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Attn: Docket No. NHTSA-2017-0069
Docket No. NHTSA-2018-0067
Docket No. EPA-HQ-OAR-2018-0283

Re: Supplemental Comment of the International Council on Clean Transportation (ICCT) on the National Highway Traffic Safety Administration's (NHTSA's) and Environmental Protection Agency's (EPA's) Proposed Rule: The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks

The International Council on Clean Transportation (ICCT) hereby submits these supplemental comments concerning the comments by the Alliance of Automobile Manufacturers[1] and the Association of Global Automakers[2] on expanding the use of technology credits, and the agencies' consideration thereof, within the standards.

Introduction

In their August 2018 regulatory proposal,[3] the National Highway Traffic Safety Administration (NHTSA) and the U.S. Environmental Protection Agency (EPA) proposed to reduce the requirements of the 2021-2026 efficiency standards in several ways. The proposal would

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1 NHTSA-2018-0067-12073 https://www.regulations.gov/document?D=NHTSA-2018-0067-12073
2 NHTSA-2018-0067-12033 https://www.regulations.gov/document?D=NHTSA-2018-0067-12033
3 National Highway Traffic Safety Administration and the U.S. Environmental Protection Agency. *"The safer affordable fuel-efficient vehicles rule for model years 2021-2026 passenger cars and light trucks; Notice of proposed rulemaking"* (August 2018), https://www.epa.gov/regulations-emissions-vehicles-and-engines/safer-affordable-fuel-efficient-safe-vehicles-proposed

directly reduce the numerical stringency of the standards, and it also indicated it could provide more regulatory credit for particular technologies. Although the direct stringency reduction and its benefit-cost analysis[4] have received the most attention, revised provisions for technology credits that the agencies asked for comment on could be just as consequential for auto industry compliance.

Regulatory credits for particular technologies have the potential to promote emission-reduction benefits beyond conventional technologies on regulatory test cycles.[5] They can also incentivize faster implementation of electric-drive technologies. However, if the technologies are already becoming widely deployed and do not have verifiable real-world benefits, the exact effects are far more uncertain. Recent developments put further focus on these credits. For one, new EPA data show how off-cycle and advanced technology vehicle credits of various types are in greater use and their effect on the standards.[6] Additionally, electric vehicle sales continue to increase and, in 2018, were already greater than the agencies projected for 2025. These developments lead to questions about whether the agencies have accurately characterized the likely future use of technology crediting provisions about which they have sought comments.

These comments assess how the use of new technology credits in the federal U.S. 2021-2026 regulations could impact the emissions and fuel economy of light-duty vehicles. This analysis informs regulators' work to finalize the standards and the associated crediting provisions by fall of 2019. We focus the assessment on the impact of regulatory provisions that are under consideration for the crediting of off-cycle, hybrid, and electric vehicle technologies. After describing and quantifying these credits on a per-vehicle basis, we evaluate the implications of the technology credits on fleetwide compliance with the greenhouse gas emission standards through 2026. The fuel economy results in miles per gallon (mpg) are also presented to show the implications for car and light truck consumers. Although there is the potential for the technology credits to deliver real-world benefits, they are analyzed within these comments as not contributing to measurable consumer fuel economy benefits for reasons discussed below.

Off-cycle credit use

The existing off-cycle credit provisions allow auto manufacturers to deploy technologies from a predefined "menu" list to receive 10 grams CO_2 per mile (g/mi). In addition, companies can petition for additional technology credit by submitting verifiable data indicating real-world benefits beyond the prescribed vehicle laboratory test cycle. The off-cycle provisions, including the technology applicability, definitions, and approval process, were built into the adopted 2017-2025 regulations based on request by automakers during the negotiations. For context, the regulatory CO_2 levels in the standards would reduce from 258 g/mi in 2017 to 173 g/mi in 2025.

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4 Bento et al., "Flawed analyses of U.S. auto fuel economy standards," Science **362** (6419), http://science.sciencemag.org/content/362/6419/1119

5 Nic Lutsey, Aaron Isenstadt, *How will off-cycle credits impact U.S. 2025 efficiency standards?*, (ICCT: Washington, DC, March 2018), https://www.theicct.org/publications/US-2025-off-cycle

6 U.S. Environmental Protection Agency, *The 2018 EPA Automotive Trends Report: Greenhouse Gas Emissions, Fuel Economy, and Technology since 1975* (EPA-420-R-19-002 March 2019), https://nepis.epa.gov/Exe/ZyPDF.cgi/P100W5C2.PDF?Dockey=P100W5C2.PDF

Figure 1 shows company off-cycle credit use for model years 2015-2017. The 15 automakers shown represent approximately 98% of U.S. vehicles sales in 2017. Two companies, Jaguar Land Rover and Fiat Chrysler, have surpassed 8 g/mi, and four additional companies have surpassed 5 g/mi in 2017. The EPA report[7] from which these data are based provides further details on how many of the companies have not yet deployed the technologies others have. For example, Jaguar Land Rover has 4 g/mi for engine start stop (versus 0.6 g/mi industry average), Honda has 1.9 g/mi for active transmission warmup (0.7 average), and Fiat Chrysler has 2.2 g/mi for active engine warmup (0.8 average).

