Comments of the
Motor & Equipment Manufacturers Association (MEMA)
to
the California Air Resources Board
RE: Proposed Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments

August 24, 2020

The Motor & Equipment Manufacturers Association (MEMA) submits these comments to the California Air Resources Board (CARB) on the "Proposed Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments" rulemaking also known Heavy-Duty (HD) Oxides of Nitrogen (NOx) Omnibus (HD NOx Omnibus).[1] MEMA appreciates CARB collaborating with stakeholders throughout this significant and complex technical rulemaking process and providing the opportunity for stakeholders to submit formal feedback on the HD NOx Omnibus proposal.

MEMA represents more than 1,000 companies that manufacture and remanufacture components, systems and materials for use in passenger cars and heavy trucks. The motor vehicle components manufacturing industry is the nation's largest sector of manufacturing jobs – employing over 871,000 workers in all 50 states – 31,190 of those jobs are in the State of California. MEMA represents its member companies through its four divisions: Automotive Aftermarket Suppliers Association (AASA); Heavy Duty Manufacturers Association (HDMA); MERA – The Association for Sustainable Manufacturing;[2] and, Original Equipment Suppliers Association (OESA). The HDMA member companies make up about 60 percent of the U.S. market for HD commercial vehicle components. The HD suppliers provide original equipment parts, systems and materials used to manufacture new commercial vehicles and related equipment as well as aftermarket replacement parts needed to repair and maintain in-service vehicles.

Suppliers' Role in Developing Innovative Technologies

HD motor vehicle suppliers develop and produce a wide range of technologies and products including complex, highly integrated vehicle systems to make vehicles more efficient and lower emissions. A typical HD vehicle contains more than 30,000 components and subsystems, the majority of which are developed through supplier innovation. Suppliers are continuously innovating providing cost-efficient technologies for hybrids,

[1] Associated proposed amendments to the Exhaust Emissions Standards and Test Procedures for 2024 and Subsequent Model Year Heavy-Duty Engines and Vehicles, Heavy-Duty On-Board Diagnostic System Requirements, Heavy-Duty In-Use Testing Program, Emissions Warranty Period and Useful Life Requirements, Emissions Warranty Information and Reporting Requirements, and Corrective Action Procedures, In-Use Emissions Data Reporting Requirements, and Phase 2 Heavy-Duty Greenhouse Gas Regulations, and Powertrain Test Procedures.

[2] The MERA member network of remanufacturers and their suppliers operates primarily in the automotive and commercial vehicle sectors and promotes the environmental, economic and product performance benefits of remanufactured goods.

zero emissions vehicles (ZEV) and other technologies that reduce vehicle emissions – including greenhouse gases (GHG), NOx, and particulate matter (PM).

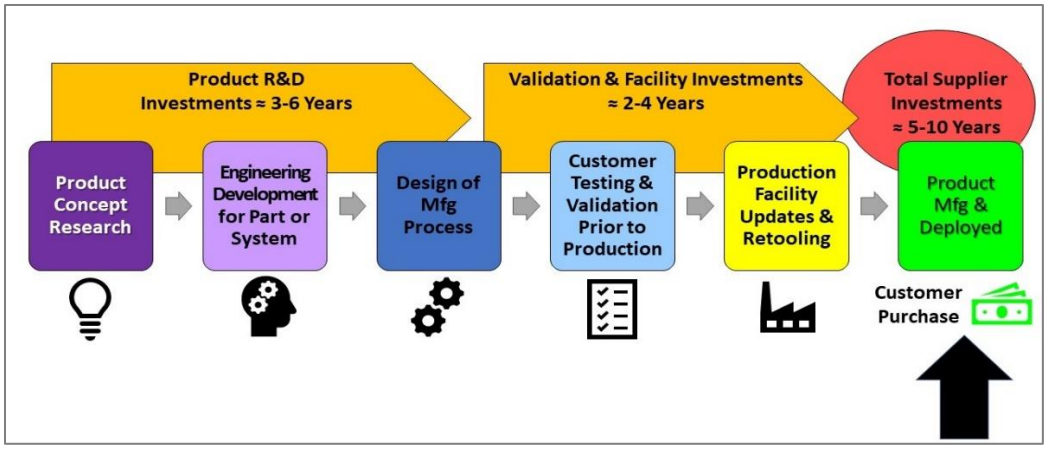
Motor vehicle suppliers lead the way in emissions technology development. Suppliers anticipate the needs of vehicle manufacturers and work independently investing and developing multiple technology solutions to assist customers in meeting the next set of emissions standards. Suppliers then work collaboratively with vehicle and engine manufacturers to help them comply with future lower emissions standards.

Because suppliers are on the front line making these technology investments for future HD NOx emissions and other emissions requirements, suppliers take on substantial risks. Development of these important technologies requires major economic resources, substantial lead-time, and several stages of product planning (see graphic below). The return on investment is estimated very carefully and amortized over several years. Importantly, suppliers do not get return on their capital investment until these technologies are deployed on vehicles. If technology deployment is delayed or a lifespan of a product is shortened, this will jeopardize carefully planned technology investments put in place several years in advance.

