**Comments of the**
**Motor & Equipment Manufacturers Association (MEMA)**
**to**
**National Highway Traffic Safety Administration and**
**U.S. Environmental Protection Agency**

**RE: Notice of Proposed Rulemaking on the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 for Passenger Cars and Light Trucks**

**Docket Nos. NHTSA-2018-0067; EPA-HQ-OAR-2018-0283; FRL-9981-74-OAR**

**October 26, 2018**

The Motor & Equipment Manufacturers Association (MEMA) submits these comments to the National Highway Traffic Safety Administration (NHTSA) and the U.S. Environmental Protection Agency (EPA) on the "Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years (MYs) 2021 – 2026 Passenger Cars and Light Trucks" Notice of Proposed Rulemaking (SAFE Vehicles Rule NPRM or NPRM).[1] MEMA appreciates the agencies' willingness to engage with stakeholders and conduct a complete public notice and comment process for this rulemaking.

MEMA represents more than 1,000 companies that manufacture new original equipment (OE) and aftermarket components, systems and materials for use in passenger cars and heavy trucks.[2] The motor vehicle components manufacturing industry is the nation's largest direct employer of manufacturing jobs – employing over 871,000 workers in all 50 states – with a total employment impact of 4.26 million jobs. Our members develop and produce a multitude of technologies and a wide-range of products, components and systems that make vehicles safer, more efficient and reduce emissions. Suppliers are committed to providing affordable technologies needed to increase fuel efficiency and continue to reduce GHG vehicle emissions.

## Suppliers' Role in Collaboratively Developing Innovative Technologies

Motor vehicle parts suppliers provide 77 percent of the value of a new vehicle. To put that statistic into perspective, a typical vehicle contains more than 30,000 components and subsystems, the majority of which are developed through supplier innovation. Suppliers also create complex and highly integrated vehicle systems to make vehicles more efficient. Examples include emissions control technologies, advanced refrigerants and HVAC systems, regenerative braking technologies, alternative propulsion systems, advanced driver assistance systems, vehicle-to-vehicle communications, and automated driving systems.

[1] 83 Fed Reg 42986

[2] MEMA represents its members through four divisions: Automotive Aftermarket Suppliers Association (AASA); Heavy Duty Manufacturers Association (HDMA); Motor & Equipment Remanufacturers Association (MERA); and, Original Equipment Suppliers Association (OESA).

In many cases suppliers lead technology development. Before suppliers work collaboratively with vehicle manufacturers (also known as original equipment manufacturers, or OEMs), suppliers anticipate the needs of OEMs and work independently creating and investing in multiple technology solutions to assist their customers in meeting the greenhouse gas (GHG) emissions and fuel efficiency standards. Suppliers have invested significant resources in the U.S. on research and development (R&D) including building facilities and technical centers. These facilities allow suppliers to work closely with their OEM customers from early in the technology development process through to the testing and validation of a whole host of systems and components as it is deployed in a vehicle.

Suppliers take on substantial risks by driving a wide array of technology advancements and innovative materials needed to improve vehicle safety, fuel efficiency and emissions reduction. Suppliers took a leadership position investing in new technologies and facilities in the U.S., therefore eliminating progress in the standards jeopardizes supplier investments, but more importantly, the U.S. global leadership position. Therefore, the impacts of the mid-term evaluation of NHTSA's Corporate Average Fuel Efficiency (CAFE) standards and the EPA's GHG vehicle emissions standards for light vehicles have enormous implications on the supplier industry.

## Summary of Comments

MEMA's comments on the SAFE Vehicles NPRM will discuss the following:

- **MEMA Supports Continued Progress in the Standards** MEMA supports continued year-over-year increases to the stringency of the CAFE and the GHG vehicle emissions standards for light vehicles starting in 2021 and extending until 2026. Of the alternatives proposed in the NPRM, alternatives 6 and 8, best preserve long-term supplier investments and employment and ensure the U.S. continues to be a global technological leader.
- **MEMA Supports the One National Program** The National Program's aligned, long-term targets have provided the domestic supplier industry with significant economic and technology development opportunities. An aligned approach would avoid a long, drawn-out legal dispute in the courts which would have damaging effects on regulatory certainty and lead manufacturers to question the stability of significant investments in the U.S. and could make other regions of the world more attractive for future investments.
- **MEMA Supports Continuing and Expanding the Credit Programs** Regardless of the stringency of the standards, it is essential for supplier investments and jobs, and continuous innovation and improvements in the technologies that the credit programs continue and expand to broaden the compliance pathways. MEMA urges the agencies to continue the current credit and incentives programs – particularly the off-cycle, air conditioning (A/C) efficiency, and the alternative mobile A/C refrigerant credit programs – through 2026 and beyond.
- **MEMA Supports the Role of Lightweighting in Fuel Efficiency** Lightweighting is an important part of the overall strategy for improving fuel efficiency and improving product performance. As currently implemented in the fleet and anticipated to be deployed in the future, lightweighting technologies, validated by stricter NHTSA standards and improved crash ratings, does not compromise safety. Statements asserting the correlation between lightweighting and safety should be removed from the final rule.

## MEMA Supports Continued Progress in the Standards

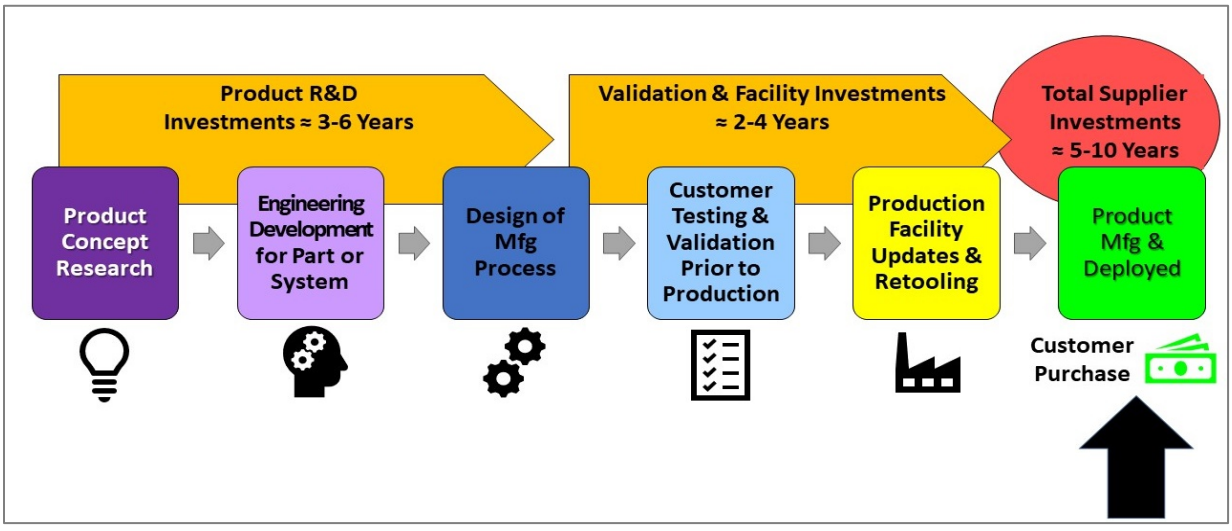
MEMA supports continued year-over-year increases in the stringency to the CAFE and GHG vehicle emissions standards for light vehicles starting in 2021 extending until 2026. It is important that the standards strike an appropriate balance between strengthening the U.S. supplier sector, continuing American technological leadership, providing greater consumer choice, and keeping vehicles affordable. Continued progress in the standards, rather than an abrupt stagnation, will ensure that the rule maintains the stability and predictability that motor vehicle suppliers need for continued employment growth and to secure significant technological investments.

*The Impact of Eliminating Progress in the Standards on Suppliers' Long-term Investments*

If the agencies eliminate progress in the standards through 2026, suppliers are at the greatest risk of having stranded investments. Suppliers have made long-term planning decisions committing to developing the necessary technologies and materials for their customers to meet the targets set for MYs 2017 – 2021 and the augural standards for MYs 2022 - 2025. Motor vehicle parts suppliers have seen employment grow three times that of any other major U.S. manufacturing sector since 2012. This employment growth reflects the long-term investment decisions in these advanced technologies.

Suppliers take on the initial investments and the associated risk for developing these emission-reducing, fuel-efficiency technologies. The roll-out of these technologies require substantial lead-time and major economic resources. A supplier's product planning and investments timeline includes several stages, each stage ranging from 6 months to 2 years depending on the technology (see Graphic 1). Importantly, suppliers do not get paid until these technologies are deployed. The return on investment is estimated very carefully and amortized over several years. Therefore, a significant delay in product deployment, a shortening of a product's anticipated lifespan or a curtailment in demand will jeopardize these investments put in place several years in advance.

**Graphic 1: Motor Vehicle Parts Suppliers Product Planning and Investments Timeframe**




As an example of significant supplier investments and job creation, DENSO, in 2017, announced expansion of its U.S. footprint with a $1 billion investment in Tennessee. This expansion was part of DENSO's commitment to advancing automotive innovation in the U.S. and will significantly increase

the role the U.S. plays in the global trend toward vehicle safety and emissions reductions. This expenditure supports system development for increasing electric vehicle demand and will also generate more than 1,000 new jobs—including technicians and engineers.

Below is a small sample of other supplier investments totaling over $3.72 billion in the U.S. since 2012:

- Honeywell and other suppliers, in producing a new class of alternative refrigerants, invested nearly **$1 billion** to invent, commercialize and expand world-scale manufacturing plants that employ hundreds of American workers. Honeywell developed the low-global-warming potential refrigerant in Buffalo, NY and now manufactures it in Louisiana.
- BorgWarner has added 600 new jobs and over **$530 million** in capital investments in the U.S. These investments include the expanding the company's research and development capabilities at its Propulsion Technical Center in Michigan, its PowerDrive Systems manufacturing facility in South Carolina, and a new 100,000 square-foot technical center in Indiana which supports BorgWarner's growing electrified product portfolio.
- Eaton invested **$500 million** for new eMobility business in Michigan and Oregon.
- Bosch invested **$40 million** in a research and technology center in California and another **$327 million** in expansions of two facilities in South Carolina to grow its broad range of advanced automotive technology products.
- Schaeffler invested **$60 million** in an expansion in Ohio to bolster its electrification business in both production manufacturing and engineering R&D and **$36.5 million** in a facility expansion in South Carolina.
- DENSO made a **$75 million** expansion in its North American headquarters in Michigan including a new testing facility and a **$500,000** facility expansion in Ohio for R&D.
- Autoliv invested **$32 million** for a North American headquarters expansion in Michigan.
- NGK/NTK has invested over **$25 million** in expanding and upgrading its USA technical center in Michigan, expanding production capability in West Virginia, building a new Innovation Center to incubate new technologies and improvements in other facilities in Wisconsin, Iowa, and California.
- Tenneco invested **$23 million** in a customer center in Michigan
- Veoneer Inc. invested **$22.6 million** in a new headquarters in Michigan and will house 1500 employees.
- MAHLE opened a new **$16 million** North American powertrain headquarters in Michigan.
- Umicore Autocat USA Inc. invested **$10 million** in an expansion of its Michigan facility that develops and tests emission control systems based on advanced catalytic technology.
- Continental made a **$10 million** facility expansion in Texas for R&D and built a 65,000 square foot R&D center in California that will focus on R&D for chassis, powertrain, tires, rubber and plastics.
- Valeo invested **$5 million** for a new test track in Michigan.
- Nexteer opened a new **$4 million** global headquarters in Michigan.

There are other significant ongoing commitments and investments made by other suppliers in the same timeframe.

U.S. investment and R&D over the next several years in the vehicle industry – from Silicon Valley to Detroit and across America – may well determine global leadership in transportation and technology for generations to come. The vehicle industry finds itself at a critical inflection point with the development of transformative innovations in fuel efficiency and emissions-reducing technologies, and advanced safety and automated technologies.

The U.S. has the opportunity to be the world's leader in vehicle technology. Unfortunately, the uncertainty in the fuel efficiency and GHG emissions standards and significant changes in U.S. trade policy has made planning for future investments very difficult for the vehicle industry. In fact, many of our members have indicated that their companies are considering delaying, deferring, or cancelling plans for further U.S. investments. These are the kinds of critical investments we need domestically to support jobs as well as support our nation's economic growth and success. In order to preserve supplier jobs and investments in emission-reducing technologies, MEMA urges the agencies to establish continued year-over-year increases to the standards.

*The Impact of Eliminating Progress in the Standards on U.S. Supplier Manufacturing Jobs*

Eliminating progress in the standards through 2026 would have a detrimental economic impact on U.S. supplier manufacturing jobs – the largest sector of manufacturing jobs in the U.S. – employing over 871,000 workers in all 50 states with a total impact of 4.26 million jobs. Out of the automotive industry's direct and indirect jobs, suppliers make up the largest portion of those jobs, 44 percent, compared to OEMs' 33 percent and auto dealers' 23 percent.[3] Motor vehicle parts suppliers have seen employment grow 19 percent since 2012 – an increase three times that of any other major U.S. manufacturing sector. Continued progress in the standards is necessary to continue strengthening technology development and supplier manufacturing sector jobs.

According to analysis by IHS Markit,[4] the agencies' preferred alternative 1 of zero percent increases year-on-year through 2026 would result in a loss of 67,000 direct automotive industry jobs.[5] The full impact of the agencies' preferred alternative would result in an overall industry loss of 500,000 direct, indirect and induced jobs by 2025 in comparison to the employment levels

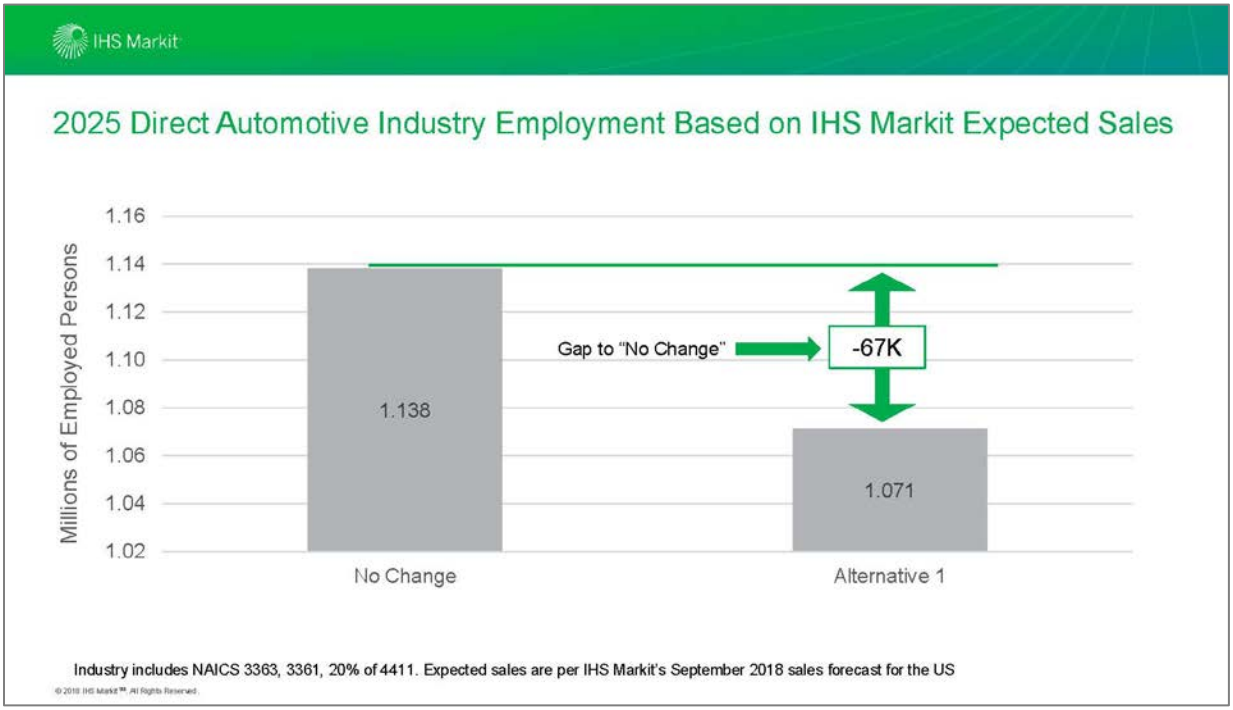
[3] Alliance of Automobile Manufactures' Cars Move America: State of the Auto Industry available here: https://autoalliance.org/economy/cars-move-america/

[4] MEMA commissioned IHS Markit (IHSM) to conduct the analysis. See footnote 7 for employment analysis assumptions.

[5] Automotive industry jobs include auto dealership, vehicle manufacturers and motor vehicle parts supplier jobs.

