TOYOTA

TOYOTA MOTOR NORTH AMERICA, INC.
Sustainability and Regulatory Affairs
325 7th Street, NW, Washington DC 20004

October 26, 2021

U.S. Department of Transportation
Docket Management Facility, M–30
Docket No. NHTSA–2021– 0053
West Building, Ground Floor, Rm. W12–140
1200 New Jersey Avenue SE
Washington, DC 20590

RE: Corporate Average Fuel Economy Standards for Model Years 2024–2026 Passenger Cars and Light Trucks; NHTSA–2021–0053; RIN 2127–AM34

Dear Sir or Madam:

Toyota Motor North America, Inc. (Toyota) appreciates the opportunity to provide comments on the above-referenced Notice of Proposed Rulemaking (NPRM) to revise the Corporate Average Fuel Economy standards for 2024 to 2026 model year light-duty vehicles. In addition, Toyota is a member of the Alliance for Automotive Innovation (AAI) and supports and incorporates by reference AAI's comments on this proposal.

Toyota embraces an electric vehicle future and has put more electrified vehicles (EVs) on U.S. roads than any other automaker. We have unreservedly signed up to meet the challenge of making 40 to 50 percent of the vehicles we sell electric (battery electric, fuel cell electric, and plug-in hybrid) by 2030. Our common goal is straightforward: reduce the amount of carbon that autos release into the atmosphere. In line with this goal, Toyota recently submitted comments generally supporting EPA's proposed 2023-2026 model year GHG standards and associated regulatory flexibilities. However, Toyota cannot offer the same general support for NHTSA's preferred alternative CAFE standards due largely to two overarching issues.

First, while Toyota appreciates NHTSA's consideration and incorporation of various flexibilities to promote electrification, the preferred alternative CAFE standards depart materially from EPA's preferred alternative by insufficiently incorporating regulatory adjustments previously made by NHTSA to better harmonize the CAFE and GHG programs. The result is a significant erosion in the "One National Program" concept so critical to automakers and previously lauded by both NHTSA and EPA. We urge NHTSA, in collaboration with EPA, to revisit the harmonization areas outlined in our attached comments to ensure greater consistency between these two important sets of regulations and achieve needed environmental and energy benefits in a more efficient manner.

Second, Toyota shares AAI's concern about NHTSA including the fuel economy improvement and energy reduction benefits of electric vehicles in determining maximum feasible fuel economy standards. This unprecedented step runs contrary to law and undermines the electrified vehicle technology incentives intended by the statute. Toyota agrees the inevitable march toward greater electrification of the fleet raises questions about the best way to regulate fuel economy and we look forward to thoughtful dialogue about the role of the CAFE program as NHTSA and EPA consider future regulations for 2027 model year and later vehicles.

The attached comments also touch on various other analytical, modeling and technology topics addressed in the NHTSA's proposal, many of which Toyota supports or for which we offer minor adjustments or clarifications.

Should you have any questions about these comments, please reach out to Rick Gezelle (rick.gezelle@toyota.com), Senior Principal Engineer, should you have any questions or require additional information.

Sincerely

Tom Stricker
Group Vice President
Sustainability and Regulatory Affairs
Toyota Motor North America

Attachment I – Comments of Toyota Motor North America, Inc.

Notice of Proposed Rulemaking: Corporate Average Fuel Economy
Standards for Model Years 2024–2026 Passenger Cars and Light Trucks
Docket ID Number: NHTSA–2021–0053
October 26, 2021

Toyota Motor North America, Inc. (Toyota) appreciates the opportunity to provide comments on the above-referenced Notice of Proposed Rulemaking (NPRM) to revise the Corporate Average Fuel Economy (CAFE) standards for 2024 to 2026 model year light-duty vehicles. As a member of the Alliance for Automotive Innovation (AAI), Toyota supports and incorporates by reference the AAI's comments. In addition, we have attached (as Appendix 1) and incorporate by reference our comments submitted to EPA on the proposed 2023 through 2026 model year GHG standards, which include references to this matter.

As explained in more detail in our comments to EPA, Toyota generally supports the proposed EPA GHG standards. However, NHTSA's proposed CAFE standards are materially more stringent than EPA's preferred alternative based on NHTSA insufficiently incorporating legally permissible regulatory adjustments to better align NHTSA and EPA's regulations. Maintaining some semblance of a unified national approach in this area has been an important objective for automakers and the government alike over the past decade but appears to have been set aside with this latest NHTSA proposal. As described below, we urge NHTSA to consider adjustments to align stringency with EPA and minimize unnecessary costs on consumers while reducing energy consumption.

1) The Proposed CAFE Standards Are Not Adequately Harmonized with EPA's Proposed GHG Standards.

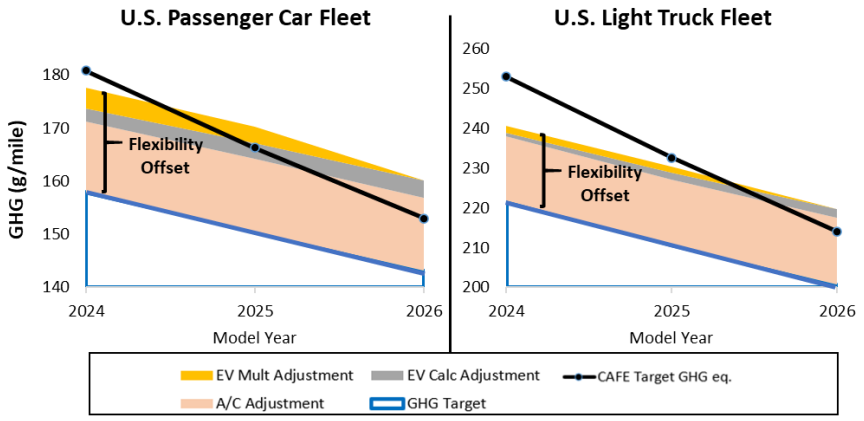
The goal of harmonized CAFE and GHG standards has long been to "allow automakers to produce and sell a single fleet nationally, mitigating the additional costs that manufacturers would otherwise face in having to comply with multiple sets of federal and state standards."[1] The agencies have recognized that CAFE statutory constraints must be addressed during the standard-setting process for this objective to be realized and have taken steps to address these differences in past rulemakings.

Misaligned Stringency

The proposed CAFE standards do not adequately account for the flexibility and fleet compliance restrictions relative to the GHG program. The stringency of the proposed CAFE requirements eclipses the GHG program in 2025 model year for the U.S. passenger car fleet and 2026 model year for the U.S. light truck fleet.

[1] U.S. EPA, U.S. DOT Light-Duty Vehicle Greenhouse Gas (GHG) Emission Standards and Corporate Average Fuel Economy (CAFE) Standards, Final Rule, EPA–HQ–OAR–2009–0472, NHTSA–2009–0059, May 2010, at 25326.

Figure 1 – CAFE/GHG Stringency Comparison[2]



Source: Alliance for Automotive Innovation based on CAFE Model Central Analysis.

The imbalanced stringency for 2025 and 2026 model year generally causes the proposed CAFE standards to require greater fuel economy and CO2 improvements than the proposed GHG standards and effectively erases the benefit of the GHG program's electrification incentives. Further, it is uncertain whether the trajectory of the proposed standards can be sustainable for post-2026 compliance if the annual rate of CAFE stringency increases continues to exceed that of the GHG standards.

Based on the parameters evaluated in Figure 1, the CAFE program "appears" less stringent than the GHG program for 2024 model year, particularly for light trucks, but the stringency gap shrinks when credit transfer limitations and other harmonization factors not being analyzed here are considered. Any CAFE stringency lag for 2024 model year stems from the one-year implementation delay dictated by the 18-month statutory leadtime requirement. Nonetheless, targeted oil savings and GHG reductions for 2024 model year will be achieved through the proposed GHG standards. Any effort to balance or make up for the relatively less stringent 2024 CAFE requirements with the relatively tougher 2025-2026 model year stringency, or balance passenger car and light truck stringency, implies credit averaging which is prohibited during the standard setting process under 49 U.S. Code § 32902(h)(3).