In the case of HD NOx, motor vehicle suppliers have already invested billions of dollars in research & development (R&D) to advance technologies supporting California's environmental and air pollution reduction goals. Motor vehicle suppliers have been ramping up R&D investment for the last several years to meet the standards expected to be set in CARB's HD NOx Omnibus rulemaking. Suppliers have provided innovative new technologies to support the Low NOx Demonstration Program years before our OEM partners have called for these capabilities.

Consequently, CARB's proposed HD NOx Omnibus rulemaking has enormous implications on the motor vehicle supplier industry. The investment risks suppliers take on, forms the foundation of MEMA's position on CARB's proposed HD NOx standards, certification cycles, HD in-use testing (HDIUT), averaging, banking and trading (ABT) program, optional 50-state program, extended full useful life (FUL), and the extended emissions warranty. MEMA outlines below which elements suppliers support and which elements are problematic.

Motor Vehicle Parts Suppliers Product Planning and Investments Timeframe



Summary of MEMA Comments

MEMA's comments on the HD NOx Omnibus will discuss the following:

- **MEMA Supports Implementation of Best Available Technologies –** MEMA supports a program that brings the best available, cost-effective emissions reductions technologies to the marketplace, drives global technology leadership, and continues strengthening supplier manufacturing jobs.
- **MEMA Supports New Standards and Test Cycles –** MEMA supports HD NOx standards of 0.05 grams per brake horsepower per hour (g/bhp-hr) in MYs 2024-2026 and 0.02 g/bhp-hr starting in MY2027 for the Federal Test Procedure and the Ramped Modal Cycle Supplemental Emission Test (FTP/RMC). These standards have been proven feasible.[3,4] MEMA also supports the proposed low-load certification cycle (LLC) and idling certification cycle. These standards, certification cycles, and new in-use testing applying Moving Average Windows (MAW) will better evaluate real-world emissions performance of HD powertrains. Importantly, these requirements will encourage best-in-class technology adoption.
- **MEMA Supports Optional 50-State Program but with Adjustments –** MEMA supports an optional 50-state program that allows vehicle manufacturers to certify their MYs 2024-2026 engines nationwide to a HD NOx standard less stringent than California's. However, MEMA recommends a slightly more stringent standard than the proposed 0.1 g/bhp-hr to encourage industry to start deploying the best available technologies in 2024 and to work toward the 2027 goal of 0.02 g/bhp-hr.
- **MEMA Has Concerns with the ABT Program –** While MEMA supports the ABT program generally, we have concerns with the state's proposal. MEMA's concern is that the proposed ABT program would allow vehicle manufacturers to generate credits for the HD NOx Omnibus program with the same HD Zero Emissions Vehicles (ZEVs) that are being used to comply with California's Advanced Clean Trucks (ACT) rule. Vehicle manufacturers having the ability to earn ABT credits for HD ZEVs required by the ACT, creates a situation where not only is the best available HD NOx emissions control technology not needed or deployed, it is also spread across fewer diesel engine vehicles. Thus, suppliers' return on investment, which would be reinvested in development of HD electrified powertrains, will be lowered.
- **Extended FUL and Emissions Warranty Poses Challenges –** MEMA greatly appreciates the revised downward miles, hours, and years for the proposed FUL and extended emissions warranty. MEMA strongly supports a phased-in approach as this helps address suppliers' need for adequate lead-time to understand and improve component durability. Suppliers would take on significant cost implications early. They currently do not have access to the necessary data to assess and make improvements. MEMA requests CARB provide data on HD vehicles registered in California on the road today, higher quality data on usage patterns, as well as drive and duty cycles of second and third truck owners.

[3] Manufacturers of Emissions Control Association (MECA), "Technology Feasibility for Heavy-Duty Diesel Trucks in Achieving 90% Lower NOx Standards in 2027," February 2020.
[4] C. Sharp, "Update on Heavy-Duty Low NOx Demonstration Program at SwRI," September 2019.

MEMA Supports Implementation of Best Available Technologies

MEMA appreciates that CARB initiated, nearly seven years ago, the Low NOx Demonstration Program with Southwest Research Institute (SwRI) in collaboration with U.S. EPA, to demonstrate the feasibility of achieving 90 percent reduction of NOx emissions from current HD engines.[5] Within those seven years, CARB collaborated with industry stakeholders – including technology suppliers – early in the regulatory development process. Within that process there were in-depth discussions to understand current and prospective technologies. Suppliers provided significant technology advancements that support important emissions reductions from HD vehicles since California last revised the HD NOx standards.

As a result, MEMA strongly supports the goals of CARB's HD NOx Omnibus rulemaking outlined in the Initial Statement of Reasons (ISOR).[6] MEMA encourages stringent new standards that support implementation of the best available cost-effective, emissions reduction technologies. HD suppliers support a holistic HD NOx emissions reduction strategy that is aligned with market forces and drives adoption of these HD emissions technologies. The framework outlined in CARB's HD NOx Omnibus will foster both technology innovation and development opportunities. Maintaining stringency in the HD NOx standards is necessary to continue strengthening supplier manufacturing sector jobs – the largest sector of manufacturing jobs in the U.S. – and driving a global technology leadership position for U.S. manufacturers.