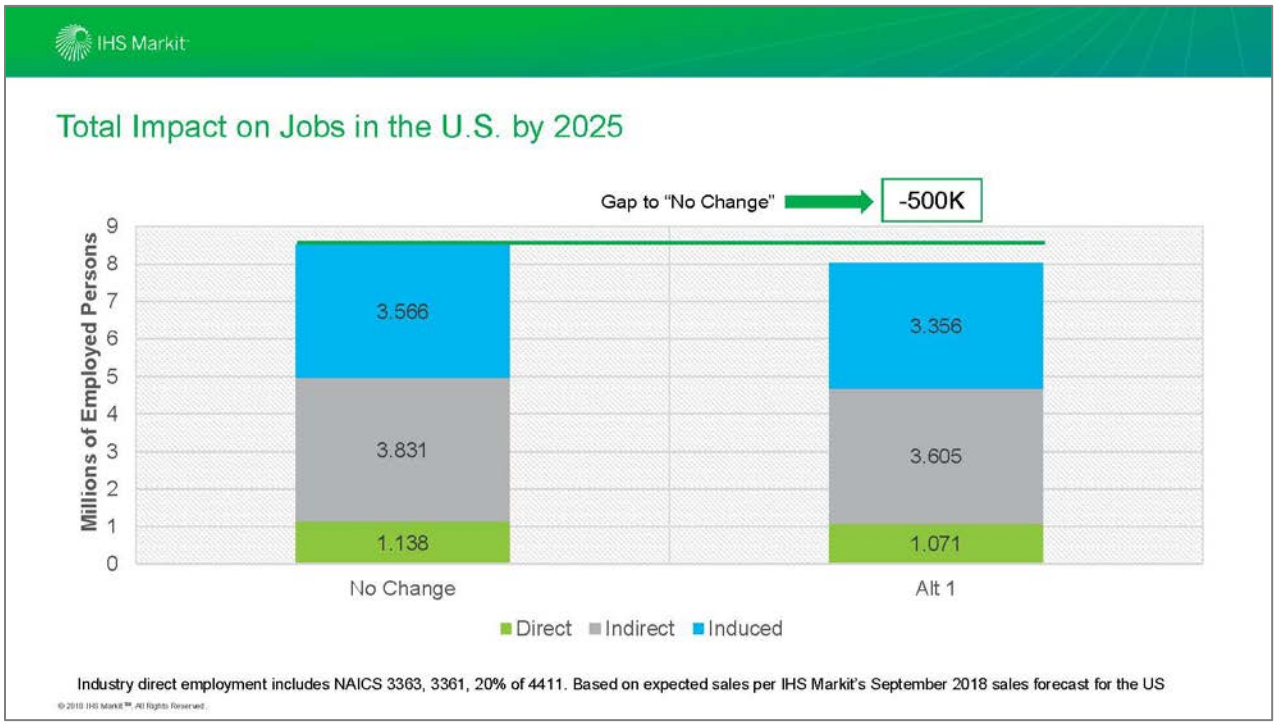
supported by the augural standards.[6,7] (See Graphics 2 and 3) These are jobs that the U.S. will lose to other markets, including China.

**Graphic 2. Alternative 1 Direct Automotive Industry Employment Impact in Comparison to Augural Standards[8]**




[6] The industries that make up the motor vehicle parts manufacturing industry use many different types of products and services from various industrial sectors of the economy. As a result, a change in parts output would result in both a direct contribution (through production) and an indirect contribution (via supply-chain dynamics) across a broad spectrum of sectors. The contribution of these supplier industries has implications for each supplier industry's own supply chains, magnifying the indirect contribution. As explained below, the net effects on the U.S. economy and its industrial sectors, due to these contributions, are divided into three stages: the **direct** contribution, the **indirect** contribution and the **induced** economic contribution. For each stage in the analysis, the economic contribution is quantified in terms of employment, value added contribution to GDP, and labor income. The **direct contribution** is the effect of the core industry's output, employment, and income.
Any changes in the purchasing patterns or activities by the motor vehicle parts manufacturing industry initiate the **indirect contributions** to all the supplier industries that support the industry. Changes in demand from the direct industries lead to corresponding changes in output, employment, and income throughout their supply chains and inter-industry linkages. The affected supplier activities span most industries in the U.S. economy. Finally, workers and their families in both the direct and indirect industries spend their income on food, housing, leisure, autos, household appliances, furniture, clothing, and other consumer items. The additional output, employment, and income effects that result from their consumer spending activities are categorized as the **induced economic contribution**.
[7] IHSM followed the agencies' models for employment. Generally, the IHSM analysis diverges from the agencies' estimates due to 4 assumptions that are different. IHSM assumes generally less vehicle sales in each forecasted year over the agencies. The agencies assume a high constant sales forecast while IHSM expects a decline in sales in the next few years to address the replacement cycle trends in the U.S. fleet. IHSM is assuming a different U.S. content value than the agencies, IHSM sets U.S. content levels across all vehicles sold in the market is set to 46 percent and held constant for 2016-2025. The level of U.S. content the agencies use is not disclosed so it is impossible to verify. The difference in U.S. content is most likely the largest driver in the discrepancy. IHSM assumed baseline of employment is consistent with the reported NAICS codes listed by the agencies and is much lower than the agencies reported starting employment point for their curve. IHSM has assumed different technology requirements and direct manufacturing costs from the agencies which drive the primary differences in the employment models.
[8] Based on IHSM modeling and data. See footnote 7 and 8.

**Graphic 3. Alternative 1 Total Impact on U.S. Jobs in Comparison to the Augural Standards**[9]




*The Impact of Eliminating Progress in the Standards on U.S. Leadership in Global Innovation*

The U.S. has a strong history of being a global leader in innovation. Our nation is uniquely positioned to lead the world in advanced fuel efficiency and emissions-reducing technologies. Continued progress in the standards is necessary to preserve U.S. competitiveness.

In an increasingly competitive global marketplace, a stagnation in the GHG standards will tilt the balance away from American innovation, where U.S. companies currently have a competitive edge. Significantly reducing the stringency of the standards in the U.S. increases the likelihood that work on these emissions-reducing technologies will shift to other markets. If suppliers do not have the certainty that the technology is needed in the U.S., suppliers' centers of innovation will not be established in the U.S. and the technologies will not be developed or manufactured in the U.S.

As an example, if China progresses ahead of the U.S. in the targets, it would result in a scenario where investments that would have been made in the U.S. on emission-reducing technologies will instead go to China. This will result in a loss of U.S. jobs and innovative technology development to other progressive markets, including China.

While China is an important trading partner for the U.S. automotive industry, it remains a competitor for U.S. motor vehicle suppliers, particularly in innovative technology development. In recent years, the Chinese government has announced several policies designed to promote the development and localization of strategic industries. For example, the "Made in China 2025" initiative identifies "new energy vehicles" (NEVs) as one of ten priority sectors. As part of this

[9] Based on IHSM modeling and data. Also see footnote 7. The 2016 employment baseline is set to the BLS baseline for NAICS codes 3363, 3361, 20 percent of 4411 per Section 8 of the PRIA.

initiative, China set a target to sell 35 million vehicles annually by 2025, with a further objective that at least one-fifth of them be classified as NEVs. The plan has a domestic content goal of 70 percent by 2020 and 80 percent by 2025. This initiative is focused on increasing Chinese innovation and providing government assistance to Chinese industries to take investment from other regions. The China 2025 policy implemented at the same time as U.S. policy changes could hinder U.S. development of advanced emission reduction technologies, could harm the competitiveness of suppliers who develop and manufacture these technologies in the U.S.

The National Program's long-term targets have provided the domestic supplier industry with significant economic and technology development opportunities and have been key to U.S. companies' global leadership in innovation. MEMA urges NHTSA and EPA to ensure that the U.S. continues to be a global leader in these fuel efficiency, emissions-reducing technologies and further enhance U.S. competitiveness in the motor vehicle industry worldwide.

*Availability of the Necessary Cost-Efficient Technologies*

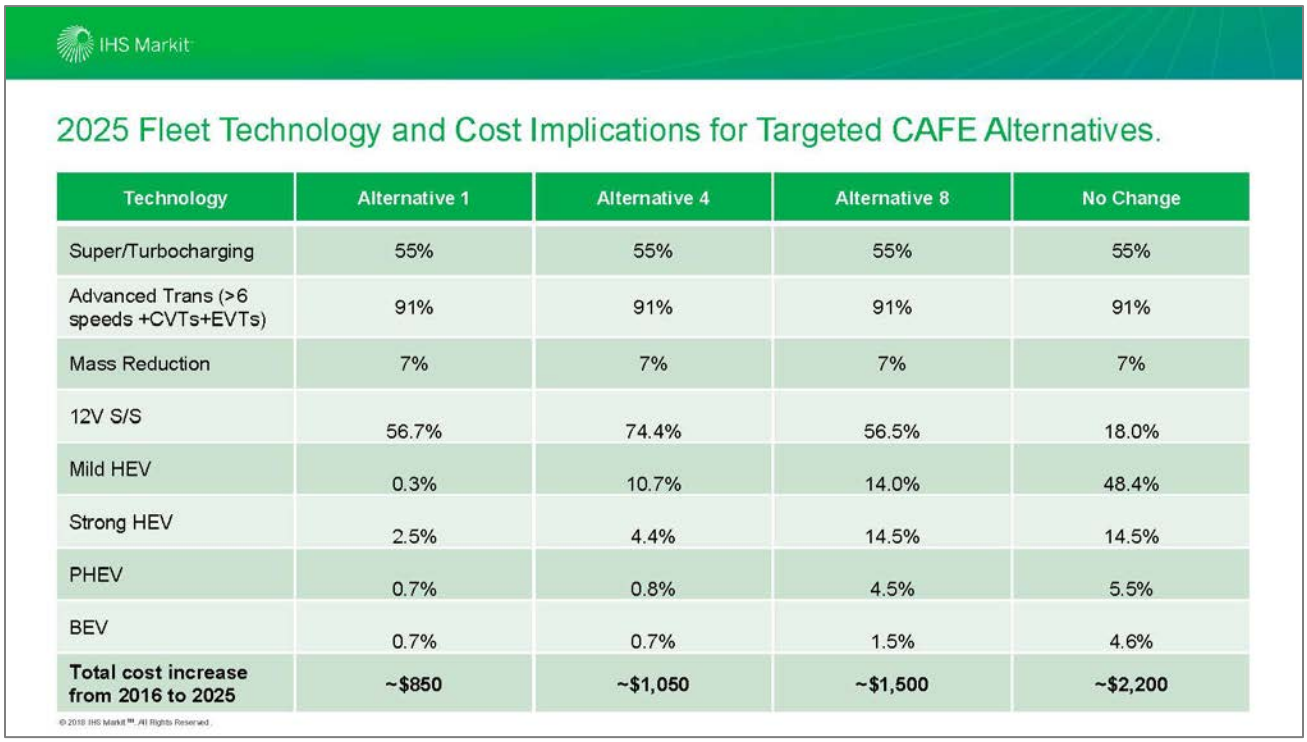
The agencies cite the need to reduce the overall average new vehicle ownership costs as a leading reason to propose alternative 1 and eliminate further fuel efficiency progress in the standards through 2026. The agencies argue that fuel efficiency technologies are too expensive explaining that the technology required to deliver additional efficiencies would be significantly more complicated and costlier. [10] If alternative 1 is implemented, the agencies estimate that the overall average vehicle ownership costs for new vehicles will be reduced by $2,330 by MY2025 compared with vehicle costs under the augural GHG standards.[11] Importantly, the agencies estimate that with alternative 1 there will be an overall $1,850 reduction in the average required technology costs in MY2025 compared to the augural GHG standards.[12]

IHS Markit estimated the technology packages required to hit the 2025 targets under three of the alternatives (alternatives 1, 4 and 8) along with the augural standards (no change) and the cost implications associated with each one.[13] The table below (Graphic 4) shows the deltas from 2016 baseline technology adoption and shows the technology cost per-vehicle average for the fleet. The table also shows that IHS Markit's modeling of the direct manufacturing costs and cost of the individual technologies are lower than the agencies' reported values. Based on IHS Markit's assumptions and analysis, there would be a $1,350 reduction in the average required technology costs in MY2025 compared to the no change in the standard, which is contrary to the agencies' estimate of $1,850. Additionally, IHS Markit estimates that the technology costs for alternative 8 in 2025 would be $1,500, which is only $650 per vehicle above alternative 1.

MEMA supports the agencies setting the CAFE and GHG standards for MYs 2021 through 2026 at a rate that will ensure new motor vehicles remain affordable to Americans. However, the potential increased cost of new vehicle technology that improves fuel efficiency and limits GHG emissions cannot be considered in a vacuum. Given the other benefits from alternative 8 including increasing auto industry manufacturing jobs and preserving investments, an increase of $650 for technology costs per vehicle is not significant and is not a justification for eliminating progress in the standards.

[10] 83 Fed Reg 42991
[11] Proposed Regulatory Impact Assessment (PRIA), Table 9-67.
[12] PRIA, Table 9-57
[13] MEMA commissioned IHSM to conduct the analysis.

**Graphic 4: 2025 Fleet Technology and Cost Implications According to Alternatives**[14]




MEMA shares the goals of the administration of reducing the impact of price to consumers buying new motor vehicles. However, if a unified National Program is not achieved, the price of new vehicles will increase since the aligned timeline and targets of a National Program will provide economies of scale and reduced compliance costs. At the same time, as vehicle technology is more widely deployed and accepted, the cost of that technology will decrease and become more widely available to the driving public. Therefore, because credit programs, such as the A/C efficiency and the off-cycle technology, allows the vehicle manufacturers to comply with more cost-efficient technologies, MEMA strongly supports the continuation and expansion of the credit programs.

*Analysis of the NPRM Proposed Alternatives*

MEMA evaluated the eight alternatives proposed in the NPRM and determined which would best preserve long-term supplier investments, jobs, and ensure the U.S. continues to be a global technological leader. From MEMA's analysis, alternatives 6 and 8, which would establish a 2 percent increase year-on-year for passenger cars and a 3 percent increase year-on-year for passenger cars and light trucks meet these criteria. Both alternatives generally track vehicle manufacturers' historic rate of improvement.[15]

[14] Based on IHSM modeling and data. Technology costs for 2025 are based on the IHSM simulation of technology requirements. Costs are direct manufacturing costs derived from interviews with global suppliers. These are high volume fully depreciated costs consistent with typical supplier contract prices which assume a level discounting per individual technology through 2025. IHSM did not adjust these costs and used 2017-dollar value costs for the individual technologies to account for any inflation. These costs are grown from a baseline 2016 technology cost of $0. Assumed a rational, back loaded, near linear growth trend in technology cost from 2016 to 2025.

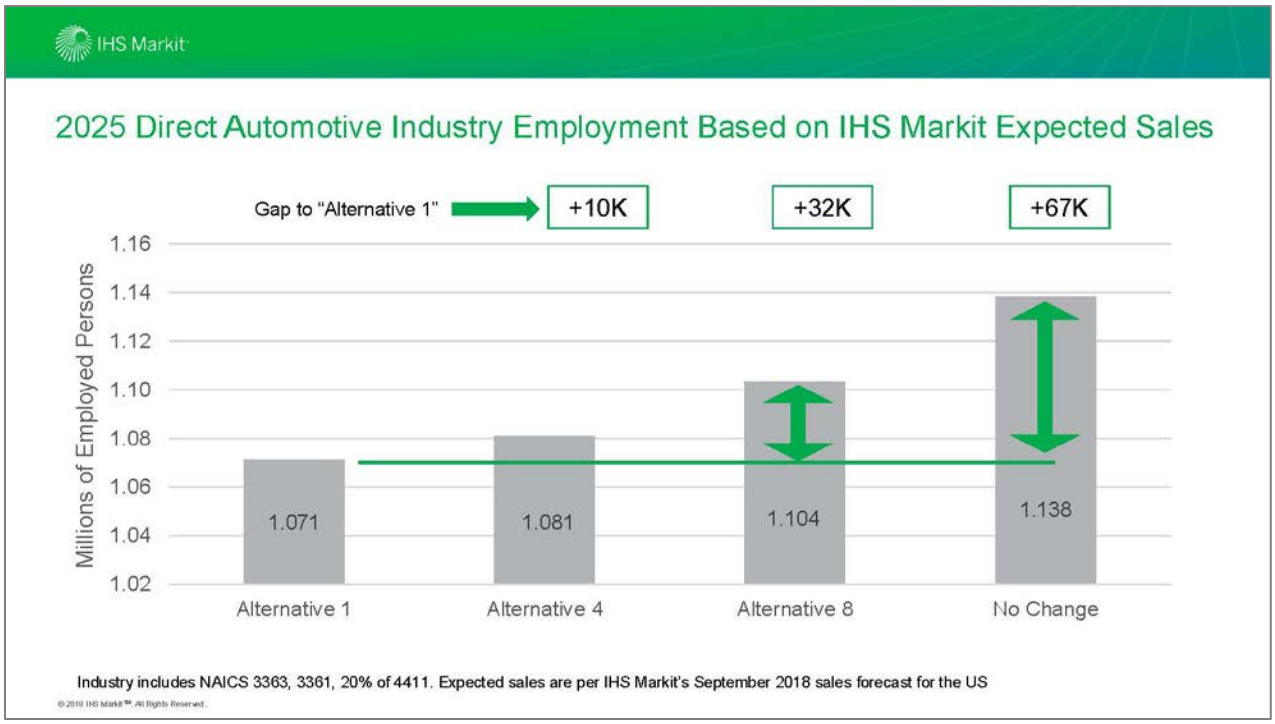
[15] Based on EPA 2015 and 2016 performance reports.