Flexibility Constraints That Can Cause Misaligned Stringency

The CAFE program is unable to offer the same level of technology incentives and flexibilities afforded by the GHG program. First, GHG compliance can be augmented with credits for reducing the leakage of refrigerants from air conditioning (AC) systems and switching to refrigerants having a lower global warming potential. As there is no efficiency or fuel economy benefit derived from these actions, no credit or Fuel Consumption Improvement Value (FCIV) exists for the CAFE program. The AC leakage credit has previously been addressed by

[2] CAFE-GHG harmonization considerations extend beyond the AC Leakage, Electric Vehicle Miles-Per-Gallon versus Grams-Per-Mile Calculations, and Electric Vehicle Production Multipliers shown in this figure.

offsetting the CAFE and GHG standards by approximately the value of that credit so both standards require the same level of effort for compliance. As seen in Figure 1, the difference between the 2026 model year CAFE and GHG standards for both passenger cars and light trucks is less than the normal offset provided for the A/C leakage credits.

Second, the GHG program includes a production multiplier to incentivize the deployment of battery electric vehicles (BEVs), fuel cell electric vehicles (FCEVs), and plug-in hybrid electric vehicles (PHEVs) given current challenges in the emerging market for electric vehicles. This provision is not available to the CAFE program. Similarly, EPA assigns zero GHG tailpipe emissions for operation on electricity whereas CAFE fuel economy is determined by an energy-equivalent calculation where the results are significantly boosted by an incentive for alternatively fueled vehicles. EPA's treatment provides a greater compliance benefit. For example, a midsize BEV achieving a 250-mpg fuel economy rating nets 35.5 g/mi less benefit compared to the GHG program's zero-tailpipe emissions. The fleetwide impacts of this discrepancy scale with electric vehicle market share. As electrification sales increase at the levels being projected by the CAFE and GHG proposals, the production multiplier and zero gram-per-mile tailpipe emissions provisions will have a more pronounced impact requiring greater CAFE standard adjustments to maintain equivalent stringency.

Fleet Compliance Restrictions That Can Cause Misaligned Stringency

The CAFE program's less flexible fleet compliance requirements are another potential source of imbalanced stringency. The domestic passenger automobile, non-domestic passenger automobile, and light truck fleets must each independently comply within 2 mpg of their respective fleet standards due to the statutory credit transfer limit described in 49 U.S.C. 32903(g)(3). As CAFE standards increase, the 2-mpg credit transfer limit becomes more constraining due to the inverse mathematical relationship between fuel economy and fuel consumption. For the proposed 2026 model CAFE standards, there will be over 50% less ability to move credits between fleets compared to the 2011 model year standards when the transfer limit was first enacted.

Further, the domestic passenger car fleet must comply with a minimum standard defined by 92 percent of the fuel economy of the combined domestic and non-domestic passenger automobile fleets and do so without the use of transferred credits. In contrast, the GHG program has no domestic versus import distinction and allows an unlimited transfer of credits between the passenger car and light truck fleets. As a result, GHG compliance can be better balanced between the fleets accommodating a wider range of compliance strategies tailored to a manufacturer's specific technology, product cadence, and market circumstances with no negative energy or environmental outcomes.

Lack of Coordination Between CAFE and GHG Programs

The proposal explains that the updated CAFE Model[3] simultaneously simulates GHG and CAFE compliance which theoretically should help reveal program differences that necessitate adjustments for an appropriate level of harmonization. However, the CAFE Model simulates only SAFE 2 GHG program compliance, excluding consideration of EPA's recently proposed 2023-2026 model year GHG standards. NHTSA needs to simultaneously analyze manufacturer compliance with the proposed CAFE and GHG requirements to ensure reasonable stringency alignment. The proposal notes that "NHTSA endeavors to create standards that meet our statutory obligations and still avoid requiring manufacturers to build multiple fleets of vehicles for the U.S. market."[4] Attaining single fleet compliance with both programs by forcing manufacturers to design for the most stringent elements of both programs does not achieve this objective consistent with past practice.

Request for Improved Harmonization

NHTSA and EPA have previously addressed the CAFE statutory restrictions by adjusting the standards relative to the GHG standards. As noted in the 2012 joint EPA/NHTSA rulemaking, "… the rates of increase in stringency for CAFE standards are lower than EPA's rates of increase in stringency for GHG standards. As in the MYs 2012-2016 rulemaking, this is for the purposes of harmonization and in reflection of several statutory constraints in EPCA/EISA."

Toyota requests NHTSA follow past practice and adjust the CAFE standards to better account for its statutory constraints and more closely align with GHG program stringency in keeping with the shared objectives for One National Program. We understand that the relatively faster CAFE improvement rate may aim to attain the annual stringency of the GHG program following the one-year implementation delay caused by the CAFE statutory leadtime requirement.[5] However, the proposed 8% annual improvement ultimately overshoots the stringency of the proposed GHG requirements.

2) Conventional Hybrids Play an Important Role

Seizing Today's Opportunities

The surest way to reduce carbon the fastest is to embrace all forms of electrified vehicles to meet the varying needs of consumers, as well as low carbon fuels to reduce carbon from Internal Combustion Engines (ICEs) as the fleet turns over to electrified vehicles. For many consumers, hybrids can be a more attainable and affordable path to the benefits of electrification.

[3] The CAFE Compliance and Effects Modeling System ("CCEMS") is referred to as the CAFE Model.
[4] U.S. DOT. CAFE Standards for Model Years 2024–2026 Passenger Cars and Light Trucks, NHTSA–2021–0053, September 2021 at 49793.
[5] *Id.* at 49604.

The proposal refers several times to manufacturer announcements on "forthcoming new higher fuel-economy and electric vehicle models" as evidence that the preferred alternative is feasible. While manufacturer statements accurately capture the industry's commitment to an electrified future, work remains to secure a viable market for these products. The market share for BEVs, PHEVs, and FCEVs has averaged 2.4% percent over the 2018 – 2021 period.[6] As noted in our GHG comments, consumers are becoming more open to alternative powertrains, but potential buyers still see obstacles to ownership because of price, range anxiety, charging time, lost utility and host of other factors presenting a more expensive and less convenient proposition compared to their current vehicle.

Strong hybrids can avoid many of these current concerns while providing significant benefits today and getting consumers acclimated to electrification as it becomes more prevalent over the next decade. Toyota is making progress in deploying strong hybrid technology across our product lineup. Hybrids comprise over 20 percent of our 2021 model year sales. Our goal is for every model to have a hybrid option available by 2025 model year.[7] We currently offer three models (Sienna, Venza, and Prius) with only a hybrid powertrain.

The Challenge for Heavier, More Capable Light Trucks

Segments like full-size pickup trucks face "unique challenges in the costs of applying advanced technologies due to the need to maintain vehicle utility and meet consumer expectations".[8] The CAFE proposal recognizes large pickup trucks represent a significant share the light duty vehicle fleet and that tractive energy requirements generally dictate higher levels of fuel consumption and GHG emissions. We agree with NHTSA's assessment that "offering incentives could encourage the deployment of technologies that can significantly improve the efficiency of these vehicles and that also will foster production of those technologies at levels that will help achieve economies of scale, would promote greater fuel savings overall and make these technologies more cost effective and available in the future model years to assist in compliance with CAFE standards".[9] This is consistent with EPA's conclusion that the full-size pickup truck incentive remains sound policy.