As CARB pointed out in its proposal, after the U.S. EPA finalized its HD Phase 2 GHG Standards (Phase 2) in 2016[7] many technologies continued to develop, reducing not only carbon dioxide (CO_2) emissions, but also NOx emissions. These technologies have been tested as part of CARB's Low NOx Demonstration Program with SwRI and can reduce both CO_2 and NOx simultaneously and others can reduce NOx emissions without increasing CO_2.[8,9] More importantly, the technology strategies CARB pinpointed to cost-effectively achieve the proposed standards demonstrated NOx reductions with minimal or no impact on CO_2 emissions and, in some cases, attained Phase 2 GHG requirements.[10] These innovative technologies could continue to improve as they are implemented as part of a comprehensive HD NOx Omnibus program.

MEMA encourages CARB and U.S. EPA to continue to coordinate their HD low NOx programs as closely as possible. Closely coordinated low HD NOx rules will provide the stability and predictability that motor vehicle suppliers need for controlling capital costs and drive significant domestic technological investments.

[5] CARB's Staff Report: Initial Statement of Reasons (ISOR) on the Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments, ES-1
[6] ISOR, ES-1 - ES-19
[7] 81 Fed Reg 73478
[8] ICCT (2019) "Future Heavy-duty Emission Standards: An Opportunity for International Harmonization" available at https://theicct.org/publications/future-hdv-standards-harmonization
[9] MECA, "Technology Feasibility for Heavy-Duty Diesel Trucks in Achieving 90% Lower NOx Standards in 2027." February 2020, p. 2.
[10] ISOR, III-12-26

MEMA Supports Proposed HD NOx Standards and Test Cycles

MEMA supports CARB's comprehensive framework of improved HD NOx standards, new test cycles, and in-use emission standards that encourage implementation of cost-effective innovative technologies. These proposed elements, which better represent real-world in-use conditions of HD vehicles, will drive additional NOx emissions reductions on the road and encourage utilization of best-in-class technologies.

Research supports a need for low-load and low speed operation standards to control HD NOx emissions as current certification cycles do not match real-world testing. Data indicates that low-load operation accounts for as much as half of the NOx emissions from a vehicle over a given shift-day.[11] Research also suggests, that by 2030, low-speed, low-load emissions will represent half of all NOx emissions of the HD vehicle fleet in California.[12] Consequently, MEMA supports CARB adopting a new LLC and an idling certification cycle for evaluating the emissions performance of HD vehicles and powertrains that have varied vocations and duty cycles.

Importantly, CARB's proposed standards are performance-based and technology-neutral. These proposed NOx standards and test cycles will enable multiple technology paths and will not require one "single strategy or technology [to] enable NOx emission reductions necessary to achieve ... the proposed standards."[13]

MEMA also supports CARB's proposal to implement new HD engine NOx emissions standards in two steps. The first step for MYs 2024–2026 engines and the second step for MY2027 and subsequent year engines.[14] These dates align with U.S. EPA's Phase 2 target dates.[15] These elements are important to the motor vehicle supplier industry, which needs regulatory certainty for long-term development and planning.

MEMA Supports Stringent NOx Emission Standards for MYs 2024–2026

MEMA supports CARB's proposed 0.05 g/bhp-hr NOx emission standard on the FTP/RMC for MYs 2024–2026.[16] MEMA agrees that a 0.05 g/bhp-hr HD NOx emission standard, a 76 percent reduction of NOx emissions, has been demonstrated to be achievable and cost-effective in the U.S. by using currently available technologies without significant hardware changes.[17] These modifications are currently commercially available and have been proven through the SwRI Stage 1 Low NOx Demonstration testing program and modeling work through Manufacturers of Emission Controls Association (MECA).[18]

MEMA supports CARB's proposed LLC emission standard of 0.20 g/bhp-hr in MY2024 as this standard is technologically feasible and can be achieved cost effectively with minor

[11] 85 Fed Reg 3321
[12] California Air Resources Board, "CARB Staff Current Assessment of the Technical Feasibility of Lower NOx Standards and Associated Test Procedures for 2022 and Subsequent Model Year- HDDEs."
[13] ISOR, III-11
[14] ISOR, III-5
[15] 81 Fed Reg 73478
[16] ISOR, III-12
[17] ICCT (2019) "Future Heavy-duty Emission Standards: An Opportunity for International Harmonization" available at https://theicct.org/publications/future-hdv-standards-harmonization
[18] C. Sharp, Update on Heavy-Duty Low NOx Demonstration Program at SwRI, September 2019. And MECA, "Technology Feasibility for Heavy-Duty Diesel Trucks in Achieving 90% Lower NOx Standards in 2027." February 2020, p. 20.

hardware modifications.[19] In fact, the incremental cost of achieving CARB's proposed MY2024 standards for FTP and LLC is estimated to be as low as $105 for a Class 8 vehicle compared with meeting the EPA 2010 standards in 2024.[20] MEMA also supports CARB's proposed idling emission standard of 10 g/hr in MY2024. This idling standard is feasible and is a less stringent standard than what was demonstrated to be achievable by SwRI.[21]

MEMA Supports Stringent NOx Emission Standards for MY2027 and Subsequent Years

MEMA supports CARB's proposed 0.02 g/bhp-hr HD NOx standard on the FTP/RMC for MY2027 and subsequent years. A 0.02 g/bhp-hr HD NOx standard is feasible, and will encourage reliable, cost-effective solutions and will maximize California's air quality benefits. Importantly for MEMA, a 0.02 g/bhp-hr standard in MY2027 will drive best available technology adoption that will provide investment payoff for HD vehicle suppliers that have made significant investments in these important technologies and will accelerate additional technologies under development.