In comparison to the agencies' preferred alternative 1, implementing alternative 8 would provide enough demand for these advanced technologies that it would result in the automotive industry growing 32,000 more direct jobs by 2025. The full impact of alternative 8 would result in 250,000 more direct, indirect and induced jobs by 2025 in comparison to the employment levels of alternative 1 (see Graphics 5, 6 and 7). Alternative 4 would result in only one-third of the growth by 2025 compared to alternative 8. Alternative 6 is only slightly less stringent than alternative 8 because it starts the 2 percent and 3 percent growth a year earlier (replacing a more stringent standard for MY2021). Alternative 6 also provides a steady increase that tracks closely with the historic annual improvement rate. While our analysis did not have official estimates for alternative 6, alternative 6 should have similar job impacts of alternative 8.

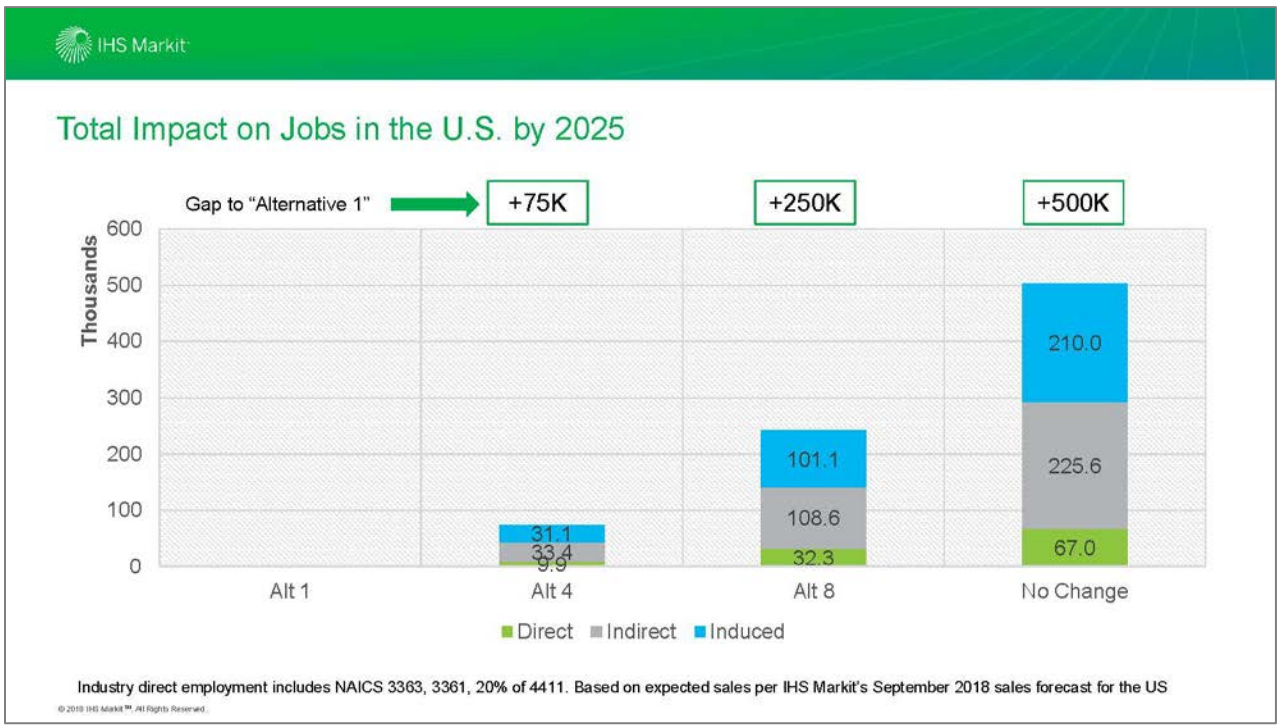
MEMA is open to discussing with the EPA, NHTSA, and the State of California whether there are other ways to meet the goal of emissions reduction, consumer affordability and MEMA's criteria of preserving supplier investments, supplier jobs, and global technological leadership beyond the alternatives outlined in the proposed rulemaking.

MEMA opposes the proposed alternatives that eliminate the off-cycle and A/C efficiency credit programs (alternatives 3 and 7). MEMA also opposes elimination of the A/C refrigerant leakage credits in the alternatives. MEMA strongly supports continuation of the current off-cycle, A/C efficiency credit and A/C refrigerant leakage credits programs through 2026, with more analysis is provided below. It is important to provide a variety of regulatory tools that allow vehicle manufacturers to manage their product mix to meet the standards.

**Graphic 5. 2025 Direct Employment Impact in Comparison to Alternative 1**[16]

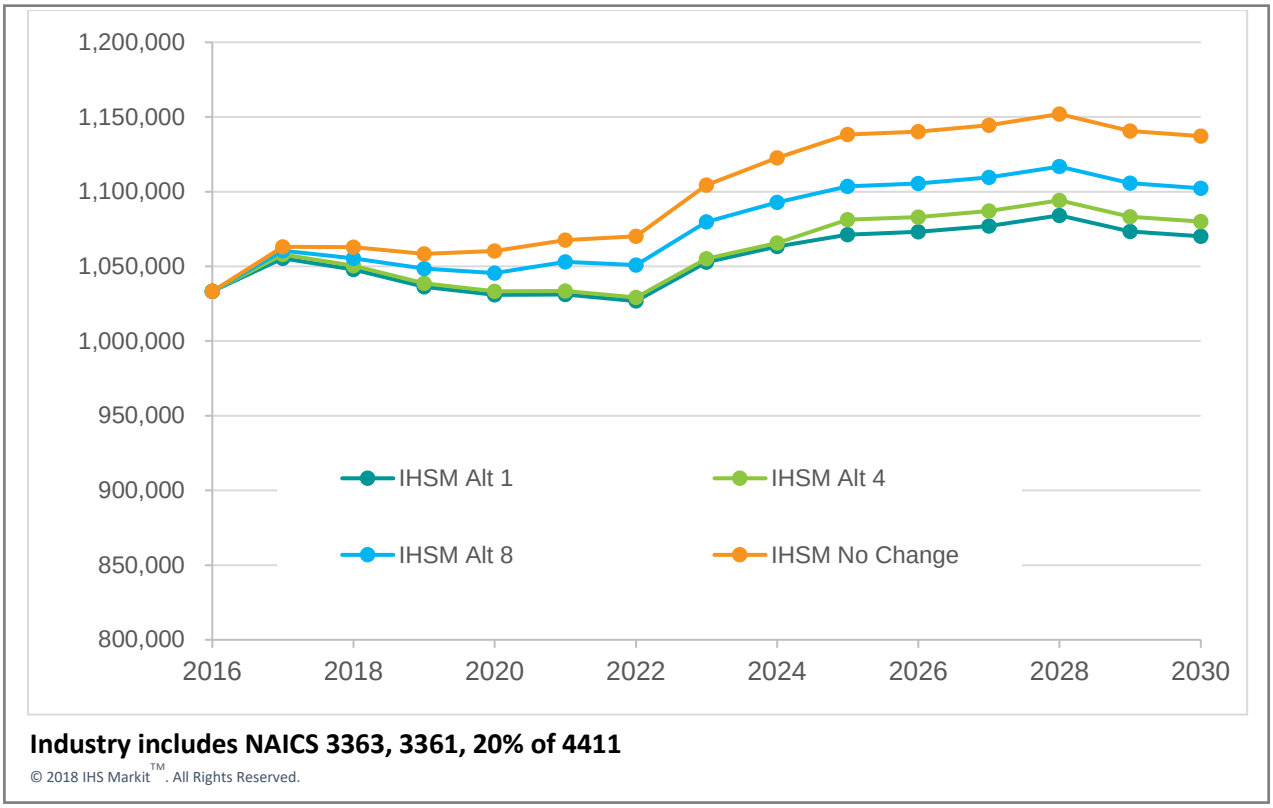



**Graphic 6: Total Impact on U.S. Jobs in Comparison to Alternative 1**[17]




[16] Based on IHSM modeling and data. See footnote 7 for assumptions on employment estimates.
[17] Based on IHSM modeling and data. See footnotes 7 and 9 for assumptions on employment data.

**Graphic 7. Estimate of Automotive Industry Job Growth by Proposed Alternatives**[18]




**Industry includes NAICS 3363, 3361, 20% of 4411**



## MEMA Supports a One National Program

MEMA supports a One National Program negotiated with California. As such, MEMA supports California retaining its 2013 waiver for its GHG and Zero Emissions Vehicle (ZEV) standards at this time. MEMA urges a continued focus by the Administration and California on negotiating a nation-wide solution and a unified program that all three agencies can agree upon. The revocation of California's waiver could derail discussions and initiate a legal dispute, the ramifications of which will have damaging effects on industry's ability to invest and plan for the future.

MEMA recognizes California's dedicated role with regards to the nation's mobile source emissions programs. California's authority has been important in driving investments and innovation in the emissions-reducing technologies market. It is critical that California remains in these discussions to negotiate a unified program across the U.S.

MEMA supports the stability and certainty of a One National Program coordinated with California and the states. A National Program of unified targets and timelines is critical in allowing suppliers to make important necessary long-term business planning decisions which drives

[18] IHSM followed the agencies model for calculating employment impact but used IHSM estimated vehicle sales, IHSM U.S. content calculations, IHSM 2016 employment as a baseline for the forecast, and IHSM technology requirements and costs. IHSM models do not consider changes in U.S. content due to imported vehicles, technology or localization of parts/vehicle production in the U.S. IHSM models do not consider improvements in productivity at the manufacturing level for automakers and suppliers and do not consider impact to A/C refrigerant suppliers due to removal of the refrigerant credits.

domestic investments in these emissions-reducing technologies and grows supplier jobs. A unified national program aids in providing industry stakeholders with economies of scale, leading to reduced compliance costs and improved market availability for the OEMs. Consumers would ultimately enjoy better vehicle costs by leveraging economies of scale if a One National Program is maintained.

## MEMA Supports Continuing the Credit Programs

MEMA strongly supports the continuation of the current credit programs and urges the agencies to continue these programs as a key enabler to achieving the agencies' goals. It is critical that the regulations provide a variety of regulatory tools that broaden the pathways vehicle manufacturers can use to manage their product mix to meet the standards. Credit programs are not loopholes. Rather, they provide important flexibilities and allow greater innovation which can ultimately lower compliance costs and increase consumer choice.

MEMA appreciates the agencies separating the "credits" into two categories. The first type of credit program, such as the off-cycle and A/C efficiency technology programs, grants credits for technologies that provide "real-world reductions and do not represent a loss of overall emission benefits."[19]

As outlined further below, continuing the off-cycle, A/C efficiency, and the alternative mobile A/C refrigerant credit programs through 2026 and beyond is paramount to suppliers. Even if the standards are relaxed between MYs 2021 – 2025, it is essential to supplier investments and jobs that these credit programs continue. In fact, if standards are relaxed, it will be even more important that these credit programs are maintained. Continuing these programs that recognize real GHG emissions will preserve significant investments in off-cycle technology by motor vehicle suppliers and allows the U.S. to maintain its technological innovation leadership. More importantly, continuation of these credit programs will help sustain supplier jobs and spurs further investments by maintaining market certainty for these technologies that would otherwise not be used.

The second type of credit program offers "incentives" that "help manufacturers meet a numerically more stringent standard but would not reduce real-world $CO_2$ emissions."[20] Incentive credits are important to suppliers because these are technologies that suppliers have invested significant resources to develop. However, many of these technologies are still new enough that they need incentives to provide the initial catalyst to get these technologies into the market because the initial production levels do not justify the expense. MEMA supports the continuation of these incentive programs, particularly the advanced technology multiplier incentives, pick-up truck hybrid incentives, and performance pick-up truck incentives.

The agencies seek comment on "whether the credit trading provisions in 49 CFR part 536 should cease to apply beginning in MY2022."[21] MEMA supports the current trading program because it allows vehicle manufacturers to make strategic decisions on applying the lowest compliance cost solution for their own unique product mix. It also provides vehicle manufacturers a market-based

[19] 83 Fed Reg 43460
[20] 83 Fed Reg 43461
[21] 83 Fed Reg 43452

approach for determining the technologies to invest in certain areas. The credit trading program allows important flexibilities for vehicle manufactures while providing greater consumer choice in the vehicles.

*Support of the Off-Cycle and A/C Efficiency Programs*

MEMA strongly agrees with the agencies' statement that the off-cycle and A/C efficiency credit programs have a significant role in the National Program because they "allow manufacturers to maintain consumer choice, spur technology development, and minimize compliance costs, while achieving significant GHG and oil reductions."[22] These credit programs do not distort the market but recognize technologies that achieve real-world GHG emission reductions that cannot be measured on the test-cycle.

EPA's modeling results confirm these credits are important for providing compliance tools, and also have a positive impact on regulatory compliance costs and average vehicle prices. The EPA explains that "[w]ithout the off-cycle and A/C efficiency technologies available [for a regulatory compliance tool], … manufacturers will have to apply costlier technologies to meet the standards."[23] The agencies should continue the off-cycle and A/C efficiency credit programs if the agencies are concerned about compliance costs.

Development of these technologies have been led by motor vehicle parts suppliers with significant research and development investments required to develop and deploy. If these credit programs are eliminated, these technologies would likely not be used at all by vehicle manufacturers for compliance since the benefits are not able to be accurately measured on the standard test procedure. Therefore, continuation of these credit programs is critical in supporting supplier high-tech jobs and preserving long-term supplier technology investments.

The agencies request comment on how EPA and NHTSA's existing flexibilities might be amended to reduce "market distortion."[24] The off-cycle and A/C efficiency programs do not distort the market because these credits represent real-world GHG emission reductions. In fact, elimination of the off-cycle and A/C efficiency credit programs would distort the market because it would force the vehicle manufacturers to use a much narrower, more expensive technology mix for compliance. The off-cycle and A/C efficiency programs allow more variation and cost-efficient technologies.

MEMA supports the agencies suggesting new language to refer to A/C efficiency and off-cycle technology adjustments as fuel consumption improvement values (FCIVs).[25] The use of this term acknowledges that these off-cycle and A/C efficiency technologies provide real-world emissions reductions and fuel efficiency savings and are not loopholes. It should be noted, however, that MEMA also supports FCIVs being eligible for the "carry forward" and "carry back" provisions in 49 U.S.C. 32903.[26]

The continuation and expansion of the off-cycle and A/C efficiency credits will drive domestic, high-quality, high-tech jobs, and grow the economy while furthering the goals for improved fuel economy and advancing the development of lower costs technology. Consequently, MEMA

[22] Draft TAR page 11-2.
[23] 83 Fed Reg 43469
[24] 83 Fed Reg 43441
[25] The agencies could also use energy consumption improvement values to reflect a broader range of vehicles including EVs.
[26] 83 Fed Reg 43455

requests that the off-cycle technology and the A/C efficiency technology credit programs continue through 2026 and beyond. MEMA opposes the proposed alternatives and any negotiated outcome that eliminates the off-cycle and A/C efficiency credit programs.

*Support of the A/C Refrigerant Leakage Credits*

EPA requests comment on a proposal to exclude the A/C refrigerant leakage credit – credits currently offered to vehicle manufacturers for the use of alternative mobile A/C refrigerants, such as HFO-1234yf, in light vehicles – after MY2020 in most alternatives (after MY2021 in alternatives 5 and 8).[27]

MEMA supports the credits currently offered for the use of A/C refrigerant leakage credits as they stand now. This credit program advances technological leadership, preserves significant technological investments, and allows vehicle manufacturers continued compliance flexibility while offering greater consumer choice. The industry widely supports this successful credit program and the NPRM provides little justification for eliminating the refrigerant credits beyond a desire to "harmonize" the programs. If the A/C refrigerant leakage credits are eliminated, IHS Markit estimates that between 800 and 1400 direct U.S. jobs along the full supply chain are at risk.[28] MEMA urges EPA to retain the A/C refrigerant leakage credits through MY2026 in the final rule.

