g/gal. Because AC direct emissions have no impact on fuel consumption, NHTSA does not include them in the CAFE compliance calculation.

In harmonization with the EPA GHG program, NHTSA also reinstates the full-size pickup truck incentives for strong hybrid and 20% better performance for MYs 2023 and 2024. These incentives are also considered as FCIVs and are used in the compliance calculation. Similar to previous CAFE standards, advanced technology multiplier credits are not accounted in CAFE compliance due to statutory restrictions.

DIFFERENCES IN STANDARD STRINGENCY

The main discrepancies in the two standards (i.e. fuel economy equivalence of the GHG standard compared with the fuel economy standard) come from the GHG standards starting in 2023 and the CAFE standards in 2024, the exclusion of AC refrigerant leakage credits in the CAFE standards, and the statutory exclusion in NHTSA's analysis of new dedicated alternative fuel vehicle models as a response to final fuel economy standards and advanced technology multiplier credits.

With the goal that the compliance with both standards are achievable with the same vehicle fleet, NHTSA compensated for the year delay in starting CAFE improvements by imposing higher annual improvements, such that the differences in the two standards become smaller each year (see Table 5 and Table 6). The GHG standard will reduce GHG emissions from cars and light trucks on average by 5% to 10% per year from 2023 to 2026, specifically 5.1% in MYs 2023–2024, 6.6% in MYs 2024–2025, and 10.3% in MYs 2025–2026. The fuel economy standards will increase fuel economy at a rate of 8% per year for both cars and light trucks for MYs 2024–2025, and at a rate of 10% for MYs 2025–2026.

These tables present the projected overall industry fleetwide CO_2-equivalent emission and fuel economy compliance target levels, respectively, based on projected vehicle production. Each table includes the projection from the regulatory agency and the equivalent estimation for the other agency. NHTSA also adjusts its targets for the exclusion of AC direct emission credits and, thus, it is not shown in the table. If the AC direct emission credit is included, these two programs would roughly align.[12]

Table 5. Projected average of GHG targets (g/mile)

	EPA (regulatory agency)				NHTSA			
Fleet	**2023**	**2024**	**2025**	**2026**	**2023**	**2024**	**2025**	**2026**
Passenger cars	166	158	149	132	197	181	166	150
Light trucks	234	222	207	187	274	253	233	210
Overall fleet	202	192	179	161	238	219	201	181

11 FCIV is not a "credit" in the NHTSA CAFE program. Instead, it increases the reported fuel economy of a manufacturer's fleet, which is used to determine compliance, instead of treating them as separate credits like EPA.

12 The projected average MY 2024–2026 AC direct emissions are approximately 13.1 to 13.6 g/mile for cars, and 15.1 to 16.1 g/mile for light trucks.

Table 6. Projected average of CAFE targets (mpg)

Fleet	EPA				NHTSA (regulatory agency)			
	2023	2024	2025	2026	2023	2024	2025	2026
Passenger cars	54	56	60	67	45.2	49.2	53.4	59.4
Light trucks	38	40	43	48	32.4	35.1	38.2	42.4
Overall fleet	44	46	50	55	37.4	40.6	44.2	49.1

The remaining difference between the programs comes from the EPA and NHTSA adoption of different estimates of future BEV and PHEV penetration rates that in turn, influence the advanced technology and full-size pickup incentives. Because NHTSA's analysis excludes the introduction of new dedicated alternative fuel vehicle models (including BEVs) during MY 2024–2026 as a response to final fuel economy standards,[13] the BEV and PHEV penetration rate under NHTSA's final rule is lower than EPA's estimation, especially for the later years (see Table 7).

Table 7. Estimation of BEV and PHEV penetration rate under the EPA and NHTSA final rules

		EPA estimation				NHTSA estimation		
		2023	2024	2025	2026	2024	2025	2026
Passenger cars	PHEV	10%	12%	16%	17%	2%	2%	4%
	BEV					8%	9%	9%
Light trucks	PHEV	5%	9%	11%	17%	2%	3%	3%
	BEV					2%	3%	3%
Overall fleet	PHEV	7%	10%	14%	17%	1%	2%	3%
	BEV					5%	6%	6%

COMPLIANCE AND ENFORCEMENT

Manufacturers who fail to meet the EPA GHG standard would face civil penalties. The penalties as enacted in the 1970 Clean Air Act were no more than $25,000 per vehicle for violations of various acts. To determine the appropriate penalties, EPA considers a variety of factors such as the history of the manufacturer's violations or compliance, the upside (if any) or downside economic impact of the violation, the manufacturer's actions to remedy the violation, and "such other matters as justice may require."[14] Based on the latest operative statutory civil monetary penalties for violations that occurred after November 2, 2015, in which the penalties are assessed on or after January 12, 2022, the penalties are up to $51,796 as adjusted for inflation. For assessment on or after December 23, 2020, but before January 12, 2022, the penalties were up to $48,762.[15]

13 49 U.S.C. 32902(h) requires NHTSA to exclude dedicated alternative fuel vehicles like BEVs from application in the analysis during the rulemaking time frame, while still being aware of their existence in the world as a compliance option. This means that ZEV uptake under NHTSA projection is based on the influence of other policies, such as EPA GHG standards or California's Advanced Clean Car standards, and excludes NHTSA CAFE standards.