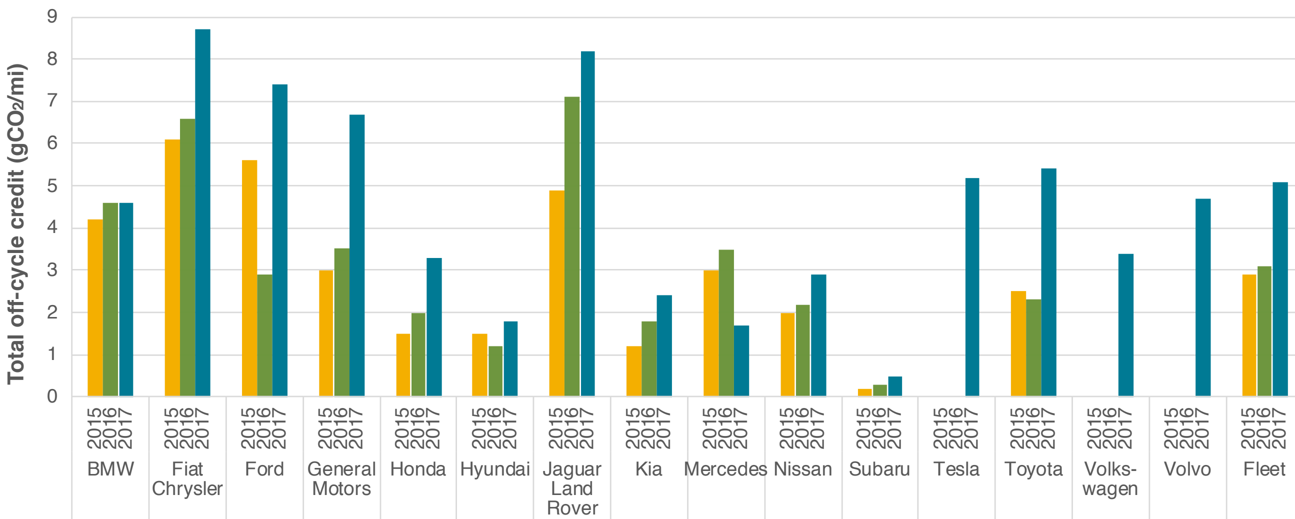

Figure 1. Average use of off-cycle credits by manufacturer

As indicated by automaker-specific trends, a continued increase in the use of off-cycle credits is likely. Most credits (4.7 g/mi fleetwide) are from the pre-defined menu technologies, and companies can keep adopting these up to the 10 g/mi maximum. The use of “off-menu” credits that require approval from EPA contribute less (0.4 g/mi fleetwide) toward compliance but are increasing, with seven companies receiving approvals for credits (BMW, Fiat-Chrysler, Ford, General Motors, Hyundai, and Toyota, Volkswagen). EPA indicates that all the credit approvals are not yet reported by the companies, so Figure 1 is likely undercounting the actual credits.

In the August 2018 proposal to reduce the regulatory stringency of post-2020 standards, the agencies asked for public comment on the automakers’ requests to streamline the crediting process, reduce the requirements for supporting data, add more technologies to the pre-defined menu, eliminate the 10 g/mi cap on menu technologies, and increase the credit amount per technology. Despite the automaker trends to use *more* off-cycle credit, the agencies project the use of off-cycle technology through 2025 remains 40% *lower* than its use in 2017, at roughly 3 g/mi. Although justification of such low projected off-cycle credits or further analysis of increased use of off-cycle credits is not presented in the proposed rule, we assess such a case below.

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[7] U.S. Environmental Protection Agency, *The 2018 EPA Automotive Trends Report: Greenhouse Gas Emissions, Fuel Economy, and Technology since 1975* (EPA-420-R-19-002 March 2019), https://nepis.epa.gov/Exe/ZyPDF.cgi/P100W5C2.PDF?Dockey=P100W5C2.PDF

Pickup hybrid technology credits

The existing 2017-2025 regulation includes special incentives for hybrid technology on full-size pickups. Automakers that meet specified technology penetration thresholds for hybrids in full-size pickups and can receive 10 g/mi (mild hybrid) and 20 g/mile (strong hybrid) per vehicle. The same credit levels are also allowed on a performance basis for non-hybrids—pickups with emissions at least 15% (for 10 g/mi mild hybrid credit) or 20% (for 20 g/mi strong hybrid credit) below the vehicle's footprint-indexed CO_2 regulatory target. Full-size pickups meeting the minimum size constraints account for 8%-10% of light-duty vehicle sales, so this is the maximum amount of the fleet that would be eligible for the credits under the provisions.