Retaining the A/C refrigerant leakage credits will help American industry to maintain its technological leadership and advantage over technology made in China. American companies spent years developing, commercializing, and ultimately patenting innovative refrigerant technology. China has been dumping outdated refrigerant in the U.S., leveraging its natural resources supply of fluorspar to undercut U.S. suppliers. EPA's refrigerant leakage credits are a critical additional lever to further incentivize use and drive the transition to more environmentally friendly American products. Eliminating the credit will reward manufacturers in China at the expense of American companies.

The credits provide an incentive for automakers to voluntarily transition to next-generation refrigerants invented and produced by American companies. The auto manufacturing industry has widely embraced the refrigerant leakage credit program, making significant investments in reliance on the availability of refrigerant leakage credits, which have been part of the regulatory structure since 2010. In producing this new class of alternatives, American suppliers have invested nearly $1 billion to invent, commercialize and build world-scale manufacturing plants that employ hundreds of American workers. The refrigerant was developed in Buffalo, NY and is now manufactured in Texas and Louisiana. Our members have invested heavily in the new refrigerant, investment that could be stranded without the availability of the credit.

Importantly, the refrigerant leakage credits provide important compliance flexibility, as using these refrigerants is a simple and cost-effective solution to meet the targets. Automakers adopting next-generation refrigerants receive credit in an amount of 13.8 g/mi for cars and 17.2 g/mi for trucks (when paired with leakage reduction measures). These credits, which represent real-world GHG emissions reductions, are one of the highest values of any credit offered in the EPA program.

[27] 83 Fed Reg 42988
[28] MEMA commissioned IHSM to conduct the analysis.

While MEMA understands the agencies' interest in harmonizing the CAFE and GHG standards, we do not believe that harmonization requires such drastic changes as eliminating the availability of refrigerant leakage credits. Harmonizing the programs does not require making them identical or equivalent. Rather, harmonization can be achieved by better coordinating the two programs to the extent feasible while allowing each agency to implement its separate and distinct mandate. Continuing the availability of A/C refrigerant leakage credits is critical to enable the agency to meet its legal mandate to reduce GHG emissions from the use of HFCs in auto A/C systems. MEMA urges EPA to maintain the availability of A/C refrigerant leakage credits through MY2026 in the final rule.

In summary, MEMA strongly supports continuing the current credit programs and urges the agencies to offer these credit programs through 2026. It is paramount that the off-cycle, A/C efficiency, and the A/C refrigerant leakage credits are continued. These credit programs do not distort the market but recognize technologies that achieve real-world GHG emission reductions. Continuation of these programs preserves significant technological investments by motor vehicle suppliers, preserves supplier jobs and allows vehicle manufactures to use the most cost-efficient pathway to compliance. MEMA opposes the proposed alternatives that eliminate the off-cycle and A/C efficiency credit programs and opposes elimination of the A/C refrigerant leakage credits.

## MEMA Supports Expansion of the Credit Programs

EPA requests stakeholders provide "comment on a variety of 'enhanced flexibilities' whereby EPA would make adjustments to current incentives and credits."[29] MEMA appreciates the EPA acknowledgement that there may need to be an expansion of the credit and incentive programs to broaden the compliance pathways. Credit programs are an important element of the regulatory framework and should be improved and expanded as the program evolves and vehicle manufacturers need more regulatory tools and greater technology variation for compliance. MEMA supports expansion of the off-cycle and the A/C efficiency programs as well as many of the "incentive" credit programs such as the advanced technology multiplier incentives, pick-up truck hybrid incentives, and performance pick-up truck incentives.

*MEMA Supports Expansion of the Off-Cycle and A/C Efficiency Programs*

Since the off-cycle and A/C efficiency credits program are based on real-world GHG emissions reduction data, these credits should not be restricted but expanded. MEMA supports:

1. Expanding the off-cycle and A/C efficiency technologies menu;
2. Revising the credit caps;
3. Streamlining the off-cycle process; and,
4. Establishing a process for suppliers to apply for a technology to be eligible for provisional off-cycle credits.

An expansion of the off-cycle and A/C efficiency credit programs will encourage further innovation in forward-looking technologies and continue domestic investments in research and development. Expanding these credit programs would provide certainty in the investments already made and aid in creating additional supplier jobs. Off-cycle and A/C efficiency technology credits

[29] 83 Fed Reg 43460

will continue to be critical for the vehicle manufacturers to cost-effectively comply with the standards, regardless of where they are set.

*MEMA Supports Increasing the Cap on Off-Cycle Menu Technologies*

MEMA strongly supports an evaluation of a significant increase of the off-cycle menu credit cap of 10 grams per mile (g/mi).[30] The 2012 federal rulemaking acknowledged that the off-cycle technologies menu cap of 10 g/mi should "be a topic for further consideration … and to be one of the issues the agencies examine during the mid-term review."[31] More than 95 percent of 2016 off-cycle credits were generated via the menu pathway and, for all but one vehicle manufacturer, it was the sole pathway used to generate off-cycle credits. Further, based on the 2015 and 2016 compliance reports, the utilization of the off-cycle technologies, should be expected to grow in the coming years – particularly technologies on the credit menu.[32]

The off-cycle technologies menu caps are counterproductive because it essentially disincentives real-world $CO_2$ reductions. According to the 2016 compliance report, BMW, Jaguar Land Rover, and FCA applied credits of 7 g/mi, 8 g/mi, and 8 g/mi, respectively, for trucks in 2016, and those figures have been growing rapidly due to the cost-effectiveness of such technologies (See Graphic 8 below).[33] When the cap is reached, vehicle manufacturer adoption of off-cycle technologies will stall since, once the cap is met, there is no compliance benefit for vehicle manufacturers to continue to invest in the technologies that cannot be measured on the test-cycle. Similarly, the sub-cap for off-cycle thermal control technologies is already being exceeded. General Motors (GM), for example, estimates that it will not be able to use 55 percent of the real-world benefit associated with its approved climate control seat technology due to the current thermal control sub-cap.[34] When these caps are met, alternative pathways to earn credits are more difficult and costlier. The vehicle GHG emissions program should continue to account for and encourage these off-cycle emissions-reducing technologies – even if the standards are weakened.

[30] 83 Fed Reg 43463
[31] 77 Fed Reg 62835
[32] Draft TAR pg. 5-222 and EPA 2015 and 2016 Manufacturer Performance Report
[33] EPA 2016 Compliance Report, p.43.
[34] https://www.epa.gov/sites/production/files/2018-02/documents/gm-rquest-ghg-credit-active-climate-control-seats-fe6357-2017-09-29.pdf

**Graphic 8. Off-Cycle Technology Credits Earned by Manufacturer**[35]

**Table 3-17. Off-Cycle Technology Credits by Manufacturer and Fleet, 2012-2016 Model Years (g/mi)**

| | 2012 Model Year | | | 2013 Model Year | | | 2014 Model Year | | | 2015 Model Year | | | 2016 Model Year | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Manufacturer | Car | Truck | All | Car | Truck | All | Car | Truck | All | Car | Truck | All | Car | Truck | All |
| BMW | 3 | 5 | 3 | 3 | 6 | 4 | 3 | 6 | 4 | 4 | 7 | 4 | 4 | 7 | 5 |
| Ford | 1 | 0 | 0 | 1 | 1 | 1 | 2 | 3 | 3 | 2 | 3 | 3 | 2 | 4 | 3 |
| GM | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 3 | 2 | 2 | 4 | 3 | 3 | 4 | 3 |
| Honda | - | - | - | - | - | - | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 2 |
| Hyundai | - | - | - | - | - | - | 1 | 4 | 1 | 1 | 3 | 2 | 1 | 5 | 1 |
| Jaguar Land Rover | - | - | - | - | - | - | 2 | 6 | 5 | 2 | 5 | 5 | 3 | 8 | 7 |
| Kia | - | - | - | - | - | - | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 3 | 2 |
| Mercedes | 1 | 0 | 0 | 1 | 1 | 1 | 3 | 1 | 2 | 4 | 3 | 3 | 4 | 3 | 4 |
| Nissan | - | - | - | - | - | - | 1 | 2 | 2 | 2 | 3 | 2 | 2 | 3 | 2 |
| Subaru | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Toyota | - | - | - | - | - | - | 2 | 3 | 3 | 3 | 3 | 3 | 1 | 3 | 2 |
| *FCA*† | *1* | *2* | *2* | *1* | *3* | *2* | *3* | *7* | *6* | *3* | *7* | *6* | *3* | *8* | *7* |
| *Volkswagen*† | *1* | *1* | *1* | *1* | *1* | *1* | - | - | - | - | - | - | - | - | - |
| **Fleet Total** | **0** | **1** | **1** | **1** | **1** | **1** | **2** | **4** | **3** | **2** | **4** | **3** | **2** | **4** | **3** |

†FCA and Volkswagen are listed separately in this table due to an ongoing investigation and/or corrective actions. These data are based on initial certification data, and are included in industry-wide "Total" or "All" values. Should the investigation and corrective actions yield different $CO_2$ data, any relevant changes will be used in future reports.

MEMA supports the proposal of replacing the current menu cap with an individual manufacturer cap that scales with the manufacturer's average fleet-wide target levels.[36] A cap would be based on a percentage of the manufacturers fleet-wide 2-cycle emissions performance (e.g. 10 percent of a manufacturer's $CO_2$ emissions fleet-wide target). MEMA agrees that, for instance, a 10 percent cap of a manufacturer's $CO_2$ emissions fleet-wide target, is a reasonable and more justifiable approach than setting a single value for cars and trucks.

According to the 2017 EPA trends report,[37] there is a 22 percent national fleet difference between two-cycle and adjusted fuel economy estimates (real world). If one assumes a 9.5 percent (of the 22 percent) difference is attributed to exogenous variables like load, grade, wind, rain/snow and tire pressure, that leaves a portion of 12.5 percent (of the 22 percent) of real-world emissions to be addressed by autonomous, A/C load reduction, thermal, electrical and other technologies. This is on average 44 g/mi for light-duty vehicles in 2017. Therefore, the 10 g/mi cap should be adjusted upward. As proposed in the NPRM, setting a cap at 15 g/mi or at 10 percent of vehicle emissions would not be unreasonable for the above reasons.

*MEMA Supports Expansion of the Off-Cycle Menu*

MEMA strongly supports an expansion of the off-cycle menu. The off-cycle menu is a heavily used credit pathway and for most vehicle manufacturers, per 2016 data, it is the sole pathway for obtaining off-cycle credits.[38] Because of technology advances since the current menu was established, there is a great need and opportunity to expand the menu to more technology categories and corresponding, reasonable credit values. Since these technologies can benefit a wide variety of vehicle types and provide more choice in the marketplace, it is critical that the off-cycle credit program has opportunities to evolve and develop with the technologies it is meant to encourage.

[35] EPA 2017 Trends Report
[36] 83 Fed Reg 43463
[37] EPA 2017 Trends Report
[38] EPA 2016 Manufacturer Performance Report, p. 44.

Appropriately expanding the technologies available on the menu (meaning, revising the menu so it reflects a more current list of available, in-production technologies that have tangible, real-world benefits) would encourage broader implementation of these technologies by OEMs into the fleet and benefit the overall regulatory program. Further, if certain off-cycle technologies are added to the menu, this provides certainty for the long-term tooling investments, product development planning, and system integration strategies for both OEMs and their suppliers.

There are several categories that should be considered for the off-cycle menu. For example, active seat cooling, 48-Volt mild-hybrid system technology, influence on glazing on stop/start, expand active warm-up category, high-efficiency alternator, and regenerative braking. MEMA offers a full description and data on many of these technologies in **Appendix A**. The suggestions are not intended to be all-inclusive. Further, MEMA supports increasing the credit values for start-stop technologies and active seat ventilation.[39] We discuss the rationale for the credit adjustments further in Appendix A.

*MEMA Supports Streamlining the Process for Earning Off-Cycle Technology Credits*

MEMA has consistently supported and advocated for EPA to evaluate ways to improve the off-cycle program allowing vehicle manufacturers to more effectively use the off-cycle technologies to meet the goals of the program. As a result, MEMA greatly appreciates EPA's request for stakeholders to provide comment on revisions to the "off-cycle process that would streamline the program."[40] Having a more efficient off-cycle technology credit program will allow for more certainty and faster vehicle manufacturer deployment of these emissions-reducing off-cycle technologies.

As a result, MEMA supports EPA allowing vehicle manufacturers to use the same methodology as another vehicle manufacturer once it has been approved by EPA without requiring submitting another application subject to public review. Requiring the next vehicle manufacturer's application to provide at least the same level of data and details as the original vehicle manufacturer application, validating the level of credit the next vehicle manufacturer is applying for based on how the technology is applied in their fleet, will be sufficient to uphold the integrity of the off-cycle program. This process will decrease the workload of the agencies and vehicle manufacturers.

MEMA supports EPA revising the regulation to allow the agency to add technologies, when the agency has adequate supporting data, to the off-cycle menu that have been approved through the third pathway or petition process. EPA should allow a public comment period on the technology and the credit value but avoid a formal rulemaking. This process would be efficient and credible. By adding these technologies when appropriate after a public comment period but avoiding a formal rulemaking would eliminate vehicle manufacturers need to submit subsequent applications after the initial application is approved. A streamlined process such as this is something the industry, including MEMA, has consistently supported and advocated for as part of improving the off-cycle technologies credit program. If the appropriate off-cycle technologies are gradually added to the off-cycle technology menu, there would be a significant workload reduction effort for agencies and vehicle manufacturers. It would also greatly increase the adoption of suppliers' off-cycle technologies.

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[39] Impact of Active Climate Control Seats on Energy Use, Fuel Use, and CO2 Emissions, SAE 2017 Thermal Management Systems Symposium, https://www.nrel.gov/docs/fy18osti/69047.pdf
p. 20 with summaries, pp. 42 -43.

[40] 83 Fed Reg 43462

If EPA expands the off-cycle technologies menu and continually adds off-cycle technologies to the menu after a third pathway petition is approved, it is critical that EPA increases or eliminates the cap on the credits gained from the off-cycle menu. As explained further below, there should be a serious evaluation of at least significantly increasing the cap for substantiated real-world GHG reductions, especially as new technology innovations can be expected in the future.

MEMA supports the agency modifying the menu through the current rulemaking to add technologies such as the high efficiency alternator and the advanced A/C compressors.[41] MEMA also requests that EPA adds active seat cooling to the off-cycle menu based on GM's off-cycle application. Active seat cooling is discussed further in Appendix A.

*MEMA Supports an Independent Supplier Off-Cycle Provisional Credit Application Process*

MEMA strongly supports EPA providing suppliers an independent application process for their off-cycle technologies to be eligible for a provisional off-cycle credit. We appreciate the agencies requesting comment on allowing a role of suppliers in the off-cycle program.[42] We also appreciate EPA collaborating with suppliers on a supplier application process that could work for both the agency and the automotive industry. Below we outline in detail why we support a supplier provisional off-cycle credit application process. We also provide feedback on why an OEM partnership with the supplier for the application process should not be required.

Suppliers have a vested interest in making sure off-cycle technologies are easily deployed by the vehicle manufacturers. Since suppliers are developing and have available technologies that could be implemented by multiple OEMs, it makes sense for suppliers to provide the agency with an initial application that allows a technology to be eligible for provisional off-cycle credits.

A supplier process, allowing a menu of provisional credits, would be a helpful alternative to the off-cycle petition process. The current process for the off-cycle credit petition is long and onerous for both the agency and OEMs, has a significant amount of risk and is unpredictable. These delays created by the process impede the ability of suppliers and OEMs to make technology investment decisions and effectively plan for compliance due to the length of application reviews and uncertainty of the outcome.

Having an established supplier application process would enable new supplier technologies to enter the market faster and gain penetration more efficiently than if each OEM petitioned separately for a credit for the same technology. For these reasons, MEMA supports an independent supplier process because it would lower investment risks for both OEMs and suppliers while reducing the workload burden of the agency and OEMs.[43]

MEMA supports the proposal included in the NPRM where a supplier provisional off-cycle application, after review by EPA, would go through a public comment period. Conversely, an OEM would not be required to go through public comment on their provisional credit application since the conservative provisional credit would be based on supplier data (ALPHA or alternative simulation results indicating off-cycle benefit). The supplier would benefit from this process

[41] 83 Fed Reg 43462

[42] 83 Fed Reg 43463

[43] Please see MEMA's previous comments on this issue at EPA-HQ-2015-0827-4314, EPA-HQ-OAR-2015-0827-6167, and EPA-HQ-OAR-2015-0827-9167

because it incentivizes and lowers development costs knowing there may be a greater demand for credit-eligible technology. Allowing suppliers to directly petition the agency for a specific technology to be eligible for a conservative provisional credit for three model years would greatly decrease the regulatory burden for OEMs because it reduces the overall credit approval time. At the end of the third model year of production, an OEM would be required to provide real world, in-use data from their vehicles to substantiate the OEM's continuation of credits for the technology. (Please see **Appendix B** for more details on MEMA's proposal on an independent supplier process.)

