COMMENTS OF MECA CLEAN MOBILITY
ON CALIFORNIA AIR RESOURCES BOARD'S PROPOSED ADVANCED CLEAN FLEETS REGULATION

October 17, 2022

MECA Clean Mobility (MECA) would like to provide both supportive comments as well as constructive recommendations to the California Air Resources Board's (CARB) proposed Advanced Clean Fleets (ACF) rulemaking to accelerate adoption of zero-emission vehicles (ZEVs) in the medium- and heavy-duty truck sector and reduce the amount of harmful emissions generated from on-road mobile sources. We support CARB's ongoing leadership in the effort to reduce the environmental footprint of transportation to meet the state's SIP and climate goals, including technology advancing regulations that provide pathways, including electrification, to clean up the heavy-duty vehicle fleet. We believe an important opportunity exists to continue to reduce greenhouse gas and criteria emissions from medium- and heavy-duty engines and vehicles through the application of innovative technologies and fuels. MECA would like to reiterate some of the suggestions in our comments on the Advanced Clean Trucks (ACT) regulation as well as include some new information on clean mobility technologies since ACT was finalized. Our recommendations have drawn on our long and successful partnership with CARB, and we believe they will strengthen this proposal by enhancing technology options that can be implemented by fleets to help meet the state's air quality and climate goals.

MECA is non-profit association of the world's leading manufacturers for clean mobility. Our members have nearly 50 years of experience and a proven track record in developing and manufacturing electric, efficiency and emission control technology for a wide variety of on-road and off-road vehicles and equipment in all world markets. Our members provide the technologies that enable electrification and all electric (both battery and fuel cell) technologies as well as emission control and efficiency technologies that reduce emissions of all pollutants, criteria and climate, to allow heavy-duty vehicles to be the cleanest possible. Our industry has played an important role in the environmental success story associated with light- and heavy-duty vehicles in the United States and has continually supported CARB's efforts to develop innovative, technology-advancing, regulatory programs to deal with air quality and climate challenges.

There is a long track record of meeting environmental goals through the implementation of performance-based standards and competing technology solutions. While technology mandates have been used to provide certainty in specific markets, they can result in premature barriers to investment and innovation in promising complementary emission reduction technologies and constrain the solution options to meet the state's air quality and climate goals.

Similar to the targets finalized in ACT, we believe that the targets in this ACF proposal are extremely aggressive, with compliance pathways limited to battery electric and fuel cell vehicles. We agree that balanced aggressive sales and purchase mandates signal to industry the direction the state is heading in the future. However, the history of the light-duty ZEV requirements resulted in multiple corrections in response to technology readiness and market demand. Repeated changes to original targets introduce uncertainty and creates risks for technology suppliers. While CARB has already expanded its ZEV policy model into the commercial vehicle sector with ACT, there remains uncertainty in the pace of electrification of several of the commercial vehicle sector

segments. It is known that some commercial vehicle segments will be more challenging to electrify than passenger cars, yet ACF purchase requirements for some fleets are even more aggressive than sales targets for light-duty vehicles.

Technology suppliers believe that this rule would benefit from the inclusion of additional compliance pathways toward the same objective of net zero emissions. As providers of technology solutions for efficient engines, hybrids and ZEVs, we recognize that the pathway to electrification has several challenges that have yet to be addressed, such as battery material availability, infrastructure and consumer acceptance. As governments and industry address these challenges and markets transition, we must continue to make progress in improving the efficiency in all commercial truck sectors. MECA recommends that CARB remain open to all reasonable technology options in the pursuit of early CO_2 reductions that deliver the greatest benefit to the climate. Therefore, we recommend the inclusion of additional compliance pathways into the current ACF proposal. In market segments where CARB deems battery electric and fuel-cell vehicles are not yet commercially available, we suggest CARB allow alternative compliance options if fleets are facing long lead times or lack of truck availability. We believe this will be particularly beneficial to fleets and the state over the next 5-10 years as critical mineral supplies, infrastructure and fleet experience all develop and mature.

While ACT allows for partial compliance crediting for near-zero emissions vehicles (NZEV), which are commonly known as plug-in hybrid electric vehicles (PHEV), ACF only allows fleet operators to add NZEV to their fleets if no new ZEV of the same weight class and configuration are available. We believe this provision is inconsistent with ACT and reduces flexibility needed for fleets making purchasing decisions that involve many factors, including vehicle operational requirements, infrastructure and cost. Therefore, we suggest CARB allow NZEV as a compliance pathway analogous to ACT, regardless of ZEV availability, for ACF regulated fleets through 2035.