Although applicable information is limited, several models likely qualify for the pickup credits. Table 1 summarizes hybrid pickups that could receive 10 g/mi in credit due to being mild hybrid or meeting the 15% performance-based threshold. Models include the Ford F150 (stop-start, diesel models), a Chevrolet Silverado 1500 (stop-start, mild hybrid), and the Dodge Ram 1500 (mild hybrid). The emission levels are from EPA certification data.[8] We assume the models get the 10 g/mi credit, but they could receive 20 g/mi depending on their specifications. The examples show how air-conditioning, off-cycle, and pickup credits together are worth a 37—42 (average 39) g/mile CO_2 reduction—and a 1.7—2.8 (average 2.3) mile per gallon (mpg) fuel economy increase. Pickups from Toyota, Nissan, and Honda do not appear to qualify.

Table 1. Examples of full-size pickups potentially eligible for hybrid and performance-based technology credits

Model	Technology	CO_2 emissions (g/mi)			Fuel economy (mpg)		
		Test cycle	With A/C, off-cycle credits[a]	With pickup credit[b]	Test cycle	With A/C, off-cycle credits[a]	With pickup credit[b]
Ford F150 2WD (2.7L)	Stop-start	313	286	276	28.4	29.7	30.8
Ford F150 2WD (3L)	Diesel	317	290	280	32.8	34.3	35.5
Ford F150 4WD (3.3L)	Stop-start	314	287	277	28.3	29.7	30.7
Chevrolet Silverado 1500 2WD (2.7L)	Stop-start	303	274	264	29.3	30.6	31.7
Chevrolet Silverado 1500 4WD (5.3L)	Mild hybrid	343	314	304	25.9	26.9	27.7
Dodge Ram 1500 2WD (3.6L)	Mild hybrid	310	278	268	28.7	30.1	31.2
Dodge Ram 1500 4WD (3.6L)	Mild hybrid	319	287	277	27.9	29.2	30.2
Dodge Ram 1500 4WD (5.7L)	Mild hybrid	364	333	323	24.4	25.4	26.2

2WD = two-wheel drive; 4WD = four-wheel drive; CO_2 = carbon dioxide; L = liter engine displacement; g/mi = gram per mile; mpg = miles per gallon; A/C = air conditioning credit (includes leakage and efficiency for CO_2, efficiency only for mpg)

[a] assumes each company's average light truck air-conditioning and off-cycle credits from model year 2017

[b] assumes 10 g/mi for mild hybrid credit or performance standard (for being 15% below footprint-indexed CO_2 target)

As indicated in the August 2018 proposal to reduce the stringency of the 2017-2025 efficiency standards, automakers asked that these hybrid incentives be expanded to all crossovers, SUVs, minivans, and pickups and that threshold criteria be removed. This would essentially expand the applicability of vehicle models from 8%-10% of light-duty vehicles to approximately half of vehicles. Automakers also asked that a 10 g/mi hybrid credit be extended to cars. The agencies asked for public comment on these provisions, and we assess below.

[8] U.S. Environmental Protection Agency, "Download fuel economy data" (2019), https://www.fueleconomy.gov/feg/download.shtml and U.S. Environmental Protection Agency, *The 2018 EPA Automotive Trends Report: Greenhouse Gas Emissions, Fuel Economy, and Technology since 1975* (EPA-420-R-19-002 March 2019), https://nepis.epa.gov/Exe/ZyPDF.cgi/P100W5C2.PDF?Dockey=P100W5C2.PDF

Electric vehicle multipliers

The 2017-2025 standards include a special crediting system to provide additional compliance credit to support advanced technologies like electric vehicles. The multipliers for fully battery electric vehicles (BEVs) are 2.0 for 2017–2019, 1.75 for 2020, 1.5 for 2021; the multipliers for plug-in hybrid electric vehicles (PHEVs) are 1.6 for 2017–2019, 1.45 for 2020, 1.3 for 2021. Credited as 0 g/mi for their electric operation, BEVs deliver a 100% CO_2 reduction (approximately a 235 g/mi reduction for the average 2017 passenger car CO_2 level). Including a 2.0 multiplier means a BEV essentially counts for a 200% CO_2 reduction (essentially a 470 g/mi reduction). With the multipliers, even a relatively small percentage of electric vehicles can make a substantial contribution to automaker compliance.