In the NPRM, EPA requests comment on suppliers being required to be partnered with an OEM to "ensure that there is practical interest in the technology prior to EPA investing resources in the approval" of the application.[44] While we understand EPA's need to have quality-control of the applications submitted, a supplier partnership with an OEM for the application is unnecessary and should not be required.

Suppliers invest significant resources for development and testing of these off-cycle technologies. As an example, a supplier recently went through the process of testing and validating fuel consumption and emissions benefits of active seat cooling technology to generate data that would justify off-cycle benefits. The internal funding for the supplier to validate the technology benefit was upwards of $500,000. This supplier technology investment was made without any assistance from an OEM. After the supplier validation was completed, the OEM made additional investment to prepare a submission based off the supplier's (and independent third party) research. These resource hurdles are sufficient to deter frivolous submissions. Suppliers fully understand the risks of spending the significant resources and failing to attract an OEM to deploy the technology. There is little to no incentive for a supplier to go through the product/technology development process, collect the necessary data, and undertake the full application process for a product/technology that would not generate OEM interest. In some cases, the technology may already be deployed by an OEM before receiving off-cycle credits from the petition pathway.

MEMA agrees that it is in a supplier's interest to collaborate with an OEM to gage interest in certain technologies. Suppliers would not necessarily want to plan any future technology projects and invest the necessary resources without having more certainty that an outlet exists for the technology. However, MEMA does not support suppliers being required to have an OEM 'sponsorship' to submit a provisional off-cycle credit application for a technology the supplier produces. Further, if suppliers submit off-cycle technology applications for technologies that are already in production and deployed by OEMs, perhaps suppliers could have an option to receive provisional credit approval priority.

MEMA has no objections to EPA's proposal to apply and limit the provisional off-cycle credit (during the technology implementation for the first three years) to the off-cycle menu credit cap. However, when the provisional off-cycle credit is validated by an OEM with real-world data and becomes a continuous off-cycle credit, the off-cycle credit should not be counted toward the off-cycle menu credit cap.

[44] 83 Fed Reg 43463

*MEMA Supports Expanding the A/C Efficiency Technology Menu and Increasing the A/C Efficiency Credit Cap, and Combining A/C Load Reduction Cap*

MEMA urges EPA to increase the cap on the A/C efficiency technology credits. The A/C efficiency credits are capped at 5.0 and 7.2 g/mi for cars and trucks, respectively, in 2017 and later model years. The total tons of credits are then based on the total volume of vehicles in a model year using these technologies. Although this cap is based on a general estimate of synergies and interactions of these technologies, it is unclear if there was an in-depth analysis by EPA or others that concluded $CO_2$ reductions from vehicle air conditioner efficiency technologies greater than the 5.0 g/mi for passenger cars were not possible (nor the original cap of 5.7 g/mi cap).

There is evidence that A/C load reduction technologies provide additive benefits and incremental improvements to the GHG emissions reduction performance of a vehicle. The National Renewal Energy Laboratory (NREL) has issued several reports recently that suggest EPA's estimate for the potential A/C $CO_2$ emissions are low.[45] According to NREL, the latest estimate of the A/C $CO_2$ emissions is 20.8 g/mi for passenger cars and 26 g/mi for trucks or 23.5 g/mi for the composite fleet. NREL's research shows EPA's underlying assumption of the A/C $CO_2$ emissions is outdated. NREL's data supports an upward scaling of the A/C efficiency menu and thermal control technologies credit caps – as much as a 51 percent increase for trucks and 74 percent increase for passenger cars. MEMA urges EPA to increase the A/C efficiency menu credit cap to 8.7 g/mi for passenger cars and 10.9 g/mi for light trucks.

**A/C Efficiency Cap**[46]

| | **Calculation of NREL Data and Current Cap** | **Proposed New Cap** |
|---|---|---|
| Passenger Cars | 20.8/11.9 x 5.0 | 8.7 g/mi |
| Light Trucks | 26.0/17.2 x 7.2 | 10.9 g/mi |

For that same reason, MEMA supports expanding the A/C efficiency technology menu. The pre-defined and pre-approved A/C efficiency credit menu, or the Mobile Air Conditioning (MAC) indirect credit menu, are playing a significant role in incentivizing air conditioner efficiency technologies. In 2014, 17 auto manufacturers, as part of their compliance demonstration, used A/C efficiency credits.[47] In 2016, 15 vehicle manufacturers utilized the A/C efficiency credits.[48] This data confirms earlier agency conclusions that these technologies will be widely adopted and will continue to play a role in overall vehicle GHG reductions and regulatory compliance.[49] Suppliers will continue to develop and deploy additional technologies improving A/C efficiency.

MEMA supports continuation of a menu approach for A/C efficiency credits. MEMA urges the agencies to consider alternatives to AC17 testing methodology. AC17 vehicle testing is expensive and component bench testing and/or simulation, which can be performed at far lower cost, can have higher fidelity to quantify real-world benefits. We urge the agencies to allow flexibility for the

[45] NREL report 17TMSS-0056, https://www.nrel.gov/docs/fy18osti/69047.pdf
[46] ITB Group calculations based on NREL data
[47] Draft TAR p. 5-210.
[48] EPA 2016 Compliance Report, p.38.
[49] Draft TAR p. 5-208.

industry to develop low-cost measurements of a technology's benefits. Menu credits could be formulaic to apply to different vehicle applications, utilizing AC17 testing, bench testing and/or simulation. This would streamline the credit application process and lower cost.

As discussed above, NREL research suggests EPA should revise upward the current thermal technologies cap of 3 g/mi and 4.3 g/mi for passenger cars and light trucks. The thermal technologies cap would need to be increased to at least 4.5 g/mile and 6.5 g/mile respectively – a 50 percent and 51 percent increase as shown by the table below.[50]

**Off-Cycle Thermal Control Cap**[51]

| | **Calculation of NREL Data and Current Cap** | **Proposed New Cap** |
|---|---|---|
| Passenger Cars | 20.8/13.8 x 3.0 | 4.5 g/mi |
| Light Trucks | 26.0/17.2 x 4.3 | 6.5 g/mi |

The EPA requests comment on establishing a combined credit cap for off-cycle menu based thermal control technologies and A/C efficiency menu technologies of 8 g/mi for passenger cars and 11.5 g/mi for light trucks.[52] MEMA supports establishing a combined cap for A/C efficiency technologies and thermal technologies. Consequently, a combined A/C efficiency and thermal technologies credit cap should be established at 13.2 g/mile for passenger car and 17.4 g/mile.

*MEMA Supports Extension of the Advanced Technology Multiplier Incentives*

Currently, the EPA program provides vehicle manufacturers with multiplier incentives that allow advanced technology vehicles – electric vehicles (EVs), fuel cell vehicles (FCVs), plug-in hybrid vehicles (PHEVs), and natural gas vehicles (CNGs) – to count as more than one vehicle toward compliance. The program offers incentive multipliers beginning in 2017 expiring in 2021. MEMA supports extending the advanced technology multiplier incentives through 2026. If California's Zero Emission Vehicle (ZEV) mandate is removed, as proposed in the NPRM, there will be significantly fewer requirements for EVs and PHEVs. There has already been significant supplier and OEM investments in these technologies. An extension of the multiplier incentives through 2026 will be needed to incentivize EVs and PHEVs.

Further, while MEMA can support an extension of these advanced technology multiplier incentives through 2026, these multiplier incentives should be set no higher than 2021 multiplier levels. If the multiplier incentives are set higher than the 2021 multiplier levels, it could lead to these incentives distorting the market by allowing too many incentives for EVs and PHEVs.

[50] NREL report 17TMSS-0056
[51] ITB Group calculations based on NREL data
[52] 83 Fed Reg 43463

**MEMA Supported Multiplier Incentives**

| | Multiplier Incentives 2017 - 2019 | Multiplier Incentives 2020 | Multiplier Incentives 2021 | MEMA Supported Multipliers 2022 - 2026 |
|---|---|---|---|---|
| **EVs and FCVs** | 2.0 | 1.75 | 1.5 | 1.5 |
| **PHEVs and CNGs** | 1.6 | 1.45 | 1.3 | 1.3 |

Under the current incentive program, vehicle manufacturers are allowed to use 0 g/mi compliance value for all electric powered vehicles instead of accounting for the GHG emissions associated with upstream electricity generation up to a per-manufacturer production cap for MYs 2022 – 2025. The EPA requests comment on extending the use of the 0 g/mi emissions factor for electric powered vehicles.[53]

MEMA supports a well-to-wheel fuel lifecycle analysis to evaluate the benefits of vehicle technologies to shape policy choices. Without this type of comprehensive assessment on the fuel impacts and comprehensive GHG costs, policies consequently improperly slant toward preferred technologies. Nonetheless, MEMA is not opposed to continuing to allow 0 g/mi emissions factor for electric powered vehicles through 2026 in order to incentivize EVs and PHEVs. However, this policy should be reviewed for the post-2026 standards.

*Expansion of Mild and Strong Hybrid Incentives for Qualifying Full-Size Light Pick Up Trucks*

The EPA currently incentivizes full-size light pickup trucks with mild-hybrids in MYs 2017–2021. Since mild-hybridization is just emerging in the marketplace, the elimination of these credits in MY2022 will inhibit the expansion of this technology in full-size pickups. Further, the sales/production threshold (i.e. production/threshold is 80 percent in 2021)[54] for receiving the incentives may discourage vehicle manufacturers from implementing this technology due to concerns that the sales volumes may not be met. Therefore, MEMA urges EPA to extend these incentives for mild-hybrid pick-up trucks through 2026, eliminate the minimum production/sales volume requirement, and extend the eligibility to all light-duty trucks including the rapidly-growing SUV and Crossover Utility Vehicle (CUV) segment. MEMA also supports revising the strong hybrid pick-up truck incentives (20 g/mi through 2025) by removing the production threshold requirement and expanding the eligibility to all light-duty trucks.

*Expansion of Incentives for Full-Size Pick-Up Truck Emission Reduction Performance*

The performance thresholds in the incentive program for full-size pick-up trucks that significantly outperform the GHG emissions targets, 15 percent below or 20 percent below the applicable target through 2025,[55] are extremely challenging. These performance thresholds could be lowered and still incentivize game changing emission reduction technologies in pick-up trucks.

MEMA urges EPA to review these performance thresholds, earning a 20 g/mi and 10 g/mi incentive respectively, and consider lowering them. For instance, lowering the 20 percent below

[53] 83 Fed Reg 43461
[54] 40 CFR 86.1870-12(a)(1)
[55] 40 CFR 86.1870-12(b)

target performance to 15 percent below and the 15 percent below target performance to 10 percent. Alternatively, EPA could create three tiers of thresholds by adding a 10 percent threshold coinciding with a lower credit. MEMA also urges these credits to be extended to all light-duty trucks, not just full-size pick-up trucks, and the production/sales thresholds be removed from the emissions reduction performance credit.[56]

*MEMA Supports Evaluating Advanced Vehicle Safety Technologies for Fuel Efficiency Benefits*

MEMA supports the agencies developing a program to evaluate the aggregate benefits of advanced driver assistance systems, connected vehicle technologies, and automated driving systems. These technologies are designed to avoid or mitigate vehicle crashes. Reducing vehicle crashes and the resulting traffic congestion, decreases idling and emissions. Optimizing driving routes can enhance vehicle fuel efficiency.

If compelling data is generated proving the emissions reduction and enhanced fuel efficiency benefits, MEMA supports developing a credit system that incentivizes and accelerates the adoption of connected vehicle technologies and advanced driver assistance systems that mitigate congestion and provide multiple benefits. Initial findings indicate that deploying existing driver assistance features could save nearly 10,000 lives annually and reduce system-wide fuel consumption by up to 18-25 percent.[57]

While there is no statutory prohibition allowing congestion mitigation and safety-related technology to be credited in the CAFE and the GHG vehicle emissions programs, there is currently regulatory language that prevents vehicle manufacturers from earning credits for crash avoidance technologies, technologies that reduce the frequency of crashes or safety critical systems. MEMA urges EPA to strike the language of 40 CFR Section 86.1869 in the final rule.[58]

## The Role of Lightweighting and Safety in Fuel Efficiency

MEMA agrees with the recognition in the NPRM that the use of lighter weight materials, otherwise known as mass reduction or lightweighting – high strength steel, aluminum, plastics, polymer composites, carbon fiber and magnesium – has been and continues to be an important cost-effective strategy in meeting the fuel efficiency and emission reduction standards.

However, the agencies make the unsubstantiated statement in the NPRM that if OEMs increasingly choose the technology option of "vehicle lightweighting … as the stringency of the standards increases, so does the likelihood that higher stringency will increase on-road fatalities."[59] MEMA disagrees that there is a correlation between lightweighting and safety as it is implemented in the fleet today.

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[56] Program requires a minimum of 15 percent in MY2017 increasing to 40 percent in MY2021.

[57] "Roadmap to Safer Driving Through Advanced Driver Assistance Systems" MEMA/The Boston Consulting Group (BCG), 2016 https://www.mema.org/sites/default/files/MEMA%20BCG%20ADAS%20Report.pdf; and SAFE estimates based on independent fuel efficiency modeling conducted by Air Improvement Resource, Inc.

[58] 40 CFR Section 86.1869 – *Off-cycle credits may not be approved for crash-avoidance technologies, safety critical systems or systems affecting safety-critical functions, or technologies designed for the purpose of reducing the frequency of vehicle crashes*.

[59] 83 Fed Reg 42991

Independent research conducted by NHTSA, Dynamic Research Incorporated (DRI) and other organizations consistently find that vehicle size and design, not mass, is the leading driver dictating vehicle safety.[60] NHTSA and numerous other automotive safety experts acknowledge the overall safety and fuel economy benefits of reducing weight in the largest, heaviest trucks and cars, while maintaining or increasing their size for safety and comfort. [61,62,63] NHTSA itself has reached this conclusion on multiple occasions.[64,65] NHTSA states in its 2012 report, "Potential combinations of mass reductions … proportionately somewhat higher for the heavier vehicles may be safety-neutral or better as point estimates and, in any case, unlikely to significantly increase fatalities." The report goes on to explain that this conclusion is "not due to a paucity of data, but because the societal effect of mass reduction while maintaining footprint, if any, is small."[66]

In fact, every aluminum-bodied vehicle ever tested earned a 5-star safety rating from NHTSA.[67] In 2016, a record 26 vehicles were identified as "aluminum-intensive" with over 500 pounds of aluminum content (16 percent of curb mass). Average lightweight material content for these vehicles exceeds 33 percent of total curb mass. It is also well known that plastics and polymer composites comprise 50 percent of the volume of the average vehicle, yet only 10 percent of its mass.[68] OEMs are increasingly using advanced lower-density materials to cost effectively deliver vehicles that are safer, more fuel efficient and environmentally friendly.

It is important to recognize that mass does not equal strength. Lightweighting materials such as high strength steels, aluminum alloys and magnesium are in most cases stronger (or at least as strong as) the heavier materials they are replacing.