MEMA supports CARB's proposed LLC emission standard of 0.05 g/bhp-hr and an idling emission standard of 5.0 g/hr in MY2027 and subsequent years. These proposed standards for LLC and idling have been proven feasible in Stage 3 of the Low NOx Demonstration Program using the same engine and aftertreatment hardware systems.[22]

As outlined in the ISOR, the Low NOx Demonstration Program evaluated the feasibility of attaining a 0.02 g/bhp-hr NOx standard on modern HD engines.[23] This tailpipe standard corresponds to a 90 percent reduction in NOx emissions from the current 0.20 g/bhp-hr. Since then, the Low NOx Demonstration Program has proven that 0.02 g/bhp-hr standard is feasible with technologies that exist today with many aftertreatment designs that can meet this standard.[24] Modeling conducted by MECA predicts that HD diesel engines are able to achieve 0.02 g/bhp-hr with commercially available catalysts, improved urea dosing, and better engine-out NOx control and calibration.[25] Although MECA's results do not provide the normal compliance margins vehicle and engine manufacturers need, the research shows the potential of currently available emissions control technologies without major changes to the current aftertreatment architecture. Furthermore, the Low NOx Demonstration Program results found that the 0.02 g/bhp-hr is feasible with no increase in fuel consumption.[26]

A HD NOx standard of 0.02 g/bhp-hr in MY2027 can be achieved cost-effectively. Production improvements of today's emissions technologies are 60 percent smaller, 40 percent lighter, and significantly less expensive than 10 years ago.[27] In fact, costs of aftertreatment technology needed to meet the EPA 2010 standard dropped about 25

[19] MECA "Technology Feasibility for Model Year 2024 Heavy-Duty Diesel Vehicles in Meeting Lower NOx Standards" June 2019. available at http://www.meca.org/resources/MECA_MY_2024_HD_Low_NOx_Report_061019.pdf
[20] ICCT (2020) "Estimated Cost of Diesel Emissions-Control Technology to Meet Future California Low NOx Standards in 2024 and 2027" available at https://theicct.org/publications/cost-emissions-control-ca-standards, p. 2
[21] ISOR, III-15
[22] ISOR, III-23
[23] ISOR, ES-1
[24] ISOR, III-16
[25] MECA, "Technology Feasibility for Heavy-Duty Diesel Trucks in Achieving 90% Lower NOx Standards in 2027" 2020, p. 19.
[26] C. Sharp, Update on Heavy-Duty Low NOx Demonstration Program at SwRI, September 2019.
[27] MECA, "Technology Feasibility for Model Year 2024 Heavy-duty Diesel Vehicles in Meeting Lower NOx Standards" 2019, p. 2.

percent.[28] The ICCT estimates the incremental cost of achieving CARB's proposed MY2027 standards for the FTP and LLC is estimated to be as low as $2,200 (for a Class 8 vehicle) compared with meeting the EPA 2010 standards in 2027.[29] Similarly, according to research conducted by MECA, the incremental cost of achieving the proposed MY2027 standards for the FTP and the LLC is estimated to range from approximately $1500 to $2050 (for a Class 8 vehicle, 12-13 liter engine) – an increase of about 1 percent of the cost of a 2027 truck.[30]

MEMA Supports CARB's Proposed Tiered HD NOx Emissions Standards for FUL

CARB proposes a tiered approach. In MY2027, the HD NOx emissions standards are 0.02 g/bhp-hr for the first 435,000 miles of FUL and 0.035 g/bhp-hr for 435,000-600,000 miles of FUL. In MY2031, CARB proposes a 0.04 g/bhp-hr for 600,000-800,000 miles of FUL.[31] MEMA supports this tiered approach as it meets MEMA's criteria of encouraging the best available technology and these standards are supported through data from the Low NOx Demonstration Program.[32]

MEMA Supports Stringent PM Standards

MEMA supports CARB's proposed HD PM standard of 0.005 g/bhp-hr on the FTP and RMC-SET test cycles for MY2024 and subsequent years.[33] This HD PM standard is feasible as supported by the Low NOx Demonstration Program and will encourage anti-backsliding with the best available existing Diesel Particulate Filters (DPF) aftertreatment systems.[34]

MEMA Supports Amendments to On-board Diagnostic (OBD) Requirements

MEMA supports CARB's proposal to provide OBD interim relief by maintaining OBD thresholds for PM and NOx at current levels.[35] As suggested in the ISOR, this proposal can help industry focus first on improved emissions controls to meet the new standards before focusing on necessary improvements to ensure detection of faults at lower emission levels. The OBD threshold staying constant is an important element for the significantly extended emissions warranty. However, development is ongoing with software, specifically on vehicle health management. Furthermore, with the Real Emissions Assessment Logging (REAL) OBD implementation phase-in starting in MY2022, the aftertreatment system and tailpipe emissions can be monitored in real-time, which will provide more data to understand the emissions level beyond the current FUL. Therefore, when improved OBD technology becomes available in the future and there is improved understanding of the systems and components with the extended FUL requirements to support an OBD threshold tightening, CARB should consider tightening the OBD threshold. If and when