The electric vehicle share of new vehicles in the U.S. was 1.2% in 2017 and 2.1% in 2018. At these levels, the fleet average total amount of CO_2 credit from the multipliers was approximately 2 g/mi in 2017 and 3.5 g/mi in 2018. As with off-cycle credits, some companies have accrued more than the fleet average. As an example, Figure 2 shows the case of General Motors, including how the electric vehicle multipliers provide 7.8 g/mi CO_2 reduction toward 2017 passenger car compliance. As shown the multipliers delivered more reduction than off-cycle credits, but less than air conditioning credits. This was due to approximately 23,000 total Chevrolet Bolt BEVs and 20,000 Chevrolet Volt PHEVs in 2017, together accounting for about 4.4% of General Motors' passenger car sales.

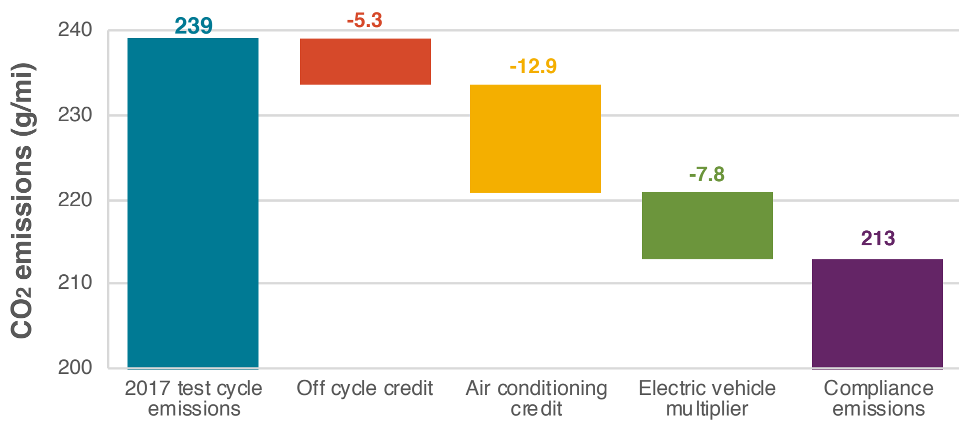

Figure 2. Effect of off-cycle credit, air conditioning credit, and electric vehicle multiplier in reducing General Motors' passenger car model year 2017 CO_2 emissions

This Figure 2 case, where 4% electric share provides 7.8 g/mi of credit, provides a clear example of how multiplier crediting becomes more valuable with increased electric vehicle deployment. Although the multipliers are set to expire after model year 2021, the August 2018 proposal to reduce the stringency of post-2020 standards includes consideration of continuing the electric vehicle multipliers. Based on input from automakers, the agencies asked for comment on expanding and increasing the value of electric vehicle multipliers to 2.0-4.5. As for off-cycle and hybrid credit provisions, the agencies conducted only very limited analysis of the effect of electric vehicle multipliers provisions. We assess their potential impact below.

Analysis of future use of technology credits

To analyze various regulatory scenarios, we base our analysis on the scenarios outlined in the August 2018 regulatory proposal for 2021-2026 standards. For the stringency of the standards, we include the adopted 2017-2025 standards with their original provisions as adopted in 2012 and the rolled-back 2021-2026 standards as proposed in August 2018. We also include several cases between these two boundary stringency levels, including increased use of off-cycle credits, expansion of hybrid credits, and increased use of electric vehicle multipliers. All the regulatory provisions are chosen from within the agencies' August 2018 rulemaking analysis, as the agencies are bound to finalize a rule that is analyzed in their proposal.

Incremental standards. Figure 3 shows the adopted 2017-2025 standards, which approximately require a 4% per year reduction in new light-duty vehicle CO_2 emissions, and the August 2018-proposed standards that amount to 0% per year CO_2 reduction over 2020-2026. To analyze the intermediate cases, we use the agencies' most stringent alternative, which the agencies refer to as "alternative 8," and it includes 2%/year CO_2 reduction for cars and 3%/year for light trucks for model years 2021-2026. For this analysis, we refer to this as "2.5%/year" scenario.

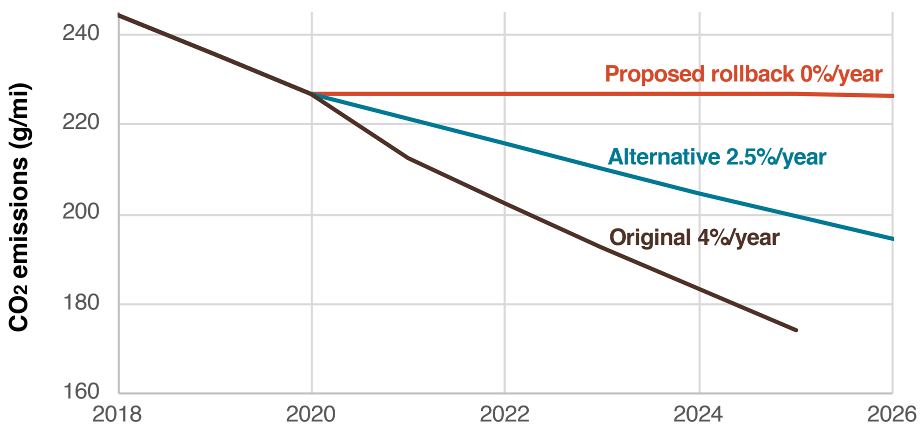

Figure 3. Fleet CO_2 emissions targets for the proposed 0%/year standards, alternative 2.5%/year standards, and the originally adopted 4%/year standards.