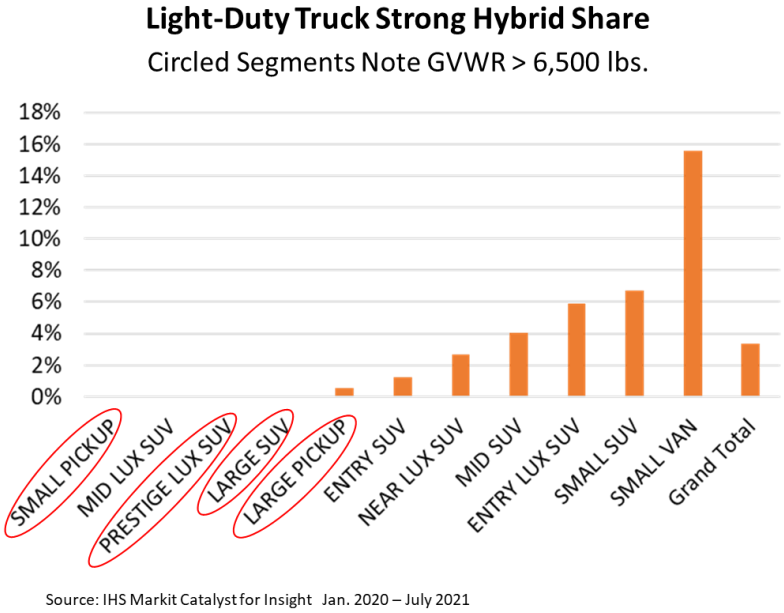
Toyota appreciates NHTSA leveraging its existing authority for flexibilities, and we support reinstituting FCIVs for full-size pickup trucks. We request applicability of this provision run through the 2026 model year to accommodate product entries over the duration of the proposed CAFE standards and support compliance when the standards become the most challenging.

[6] 2018 – 2021 Calendar years; IHS Markit Catalyst for Insight – New Registration - Data as of July 31, 2021.
[7] Excludes low volume/high performance models.
[8] U.S. EPA. Revised 2023 and Later Model Year Light-Duty Vehicle GHG Emissions Standards, EPA–HQ–OAR–2021–0208, August 2021, at 43761.
[9] U.S. DOT. CAFE Standards for Model Years 2024–2026 Passenger Cars and Light Trucks, NHTSA–2021–0053, September 2021 at 49833.

Applicability is currently noted as running through 2026 model year in some places in the proposal and 2025 in others.

We also request the strong hybrid incentive be extended to all light trucks having a gross vehicle weight rating (GVWR) greater than 6,500 lbs. The market challenge for this narrow segment is the same as that for full-size pick-up trucks. All pickup trucks and body-on-frame SUVs contend with difficulty in providing low CO2 performance while preserving towing and hauling capabilities. As seen in Figure 2, the share of hybrids in this segment remains low relative to the industry gains made in most every other light truck category.

Figure 2 – Light-Duty Truck Strong Hybrid Sales



Incentivizing this slightly broader segment will help manufactures "address cost, utility, and consumer acceptance challenges".[10] The additional trucks with a GVWR greater than 6,500 lbs. represent about half the sales volume of full-size pickup trucks. Any environmental impact of expanding this flexibility should remain minimal given that EPA's past analyses have demonstrated a low relative impact of the full-size pickup truck provision.[11]

[10] U.S. EPA. Revised 2023 and Later Model Year Light-Duty Vehicle GHG Emissions Standards, EPA–HQ–OAR–2021–0208, August 2021, at 43761.

[11] Memorandum, "Spreadsheet tool for the comparative analysis of program stringencies for various light-duty vehicle GHG footprint curves and compliance flexibilities combinations," July 2018, Kevin Bolon, EPA Office of Air and Radiation. Docket No. EPA-HQ-OAR-2018-0283. The SAFE Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks, Prepublication Version, NHTSA-2018-0067; EPA-HQ-OAR-2018-0283, July 2018, at Table X-5 and 894-895.

Compliance Modeling Overestimates Hybrid Costs

NHTSA's estimated costs are significantly higher than Toyota's understanding based on our current products and experience developing and marketing hybrids systems over the last two decades. As seen in Table 1, the estimated costs for power split hybrids used as an input to compliance modeling for the proposed standards are more than twice the cost estimates in the National Academies of Science Engineering and Medicine (NASEM) 2025-2035 CAFE Study. Further, NHTSA's projected power split system costs are always significantly higher than P2 system costs for the same vehicle class. Toyota's experience is that the relative cost of the power split and P2 systems depends on vehicle class and operational requirements, and that for many applications power split and P2 system costs are much more similar than NHTSA's estimates suggest.

Table 1 – Power Split Hybrid System Costs

	NASEM (2025 MY)	NHTSA (2020 MY)*
Medium Car	$2,055	$4,360 - $5,476
CUV/Small SUV+	$1,755	$4,554 - $5,335

* Cost ranges represents NHTSA's non-performance to performance vehicle technology classes. Direct Manufacturer Costs.
+ CUV applies to NASEM cost assessment; Small SUV to NHTSA. CUV and Small SUV considered sufficiently similar for cost comparison.

Sources:

1/ NASEM Costs – TABLE 4.6 Projected Costs and Effectiveness of Representative PS Hybrid Technology Packages; NASEM 2021. Assessment of Technologies for Improving Light-Duty Vehicle Fuel Economy 2025-2035.

2/ NHTSA Costs – Table 3-95 – Cost Estimation for Hybrid and Plug-in Hybrid Electric Drivetrain for all Non Performance Vehicle Technology Classes in 2020. Table 3-96 – Cost Estimation for Hybrid and Plug-in Hybrid Electric Drivetrain for all Performance Vehicle Technology Classes in 2020. Technical Support Document: Proposed Rulemaking for Model Years 2024-2026 Light-Duty Vehicle Corporate Average Fuel Economy Standards

The different assessment methodologies employed by NHTSA and NASEM do not explain the significant cost gaps in Table 1. NASEM projects costs for 2025 model year hybrid systems, whereas NHTSA's assessment starts with 2020 model year costs which are then reduced via an adjustment factor in the CAFE Model over the analysis period. The adjustment factor lowers NHTSA's 2020 model year cost estimate by roughly $530-$750 for the mid-size vehicle class and roughly $570-$722 for the small-SUV class cumulatively through the 2025 model year. These estimated cost reductions are conservatively high estimates.[12] Once adjusted for future cost savings, NHTSA's 2020 hybrid costs are still typically double the NASEM estimates. Further, the NASEM committee estimates the incremental cost of midsize and crossover strong hybrids in 2020 model year to be $2,000 to 3,000 more than a conventional vehicle which is well below NHTSA's 2020 power split estimate.[13]

[12] The adjustment factors are based on Retail Price Equivalent which include profit whereas all values in Table 1 are costs only with no mark-up for pricing.
[13] NASEM 2021. Assessment of Technologies for Improving Light-Duty Vehicle Fuel Economy 2025-2035. Washington, DC: The National Academies Press. https://doi.org/10.17226/26092 at 4-67.

NHTSA suggests that the ICE is one of the largest sources of the cost discrepancy pointing out that "the 2021 NAS study does not consider the IC engine upgrade costs whereas the CAFE analysis does."[14] NHTSA also footnotes that the "NAS committee's vehicle of choice (Toyota Camry 2021) has no engine upgrade when advancing from conventional to PS hybrid."[15] The conclusion is that "While the total 2021 NAS costs are appreciably lower than the total costs for a similar vehicle powertrain conversion in the CAFE analysis, when the component sizes are normalized the net costs from both analyses are much more similar."[16]

Toyota believes the NASEM 2025 model year cost values are more representative of hybrid vehicle costs through the 2026 model year, including any accompanying engine developments and normalization for differences in component sizes and assessment methodologies. We disagree that engine upgrades should account for a large portion of the difference between the NASEM and NHTSA cost estimates. Such a significant cost difference does not exist for Toyota's 2.5L Dynamic Force engine used in the hybrid and non-hybrid versions of the 2021 model year Camry referenced by NHTSA. Toyota is willing to provide more detailed information upon request.