[28] ICCT (2020) "Estimated Cost of Diesel Emissions-Control Technology to Meet Future California Low NOx Standards In 2024 and 2027", p.1.
[29] ICCT (2020) "Estimated Cost of Diesel Emissions-Control Technology to Meet Future California Low NOx Standards In 2024 and 2027", p. 2.
[30] MECA, "Technology Feasibility for Heavy-Duty Diesel Trucks in Achieving 90% Lower NOx Standards in 2027." February 2020, p. 3. This estimate assumes current durability and warranty requirements in 2019 dollars.
[31] ISOR, III-8
[32] C. Sharp, Update on Heavy-Duty Low NOx Demonstration Program at SwRI, September 2019.
[33] ISOR, III-31
[34] Khalek et al.,"Solid Particle Number and Ash Emissions from Heavy-Duty Natural Gas and Diesel w/SCRF Engines," Imad A. Khalek, Huzeifa Badshah, Vinay Premnath, Rasto Brezny, SAE Technical Paper 2018-01-0362, April 2018.
[35] ISOR, III-10

CARB considers tightening the OBD threshold, CARB should fully evaluate cost implications and economic impacts of the OBD extension.

MEMA Supports CARB's Proposed In-Use Emissions Standards

CARB proposes switching from the currently used "Not-to-Exceed" (NTE) testing procedure to a three bin MAW (3B-MAW) HDIUT approach for HD engines.[36] HD vehicles currently meet NOx standards of 0.2 g/bhp-hr. However, there are significant deficiencies and discrepancies between NTE test results and actual emissions.[37] Engines have challenges maintaining this standard during low-load conditions. Current in-use compliance requirements have significant limitations and inadequacies due to the test excluding emissions data at lower vehicle speeds, lower engine loads, and lower aftertreatment temperatures.[38]

Consequently, MEMA supports CARB's update to a 3B-MAW test procedure and the addition of including cold start emissions in MY2027 and subsequent years. CARB's adoption of 3B-MAW HDIUT method will provide real-world emissions measurements, which will accurately quantify and reward the contributions of emissions-reducing technologies. We encourage CARB and EPA to harmonize their HDIUT and minimize variation between the CARB and EPA cycles for vehicle and engine manufacturers.

MEMA Supports an Optional 50-State Program but Recommends Adjustments

CARB's HD NOx Omnibus proposal provides an option for vehicle manufacturers to certify MYs 2024–2026 engines to a less stringent standard than CARB's 0.05 g/bhp-hr standard if they meet that standard on a nationwide basis. CARB proposes an optional 50-state program HD NOx standard of 0.1 g/bhp-hr for the FTP and RMC, an LLC standard of 0.30 g/bhp-hr, and an idling standard of 10 g/hr.[39] As outlined below, MEMA supports all of the goals of an optional 50-state program for MYs 2024–2026, but has concerns with the proposed standard of 0.1 g/bhp-hr for the FTP.

MEMA supports an optional 50-state program that would provide domestic motor vehicle suppliers with regulatory certainty and volumes for investment payoff, all while providing optimal economies of scale for vehicle manufacturers. MEMA also strongly supports HD NOx standards that will encourage the best available emissions-reducing technologies. Yet, to incentivize vehicle manufacturers to certify their MYs 2024-2026 engines to a standard lower than the current federal standard nationwide, MEMA supports allowing a less stringent California HD NOx standards for the optional 50-state program.[40] While MEMA has concerns with the proposed standard of 0.1 g/bhp-hr for the FTP, we could support a slightly more stringent standard, such as 0.08 g/bhp-hr or a similar standard, that promotes initiating new technology adoption.

The proposed 0.1 g/bhp-hr is an easy compliance target and is too lenient because this standard could be satisfied through calibration improvements. Furthermore, setting the MYs 2024-2026 standard at 0.1 g/bhp-hr could hurt technology momentum vehicle

[36] ISOR, III-36
[37] *Ibid.*
[38] ISOR, III-32
[39] ISOR, III-5
[40] Compared to CARB's 0.05 g/bhp-hr starting in MY2024 for California certification.

manufacturers and suppliers targeted moving toward the MY2027 standard at 0.02 g/bhp-hr. If vehicle manufacturers are to meet the 0.02 g/bhp-hr in 2027, they need to start deploying the best available technologies in 2024 to work toward the 2027 standard. MEMA strongly encourages CARB to set a standard for an optional 50-state program for MYs 2024-2026 that is more stringent than 0.1 g/bhp-hr. Whereas a FTP standard set at 0.08 g/bhp-hr would require vehicle manufacturers to start deploying improved emissions technologies ultimately creating more momentum toward meeting California's MY2027 proposed standard of 0.02 g/bhp-hr.