Off cycle credits. Recent compliance trends indicate continued growth in off-cycle credit use. Figure 4 shows the 2015-2017 data for the fleet average and the company with the most credits (Fiat Chrysler), as indicative of a path others may follow. The agencies' regulatory analyses indicate off-cycle credits would be worth approximately 3 g/mi through 2025, the same level as in 2016. In our recent analysis,[9] we examined cases for off-cycle credit that reflect how companies at a minimum use the 10 g/mi menu technologies, and then could continue receiving off-cycle credit approvals up to 17-25 g/mi with streamlined provisions,[10] which are similar to the

[9] Nic Lutsey, Aaron Isenstadt, *How will off-cycle credits impact U.S. 2025 efficiency standards?*, (ICCT: Washington, DC, March 2018), https://www.theicct.org/publications/US-2025-off-cycle

[10] Examples include 1.1—1.4 g/mi from variable crankcase suction valve (many automakers) and 1.9 g/mi for a high-efficiency alternator (Ford). For automaker petitions, see U.S. Environmental Protection Agency, *Compliance Information for Light-Duty Greenhouse Gas (GHG) Standards* (2018), https://www.epa.gov/vehicle-and-engine-certification/compliance-information-light-duty-greenhouse-gas-ghg-standards

broadening of the provisions the agencies are considering. For this analysis, as shown, we assume the fleet achieves 10 g/mi in the baseline case and increases off-cycle credits to 25 g/mi in the case of the agencies streamlining the off-cycle crediting process for greater use.

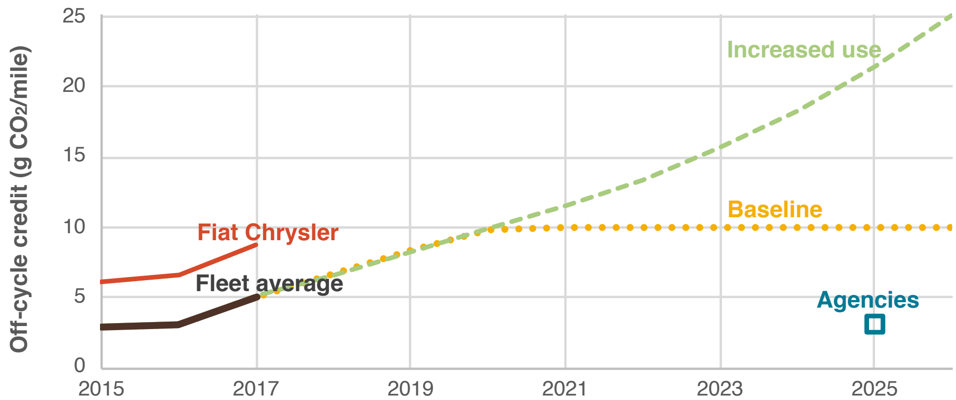

Figure 4. Off-cycle credit use for fleet (and highest manufacturer Fiat Chrysler) for 2015-2017 and regulatory scenarios through 2026

Beyond the off-cycle credits' impact on CO_2 standards, we evaluate the off-cycle credits as not contributing to measurable consumer fuel economy benefits. Our more rigorous previous research offers the rationale[11]: Real-world benefits of the existing off-cycle credits have not been sufficiently validated with empirical data, off-cycle credits are allowed for technologies that occur regardless of the off-cycle program, there is a little transparency regarding vehicle models with the technologies. Actions under consideration in the August 2018 proposal (e.g., to streamline credit approval process, increase credit values, expand menu credit options) would exacerbate these issues. Until the agencies commit to transparent and comprehensive real-world data validation, a viable long-term off-cycle program with real-world benefits will remain uncertain.