Additionally, automakers have no stated plans under any regulatory scenario to reduce weight in the smallest cars, which represent only about 3 percent of all new car and truck sales annually.[69] As a result, concerns raised in the draft rule that more stringent fuel efficiency standards may force automakers to reduce weight in the smallest vehicles are misguided. Lightweighting is currently focused on larger vehicles since there is more value for lightweighting in a heavier vehicle than a lighter vehicle. There is significantly more opportunity for automakers to reduce much more weight

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[60] Relationships between Fatality Risk, Mass, and Footprint in Model Year 2003-2010 Passenger Cars and LTVs (Docket No. NHTSA-2016-0068), NHTSA, 2016, Puckett, S.M., Kindelberger, J.C.
[61] Independent Review: Statistical Analyses of Relationship between Vehicle Curb Weight, Track Width, Wheelbase and Fatality Rates," UMTRI, 2011, Green *et. al*.
[62]Updated Analysis of the Effects of Passenger Vehicle Size and Weight on Safety, Phase I. Report No. DRI-TR-11-01. (Docket No. NHTSA-2010-0152-0030) 2011, Dynamic Research, Inc., Van Auken, R.M., Zellner, J. W.
[63] Supplemental Results on the Independent Effects of Curb Weight, Wheelbase, and Track on Fatality Risk in 1985-1998 Model Year Passenger Cars and 1985-1997 Model Year LTVs [17] DRI-TR-05-01, 2005, R.M. Van Auken and J.W. Zellner.
[64] Relationships Between Fatality Risk, Mass, and Footprint in Model year 2000-2007 Passenger Cars and LTVs, Report No. DOT HS 811 665, NHTSA 2012, Kahane, C.J.
[65] Relationships between Fatality Risk, Mass, and Footprint in Model Year 2003-2010 Passenger Cars and LTVs (Docket No. NHTSA-2016-0068), NHTSA, 2016, Puckett, S.M., Kindelberger, J.C.
[66] Report No. DOT HS 811 665, NHTSA 2012, Kahane, C.J.
[67] www.NHTSA.org and www.IIHS.org
[68] "Plastics and Polymer Composites in Light Vehicles" report, Economics and Statistics Department, American Chemistry Council, July 2018.
[69] The Aluminum Association, graphic with additional data can be found here: http://1pp2jy1h0dtm6dg8i11qjfb1-wpengine.netdna-ssl.com/wp-content/uploads/2018/08/Mass-Reduction-Chart.pdf

from the heaviest trucks and cars. As noted above, NHTSA has previously found that reducing weight in the heaviest trucks and cars benefits overall fleet safety.[70]

The use of footprint-based standards, which have proven to be an appropriate means of characterizing the vehicle fleet and drives fuel efficiency improvement across all vehicle classes. The footprint standard also eliminates the incentive to shift fleet volume to smaller cars. It also provides an incentive for reducing weight in the larger vehicles, where weight reduction is of the most benefit. The fuel economy cut off for vehicles with footprints less than 41 square feet eliminates the incentive to lightweight the smallest vehicles. As an example of this, the arrival of lighter yet safer, but still large, vehicles (like Ford's top selling, aluminum-bodied F150) makes it clear that the footprint-based regulatory approach is working as intended.

Furthermore, lightweighting is not a stand-alone system of mass reduction from the body structure, it is an entire vehicle system. This should be acknowledged in the rule. A large portion of the lightweighting done by suppliers are to non-crash related products, such as driveline and propulsion components that do not contribute to the crashworthiness of a vehicle. This is also true with other non-body, semi-structural components such as front-end modules, door modules, instrument panels, glazing, and many others. Virtual lightweighting studies performed on several vehicle models not only reinforce it, but also show significant part integration possibilities with these applications.[71] These solutions, therefore, can be extremely cost effective. Traditional steel body structure components are being replaced by plastics and other materials. Plastic/metal hybrid solutions are being explored for further lightweighting without negatively affecting the crashworthiness or cost of the overall solution.[72]

Along those same lines, while the agencies recognize that lightweighting is a cost-effective technology, the NPRM still discusses the overall cost burden of meeting the fuel efficiency and emission standards. Generally speaking, light-weighting can be done without necessarily increasing the costs of the vehicle. Suppliers can convert iron components to lightweight aluminum and remain cost-neutral or even provide a cost reduction without compromising safety. Engineered laser-welding for weight reduction, as an example, provides a substantial price reduction. Specialty aluminum or magnesium casting processes can be utilized to reduce the weight of components that are already made in lightweight materials. The downsizing of engines can lower costs, while maintaining performance.

Lightweighting is an important part of the overall strategy for improving fuel efficiency. The way lightweighting is currently implemented in the fleet and anticipated to be deployed in the future does not compromise safety. The agencies should remove any statements asserting the correlation between lightweighting and safety from the final rule. These statements are unfounded and scientifically unsupported. These challenges to the safety of lightweighting threatens the industry's

[70] Report No. DOT HS 811 665, NHTSA 2012, Kahane, C.J.
[71] George Mason University, Center for Collision Safety and Analysis, "ACC/GMU Research Project: Understanding of Numerical Polymer/Composite Material Models and their CAE applications," June 2015. Quarterly Report for the American Chemistry Council and U.S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA), Mass Reduction for Light-Duty Vehicles for Model Years 2017–2025, Final Report, DOT HS 811 666, August 2012.
[72] https://speautomotive.wordpress.com/2016/03/16/floor-rocker-reinforcement-was-the-safety-winner-45th-speinnovationawards/.

significant investments in these innovative technologies, the sector's jobs and the public perception of these technologies.

## Conclusion

The motor vehicle supplier industry is at a critical inflection point with investments and R&D in fuel efficiency and emissions-reducing technologies. Out of the eight alternatives proposed in the NPRM, alternatives 6 and 8 would best provide the regulatory certainty and stability the domestic supplier industry needs to lead the world in the development of these innovative technologies and in turn encourage further investments to strengthen the U.S. supplier manufacturing sector and grow the economy.

At a minimum, MEMA supports:

- Continued year-over-year increases to the CAFE and the GHG vehicle emissions standards for light vehicles starting in 2021 extending until 2026;
- A negotiated One National Program with California and the states; and
- A continuation of the credit programs (off-cycle, A/C efficiency, and alternative mobile A/C refrigerants) through 2026 and beyond.

These three elements are critical to the supplier industry's stability, continued job growth and preservation of important long-term strategic investments and planning.

Thank you for consideration of these comments. For more information, please do not hesitate to contact Laurie Holmes, senior director of environmental policy at 202-312-9247.

# # #

# Appendix A
# Recommended Technologies to be Added to the Off-Cycle Pre-Defined Menu

**Active Seat Cooling/Climate Controlled Seats**

MEMA recommends the agencies add active seat cooling technology as a menu item based on the recently approved off-cycle petition and the EPA decision document.[1] While we understand active seat ventilation is currently on the off-cycle menu, there is precedence for having different versions of a similar technology on the menu.

MEMA requests the off-cycle menu offer active seat cooling credits at a higher credit than what was granted through the EPA off-cycle petition. GM requested a conservative credit level for the technology in the EPA petition partly because the petition requested retroactive credits from 2010 to 2016.

MEMA also urges the agencies to increase the credit value for active seat ventilation credits. These proposed increased credit values are based on the 2017 NREL study on the impact of active climate control seats.[2]

Proposed values for these credits are:

| | Credit Provided Currently[3] | | Proposed Menu Credit* | |
|---|---|---|---|---|
| | **Car** | **Truck** | **Car** | **Truck** |
| Active Seat Ventilation | 1.0g | 1.3g | 1.5g* | 2.0g* |
| Active Seat Cooling ** | 2.3g** | 2.9g** | 3.5g* | 4.4g* |

* Impact of Active Climate Control Seats on Energy Use, Fuel Use, and CO2 Emissions. October 2017
** Based upon credits granted for active seat cooling approved in the GM application

**48-Volt Mild Hybrid**

MEMA recommends the agencies add three unique off-cycle credits to the pre-defined menu related to 48-Volt (48V) mild-hybrid system technology: (1) boardnet generator efficiency; (2) enhanced stop-start; and, (3) engine-off coasting and electric sailing.

Board-net Generator Efficiency

In December 2017, the EPA approved Ford Motor Company's petition to earn off-cycle credits for high efficiency alternators (EPA-420-R-17-0100). In conventional vehicles with an internal combustion engine, the alternator converts mechanical energy from the engine to electrical energy for a vehicle's electrical system. The electrical system powers accessory loads including climate control, entertainment systems, lighting, controllers, sensors and electrical actuators. High accessory loads are not fully captured on the 5-cycle methodology. The efficiency of the alternator determines the magnitude of electrical power generated. The approved off-cycle credit

[1] https://www.epa.gov/sites/production/files/2018-06/documents/420r18014.pdf
[2] Impact of Active Climate Control Seats on Energy Use, Fuel Use, and CO2 Emissions, SAE 2017 Thermal Management Systems Symposium, https://www.nrel.gov/docs/fy18osti/69047.pdf p. 20 with summaries, 42 -43.
[3] The values for active seat cooling are based upon 13.8g/17.2g A/C assumptions. Proposed credit assumes the greater $CO_2$ baseline of 20.8g/26g.

methodology establishes the Verband der Automobilindustrie (VDA standard, ISO 8854:2012) for measuring alternator efficiency and baseline performance of 67 percent efficiency. The methodology also established a table that correlates VDA alternator efficiency with off-cycle credit where, for example, an 80 percent efficiency alternator would earn 1.9 g/mi of off-cycle credit.

A 48V hybrid vehicle with a P0, P1, P2, P2.5 architecture employ a 48V motor generator unit (MGU) instead of a 14V alternator. In generation mode, the MGU converts mechanical power from the combustion engine to electrical energy that is fed to a 48V to 14V DC/DC converter. The DC/DC converter feeds the vehicles electrical system. MEMA proposes the 48V system efficiency, the combination of MGU and DC/DC converter efficiency, be eligible for the off-cycle pre-defined menu for high efficiency alternator.

Allowing 48V hybrid vehicle systems to qualify for the high efficiency alternator credit would encourage suppliers to develop and automakers to adopt high efficiency 48V MGU and DC/DC converters. The efficiency of the MGU and DC/DC converter are variable. For example, an asynchronous (induction) 48V MGU was tested using VDA ISO 8854:2012 and earned an efficiency level of 77.2 percent while a synchronous or magnetized reluctance 48V MGU is expected to earn greater than 83 percent.

<u>Enhanced Engine Idle Stop-Start</u>

Engine idle start-stop technology enables a vehicle to shut down an engine when the propulsion is not required and immediately restarts the engine when propulsion is requested. The agencies established an engine idle stop-start off-cycle credit to account for fuel consumption savings at idle in real-world driving rather than the relatively short idle periods of the 2-cycle test. The EPA established a base engine idle stop-start credit and a variation that incorporates a heater circulation pump system improves the probability and duration of a stop-start event during cold ambient conditions.

MEMA recommends the agencies to provide credits for technology, independent of voltage level, that further improves the probability and duration of a stop-start event in real-world driving. 48V mild-hybrid vehicles further extend engine idle stop-start events by deploying (1) regenerative braking and (2) a dual battery—48V lithium ion and 12V (lead acid or other). Regenerative braking, performed by a 48V mild hybrid system P0 to P4, is able to generate sufficient electrical energy to the electrochemical storage system to ensure a subsequent engine restart event. The additional battery capacity enables 48V mild hybrids to support high electrical accessory loads for longer durations than engine idle stop-start technology that rely on a single energy storage. MEMA recommends the establishment of a third off-cycle category for “enhanced engine idle stop-start” to encourage the adoption of technologies that further improve stop-start probability and duration.

<u>Engine-off Coasting and Electric Sailing or Start-Stop with Coasting</u>

MEMA recommends that Engine-off Coasting and Electric Sailing or Start-Stop with Coasting be added to the off-cycle pre-defined menu. During periods of no positive (propulsion) or negative (braking) torque demand, engine-off coasting may be deployed in vehicles to decrease fuel consumption. Engine-off coasting is characterized by an engine shutdown and can also include disengagement of the transmission to reduce drag losses further reducing fuel consumption. Engine-off duration may be further extended with the use of an electric motor to provide positive

torque when requested by the driver. 48V MGU are particularly well-suited for these functions as the motor response is less than 150 millisecond (ms) and can provide positive torque during a driver change of mind event to ensure drivability standards are met. The fuel savings of engine-off coasting and electric sailing are not adequately captured in the 2-cycle or 5-cycle test due to the relatively fewer and shorter coasting events in the cycles compared with real-world driving. MEMA recommends including engine-off coasting and electric sailing features to the menu to foster implementation of these fuel saving techniques.

**Start/Stop Technology** (Credit Increase)

MEMA recommends an increase of the off-cycle stop-start credit - based on advancements in systems and additional data and benchmark testing since 2012. Progressive Insurance has data from 1.2 million vehicles showing an increased idle time of 22.7 percent compared to an idle time of 13.8 percent when the credits were established.[4] In the draft TAR, the agencies updated the estimated effectiveness of Start-Stop technology, which shows a 67 percent increase in effectiveness.[5] (Subject of Daimler and Ford petitions for higher credits than the menu value for this technology.) MEMA suggests the off-cycle credits for Start-Stop technology be adjusted as follows:

| | **2012 FRM** | | **Proposed off-cycle credits (67% uplift)** | |
|---|---|---|---|---|
| **Technology** | Cars (g/mi) | Trucks (g/mi) | **Cars (g/mi)** | **Trucks (g/mi)** |
| Engine Idle Start-Stop with heater circulation system | 2.5 | 4.4 | **4.2** | **7.3** |
| Engine Idle Start-Stop without heater circulation system | 1.5 | 2.9 | **2.5** | **4.8** |

**Influence of Glazing on Stop/Start**

Solar glazing, which is recognized in the predefined list, could have an added benefit related to Stop-Start technology because the engine would not have to turn on for longer stops in order to maintain cabin temperature comfort.

**Expand Active Warm-up Category**

Some technologies can be categorized under the active warm-up category but have merit to be added as additional or separate listed credits, since they can show significant improvements in emissions reduction over and above the listed active warm-up credit values. As an example, thermal energy storage technologies collect wasted energy from the exhaust or cooling system during normal operation and re-apply this energy to either; pre-condition the powertrain during a cold start condition or enable a significant increase in the warm up rate of the powertrain. This offers the benefit of rapid or instant heat availability for cabin heating negating the use of inefficient fuel burning technologies such as fuel fired heaters or traditional remote start systems,

[4] EPA Decision Document: Mercedes-Benz Off-cycle Credits for MYs 2012-2016, EPA-420-R-14-025, September 2014.
[5] Draft TAR Table 5.83 which shows the percentage increase in effectiveness of start-stop technology.

which rely on starting and operating the engine. System integration and operation of thermal management technologies can be used to provide passive or active warm up depending on a multitude of factors.

**High-efficiency Alternator**

Automotive alternators convert mechanical energy from an internal combustion engine to electrical energy for a vehicle's electrical systems. The additional mechanical load on the engine from the alternator results in the increased consumption of fuel and $CO_2$ emissions. A variety of mechanical and electrical losses are inevitable in this energy conversion process, and high efficiency alternators use new technologies to reduce these loses thereby reducing the alternator load on the engine and resulting in better fuel economy and lower $CO_2$ emissions. (Subject of several off-cycle petition applications.)

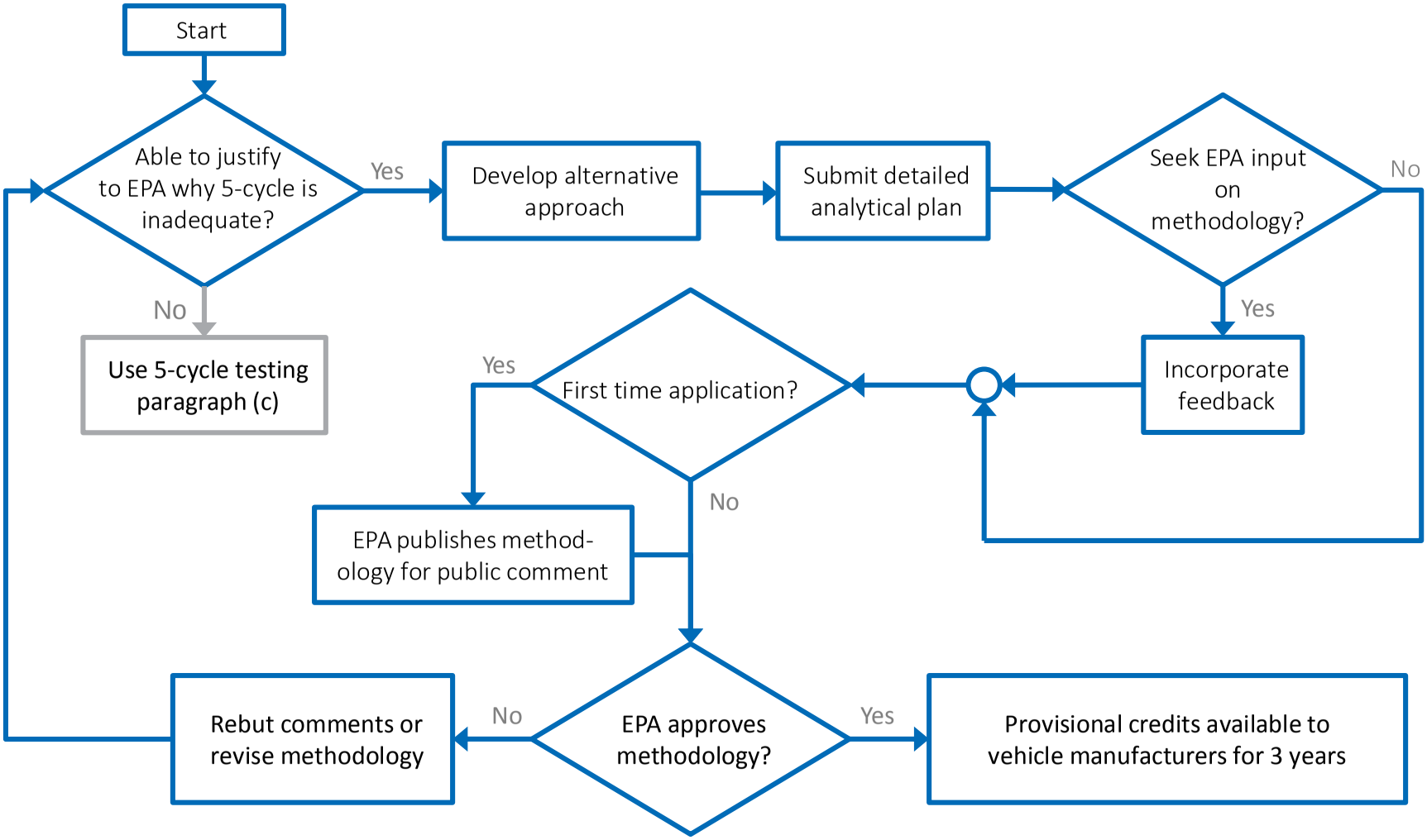
**Regenerative Braking**

Regenerative braking is a promising technology that converts wasted kinetic energy into electric energy that can be stored for future use. Regenerated energy is redirected to electrical loads in lighting, climate control and other electrically powered devices in the vehicle. On the other hand, idle start-stop systems in real world conditions may be disabled when alternators generate electricity. In this context, a regenerative braking system can extend idle stop time by effectively supplying electricity when the when the engine is stopped. The current definition of idle start-stop in the pre-defined list of off-cycle credit program only considers climate control conditions and underestimates the potential benefits of idle-start stop systems. MEMA proposes adding an idle start-stop credit multiplier for regenerative braking systems based on annual system effectiveness improvement.