MEMA urges CARB set an FTP standard of at least 0.08 g/bhp-hr for its optional 50-state program for MYs 2024-2026. Suppliers need improved emissions technologies to start being deployed in MYs 2024 – 2026 timeframe – not delaying until MY2027. Having a more stringent level earlier in the timeline establishes momentum, secures suppliers' R&D investments, provides critical regulatory certainty, and commercializes a more robust technology portfolio going into MY2027. Earlier deployment of MYs 2024-2026 technologies will serve as the underpinnings for suppliers to continue product enhancement of low NOx emissions technologies. Motor vehicle supplier development of these technologies requires substantial lead-time, major economic resources, and product planning that includes several stages over many years. Any change in the emissions technology deployment timeline – even a delay of a couple years – has significant ramifications for suppliers' return on investment. Further, the selection of 0.1 g/bhp-hr target for an alternative pathway does not align with data-driven results from the SwRI Low NOx Demonstration Program. As a result, it is critical that CARB adjusts the FTP standard in the optional 50-state program to a more stringent standard than 0.1 g/bhp-hr.

MEMA Has Concerns with the ABT Program

MEMA supports CARB's proposal of establishing a California-only credit pool for the ABT Program (CA-ABT) starting with MY2022, limiting credit transfers from federal-ABT, limiting the credit life to five MYs, and including hybrid powertrain families.[41] MEMA members stand ready to help California meet the ACT rule's medium-and heavy-duty zero emission vehicle (HD ZEVs) targets. However, MEMA has concerns the proposed CA-ABT program allows vehicle manufacturers to generate credits for the HD NOx Omnibus program with the same HD ZEVs that are required to comply with the ACT.

Under the ACT, vehicle manufacturers must produce HD ZEVs as a percentage of their fleet – starting at 9 percent in 2024 and increasing to 50 percent in 2030.[42] If vehicle manufacturers can earn credits in the Omnibus HD NOx rule CA-ABT for ACT compliance ZEVs, this would be double counting. We understand CARB staff adjusted the CA-ABT provisions where HD ZEVs do not earn credits past 2030 and any credits would sunset in 2031. While this is a step in the right direction, this does not fully address MEMA's concerns.

If the OEMs are allowed credits for their ACT HD ZEVs, an OEM could produce 1.5 ZEVs for every 1 HD diesel engine and would only have to meet a 0.05 g/bhp-hr NOx standard to meet the CARB proposed 0.02 g/bhp-hr in 2027. Since ZEVs are not subject to the

[41] ISOR, III-73 - 75
[42] Class 4-8 straight trucks

significantly extended emissions warranty, vehicle manufacturers would have further incentive to meet HD NOx compliance with HD ZEVs.

Additionally, the proposed CA-ABT program would allow HD ZEV credits to be "transferred into any other averaging set for CA-ABT calculations [allowing] a manufacturer to make more HD ZEVs in lieu of certifying other engine families to more stringent standards."[43] This credit transfer provision would essentially allow vehicle manufacturers to generate a significant amount of NOx credits from selling Class 4 and 5 ZEVs and apply those credits to Class 8 diesel engine line hauls. Then vehicle manufacturers could certify those Class 8 diesel engine vehicles at 0.05 g/bhp-hr until MY2030. Consequently, a significant portion of MYs 2027-2030 Class 8 diesel engines, which would be on the road for the next 15-20 years, could have 60 percent higher NOx emissions than if the CA-ABT did not provide credits for HD ZEVs required by the ACT.

The example above illustrates that the proposed CA-ABT program allows for HD diesel engines without the best available NOx emissions-reduction technology through MY2030. This is against the spirit of the HD NOx Omnibus. As explained in the ISOR, the HD NOx Omnibus is meant to "address different purposes … distinct and independent from the purposes and the utility provided by the proposed ACT Regulation."[44] The HD NOx Omnibus rule and the CA-ABT program should be encouraging cleaner HD diesel engines with significantly reduced NOx emissions in accordance with California's air quality goals. Instead, the CA-ABT program could allow higher NOx emissions from diesel engines (than if the CA-ABT did not allow HD ZEV credits) without any increase to HD ZEV production than what is already required by the ACT.

Additionally, vehicle manufacturers having the ability to earn CA-ABT credits for ACT-required HD ZEVs, creates a situation where not only is the best available HD NOx emissions control technology not needed or deployed, it is also spread across fewer diesel engine vehicles. Vehicle manufacturers deploying the best available technology and meeting the HD NOx emissions requirements of 0.02 g/bhp-hr in 2027 is imperative for suppliers' return on investments as well as continued growth and product development. Motor vehicle suppliers have already invested billions of dollars to develop advanced technologies required to meet increased emissions standards including the proposed 0.02 g/bhp-hr HD NOx standard.

Importantly, HD suppliers continued and strengthened R&D investments in HD electrified powertrains is contingent on vehicle manufacturers deploying the best available NOx emissions reduction technology. Suppliers return on investments that can be reinvested in electrified powertrain advancements will only happen if HD diesel engines are being equipped with the best available technology to meet the 0.02 g/bhp-hr HD NOx standard – not a less stringent NOx standard that would be allowed under the proposed CA-ABT program.

MEMA also encourages CARB to require upstream emissions accounting for the GHG and criteria pollutant emissions associated with upstream electricity generation for HD ZEVs. MEMA supports at a minimum, a well-to-wheel fuel lifecycle analysis to evaluate the

[43] ISOR, III-76
[44] ISOR, ES-16

benefits of vehicle technologies. There should be a comprehensive assessment on the fuel and energy impacts – particularly NOx emissions from electricity generation.