Hybrid credits. The existing regulations include credits for full-size pickup trucks to receive 10 g/mi (mild hybrid) or 20 g/mi (strong hybrid) if they are hybrids or perform similarly with low CO_2 levels. Based on the agencies soliciting comment on expanding these provisions, we assess the value of those credits for all mild and hybrid vehicles across vehicle types through model year 2026. For consistency with the agency modeling, and as shown in Figure 5, we apply their compliance modeling analysis of technology penetration of hybrid models within our analysis. By 2026 the adopted 4%/year standards result in 52% mild and 14% strong hybrids, the proposed 2.5%/year standards result in 47% mild and 7% strong hybrids, and the 2.5%/year standards result in 14% mild and 2% strong hybrids. We make additional assumptions that plug-in electric vehicle share increases to 3% in the 0%/year scenario, and increases to 6% in the incremental 2.5%/year and 4%/year scenarios.

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[11] Nic Lutsey, Aaron Isenstadt, *How will off-cycle credits impact U.S. 2025 efficiency standards?*, (ICCT: Washington, DC, March 2018), https://www.theicct.org/publications/US-2025-off-cycle

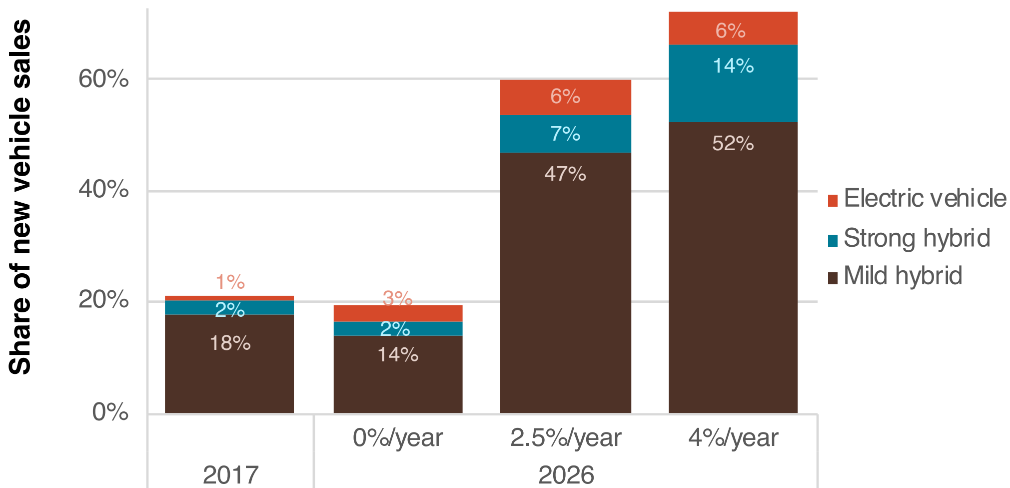

Figure 5. Electric-drive vehicle share of new vehicles for 2017 and projected for regulatory agency estimates for 2026 compliance, and ICCT projections through 2025

Electric vehicle multipliers. Under the adopted standards the electric vehicle multipliers are set to expire by 2022. We analyze the continuation of electric vehicle multipliers based on the agencies' request for comment on expanding and increasing the value of electric vehicle multipliers to 2.0-4.5. As assessed previously, multipliers, even at a 2.0 level, can be very strong motivators for electric vehicle deployment, making electric vehicles more cost effective than many advanced combustion technologies.[12] For our analysis we use 2.0, the lower bound of the electric vehicle multiplier range given by the agencies, for all plug-in electric vehicles.

Combining the descriptions above, Table 2 summarizes the analytical scenarios for CO_2 stringency and the provisions to support industry compliance with the standards. The columns each represent a regulatory scenario that is analyzed. The top row shows the stringency level in annual CO_2 improvement, for the baseline adopted 4%/year standards, the proposed 0%/year rollback, and the 2.5%/year regulatory alternative. The subsequent rows summarize whether various provisions are included, either as they are in the baseline adopted standards or with a change in the regulatory provisions as described above. The bottom rows summarize the technology shares of new vehicle sales in 2026 associated with each scenario.

[12] Nic Lutsey, *Integrating electric vehicles within U.S. and European efficiency regulations*, (ICCT: Washington, DC, June 2017), https://www.theicct.org/integrating-EVs-vehicle-CO2-regs

Table 2. Regulatory scenarios to assess the effect of technology credits

		Baseline: Adopted 2017-2025 standards	Proposed rollback	Incremental standards	Incremental with more off-cycle credit	Incremental with more off cycle and hybrid credits	Incremental with more off cycle and hybrid credit, and EV multipliers
Regulatory provisions	Stringency: Annual CO_2 reduction	4%/year	0%/year	2.5%/year	2.5%/year	2.5%/year	2.5%/year
	Off cycle credit	Increase to 10 g/mi by 2026	Same as baseline	Same as baseline	Increase to 25 g/mi by 2026	Increase to 25 g/mi by 2026	Increase to 25 g/mi by 2026
	Hybrid pickup credit	10-20 g/mi full-size pickup	Same as baseline	Same as baseline	Same as baseline	Expand to all vehicle types	Expand to all vehicle types
	Electric vehicle multiplier	No longer from 2022 on	Same as baseline	Same as baseline	Same as baseline	Same as baseline	2.0 multiplier through 2026
Technology share in 2026	Mild hybrid	52%	14%	47%	47%	47%	47%
	Hybrid	14%	2%	7%	7%	7%	7%
	Plug-in share	6%	3%	6%	6%	6%	6%