14 Civil penalties, 42 U.S.C 7524 (2013), https://www.govinfo.gov/content/pkg/USCODE-2013-title42/html/USCODE-2013-title42-chap85-subchapII-partA-sec7524.htm

15 Civil Money Penalty Inflation Adjustment, 87 Fed. Reg. 1676 (January 12, 2022), https://www.federalregister.gov/documents/2022/01/12/2022-00349/civil-monetary-penalty-inflation-adjustment

NHTSA also set its own compliance mechanism for the CAFE standards. Prior to March 2022, failure to comply with CAFE standards result in a civil penalty of $5.5 per tenth of an mpg under the target value times the total volume of vehicles manufactured for the given model year. As of March 25, 2022, NHTSA increased the CAFE penalty rate to $14, beginning with MY 2019, and accounting for annual adjustment afterward. In 2022, the penalty would be $15.[16]

BENEFITS OF THE STANDARDS

The compliance under the two regulations would result in significant fuel savings and GHG emission reductions. EPA estimates that the consumers will save more than 360 billion gallons of gasoline in calendar years 2023 to 2050 compared to a scenario in which manufacturers only comply with the SAFE rule for MYs 2021–2026.[17] Through 2050, the program will achieve reductions of more than 3.1 billion tons of CO_2, 3 million tons of CH_4, and 97,000 tons of N_2O, and result in $150 to $170 billion (in 2018 dollars) in benefits. These benefits include reduced impact of climate change, reduced energy insecurities caused by U.S. petroleum consumption and imports, improved public health, and increased savings in vehicle total cost of ownership for consumers. EPA projects the benefits will exceed the costs of manufacturer compliance by $120 to $190 billion by 2050 at 7% and 3% discount rate, respectively, and both with 3% discount rate for social cost of GHG (SC-GHG).

NHTSA uses the same methodologies to quantify costs, benefits, and net benefits as EPA. However, due to the differences in accounting for flexibilities and compliance, NHTSA's estimates on GHG reduction and fuel savings achieved by the standards are slightly lower than EPA's, while the manufacturers' costs to comply is higher.[18] The avoided gasoline consumption is estimated to be 234 billion gallons, and emission reductions are estimated to be 2.3 billion tons for calendar years 2021–2050 at 3% SC-GHG, compared to SAFE rule baseline. NHTSA projects the net benefits under 7% and 3% discount rate, and 3% SC-GHG, to be a cumulative $73 and $112 billion by 2050, respectively. Table 8 summarizes the two agencies' costs, benefits, and net benefits from compliance from 2023 to 2050 (EPA), and 2021 to 2050 (NHTSA) in 2018 billion dollars.

Table 8. Cost, benefits, and net benefits (in 2018 $billion) under compliance for calendar years 2023–2050 (EPA) and 2021–2050 (NHTSA) in two discount rate cases

	EPA (7% discount)	NHTSA (7% discount)	EPA (3% discount)	NHTSA (3% discount)
Costs	$180	$218.7	$300	$366.8
Fuels savings	$150	$292.1	$320	$478.5
Other benefits	$150		$170	
Net benefits	$120	$73.3	$190	$111.7

16 Civil Penalties, 87 Fed. Reg. 18994, (April 1, 2022), https://www.govinfo.gov/content/pkg/FR-2022-04-01/pdf/2022-06648.pdf

17 More information on the scenarios and detailed reduction benefits can be found in U.S. EPA, "Revised 2023 and Later Model Year Light Duty Vehicle GHG Emission Standards: Regulatory Impact Analysis," (December, 2021), https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1013ORN.pdf

18 More explanation on the discrepancy can be found at 2017 and Later Model Year Light-Duty Vehicle Greenhouse gas emissions and Corporate Average Fuel Economy Standards, 77 Fed. Reg 62654 (October 15, 2012) https://www.govinfo.gov/content/pkg/FR-2012-10-15/pdf/2012-21972.pdf

INTERNATIONAL CONTEXT

Figure 5 and Figure 6 show the progression of global CO_2 emission standards in major vehicle markets for passenger cars and light trucks as of June 2022, respectively. The latest GHG and fuel economy standards put the United States back on track with the countries that are leading in standard stringency until 2026. The longer-term trend will be determined by the next phase of standards for MY 2027 and beyond.