Extended Regulatory FUL and Emissions Warranty Poses Challenges

CARB proposed significant extensions for FUL and emissions warranty for trucks Classes 4-8 starting in MY2027. CARB proposed extended emissions warranty and FUL to encourage "manufacturers to make parts more durable," to "better represent the longer modern service life of heavy-duty engines," and to ensure "emissions control systems remain operational throughout a greater portion of a vehicle's service life."[45] MEMA supports a transition to extending the emissions warranty and FUL. While suppliers are capable of emissions technology durability improvements, suppliers will still face various challenges to meet the extended FUL and emissions warranty due to suppliers' lack of quality data. MEMA outlines recommendations for how CARB's goals can be achieved.

MEMA Supports CARB's Proposed Phased-in Approach for Warranty and FUL

MEMA greatly appreciates CARB staff revising downward the extended FUL and emissions warranty requirements from what was originally proposed in January 2019. MEMA is generally comfortable with the extended FUL and emissions warranty miles, years, and hours included in CARB's formal proposal. MEMA strongly supports CARB's phased-in approach to the extended FUL and emissions warranty. Suppliers will take on the resources and costs related to the research, development, and reengineering to improve the durability of emissions parts capable of meeting an extended warranty. This phased-in approach, with an increase in 2027 and another increase in 2031, allows suppliers more time to gather the necessary data and to improve durability as these technologies are adopted.

Cost Implications of the Extended Emissions Warranty

CARB proposed significantly extended emissions warranty increasing from the current 100,000 miles to 350,000 miles in 2022, 450,000 miles in 2027, and 600,000 miles in 2031. The mileage increases will have cost implications for suppliers developing new parts capable of meeting the extended warranty period.[46] It will be necessary to make improvements for all components in the emissions control system, consequently the overall cost of the system increases significantly. Because there is a current lack of adequate data, suppliers will likely bear more of the burden, risks and expenses. MEMA prefers this extended emissions warranty structure that allows for more lead-time and a phased-in approach. This extra time provides suppliers a reasonable opportunity to gather adequate product data, learn and improve. Allowing more lead time to fully understand, estimate costs related to, and plan for the extended warranty will help alleviate risks and costs for suppliers. MEMA outlines how CARB can help with adequate data.

MEMA Requests CARB Provide Research Opportunities to Aid in Data to Suppliers

Suppliers do not currently have the field data necessary to make durability improvements for a substantially extended warranty period. Currently, the data on parts in warranty from the vehicle manufacturer and back to the correct supplier is not robust enough to be useful. Few, if any, "end of life" hardware is returned to suppliers for review

[45] *Ibid.*
[46] For Class 8 vehicles.

without an intentional effort or intervention by the vehicle manufacturer or specific request by the supplier. Given the historical evidence of the flow of data on parts, vehicle manufacturers and suppliers will need to work hard at developing data flow worthy of increasing warranty durations.

However, while data flow may eventually improve between suppliers and vehicle manufacturers, because of the steep learning curve early in this process, suppliers cannot wait for higher quality data to be reported from vehicle manufacturers when the emissions warranty is extended. Suppliers are now validating products for awarded business starting production in 2024 and are developing new technology for 2026-2031. Furthermore, there will be significant cost implications to suppliers early in the learning period if data flow is not improved immediately. For suppliers to meet the proposed significantly increased emissions warranty extension, suppliers need to quickly understand and improve durability issues as new technologies are adopted. Suppliers' ability to accelerate component improved durability will be determined by how soon the data flow between the suppliers and vehicle manufacturers can be improved and whether there are increased opportunities to gather higher quality data.

Therefore, MEMA recommends that CARB could either fund a study, provide data, and/or require improved reporting mechanisms by vehicle manufacturers (or HD fleet owners) on emissions components. Both of those proposed options would need to start as soon as possible to be effective for all parties, because the emissions technologies development life cycle requires this information now. It is critical to evaluate the data of vehicles on the road today, particularly on usage patterns and the drive and duty cycles on the second, third and fourth owners of trucks. Such information would provide high quality data on the usage patterns of subsequent owners of the vehicles. Certain duty cycles can cause different failure modes and mechanisms of those specific failures. Presently, suppliers lack an understanding of what these component failure modes mean at a full engine system level and their impact on the engine system emissions. Use profiles, load, and time histories of the subsequent owners of the truck would help provide mechanisms for accelerated durability protocols including equivalent damage processes. This type of data needs to be from an extensively instrumented set of vehicles collecting stress, strain, load, and thermal histories at a sufficiently high frequency of measurement to allow for fatigue-like damage analysis.

This data is critical to enable designs that meet extended life requirements. These data profiles can be used to determine equivalent damage models. The models can be used in design and development computer durability analysis to enable design revisions and durability demonstration in time for the 2024, 2027 and then 2031 products. This type of information would significantly lower cost implications for the industry. More importantly, the data are critical for suppliers' accelerated durability development in meeting the extended warranty and FUL in 2027 and 2031.

Suppliers are not only interested in failed parts. Failed parts, by their nature, provide an incomplete picture as they are from a statistically incomplete set. Data collection is much more important to understand the requirements than seeing failed parts. Suppliers need data on wear characteristics from good parts that have a variety of usage profiles and application histories. This would most likely be a second phase study or reporting mechanism consisting of higher quality data.