# # #

# Appendix B - MEMA's Proposed Supplier Process

## Proposed Supplier Process Map for Provisional Off-Cycle Credit Approval



# MEMA's Proposed Supplier Process[1]

1) **Initial steps required**
   i. 5-cycle testing and/or simulation for 40 CFR 86.1869-12 (c) applications
   ii. Method developed and testing, simulation and analysis for paragraph 40 CFR 86.1869-12 (d) applications
   iii. In-use durability demonstration supported by testing and/or analysis for paragraph 40 CFR 86.1869-12 (b), (c), or (d) applications
2) **Data and information requirements**
   i. Detailed description of technology and how it reduces $CO_2$
   ii. Description of test vehicles; selection supported by engineering analysis
   iii. Test and/or simulation data plus other data required for paragraph (c) and (d) applications
   iv. ALPHA or alternative simulation results indicating off-cycle benefit by vehicle class
   v. Description of alternative methodology to estimate off-cycle benefit and supporting data, including vehicle testing and in-use activity, for paragraph (d) applications
   vi. Estimation of minimum off-cycle benefit by vehicle class
   vii. Demonstration of in-use durability by engineering analysis and/or component durability testing data or whole vehicle testing data
3) **EPA reviews off-cycle credit application**
   i. Review application for completeness; notify Supplier within 30 days if additional info is required
   ii. Review data and information supports provisional credit level estimate
   iii. For paragraph (d) applications make application available for public comment within 60 days; Public comment period = 30 days; Supplier may rebut comments or revise application after end of public review; EPA reviews as if new application
4) **EPA decision**
   i. Notify Supplier following evaluation of public comment for paragraph (d) applications; make decision and rationale available to public
   ii. Notify Supplier in writing; make decision and rationale available to public
      a) Provisional credit available to manufacturers at conservative levels by vehicle class for 3 years

[1] Proposed process is referencing 40 CFR 86.1869-12(e)

**Proposed Changes to §86.1869-12 to Include a Process for Suppliers to Apply for Off-Cycle Technologies to be Eligible for Off-Cycle Provisional Credits**

Below are the revisions necessary for Suppliers to apply for provisional off-cycle credits for $CO_2$-reducing technologies proposed in the original §86.1869-12 text. Specifically, these changes apply to paragraphs (d) and (e) of 40 CFR §86.1869-12 and are shown in red. Additional text that has been added for the Supplier process is shown in blue.

**§86.1869-12 $CO_2$ credits for off-cycle $CO_2$-reducing technologies.**

This section describes how manufacturers may generate credits for off-cycle $CO_2$-reducing technologies. The provisions of this section do not apply for non-MDPV heavy-duty vehicles, except that §86.1819-14(d)(13) describes how to apply paragraphs (c) and (d) of this section for those vehicles.

(a) Manufacturers may generate credits for $CO_2$-reducing technologies where the $CO_2$ reduction benefit of the technology is not adequately captured on the Federal Test Procedure and/or the Highway Fuel Economy Test. These technologies must have a measurable, demonstrable, and verifiable real-world $CO_2$ reduction that occurs outside the conditions of the Federal Test Procedure and the Highway Fuel Economy Test. These optional credits are referred to as "off-cycle" credits. Off-cycle technologies used to generate emission credits are considered emission-related components subject to applicable requirements, and must be demonstrated to be effective for the full useful life of the vehicle. Unless the manufacturer demonstrates that the technology is not subject to in-use deterioration, the manufacturer must account for the deterioration in their analysis. Durability evaluations of off-cycle technologies may occur at any time throughout a model year, provided that the results can be factored into the data provided in the model year report. Off-cycle credits may not be approved for crash-avoidance technologies, safety critical systems or systems affecting safety-critical functions, or technologies designed for the purpose of reducing the frequency of vehicle crashes. Off-cycle credits may not be earned for technologies installed on a motor vehicle to attain compliance with any vehicle safety standard or any regulation set forth in Title 49 of the Code of Federal Regulations. The manufacturer must use one of the three options specified in this section to determine the $CO_2$ gram per mile credit applicable to an off-cycle technology. Note that the option provided in paragraph (b) of this section applies only to the 2014 and later model years. The manufacturer should notify EPA in their pre-model year report of their intention to generate any credits under this section.

(b) *Credit available for certain off-cycle technologies.*

The provisions of this paragraph (b) are applicable only to 2014 and later model year vehicles. EPA may request data, engineering analyses, or other information that supports a manufacturer's use of the credits in this paragraph (b).

(1) The manufacturer may generate a $CO_2$ gram/mile credit for certain technologies as specified in this paragraph (b)(1). Technology definitions are in paragraph (b)(4) of this section. Calculated credit values shall be rounded to the nearest 0.1 grams/mile.

(i) *Waste heat recovery.* The credit shall be calculated using the following formula, rounded to the nearest 0.1 grams/mile:

$$Credit\ \left(\frac{g}{mi}\right) = ELR \times 0.007$$

Where:

ELR = the electrical load reduction of the waste heat recovery system, in Watts, calculated as an average over 5-cycle testing.

(ii) *High efficiency exterior lights.* Credits may be accrued for high efficiency lighting as defined in paragraph (b)(4) of this section based on the lighting locations with such lighting installed. Credits for high efficiency lighting are the sum of the credits for the applicable lighting locations in the following table (rounded to the nearest 0.1 grams/mile), or, if all lighting locations in the table are equipped with high efficiency lighting, the total credit for high efficiency lighting shall be 1.0 grams/mile. Lighting components that result in credit levels less than those shown in the following table are not eligible for credits.

| Lighting Component | Credit (grams/mile) |
|---|---|
| Low beam | 0.38 |
| High beam | 0.05 |
| Parking/position | 0.10 |
| Turn signal, front | 0.06 |
| Side marker, front | 0.06 |
| Tail | 0.10 |
| Turn signal, rear | 0.06 |
| Side marker, rear | 0.06 |
| License plate | 0.08 |

(iii) *Solar panels.* (A) Credits for solar panels used solely for charging the battery of an electric vehicle, plug-in hybrid electric vehicle, or hybrid electric vehicle shall be calculated using the following equation, and rounded to the nearest 0.1 grams/mile:

$$Credit\ \left(\frac{g}{mi}\right) = 0.04385 \times P_{panel}$$

Where:

$P_{panel}$ is the is the rated power of the solar panel, in Watts, determined under the standard test conditions of 1000 Watts per meter squared direct solar irradiance at a panel temperature of 25 degrees Celsius (±2 degrees) with an air mass spectrum of 1.5 (AM1.5).

(B) Credits for solar panels used solely for active vehicle ventilation systems are those specified in paragraph (b)(1)(viii)(E).

(C) Credits for solar panels used both for active cabin ventilation and for charging the battery of an electric vehicle, plug-in hybrid electric vehicle, or hybrid electric vehicle shall be calculated using the following equation, and rounded to the nearest 0.1 grams/mile:

$$Credit\ \left(\frac{g}{mi}\right) = C_{vent} + 0.04385 \times (P_{panel} - P_{vent})$$

Where:

$C_{vent}$ is the credit attributable to active cabin ventilation from paragraph (b)(1)(viii)(E) of this section;

$P_{panel}$ is the is the rated power of the solar panel, in Watts, determined under the standard test conditions of 1000 Watts per meter squared direct solar irradiance at a panel temperature of 25 degrees Celsius (±2 degrees) with an air mass spectrum of 1.5 (AM1.5); and

$P_{vent}$ is the amount of power, in Watts, required to run the active cabin ventilation system.

(iv) *Active aerodynamic improvements.* (A) The credit for active aerodynamic improvements for passenger automobiles shall be calculated using the following equation, and rounded to the nearest 0.1 grams/mile:

$$Credit\ \left(\frac{g}{mi}\right) = 19.36 \times CD_{reduced}$$

Where:

$CD_{reduced}$ is the percent reduction in the coefficient of drag ($C_d$), shown as a value from 0 to 1. The coefficient of drag shall be determined using good engineering judgment consistent with standard industry test methods and practices.

(B) The credit for active aerodynamic improvements for light trucks shall be calculated using the following equation, and rounded to the nearest 0.1 grams/mile:

$$Credit\ \left(\frac{g}{mi}\right) = 33.16 \times CD_{reduced}$$

Where:

$CD_{reduced}$ is the percent reduction in the coefficient of drag ($C_d$), shown as a value from 0 to 1.

The coefficient of drag shall be determined using good engineering judgment consistent with standard industry test methods and practices.

(v) *Engine idle start-stop.* (A) The passenger automobile credit for engine idle start-stop systems is 2.5 grams/mile, provided that the vehicle is equipped with an electric heater circulation system (or a technology that provides a similar function). For vehicles not equipped with such systems the credit is 1.5 grams/mile.

(B) The light truck credit for engine idle start-stop systems is 4.4 grams/mile, provided that the vehicle is equipped with an electric heater circulation system (or a technology that provides a similar function). For vehicles not equipped with such systems the credit is 2.9 grams/mile.

(vi) *Active transmission warm-up.* Systems using a single heat-exchanging loop that serves both transmission and engine warm-up functions are eligible for the credits in either paragraph (b)(1)(vi) or (b)(1)(vii) of this section, but not both.

(A) The passenger automobile credit is 1.5 grams/mile.

(B) The light truck credit is 3.2 grams/mile.

(vii) *Active engine warm-up.* Systems using a single heat-exchanging loop that serves both transmission and engine warm-up functions are eligible for the credits in either paragraph (b)(1)(vi) or (b)(1)(vii) of this section, but not both.

(A) The passenger automobile credit is 1.5 grams/mile.

(B) The light truck credit is 3.2 grams/mile.

(viii*) Thermal control technologies.* The maximum credit allowed for thermal control technologies is limited to 3.0 g/mi for passenger automobiles and to 4.3 g/mi for light trucks.

(A) *Glass or glazing.* Glass or glazing credits are calculated using the following equation, and rounded to the nearest 0.1 grams/mile:

$$\text{Credit} = \left[ Z \times \sum_{i=1}^{n} \frac{T_i \times G_i}{G} \right]$$

Where:

Credit = the total glass or glazing credits, in grams per mile rounded to the nearest 0.1 grams/mile. The credit may not exceed 2.9 g/mi for passenger automobiles or 3.9 g/mi for light trucks;

Z = 0.3 for passenger automobiles and 0.4 for light trucks;

$G_i$ = the measured glass area of window *i,* in square meters and rounded to the nearest tenth;

G = the total glass area of the vehicle, in square meters and rounded to the nearest tenth;

Ti = the estimated temperature reduction for the glass area of window *i,* determined using the following formula:

$T_i = 0.3987 \times (Tts_{base} - Tts_{new})$

Where:

$Tts_{new}$ = the total solar transmittance of the glass, measured according to ISO 13837, "Safety glazing materials—Method for determination of solar transmittance" (incorporated by reference in §86.1).

$Tts_{base}$ = 62 for the windshield, side-front, side-rear, rear-quarter, and backlite locations, and 40 for rooflite locations.

(B) *Active seat ventilation.* The passenger automobile credit is 1.0 grams/mile. The light truck credit is 1.3 grams/mile.

(C) *Solar reflective surface coating.* The passenger automobile credit is 0.4 grams/mile. The light truck credit is 0.5 grams/mile.

(D) *Passive cabin ventilation.* The passenger automobile credit is 1.7 grams/mile. The light truck credit is 2.3 grams/mile.

(E) *Active cabin ventilation.* The passenger automobile credit is 2.1 grams/mile. The light truck credit is 2.8 grams/mile.

(2) The maximum allowable decrease in the manufacturer's combined passenger automobile and light truck fleet average $CO_2$ emissions attributable to use of the default credit values in paragraph (b)(1) of this section is 10 grams per mile. If the total of the $CO_2$ g/mi credit values from paragraph (b)(1) of this section does not exceed 10 g/mi for any passenger automobile or light truck in a manufacturer's fleet, then the total off-cycle credits may be calculated according to paragraph (f) of this section. If the total of the $CO_2$ g/mi credit values from paragraph (b)(1) of this section exceeds 10 g/mi for any passenger automobile or light truck in a manufacturer's fleet, then the gram per mile decrease for the combined passenger automobile and light truck fleet must be determined according to paragraph (b)(2)(i) of this section to determine whether the 10 g/mi limitation has been exceeded.

(i) Determine the gram per mile decrease for the combined passenger automobile and light truck fleet using the following formula:

$$\text{Decrease} = \frac{Credits \times 1{,}000{,}000}{[(\text{Prod}_C \times 195{,}264) + (\text{Prod}_T \times 225{,}865)]}$$

Where:

Credits = The total of passenger automobile and light truck credits, in Megagrams, determined according to paragraph (f) of this section and limited to those credits accrued by using the default gram per mile values in paragraph (b)(1) of this section.

$Prod_C$ = The number of passenger automobiles produced by the manufacturer and delivered for sale in the U.S.

$Prod_T$ = The number of light trucks produced by the manufacturer and delivered for sale in the U.S.

(ii) If the value determined in paragraph (b)(2)(i) of this section is greater than 10 grams per mile, the total credits, in Megagrams, that may be accrued by a manufacturer using the default gram per mile values in paragraph (b)(1) of this section shall be determined using the following formula:

$$\text{Credit (Megagrams)} = \frac{[10 \times ((\text{Prod}_C \times 195{,}264) + (\text{Prod}_T \times 225{,}865))]}{1{,}000{,}000}$$

Where:

$Prod_C$ = The number of passenger automobiles produced by the manufacturer and delivered for sale in the U.S.

$Prod_T$ = The number of light trucks produced by the manufacturer and delivered for sale in the U.S.

(iii) If the value determined in paragraph (b)(2)(i) of this section is not greater than 10 grams per mile, then the credits that may be accrued by a manufacturer using the default gram per mile values in paragraph (b)(1) of this section do not exceed the allowable limit, and total credits may be determined for each category of vehicles according to paragraph (f) of this section.

(iv) If the value determined in paragraph (b)(2)(i) of this section is greater than 10 grams per mile, then the combined passenger automobile and light truck credits, in Megagrams, that may be accrued using the calculations in paragraph (f) of this section must not exceed the value determined in paragraph (b)(2)(ii) of this section. This limitation should generally be done by reducing the amount of credits attributable to the vehicle category that caused the limit to be exceeded such that the total value does not exceed the value determined in paragraph (b)(2)(ii) of this section.

(3) In lieu of using the default gram per mile values specified in paragraph (b)(1) of this section for specific technologies, a manufacturer may determine an alternative value for any of the specified technologies. An alternative value must be determined using one of the methods specified in paragraph (c) or (d) of this section.

(4) Definitions for the purposes of this paragraph (b) are as follows:

(i) *Active aerodynamic improvements* means technologies that are automatically activated under certain conditions to improve aerodynamic efficiency (e.g., lowering of the coefficient of drag, or Cd), while preserving other vehicle attributes or functions.

(ii) *High efficiency exterior lighting* means a lighting technology that, when installed on the vehicle, is expected to reduce the total electrical demand of the exterior lighting system when compared to conventional lighting systems. To be eligible for this credit, the high efficiency lighting must be installed in one or more of the following lighting components: low beam, high beam, parking/position, front and rear turn signals, front and rear side markers, taillights, and/or license plate lighting.