Results

Figure 6 shows the resulting regulatory scenario test-cycle CO_2 emissions. The bottom-most line represents the adopted standards of approximately 4%/year reduced CO_2 emissions, moving the fleet from 280 g/mi in 2018 to 215 g/mi in 2025, or a 22% reduction. Moving up from that, the 2.5%/year standards reach 238 g/mi, or a 13% reduction from 2018 to 2026. Including each type of technology credits allows for incrementally higher CO_2 emissions: including greater off-cycle credits results in 254 g/mi (green), including hybrid credits results in 261 g/mi (purple), and including the electric vehicle multiplier results in 275 g/mi (yellow) in 2026. The 0%/year rollback is shown in red, delivering 265 g/mi in 2026. As shown, the 2.5%/year standards with all three crediting provisions (off cycle credit, hybrid credit, electric vehicle multiplier) results in higher CO_2 for the combustion vehicles than the 0%/year rollback from 2022 through 2026.

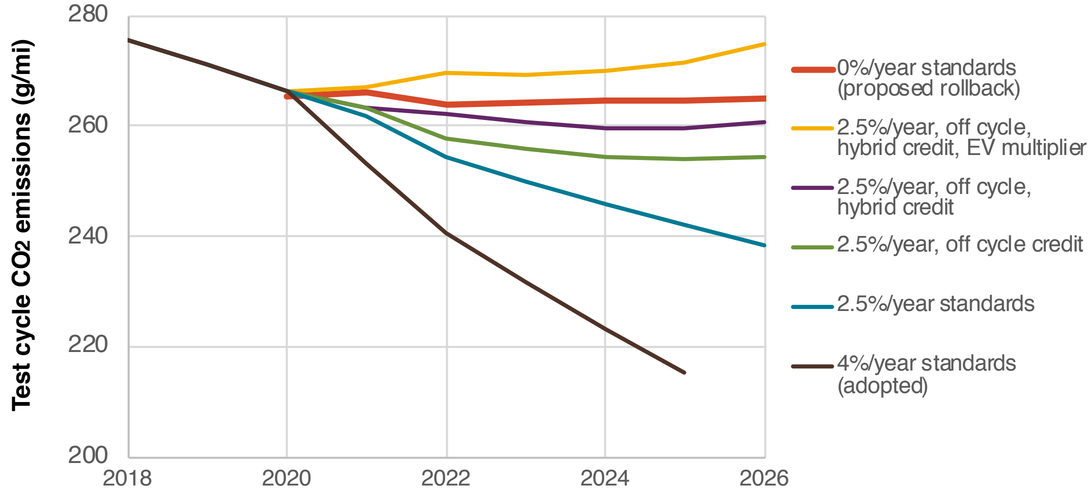

Figure 6. Test cycle combustion vehicle CO_2 emissions for model years 2018 through 2026 from regulatory scenarios

The regulatory scenarios ultimately reveal similar trends when passenger cars or light trucks are examined separately. Figure 7 shows the associated consumer label fuel economy in 2026 under each regulatory scenario, but separately shows how each scenario affects passenger cars and light trucks. For passenger cars, as shown in the top of chart, the adopted standards would achieve 36 mpg (brown), compared to the 2.5%/year case reaching 32 mpg (blue). Including the technology provisions, the fuel economy is reduced to 31 mpg with off cycle credits (green), to 30 mpg with off cycle and hybrid credits (purple), to 28 mpg with electric vehicle multipliers and off cycle and hybrid credits (yellow). The rollback scenario (red) results in 30 mpg. For context the estimated 2018 passenger car fuel economy is shown with a gray line at 29 mpg.