MEMA Supports Serviceability Improvements

Since CARB will significantly increase emissions warranty requirements for HD vehicles, MEMA encourages California to provide guidelines or requirements for dealer and independent service providers to concurrently improve diagnostic routines, tools, and training. These improvements are important to better control repair costs.

Inadequate or incomplete service diagnostic routines can incorrectly identify faults in these emissions components. Improving service dealership education on this topic must be a priority. Along those same lines, review and improvement of diagnostic tools and training is needed for dealer service and independent service providers. Moreover, these diagnostic tools and training must be fully utilized by both independent service providers as well as vehicle fleet and dealer technicians to improve maintenance and repair costs. Service repair technicians require increasingly sophisticated tools in order to correctly identify the root cause of emissions component failure. These decisions – without complete information – can lead to incorrect repairs and needed follow-up repairs, which adds costs.

Software solutions exist on the market today that can improve trouble shooting and diagnostics. To streamline and improve vehicle health management and serviceability, a vehicle industry standards organization SAE International created JA6268,[47] which standardizes the practice of component health indicators development. Similar language could be used to standardize diagnostic tools and training.

MEMA Does Not Support HD Hybrids Being Included in Warranty and FUL Extensions

It is too early to include HD hybrid powertrains in the same extended emissions warranty and FUL requirements as similar conventional engines. We appreciate CARB is intending these requirements to be technology neutral while providing consumers with similar protection for any powertrain platforms they chose.[48] However, there is currently very limited numbers of HD hybrids in the market. As a result, it would be difficult and impractical to have data assessing the feasibility of the extended FUL and emissions warranty requirements for HD hybrid powertrain under this proposal. MEMA recommends that CARB postpones requiring HD hybrids to be subject to the same extended emissions warranty and FUL requirements as similar conventional engines.

MEMA Supports CARB's Proposed Updated Maintenance Intervals

If CARB does extend the service life and emissions warranty requirements for HD hybrids and Otto cycle engines, it is important that relevant maintenance intervals are updated starting in MY2027. MEMA supports CARB's proposed updated maintenance intervals for HD diesel engines to include hybrid applications and HD Otto cycle engines.

Further, the validation data requirements for emissions deterioration factors (DFs) used by vehicle manufacturers for their certification now includes an option to use on-board sensors to validate the DFs submitted by vehicle manufacturers. Therefore, if the maintenance intervals of such components used for validation data were to be extended, then the intervals should not be extended beyond a point that the performance of those components is no longer sufficient to be used for compliance purposes. This needs to be considered when CARB reviews and updates the maintenance intervals for HD diesel engine applications.

[47] SAE Standard JA6268 "Design and Run-Time Information Exchange for Health-Ready Components"
[48] ISOR, III-56

MEMA Opposes the Expansion of the Applicability of Warranty Coverage

CARB proposes that the extended emissions warranty coverage that starts in MY2027 will be expanded to California-certified vehicles with California-certified engines, even if they are registered outside California. CARB argues that having this extended emissions warranty remain with the vehicle "incentivizes timely repairs for faulty emission-related components so that when the vehicles eventually do operate in California, they will have lower emissions."[49] MEMA opposes this proposed provision to extended emissions warranty coverage for HD vehicles that are California certified but registered in another state. Vehicles registered outside of California should be subject to federal emissions warranty requirements. MEMA urges CARB and U.S. EPA to work together to coordinate and align federal and California emissions warranty requirements starting in 2027 as much as possible. However, it is plausible that EPA could adopt different extended emissions warranty requirements. Having uncoordinated requirements would be extremely burdensome for the industry. If emissions warranties are unaligned and CARB is requiring all California-certified engines to meet CARB's extended emissions warranty, regardless if the vehicle is registered outside California, this would add further complexities and costs, would be difficult to enforce, and would cause confusion.

Conclusion

MEMA supports CARB's proposed HD NOx Omnibus program's stringent HD NOx standards of 0.05 g/bhp-hr in MYs 2024-2026, and of 0.02 g/bhp-hr in MY2027 and subsequent years, the LLC and idling certification cycles, and the 3B-MAW HDIUT. These proposed standards and methodologies promote the best available, reliable, cost-effective emissions reduction technologies in the marketplace. These methodologies are better at evaluating real-world emissions performance for HD powertrains. MEMA encourages CARB and U.S. EPA to continue to coordinate on their HD low NOx programs and to work to harmonize the programs as closely as possible. A true national program with stringent, long-term targets will provide regulatory certainty for the domestic supplier industry. These elements will provide a stable framework the industry needs for long-term planning and investment decisions critical to continue strengthening supplier manufacturing sector jobs and driving global technology leadership.

MEMA urges CARB to reconsider allowing vehicle manufacturers to generate credits for the HD NOx Omnibus program with the same HD ZEVs required to comply with the ACT. While MEMA supports all the goals of CARB's proposed optional 50-state program, MEMA strongly recommends a slightly more stringent standard of at least 0.08 g/bhp-hr for the FTP. Lastly, MEMA recommends that CARB fund a study or provide a requirement for the data collection necessary for suppliers to adequately evaluate and prepare for the extended warranty requirements. For more information, please do not hesitate to contact Laurie Holmes, MEMA senior director of environmental policy at 202-312-9247 or lholmes@mema.org.

[49] ISOR, III-54