(iii) *Engine idle start-stop* means a technology which enables a vehicle to automatically turn off the engine when the vehicle comes to a rest and restarts the engine when the driver applies pressure to the accelerator or releases the brake. Off-cycle engine start-stop credits will only be allowed for a vehicle if the Administrator has made a determination under the testing and calculation provisions in 40 CFR Part 600 that engine start-stop is the predominant operating mode for that vehicle.

(iv) *Solar panels* means the external installation of horizontally-oriented solar panels, with direct and unimpeded solar exposure to an overhead sun, on an electric vehicle, a plug-in hybrid electric vehicle, a fuel cell vehicle, or a hybrid electric vehicle, such that the solar energy is used to provide energy to the electric drive system of the vehicle by charging the battery or directly providing power to the electric motor or to essential vehicle systems (e.g., cabin heating or cooling/ventilation). The rated power of the solar panels used to determine the credit value must be determined under the standard test conditions of 1,000 $W/m^2$ direct solar irradiance at a panel temperature of 25 ±2 °C with an air mass of 1.5 spectrum (AM1.5).

(v) *Active transmission warmup* means a system that uses waste heat from the vehicle to quickly warm the transmission fluid to an operating temperature range using a heat exchanger, increasing the overall transmission efficiency by reducing parasitic losses associated with the transmission fluid, such as losses related to friction and fluid viscosity.

(vi) *Active engine warmup* means a system that uses waste heat from the vehicle to warm up targeted parts of the engine so that it reduces engine friction losses and enables the closed-loop fuel control more quickly. It allows a faster transition from cold operation to warm operation, decreasing $CO_2$ emissions, and increasing fuel economy.

(vii) *Waste heat recovery* means a system that captures heat that would otherwise be lost through the engine, exhaust system, or the radiator or other sources and converting that heat to electrical energy that is used to meet the electrical requirements of the vehicle or used to augment the warming of other load reduction technologies (e.g., cabin warming, active engine

or transmission warm-up technologies). The amount of energy recovered is the average value over 5-cycle testing.

(viii) *Active seat ventilation* means a device which draws air, pushes or forces air, or otherwise transfers heat from the seating surface which is in contact with the seat occupant and exhausts it to a location away from the seat. At a minimum, the driver and front passenger seat must utilize this technology for a vehicle to be eligible for credit.

(ix) *Solar reflective surface coating* means a vehicle paint or other surface coating which reflects at least 65 percent of the impinging infrared solar energy, as determined using ASTM standards E903, E1918-06, or C1549-09 (incorporated by reference in §86.1). The coating must be applied at a minimum to all of the approximately horizontal surfaces of the vehicle that border the passenger and luggage compartments of the vehicle, (e.g., the rear deck lid and the cabin roof).

(x) *Passive cabin ventilation* means ducts, devices, or methods which utilize convective airflow to move heated air from the cabin interior to the exterior of the vehicle.

(xi) *Active cabin ventilation* means devices which mechanically move heated air from the cabin interior to the exterior of the vehicle.

(xii) *Electric heater circulation system* means a system installed in a vehicle equipped with an engine idle start-stop system that continues to circulate heated air to the cabin when the engine is stopped during a stop-start event. This system must be calibrated to keep the engine off for a minimum of one minute when the external ambient temperature is 30 °F and when cabin heating is enabled.

(c) *Technology demonstration using EPA 5-cycle methodology.*

To demonstrate an off-cycle technology and to determine a $CO_2$ credit using the EPA 5-cycle methodology, the manufacturer shall determine the off-cycle city/highway combined carbon-related exhaust emissions benefit by using the EPA 5-cycle methodology described in 40 CFR Part 600. This method may not be used for technologies that include elements (e.g., driver-selectable systems) that require additional analyses, data collection, projections, or modeling, or other assessments to determine a national average benefit of the technology. Testing shall be performed on a representative vehicle, selected using good engineering judgment, for each model type for which the credit is being demonstrated. The emission benefit of a technology is determined by testing both with and without the off-cycle technology operating. If a specific technology is not expected to change emissions on one of the five test procedures, the manufacturer may submit an engineering analysis to the EPA that demonstrates that the technology has no effect. If EPA concurs with the analysis, then multiple tests are not required using that test procedure; instead, only one of that test procedure shall be required—either with or without the technology installed and operating—and that single value will be used for all of the 5-cycle weighting calculations. Multiple off-cycle technologies may be demonstrated

on a test vehicle. The manufacturer shall conduct the following steps and submit all test data to the EPA.

(1) Testing without the off-cycle technology installed and/or operating. Determine carbon-related exhaust emissions over the FTP, the HFET, the US06, the SC03, and the cold temperature FTP test procedures according to the test procedure provisions specified in 40 CFR part 600 subpart B and using the calculation procedures specified in §600.113-12 of this chapter. Run each of these tests a minimum of three times without the off-cycle technology installed and operating and average the per phase (bag) results for each test procedure. Calculate the 5-cycle weighted city/highway combined carbon-related exhaust emissions from the averaged per phase results, where the 5-cycle city value is weighted 55% and the 5-cycle highway value is weighted 45%. The resulting combined city/highway value is the baseline 5-cycle carbon-related exhaust emission value for the vehicle.

(2) Testing with the off-cycle technology installed and/or operating. Determine carbon-related exhaust emissions over the US06, the SC03, and the cold temperature FTP test procedures according to the test procedure provisions specified in 40 CFR part 600 subpart B and using the calculation procedures specified in §600.113-12 of this chapter. Run each of these tests a minimum of three times with the off-cycle technology installed and operating and average the per phase (bag) results for each test procedure. Calculate the 5-cycle weighted city/highway combined carbon-related exhaust emissions from the averaged per phase results, where the 5-cycle city value is weighted 55% and the 5-cycle highway value is weighted 45%. Use the averaged per phase results for the FTP and HFET determined in paragraph (c)(1) of this section for operation without the off-cycle technology in this calculation. The resulting combined city/highway value is the 5-cycle carbon-related exhaust emission value including the off-cycle benefit of the technology but excluding any benefit of the technology on the FTP and HFET.

(3) Subtract the combined city/highway value determined in paragraph (c)(1) of this section from the value determined in paragraph (c)(2) of this section and round to the nearest 0.1 grams/mile. The result is the off-cycle benefit of the technology or technologies being evaluated, subject to EPA approval.

(4) Submit all test values to EPA, and include an engineering analysis describing the technology and how it provides off-cycle emission benefits. EPA may request additional testing if we determine that additional testing would be likely to provide significantly greater confidence in the estimates of off-cycle technology benefits.

(d) *Technology demonstration using alternative EPA-approved methodology*.

(1) This option may be used only with EPA approval, and the manufacturer must be able to justify to the Administrator why the 5-cycle option described in paragraph (c) of this section insufficiently characterizes the effectiveness of the off-cycle technology. In cases where the EPA 5-cycle methodology described in paragraph (c) of this section cannot adequately measure the

emission reduction attributable to an off-cycle technology, the manufacturer may develop an alternative approach. Prior to a model year in which a manufacturer intends to seek these credits, the manufacturer must submit a detailed analytical plan to EPA. The manufacturer may seek EPA input on the proposed methodology prior to conducting testing or analytical work, and EPA will provide input on the manufacturer's analytical plan. The alternative demonstration program must be approved in advance by the Administrator and should:

(i) Use modeling, on-road testing, on-road data collection, or other approved analytical or engineering methods;

(ii) Be robust, verifiable, and capable of demonstrating the real-world emissions benefit with strong statistical significance;

(iii) Result in a demonstration of baseline and controlled emissions over a wide range of driving conditions and number of vehicles such that issues of data uncertainty are minimized;

(iv) Result in data on a model type basis unless the manufacturer demonstrates that another basis is appropriate and adequate.

(2) *Notice and opportunity for public comment.* The Administrator will publish a notice of availability in the FEDERAL REGISTER notifying the public of a manufacturer's proposed alternative off-cycle credit calculation methodology. The notice will include details regarding the proposed methodology, but will not include any Confidential Business Information. The notice will include instructions on how to comment on the methodology. The Administrator will take public comments into consideration in the final determination, and will notify the public of the final determination. Credits may not be accrued using an approved methodology until the first model year for which the Administrator has issued a final approval.

(3) With respect to fuel consumption improvement values applicable to the determination of average fuel economy under 600.510-12(c)(3) for the 2017 and later model years, EPA will consult with the U.S. Department of Transportation, National Highway Traffic Safety Administration, prior to making a decision on a manufacturer's application submitted under the requirements of this paragraph (d).

(4) A supplier may petition the EPA for approval of provisional credits to be made available to manufacturers. A manufacturer may apply for provisional credits for technologies that have been pre-approved by the EPA for a supplier-offered technology.

The manufacturer supplier must be able to justify to the Administrator why the 5-cycle option d~~escribed in par~~agraph (c) of this section insufficiently characterizes the effectiveness of the off-cycle technology. In cases where the EPA 5-cycle methodology described in paragraph (c) of this section cannot adequately measure the emission reduction attributable to an off-cycle technology, the manufacturer supplier may develop an alternative approach. Prior to a model year in which ~~a manufacturer~~ intends to seek these credits, The manufacture~~r~~ supplier

must submit a detailed analytical plan to EPA. The manufacturer supplier may seek EPA input on the proposed methodology prior to conducting tes~~ting or analyti~~cal work, and EPA will provide input on the manufacturersupplier's analytical plan. The alternative demonstration program must be approved in ~~advance by th~~e Administrator and should:

(i) Use a combination of laboratory testing and vehicle simulation modeling, on-road testing, on-road data collection, or other approved analytical or engineering methods;

(ii) Be robust, verifiable, and capable of demonstrating the real-world expected provisional emissions benefit with strong statistical significance;

(iii) Result in a simulation or demonstration of baseline and controlled emissions over a wide range of driving conditions and number of vehicle classes to which the technology applies ~~such~~ that issues of data uncertainty ~~are minimize~~d;

(iv) Result in data on a model type basis unless the manufacturer supplier demonstrates that another basis is appropriate and adequate.

(5) *Notice and opportunity for public comment.* The Administrator will publish a notice of availability in the FEDERAL REGISTER notifying the public of a manufacturer's supplier's proposed alternative off-cycle credit calculation methodology. The ~~notice will includ~~e details regarding the proposed methodology, but will not include any Confidential Business Information. The notice will include instructions on how to comment on the methodology. The Administrator will take public comments into consideration in the final determination, and will notify the public of the final determination. Manufacturer credits may not be accrued using an approved methodology until the first model year for which the Administrator has issued a final approval for the provisional ~~credits and the manufacturer~~ has applied for provisional credits for its applicable models.

(6) With respect to fuel consumption improvement values applicable to the determination of average fuel economy under 600.510-12(c)(3) for the 2017 and later model years, EPA will consult with the U.S. Department of Transportation, National Highway Traffic Safety Administration, prior to making a decision on a manufacturer's supplier's application submitted under the requirements of this paragraph (d).

(e) *Review and approval process for off-cycle credits.*

(1) *Initial steps required.*

(i) A manufacturer requesting off-cycle credits under the provisions of paragraph (c) of this section must conduct the testing and/or simulation described in that paragraph.

(ii) A manufacturer requesting off-cycle credits or a supplier requesting provisional off-cycle credits under the provisions of paragraph (d) of this section must develop a

methodology for demonstrating and determining the benefit of the off-cycle technology, and carry out any necessary testing (and/or vehicle simulation for a supplier) and analysis required to support that methodology.

(iii) A manufacturer requesting off-cycle credits under paragraphs (b), (c), or (d) of this section must conduct testing and/or prepare engineering analyses that demonstrate the in-use durability of the technology for the full useful life of the vehicle. A supplier requesting provisional off-cycle credits under paragraph~~s (b), (c), or~~ (d) of this section must conduct testing and/or prepare engineering analyses that demonstrates the ~~in-use~~ durability of the technology ~~for the full useful life of the vehicle~~.

(2) *Manufacturer* d*ata and information requirements.* The manufacturer seeking off-cycle credits must submit an application for off-cycle credits determined under paragraphs (c) and (d) of this section. The manufacturer's application must contain the following:

(i) A detailed description of the off-cycle technology and how it functions to reduce $CO_2$ emissions under conditions not represented on the FTP and HFET.

(ii) A list of the vehicle model(s) which will be equipped with the technology.

(iii) A detailed description of the test vehicles selected and an engineering analysis that supports the selection of those vehicles for testing.

(iv) All testing and/or simulation data required under paragraph (c) or (d) of this section, as applicable, plus any other data the manufacturer has considered in the analysis.

(v) For credits under paragraph (d) of this section, a complete description of the methodology used to estimate the off-cycle benefit of the technology and all supporting data, including vehicle testing and in-use activity data.

(vi) An estimate of the off-cycle benefit by vehicle model and the fleetwide benefit based on projected sales of vehicle models equipped with the technology.

(vii) An engineering analysis and/or component durability testing data or whole vehicle testing data demonstrating the in-use durability of the off-cycle technology components.

(3) *Supplier* d*ata and information requirements.* The supplier seeking approval of provisional off-cycle credits must submit an application for provisional off-cycle credits under paragraph (d) of this section. The supplier's application must contain the following:

(i) A detailed description of the off-cycle technology and how it functions to reduce $CO_2$ emissions under conditions not represented on the FTP and HFET.

~~(ii) A list of the vehicle model(s) which will be equipped with the technology.~~

(ii) A detailed description of the test vehicles or test systems selected and an engineering analysis that supports the selection of those vehicles or systems for testing.

(iii) All testing and/or simulation data required under paragraph ~~(c) or~~ (d) of this section, ~~as applicable,~~ plus any other data the ~~manufacturer~~ supplier has considered in the analysis.

(iv) Vehicle simulation results indicating the provisional off-cycle benefit for each vehicle class to which the technology is intended to be applied. The Administrator has developed a vehicle simulation modeling tool called ALPHA which may be used to determine off-cycle benefits by vehicle class.

(v) A complete description of the methodology used to estimate the off-cycle benefit of the technology and all supporting data, including vehicle testing or testing combined with vehicle simulation results ~~and in-use activity data~~.

(vi) An estimate of the off-cycle benefit by vehicle model ~~and the fleetwide benefit based on projected sales of vehicle models equipped with the technology~~.

(vii) An engineering analysis and/or component durability testing data or whole vehicle testing data demonstrating the ~~in-use~~ durability of the off-cycle technology components.

(4) *EPA review of the off-cycle credit application.* Upon receipt of an application from a manufacturer or supplier, EPA will do the following:

(i) Review the application for completeness and notify the manufacturer or supplier within 30 days if additional information is required.

(ii) Review the data and information provided in the application to determine if the application supports the level of credits estimated by the manufacturer or supplier.

(iii) For credits for a manufacturer or supplier under paragraph (d) of this section, EPA will make the application available to the public for comment, as described in paragraph (d)(2) of this section, within 60 days of receiving a complete application. The public review period will be specified as 30 days, during which time the public may submit comments. Manufacturers or suppliers may submit a written rebuttal of comments for EPA consideration or may revise their application in response to comments. A revised application should be submitted after the end of the public review period, and EPA will review the application as if it was a new application submitted under this paragraph (e)(3).

(5) *EPA decision.*

(i) For credits under paragraph (c) of this section, EPA will notify the manufacturer of its decision within 60 days of receiving a complete application.

(ii) For credits under paragraph (d) of this section, EPA will notify the manufacturer or supplier of its decision after reviewing and evaluating the public comments. EPA will make the decision and rationale available to the public.

(iii) EPA will notify the manufacturer or supplier in writing of its decision to approve or deny the application, and will provide the reasons for the decision. EPA will make the decision and rationale available to the public.

(iv) The Administrator may make off-cycle credits permanently available to manufacturers after three model years of vehicle production for which a technology has been applied and received provisional credits. The technology will then be available through the pre-determined menu according to paragraph (b) of this section with the technology and credit level described in a modification to paragraph (b).

(f) *Calculation of total off-cycle credits.*

Total off-cycle credits in Megagrams of $CO_2$ (rounded to the nearest whole number) shall be calculated separately for passenger automobiles and light trucks according to the following formula:

Total Credits (Megagrams) = (Credit × Production × VLM) ÷ 1,000,000

Where:

Credit = the credit value in grams per mile determined in paragraph (b), (c) or (d) of this section.

Production = The total number of passenger automobiles or light trucks, whichever is applicable, produced with the off-cycle technology to which to the credit value determined in paragraph (b), (c), or (d) of this section applies.

VLM = vehicle lifetime miles, which for passenger automobiles shall be 195,264 and for light trucks shall be 225,865.

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