Overestimated power spilt hybrid costs along with the inappropriate treatment of BEVs and PHEVs as described in Section 3 below suppress conventional hybrid technology's contribution to maximum feasible CAFE standards. The CAFE Model outputs project nine percent of Toyota's fleet will consist of strong hybrids in response to the preferred alternative standards when that sales share has already reached over 20 percent. We request the CAFE compliance modeling be re-run with more appropriate cost values for power split hybrids and without the inappropriate inclusion of BEVs and PHEVs. The new results should be more indicative of conventional strong hybrid's potential for significant fuel economy improvements and GHG reductions as an affordable electrified powertrain option.

3) BEVs and PHEVs (Electrification Portion) Should Not Be Used in CAFE Standard Setting

Electrification Challenges CAFE Program

The recent NASEM 2025-2035 CAFE study notes that the Energy Policy & Conservation Act (EPCA), as amended by Energy Independence and Security Act (EISA), could reduce the effectiveness of the CAFE program in meeting efficiency and petroleum reduction goals as electrified vehicles gain significant market share. EPCA prohibits the fuel economy of dedicated

[14] U.S. DOT. CAFE Standards for Model Years 2024–2026 Passenger Cars and Light Trucks: Technical Support Document, NHTSA–2021–0053, September 2021 at PDF Pg. 317.
[15] *Ibid.*
[16] *Id.* at PDF Pg. 319.

alternative- fueled vehicles from being considered when deciding maximum feasible standards and allows only the operation on gasoline or diesel fuel for dual fueled vehicles.[17]

While the CAFE standards may become less stringent relative to the EPA GHG standards, NHTSA's charge is to reduce petroleum consumption and electrification of the fleet accomplishes this by default.

However, NHTSA improperly considered BEVs and PHEVs in its standard-setting. The CAFE proposal describes in detail how assumed manufacturer compliance with California's (CA's) Zero Emission Vehicle (ZEV) Mandate and its adoption by other states[18] is incorporated into the baseline or No-Action alternative as well as the other alternatives considered during the standards setting process, including the preferred alternative known as Alternative 2. BEV sales[19] resulting from ZEV compliance are an input to the CAFE Model runs used to demonstrate the feasibility of the preferred alternative. Embedding CA/177 State ZEV compliance into the baseline and CAFE Model requires fuel economy values be assigned to those BEVs.

BEVs are also added in the 2023 model year fleet analysis, and PHEVs (including their electrical portion of operation) are added during the standard-setting years and beyond. The multi-year planning feature of the CAFE Model enables technology to be added outside of the standard-setting years to account for the role of technology and product cadence in manufacturer compliance planning. These electrification technologies are being added in response to the proposed standards even when that occurs outside of the model years of the standard-setting.

NHTSA justifies the inclusion of ZEV compliance as part of its standard setting on the grounds that it is statutorily required to consider "the effect of other motor vehicle standards of the Government on fuel economy" under 49 U.S.C. § 32902 (f). Toyota fully supports the AAI comments addressing in detail how the proposed treatment of BEVs and PHEVs during standard-setting violates EPCA/EISA restrictions and why NHTSA's obligation to consider the effect of other motor vehicle standards does not take precedence over that BEV and PHEV prohibition. In sum, both statutory requirements must be satisfied. NHTSA can only consider impact of other government regulations when not prohibited from doing so by EPCA/EISA. Toyota requests NHTSA re-run its standard-setting analyses omitting the fuel economy benefits of BEVs and the electricity portion of PHEVs consistent with 49 U.S.C. § 32902.

Concerns with Longer-Term Proposal

The proposal seeks comment on whether and how NHTSA might consider adding electrification as an attribute on which to base CAFE standards. NHTSA offers the idea of developing fuel economy standards as a function of footprint along with a new second attribute based on the

[17] 49 U.S.C. § 32902(h).
[18] Under Section 177 of the Clean Air Act.
[19] As described in the CAFE proposal, ZEV compliance is modeled through BEV sales and not FCEVs or PHEVs.

degree of vehicle electrification, defined as the fraction of work done by electric motors over the test cycles.[20]

NHTSA believes the concept would rely on electrification as a second vehicle attribute that is *related to* fuel economy, which NHTSA claims is specifically authorized by the statute.

Toyota agrees with AAI's assessment that the current footprint-based standards already account for vehicle electrification to the greatest extent allowed under EPCA. Please see AAI comments for details. NHTSA's concept is unnecessarily complex and still relies on the fuel economy of dedicated alternative-fuel vehicles, inconsistent with the NHTSA's EPCA/EISA authority. The Technical Support Document (TSD) notes that under this concept, "The relevant policy goal is using electrification to achieve deep reductions in GHG emissions"[21] which in Toyota's view will already be fulfilled by EPA's policy goal for the vehicle GHG program.

4) Conclusion

Toyota is committed to meeting the challenge of making 40-50% of the vehicles we sell electrified by 2030. Our recent comments to EPA generally support the proposed 2023-2026 model year GHG standards. However, we cannot support the preferred alternative CAFE standards for 2024-2026 model year because they are materially more stringent than EPA's preferred alternative. This is because the proposed CAFE standards fail to account for differences in compliance flexibilities allowed between the NHTSA and EPA statutes. NHSTA should adjust the proposed CAFE standards so they are more closely aligned with proposed GHG program stringency consistent with past practice.

We appreciate NHTSA leveraging its current authority for flexibilities to re-institute the incentive for full-size hybrid pickup trucks. Expanding this incentive to a slightly broader category of trucks will help promote advanced technology in segments that have proven difficult to hybridize. In addition, Toyota believes NHTSA has overstated hybrid system costs resulting in a lower expected contribution from hybrids in improving fuel economy.

Finally, Toyota shares AAI's concern about NHTSA including the fuel economy improvement and energy reduction benefits of electric vehicles in determining maximum feasible fuel economy standards. This unprecedented action is inconsistent with the program's governing statute and undermines the electrified vehicle technology incentives intended by the statute.

[20] U.S. DOT. CAFE Standards for Model Years 2024–2026 Passenger Cars and Light Trucks: Technical Support Document, NHTSA–2021–0053, September 2021 at Section 1.2.3, PDF Pg. 24.
[21] *Id.* at PDF Pg. 25.

Toyota requests NHTSA re-run the compliance modeling used to justify the feasibility of the preferred alternative standards with more appropriate hybrid system costs, without BEVs and PHEVs, and with greater attention to CAFE-GHG program harmonization.

Appendix I – Comments of Toyota Motor North America, Inc.

Notice of Proposed Rulemaking: Revised 2023 and Later Model *Year*
Light-Duty Vehicle Greenhouse Gas Emissions Standards
Docket ID Number: EPA–HQ–OAR–2021–0208
September 27, 2021

Toyota Motor North America, Inc. (Toyota) appreciates the opportunity to provide comments on the above-referenced Notice of Proposed Rulemaking (NPRM) to revise the greenhouse gas (GHG) standards for 2023 to 2026 model year light-duty vehicles. As a member of the Alliance for Automotive Innovation (AAI), Toyota supports and incorporates by reference the AAI's comments. Toyota will comment separately on NHTSA's proposed 2024 through 2026 model year CAFE standards, although we touch upon certain harmonization aspects of the proposed CAFE regulation in these comments.

1) Toyota Generally Supports EPA's Proposed Standards

Toyota embraces an electric vehicle future and shares the Administration's objective of 40% to 50% of new vehicles sales in 2030 being electrified. We believe the surest way to reduce carbon the fastest is to embrace all forms of electrified vehicles to meet the varying needs of consumers, as well as low carbon fuels to reduce carbon from Internal Combustion Engines (ICEs) as the fleet turns over to electrified vehicles. We appreciate that the proposed standards remain performance-based while providing limited regulatory incentives to promote electrification and provide manufacturer's with needed regulatory flexibility.