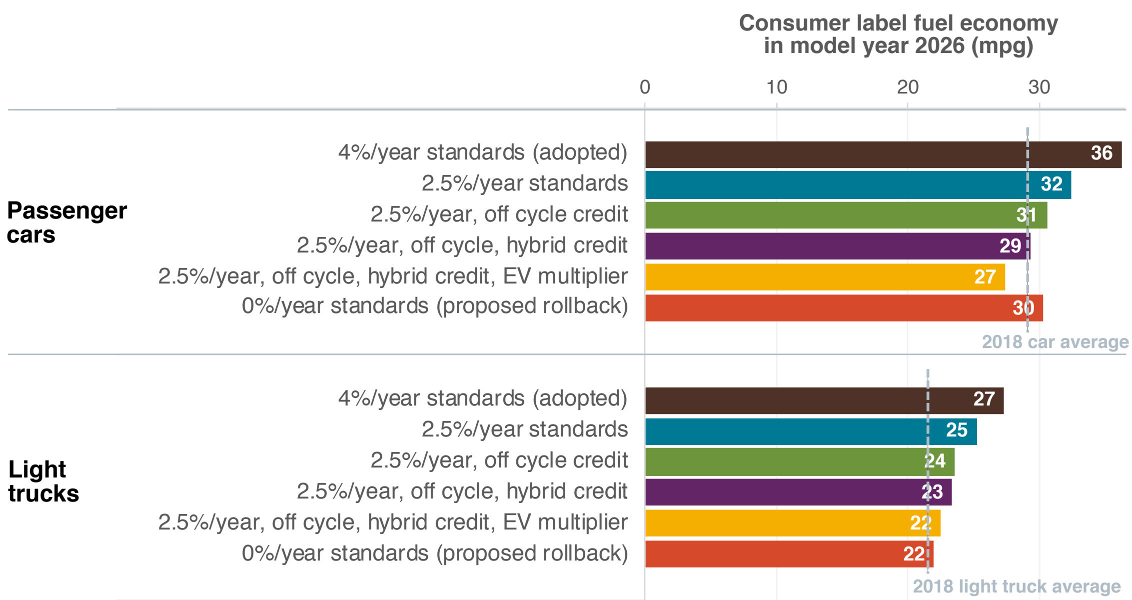

Figure 7. Consumer label fuel economy for model year 2026 combustion vehicles from regulatory scenarios

Shown in the bottom portion of Figure 7 are the resulting light truck 2026 consumer label fuel economy values. The average light truck under the adopted standards would achieve 27.3 mpg (brown), compared to the 2.5%/year case reaching 25.2 mpg (blue). Including the technology provisions, fuel economy is reduced to 23.5 mpg with off cycle credits (green), to 23.3 mpg with off cycle and hybrid credits (purple), to 22.5 mpg with electric vehicle multipliers and off cycle and hybrid credits (yellow). The rollback scenario (red) results in 21.9 mpg. For context the estimated 2018 light truck fuel economy is shown with a gray line at 21 mpg.

Considering the effect of all the technology credits for the 2.5%/year scenario across cars and light trucks, new light-duty vehicle fuel economy for 2022 through 2026 would remain at 25 mpg. This amounts to model year 2026 new vehicles as a whole having the same average fuel economy as new vehicles in 2016. For comparison, under the original 2017-2025 standards with their regulatory crediting provisions, combustion vehicle fuel economy would have increased to 32 mpg by 2025.

Conclusions

Regulatory credits for particular technologies have the potential to promote greater emission-reduction benefits. However, if the technologies are already becoming widely deployed, do not have verifiable real-world benefits, or are allowed high credit values, the crediting schemes can undermine the original intent of the standards. Our examination of technology credits in these comments on the U.S. CO_2 and fuel economy standards leads to three conclusions.

Increased use of technology credits could eliminate the intended benefits of the regulatory standards. Even with the strongest regulatory stringency the U.S. regulators are considering in their August 2018 proposal, we find that technology credits (i.e., off-cycle credits, hybrid credits, electric vehicle multipliers) could negate the CO_2 benefits from all new combustion vehicles through 2026.

Consumers receive much lower fuel economy from a regulation that is more dependent on technology credits. Consumers in 2018 see average fuel economy values of 28 mpg for cars and 21 mpg for light trucks. By 2026, the standards could increase fuel economy to 32—37 mpg for cars, and to 25—27 mpg for light trucks. With the use of credits as considered by U.S. regulators, fuel economy could stagnate near 2018 levels indefinitely. Considering the abundant cost-effective technology to increase efficiency by 4%/year,[13] this would be a lost opportunity.

Technology credits present a responsibility for regulators to credibly and transparently assess their increased use. Based on the August 2018 proposal, the agencies are considering credits that could quietly eliminate the original effect of the vehicle regulations, but with less analysis than is presented here in this analysis. As automakers press for these extra credits, instead of downplaying their use, this analysis indicates the importance of regulators fully analyzing any opening of credits with as much rigor as the primary technology paths.

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[13] See Nic Lutsey, Dan Meszler, Aaron Isenstadt, John German, Josh Miller, *Efficiency technology and cost assessment for U.S. 2025–2030 light-duty vehicles*, (ICCT: Washington DC, March 2017), http://www.theicct.org/US-2030-technology-cost-assessment and Josh Miller and Nic Lutsey, Consumer benefits of increased efficiency in 2025-2030 light-duty vehicles in the U.S., (ICCT: Washington DC, June 2017), https://www.theicct.org/publications/consumer-benefits-increased-efficiency-2025-2030-light-duty-vehicles-us