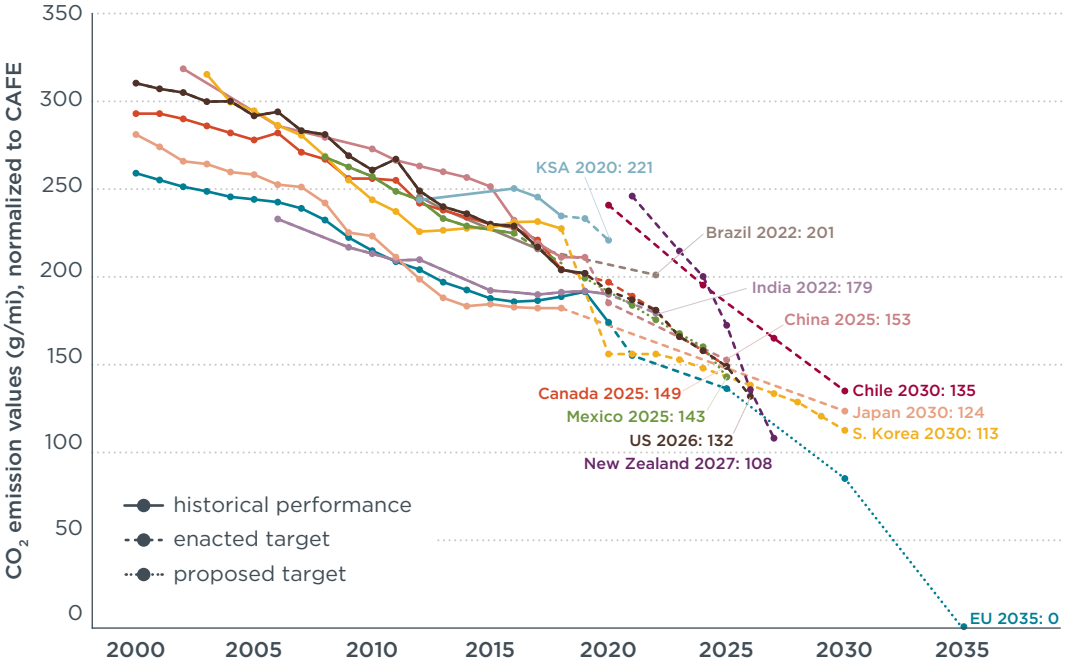

Figure 5. Passenger car CO_2 emission standards, normalized to CAFE

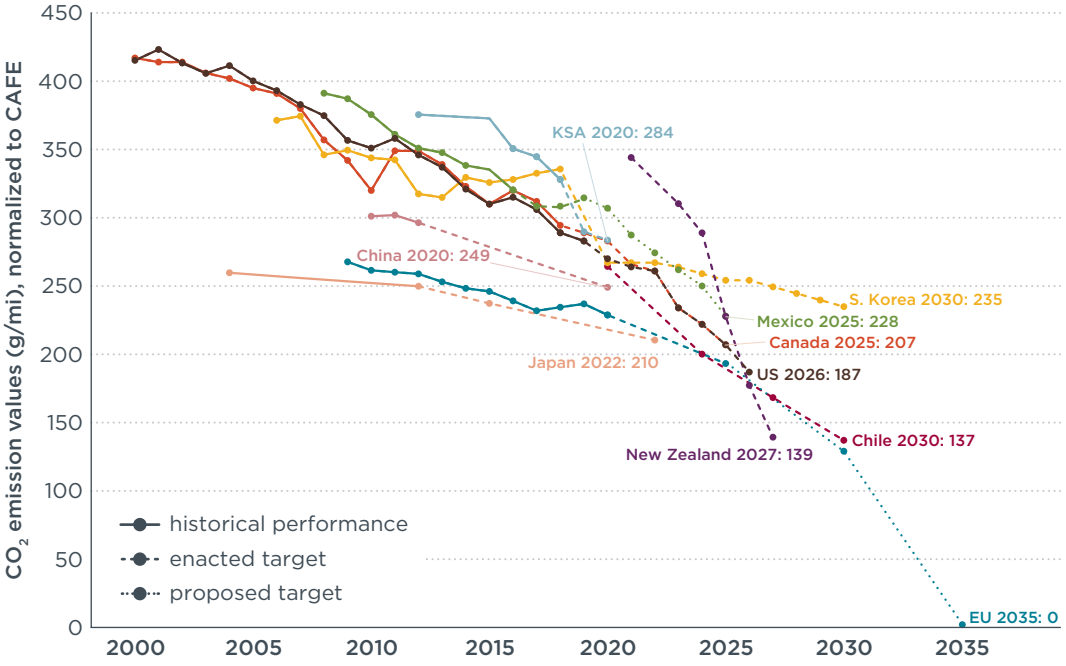

Figure 6. Light truck CO_2 emission standards, normalized to CAFE