Toyota generally supports the proposed 2023-2026 model year GHG standards. Successful implementation of, and compliance with, the proposed standards requires complementary market-development and sustainment measures, including non-discriminatory consumer tax credits, infrastructure investments on electric charging and hydrogen refueling, critical mineral supply chain development, and a robust system to recycle end-of-life vehicle batteries. Toyota stands ready to work with federal and state regulators and lawmakers to support these measures provided they maintain a level competitive playing field.

2) EPA has Underestimated the Level of Electrification Needed to Meet the Standards

A Big Jump in A Few Years

The proposed GHG standards present a formidable challenge in attaining the levels of electrification being projected for compliance. EPA estimates the share of BEVs, FCEVs, and PHEVs will need to grow from an average of 2.4 percent[1] today to 8 percent (NHTSA is projecting 12 percent for its proposed CAFE regulation) by 2026. Efforts to build the market must start now to more than triple the share of these technologies in just four years. For perspective, it's taken conventional hybrids 20 years to eclipse 3 percent of the U.S. market, even though hybrids require no new infrastructure, have no range anxiety issues, can be refueled virtually anywhere, and require no behavioral changes.

[1] 2018 – 2021 Calendar years; IHS Markit Catalyst for Insight – New Registration - Data as of July 31, 2021.

As described below, Toyota believes the task is even greater than projected by EPA because more electrification will be needed to comply with the proposed standards, which overestimate the likely contribution of ICE vehicle improvements and thus underestimate the level of BEV, FCEV, PHEV, and conventional hybrid volumes likely needed for compliance.

EPA has Overestimated the GHG Performance from ICEs

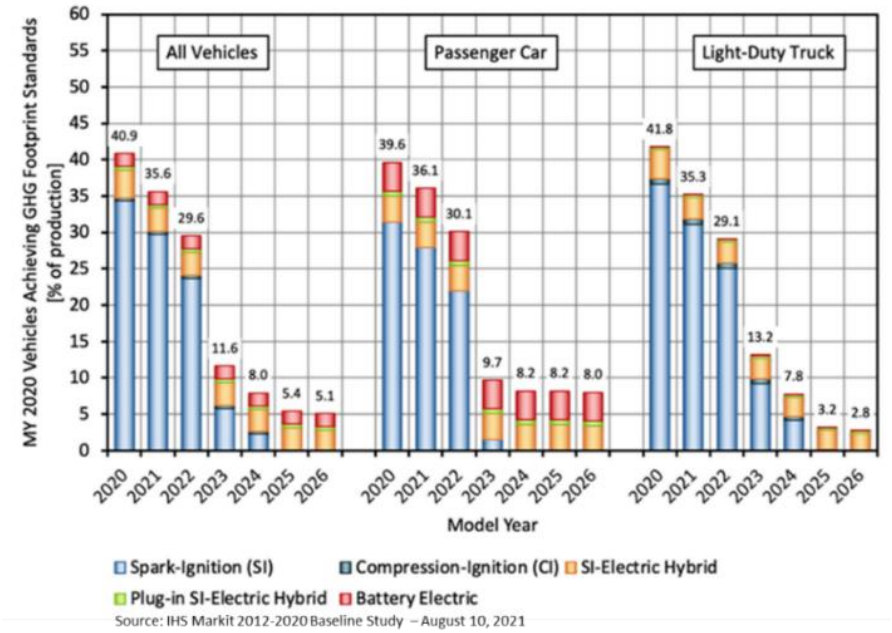
Toyota has provided extensive information, in public comments and under CBI, on the effectiveness of CO2 reduction technologies including those for advanced gasoline engines.[2] The data has consistently documented that even advanced ICE-only powertrains will fall short of the proposed standards and that while future advancements are possible, a point of diminishing returns is in part driving the transition to electrified powertrains, including conventional hybrids. EPA notes manufacturer plans and announcements of "a rapidly growing shift in investment away from internal-combustion technologies and toward high levels of electrification".[3]

EPA projects roughly 87 percent of the 2026 model year fleet will continue to be conventional gasoline powertrains. We are confused by EPA's statement that "the standards can be met largely with the kinds of advanced gasoline vehicle technologies already in place in vehicles within today's new vehicle fleet …".[4]

This position is at odds with findings from the most recent evaluation of U.S. fleet performance conducted by IHS Markit using manufacturer-supplied data. This baseline study assessed the percentage of 2020 model year vehicles capable of meeting the proposed GHG standards. As Figure 1 illustrates, only electrified powertrains (HEV, PHEV, BEV and FCEV) can attain the proposed targets for the 2024 model year and later passenger cars and 2025 MY and later light trucks. Most gasoline engine technologies modeled by EPA are already being used in the 2020 model year fleet. A more widespread adoption of top-performing gasoline engine technologies through 2026 model year will not result in fleet compliance.

[2] Toyota comments on: Draft Technical Assessment Report on 2022-2025 Model Year Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, EPA-420-D-16-900 Pgs. 2-5 and Appendix 1; Proposed Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation, EPA-420-R-16-020, Pgs. 3-8; Request for Comment on Reconsideration of the Final Determination of the Mid-Term Evaluation of Greenhouse Gas Emissions Standards for Model Year 2022–2025 Light-Duty Vehicles; Request for Comment on Model Year 2021 Greenhouse Gas Emissions Standards, EPA–HQ–OAR–2015–0827, Pgs. 3-9; Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule For Model Years 2020 – 2026 Model Year Passenger Cars and Light Trucks, NHTSA–2018–0067; EPA–HQ–OAR–2018–0283, Pgs. 2-9 and Appendices A-C.
[3] U.S. EPA. Revised 2023 and Later Model Year Light-Duty Vehicle GHG Emissions Standards, EPA–HQ–OAR–2021–0208, August 2021 at 43766.
[4] *Id.* at 43777.

Figure 1 – 2020 MY US Fleet Performance Against Proposed Standards



Modeling Assumptions Are Critical

The performance discrepancy is due to overly optimistic technology effectiveness assumptions and a reliance on unproven technologies being added to an older baseline fleet. For example, HCR2 Atkinson engine technology has returned to EPA's compliance modeling.[5] EPA now defines HCR2 as "the addition of dynamic cylinder deactivation and cooled EGR within non-HEV Atkinson Cycle engine applications".[6] However, the cost, technology effectiveness, and underlying engine map used for modeling HCR2 technology appears identical to that used for the SAFE 2 Final Rule which is represented by the simulated and experimental effectiveness of the 2014 2.0L SKYACTIV engine with the addition of cooled Exhaust Gas Recirculation (cEGR), 14:1 compression ratio (CR), and cylinder deactivation.[7,8] There is still no U.S. production vehicle that incorporates this definition of HCR2 technology because the 14:1 CR requires higher octane than currently available in U.S. regular grade gasoline. Further, there are more cost-effective pathways than combining cylinder deactivation with Atkinson cycle engines which have inherently low pumping loss characteristics.

[5] EPA is using the CAFE Compliance and Effects Modeling System ("CCEMS"), otherwise known as the CAFE Model.
[6] U.S. EPA. Revised 2023 and Later Model Year Light-Duty Vehicle GHG Emissions Standards: Regulatory Impact Analysis, EPA-420-R-21-018, August 2021, at 2-13.
[7] U.S. DOT. The SAFE Vehicles Rule for Model Year 2021 – 2026 Passenger Cars and Light Trucks: Preliminary Regulatory Impact Analysis (PRIA), at 303-304.
[8] U.S. EPA. Revised 2023 and Later Model Year Light-Duty Vehicle GHG Emissions Standards: Regulatory Impact Analysis. EPA-420-R-21-018, August 2021, at 4-3.

EPA compliance modeling applies HCR2 engine technology to over 40 percent of Toyota's fleet by 2026 model year. For example, Camry receives HCR2 along with engine friction reduction (EFR) in 2024 model year. The resulting 51.7 mpg fuel economy is about a 9% improvement over Toyota's current generation Camry powered by a 2.5L Atkinson engine which has a world-best 40% thermal efficiency.[9] The modeled CO2 and fuel economy are closer to hybrid Camry performance and are unreasonably large for the technologies involved. First, cylinder deactivation is the only practical distinction between HCR2 and Toyota's 2.5L Dynamic Force Atkinson engine. NHTSA's evaluation has determined applying only cylinder deactivation to Atkinson cycle engines (HCR1) nets an incremental improvement of roughly 2 percent.[10] Second, the 2.5L Dynamic Force engine already encompasses EFR as explained in past comments under CBI.[11] Finally, IACC and EFR benefits appear to be double counted on top of ERF already being included in the Camry 2.5L Atkinson engine. This is because IACC and EFR are both fully included in the simulated HCR2 engine map, yet both technologies are added again in the CAFE Model runs.

EPA modeling sequentially adds enhanced technology to a 2017 baseline fleet until compliance with the proposed standards is achieved. The 2017 model year fleet is outdated because it fails to capture more recent state-of-the-art technologies in the U.S. fleet and requires the CO2 reduction effectiveness of those technologies to be assumed or simulated. An example is Toyota's 2.5L Atkinson engine technology which has been in the market since 2018 model year. The Camry example above could largely be avoided using a more recent baseline. A 2020 model year baseline fleet is more appropriate and provides a more accurate performance assessment, and with fewer product redesign cycles available, there is less chance for technology effectiveness errors to propagate through the fleet. The 2017 baseline has resulted in more Atkinson technology being assumed in the 2018 through 2021 model year fleets than really exists in the market.[12]

The Focus is on Successful Outcomes

Pointing out these ICE limitations in no way diminishes Toyota's general support for the proposed standards, but rather is intended to stress that compliance will require a more substantive shift to electrified powertrains, including conventional hybrids. We need to begin

[9] The CO2 and fuel economy performance of Toyota's 2.5L Dynamic Force engine reside between the HCR1 and HCR2 Atkinson cycle designations. See Toyota supplemental comments on The SAFE Vehicles Rule for Model Years 2021 – 2026 Passenger Cars and Light Trucks; Pg. 2.
[10] U.S. DOT. Proposed Rulemaking for Model Years 2024-2026 Light Duty Vehicle Corporate Average Fuel Economy Standards: Technical Support Document, August 2021, at Section 3.1.1.2.2.1 and Figure 3-5.

[11] Toyota comments on The SAFE Vehicles Rule for Model Year 2021 – 2026 Passenger Cars and Light Trucks: Appendix C, Pg. 4.
[12] EPA Analysis using the CAFE Model at CAFE_model_runs\output\Run4_NonFW-OEMs_SAFE-to-Proposal\reports-csv\technology_utilization_report.

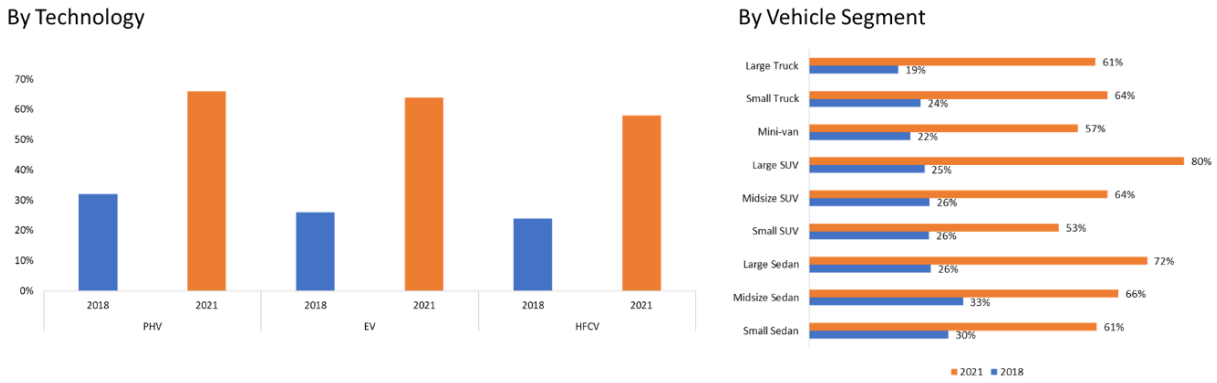
working together now to chart a path for near-term market readiness and growth of electrified powertrains.

3) Success Depends on Converting Growing Consumer Openness to Vehicle Purchases

Shifting Consumer Tastes

Electrified powertrains must become more accessible to mainstream consumers for a carbon neutral future to be realized. Toyota market research has found consumer attitudes are shifting to a greater openness about alternative powertrains as seen if Figure 2. That growth in consumer openness is also being observed in vehicle segments that have traditionally been less inclined toward alternative powertrains. The changing attitudes appear to stem from increasing consumer exposure to electrified powertrains via the growing availability of vehicle models, styles and types, and the media attention created through manufacturer and government announcements.

Figure 2 – Growing Consideration of Alternatively Fueled Vehicles



Challenges Coming into Sharper Focus

While the openness to electrification is growing, converting that openness to purchase intent and ultimately vehicle sales remains a challenge. As mentioned previously, the market share for BEVs, PHEVs, and FCEVs has averaged 2.4% percent over the 2018 – 2021 period. Potential buyers still see obstacles to ownership because of price, range anxiety, charging time, lost utility and host of other factors presenting a more expensive and less convenient proposition compared to their current vehicle as seen below (Figure 3). A general lack of knowledge and misunderstanding contribute to these purchase barriers.

Figure 3 – Barriers to Purchase

PHV	
Limited charging stations	36%
Limited electric range	32%
Charging time	31%
Price	30%
Battery concerns	30%
Charging the vehicle is required	29%
Limited fueling stations	29%
Don't know enough to consider it	29%
Unknown maintenance required	26%

EV	
Battery concerns	43%
Limited electric range	40%
Limited charging stations	39%
Charging time	38%
Charging the vehicle is required	37%
Price	35%
Limited fueling stations	35%
Unknown maintenance required	30%
Don't know enough to consider it	28%
Maintenance costs expensive	24%

HFCV	
Don't know enough to consider it	44%
Limited fueling stations	34%
Unknown maintenance required	29%
Price	26%
QDR Concerns	19%
Maintenance costs expensive	19%
Safety concerns	18%
Battery concerns	17%
Limited electric range	16%

An All-Hands-on-Deck Approach Required

Converting openness to vehicle purchases entails bolstering the value proposition of electrification with more certain refueling availability, greater cost parity, and more of a perceived overall benefit relative to today's powertrains. This will take time and requires a systems-based approach where auto companies continuously make better vehicles, our customers both want and can afford those vehicles, and the government helps with infrastructure, codes and standards, and demand-side policies during the transition. We strongly agree with AAI's comments that specify a list of ten shared responsibilities including an all-of-government effort needed to support the transition to electrified vehicles. Toyota stands ready to do its part.

For the reasons outlined in Sections 2 and 3 above, any additional increase in stringency beyond the proposed standards would create significant risk that threatens the feasibility of the standards. Toyota does not support either Alternative 2 or the 5 to 10 g/mi stringency increase in the 2026 model year standards for which EPA has sought comment.

4) Toyota Supports Flexibilities that Can Accelerate the Shift to Electrification

Most of the necessary investments discussed above in infrastructure, R&D, and consumer incentives essential to building a viable electrification market fall outside of EPA's (and NHTSA's) authority and control. This makes it important for EPA (and NHTSA) to leverage the flexibility provisions under existing authority. We appreciate EPA's holistic approach and support regulatory flexibilities that help manufacturers manage compliance and push desired technologies into a growing but uncertain market.

As EPA noted, technology incentives available in the GHG program can help manufacturers get advanced technologies into the market more quickly than without those incentives.[13] While concerns have been raised about lost environmental benefits associated with regulatory

[13] U.S. EPA. Revised 2023 and Later Model Year Light-Duty Vehicle GHG Emissions Standards, EPA–HQ–OAR–2021–0208, August 2021, at 43756.

flexibilities, we share EPA's policy position that any near-term loss needs to be balanced with the potential for significant longer-term, sustainable payoffs from electrified powertrains successfully transitioning from the current early adopter stage to one of self-sustained growth.

Further, EPA fully accounts for the potential environmental impacts in the benefit-cost analysis. EPA "recognized that they would reduce the effective stringency of the standards, but believed that it was worthwhile to have a limited near-term loss of emissions reduction benefits to increase the potential for far greater emissions reduction and technology diffusion benefits in the longer term."[14] Such a pragmatic approach should also apply to the incentive expiration dates and benefit caps intended to limit potential near-term environmental losses. The temporary nature of the proposed provisions helps limit any losses.

Advanced Technology Vehicle Multipliers – Striking an Appropriate Balance

Toyota requests the PHEV multiplier be increased closer to that provided for BEVs. As explained further in Appendix 1, PHEVs have similar lifecycle CO2 emissions under many operating conditions, can be more financially accessible to a larger consumer base, and fill utility and range gaps currently associated with BEVs. Toyota requests the proposed 1.6X multiplier be increased to 1.8X, or alternatively the 1.6X multiplier not decline over the duration of the provision.

We also request the proposed 2.5 g/mi cumulative cap be increased to 5.8 g/mi consistent with the benefit provided under the CA Framework.[15] Alternatively, Toyota could support a 4.0 g/mi cap representing the approximate mid-point between the proposed 2.5 g/mi cap and the effective 5.8 g/mi cap from the CA Framework. Either approach can increase technology deployment while limiting concerns about potential loss of environmental benefits.

Finally, we request the multipliers and cap be extended to 2026 model year, or at least both be available any four years between and including 2022 and 2026 model years. The any four-year availability option is consistent with EPA's thought of allowing multiplier credits to be generated in model year 2026 without an increase in the cap. Allowing for the incentive in the 2026 model year via a slightly broader or more flexible period of coverage can motivate later product entries as EPA recognizes and ensure an equitable benefit for all manufacturers independent when products enter the market.[16] We understand part of EPA's intention is to signal that multipliers will not be a part of 2027 model year and later standards as technologies become mainstream and core to compliance. Given the current uncertainty of reaching such a desired outcome by 2026 model year, we request EPA defer the decision to eliminate the ATV multiplier until the 2027 and later rulemaking.

[14] *Id.* at 43733.
[15] 5.8 g/mi is the effective annual result of the CA Framework 1% (of the 3.7% annual stringency increase) limit on Advanced Technology Multipliers.
[16] U.S. EPA. Revised 2023 and Later Model Year Light-Duty Vehicle GHG Emissions Standards, EPA–HQ–OAR–2021–0208, August 2021, at 43757.

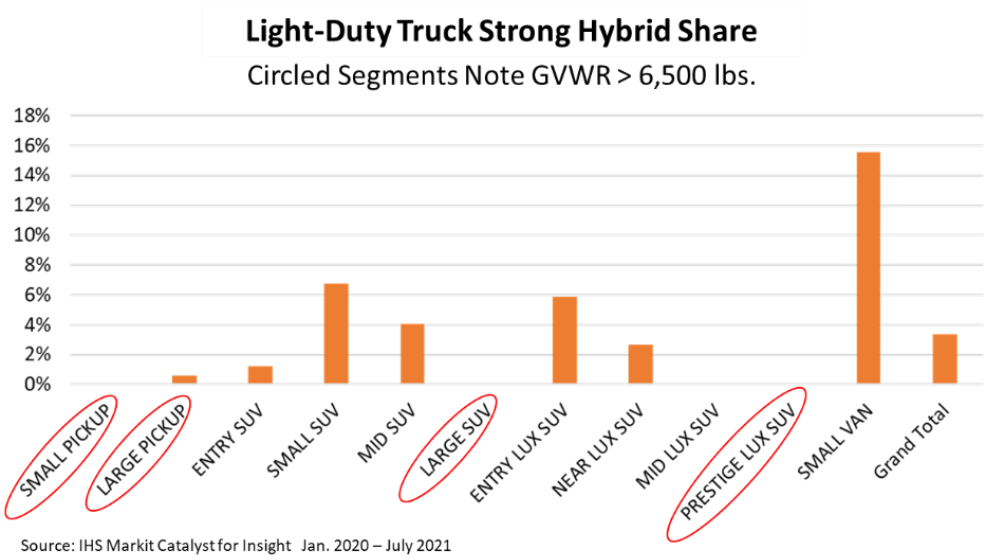
Manufacturers are at different stages in the transition to electrification. Any revision to the proposed flexibility needs to maintain a level competitive playing field recognizing electrification strategies and deployment plans are substantially fixed over the period of the regulation. For this reason, we could not support any lowering of the multipliers even if associated with raising the benefit cap.

Full-Size Pickup Truck Credits – A Challenge for Heavier, More Capable Light Trucks

Toyota supports reinstituting the advanced technology incentives for full size pick-up trucks, but requests the incentives apply through 2026 model year, or at least any four years between and including 2022 and 2026 for the same reasons provided for ATV multipliers. EPA has appropriately acknowledged the segment's "unique challenges in the costs of applying advanced technologies due to the need to maintain vehicle utility and meet consumer expectations". EPA's determination that "these full-size pickup truck credits are appropriate to further incentivize advanced technologies penetrating this particularly challenging segment of the market" remains sound policy to promote significant future GHG reductions.[17]

Unfortunately, the market challenge is not unique to full-size pick-up trucks. All pickup trucks and body-on-frame SUVs contend with similar difficulty in providing low CO2 performance while preserving towing and hauling capabilities. We request the strong hybrid incentive be extended to all light trucks having a gross vehicle weight rating (GVWR) greater than 6,500 lbs. As seen in Figure 5, the share of hybrids remains low in this segment of light trucks relative to the gains made in most every other segment.

Figure 5 – Light-Duty Truck Strong Hybrid Sales



[17] *Id*. at 43761.

Incentivizing this slightly broader segment will help manufactures "address cost, utility, and consumer acceptance challenges" as noted by EPA.[18] The additional trucks with a GVWR greater than 6,500 lbs. represent about half the sales volume of full-size pickup trucks. Any environmental impact of expanding this flexibility should remain minimal given that EPA's past analyses have demonstrated a low relative impact of the full-size pickup truck provision.[19]

Off-Cycle Credits – A Path to Real-World Benefits

Off-cycle technologies net immediate real-world emissions reductions and should be viewed no differently than emissions reductions achieved over the Federal Test Procedure. Toyota supports robust verification of off-cycle technology benefits and strongly encourages EPA to use a timely and streamlined process as suggested in past Toyota and AAI comments. We agree with AAI's current comments on the broader off-cycle technology program including but not limited to the approval process, credit values, and benefit limits.

Toyota also supports increasing the maximum credits earned under the technology menu from 10 g/mi to 15 g/mi. Please see the AAI comments for additional details. We understand the refined definitions for passive cabin ventilation, active engine warm-up, and active transmission warm-up technologies are intended to better account for the real-world benefit of these technologies. The proposed changes affect program stringency because previously approved credits for these technologies that will no longer be available have already been incorporated into compliance plans. We request the revised definitions be effective starting with the 2025 model year at the earliest to provide adequate lead time for appropriate countermeasures and compliance plan adjustments.

Passive cabin ventilation, engine warm-up, and transmission warm-up technologies that meet the current definitions provide environmental benefit albeit less than under the proposed revised definitions. Once the new definitions become effective, existing passive cabin ventilation, engine warm-up, and transmission warm-up systems designed to meet the original definitions should still be granted some level of credit based on their real-world performance.

Averaging Banking Trading – Extended Credit Life Needed to Manage Stringency Jump

The proposal notes Averaging Banking and Trading allows more stringent standards than otherwise could be considered by providing manufacturers an important tool to resolve lead time and feasibility issues, and that the targeted extension of credit carry-forward is appropriate

[18] *Ibid*.

[19] Memorandum, "Spreadsheet tool for the comparative analysis of program stringencies for various light-duty vehicle GHG footprint curves and compliance flexibilities combinations," July 2018, Kevin Bolon, EPA Office of Air and Radiation. Docket No. EPA-HQ-OAR-2018-0283. The SAFE Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks, Prepublication Version, NHTSA-2018-0067; EPA-HQ-OAR-2018-0283, July 2018, at Table X-5 and 894-895.

considering the stringency and implementation timeframe of the proposed standards.[20] Toyota agrees extending the life of credits manufacturers have earned from 2016 to 2020 model year can help manage the short lead time provided to comply with the proposed 10% stringency jump between 2022 and 2023 MY and the required annual improvements that follow. Well-established design cycles dictate product cadence and limit the opportunities for new technology to be introduced between now and 2026 model year. About one-fifth of the fleet is redesigned each year, and therefore the compliance burden of rapidly increasing standards will fall significantly on a few models, many which are already well into product development. We agree with EPA that "it is again appropriate in the current context to provide a targeted, limited amount of additional flexibility to carry-forward credits into the 2023-2026 MYs, to ease the manufacturers' transition to these more stringent standards".[21]

5) Success Can be Aided by Harmonized GHG and CAFE Requirements

One National Program More Important Now Than Ever

The purpose of the National Program for GHG and CAFE standards has always been "establishing consistent, harmonized, and streamlined requirements that would reduce GHG emissions and improve fuel economy for all new cars and light-duty trucks sold in the United States."[22] The preamble of the 2012 Final Rule states the "National Program will deliver additional environmental and energy benefits, cost savings, and administrative efficiencies on a nationwide basis that would likely not be available under a less coordinated approach and that it will "allow automakers to produce and sell a single fleet nationally, mitigating the additional costs that manufacturers would otherwise face in having to comply with multiple sets of federal and state standards."[23] These core principles become paramount as the automotive industry embarks on significant investments toward the most significant technology transition in the past 100 years.

While we are still reviewing both the GHG and CAFE proposals given the short comment period, we remain concerned that the proposals were issued as two separate regulations and seem to be moving further away from a unified federal approach.

Our early analysis finds an erosion of harmonization between the proposed GHG and CAFE programs that breaks from recent regulatory history. Our preliminary analysis shows several reasons for this, but a significant one appears to be that the GHG proposal overestimates the

[20] U.S. EPA. Revised 2023 and Later Model Year Light-Duty Vehicle GHG Emissions Standards, EPA–HQ–OAR–2021–0208, August 2021, at 43753.
[21] *Ibid*.
[22] Remarks by the President on National Fuel Efficiency Standards, The White House, May 19, 2009, http://www.whitehouse.gov/the_press_office/President-Obama-Announces-National-Fuel-Efficiency-Policy.
[23] U.S. EPA, U.S. DOT Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, Final Rule, EPA–HQ–OAR–2009–0472, NHTSA–2009–0059, May 2010, at 25326.

performance contribution of gasoline-only powertrains and the CAFE proposal underestimates the cost of electrification required to comply.

Toyota's upcoming comments on the proposed CAFE standards will address concerns specific to that program in greater depth. For now, we highlight several areas of disharmony, primarily involving compliance modeling and assumptions, that cause the agencies to draw different conclusions on fundamental issues such as the level of electrification needed for compliance. Toyota can provide further information to EPA and NHTSA if requested.

Adjustments for Equivalent GHG-CAFE Stringency

NHSTA has not adequately adjusted the CAFE standards to account for the flexibility and fleet credit transfer restrictions relative to the GHG program. The result is the proposed CAFE standards become more stringent than the proposed GHG standards. Greater detail is forthcoming in Toyota comments on the CAFE standards proposal.

CA/177 State ZEV Compliance

In determining the feasibility of the proposed standards, NHTSA has incorporated assumed manufacturer compliance with the CA/177 State ZEV program as input to the CAFE Model without considering ZEV compliance costs. Including ZEV compliance as a given ignores ZEV compliance uncertainties, double counts regulatory benefits while ignoring all costs, and discards NHTSA's long-standing compliance modeling process where the least expensive improvement technologies are assumed to be deployed into the fleet first. This dubious approach masks the cost of electrification to consumers as well as the overall cost of the regulation. Toyota will address this concern in the upcoming CAFE comments.

Advanced Gasoline Technologies

For compliance modeling of gasoline powertrains, EPA is extensively relying on the HCR2 classification of Atkinson engine technology for which the assumed efficacy remains unproven and highly unlikely as previously explained. NHTSA effectively deploys only to the HCR1 level of Atkinson engines which better reflects the state of technology in the fleet today and identifies HCR1D[24] as a more advanced future pathway that while not cost-effective has a considerably more reasonable assumed technology effectiveness than HCR2.

CAFE Model Versions

EPA and NHTSA are using different versions of the CAFE Model. We appreciate EPA using Autonomie simulation to determine technology effectiveness and the CAFE Model to determine compliance pathways for the proposed standards. However, EPA is relying on an outdated version of the CAFE model and several input assumptions "for the purpose of enabling direct

[24] The HCR1D Atkinson cycle designation differs from HCR1 by the addition of cylinder deactivation.

comparison to the SAFE FRM analysis".[25] NHTSA is using the latest version of the CAFE model that incorporates many recommendations highlighted in the peer review of modeling tools for GHG/CAFE policy analysis.[26] Toyota believes it is important for both agencies to use the same version of the most recent model with the same and most recent input assumptions where possible.

Baseline Fleets

The baseline fleet represent a snapshot of performance and the starting point from which technologies are "added" to the fleet to demonstrate compliance pathways using the CAFE Model. EPA is starting with a 2017 baseline fleet whereas NHTSA uses a more appropriate 2020 baseline fleet. EPA's older baseline fleet is missing the latest, cleanest, and most efficient technologies in vehicles on the road today. Instead, EPA must rely on more assumed or simulated technology effectiveness for these very same technologies where errors propagate through the fleet over a longer period (2017 to 2026 model year) as explained previously. The 2017 fleet excludes important recent market trends that have real impact on overall fleet performance such as the ongoing shift in vehicle mix.

Deployment of Off-Cycle Technologies

EPA is adding off-cycle technologies to the fleet more rapidly than being deployed by manufacturers. Compliance modeling assumes many manufacturers have earned upwards of 10 g/mi to 15 g/mi of credits by the 2020 model year while manufacturer compliance data over the same period shows significantly fewer credits being earned. Further, the pool of available credits over the 2023 through 2026 model years will be reduced by the proposed revised definitions for passive cabin ventilation, engine warm-up, and transmission warm-up technologies. NHTSA more realistically assumes manufacturers will not reach maximum credit values until the 2026 model year and that some companies will not attain the maximum. EPA's inflated off-cycle credit assumptions factor into the artificially low the reliance on electrification for compliance.

6) Conclusion

Toyota generally supports the proposed 2023-2026 model year GHG standards recognizing that compliance will involve numerous stakeholders collaborating to increase customer adoption rates for BEV, FCEV, PHEV, and conventional hybrids. The more widespread deployment of today's best-in-class conventional gasoline technologies will also play an important role. Flexibilities and regulatory harmonization between EPA's GHG regulations and NHTSA's CAFE regulations are critical to cost-effectively manage compliance. Toyota is ready to contribute the proposed

[25] U.S. EPA. Revised 2023 and Later Model Year Light-Duty Vehicle GHG Emissions Standards, EPA–HQ–OAR–2021–0208, August 2021, at 43768.
[26] CAFE Model Peer Review, U.S. Department of Transportation, National Highway Traffic Safety Administration, DOT HS 812 590, Jul. 2018, https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/812590-cafe-peer-review.pdf.

program's success to achieve the desired greenhouse reductions while simultaneously meeting the needs of our customers.