We believe that in those truck sectors that are more challenging to fully electrify in the near-term, hybrid electric vehicles can offer significant emission reductions as these sectors transition to full electric and the infrastructure is readied for a significant number of electric trucks. While NZEV have a potential but limited compliance pathway in this regulation, non-plug-in hybrid electric vehicles (HEV) are not eligible for compliance. MECA recommends CARB consider allowing HEVs, that meet or exceed the MY2027 Phase 2 GHG standard early (or exceed the standard after MY2027), to be a compliance option for fleets, especially in the early years of ACF implementation.

The types of vehicles that could meet low criteria and GHG emission levels include advanced HEVs that couple the cleanest engine technologies with electrified powertrains. In passenger cars, we have seen HEVs continue to improve with sustained innovation of advanced combustion, efficiency and electric technologies. This battery and component innovation has expanded into electric trucks, and incentives will enable faster penetration into the commercial truck fleet. Such a parallel technology approach would not subtract from the ACF but only expand the options and increase the flexibility needed by both the vehicle providers and end-users during the fleet transition.

A review of hybrid passenger vehicles currently available for sale shows that fuel economy in city driving is 50-100% higher for the hybrid model compared to its gasoline counterpart. This

type of savings, if incentivized through technology for vocational trucks that spend most of their time on city streets, would result in much greater benefits than current Phase 2 GHG limits. For those truck segments that are less amenable to full electric powertrains, broad application of hybridization delivers sustainable electrification and magnitudes greater emission reductions than a limited number of all-electric trucks.

In the transition to CARB's goal of a net zero-emission fleet, conventional engines will continue to be built for years to come and, if operated on low carbon fuel, these will also offer parallel criteria and GHG reductions. Beginning with MY 2024, new heavy-duty vehicles in California will be required to meet tighter NOx emission limits, which become more stringent (0.02 g/hp-hr over the FTP) in MY 2027. EPA is considering federal standards nearly on par with those finalized in CARB's Omnibus. In previously submitted comments to the Omnibus and ACT regulations, we have provided information that suggests upstream NOx emissions for electricity generation to power heavy-duty electric trucks are likely equal to or potentially greater than tailpipe emissions from engine-powered trucks, through the 2030-2035 time frame. These emission comparisons assume that California's power grid will meet its renewable energy targets and that the non-renewable portion of power will continue to be generated from natural gas sources, which produce NOx emissions. If projections of upstream NOx emissions from power generation are not accurate, the result would be an unintended increase in the state NOx inventory.

MECA supports CARB's inclusion of both battery electric and fuel cell electric vehicles (FCEV) in the ACT and ACF rules. In addition to hydrogen FCEV, there is broad industry support for internal combustion engines fueled with clean hydrogen, and most engine manufacturers are conducting significant development work worldwide to meet this technology need. Similar to FCEVs, hydrogen-fueled internal combustion engines (H2ICE) are attractive options in commercial trucking where challenges remain in applying current BEV technology to several vocations. One of the main benefits of H2ICE in the commercial vehicle sector is the opportunity to leverage existing investments in manufacturing capacity in engines and aftertreatment while growing the market for on-board hydrogen storage technology and infrastructure. For more challenging vehicle use-cases, this technology can be commercialized sooner than FCEVs and begin delivering carbon reductions earlier.

H2ICE vehicles share many characteristics with vehicles on the road today, including the base engine, installation parts, powertrain components and aftertreatment system architectures. Furthermore, H2ICE can borrow technology from currently available engines, such as cylinder heads, ignition systems, fuel injection, turbochargers, cooled exhaust gas recirculation (EGR), and engine control unit/software, among others. Nearly all on-road and off-road engine OEMs, along with their suppliers, are developing H2ICE for commercial introduction in the MY 2025-2027 time frame.

These commonalities provide engine makers and fleet end users an alternate hydrogen technology to support the transportation transition by utilizing existing powertrain components and maintenance experience to reduce capital costs and total ownership costs for low-carbon vehicle options with near-term commercial availability. Fleets have the ability to begin to transition their vehicles to zero CO_2 at competitive initial capital costs while maintaining current workforce and familiar maintenance practices. Suppliers can build manufacturing capacity for hydrogen storage tanks, which will also be used by FCEVs once technology and cost challenges are overcome. On the hydrogen fueling side, pathways that incentivize fleet penetration of H2ICE will create demand

for current and future hydrogen fuel infrastructure that will be needed for higher penetration of FCEVs. Infrastructure investments can be justified as utilization increases and provides returns on the capital-intensive expenditures of hydrogen fueling stations.

In order to address any potential criteria emissions from H2ICE, lessons can be directly applied from currently available engine and aftertreatment technologies, which includes decades of development leading to today's EGR systems, diesel particulate filters (DPF) and selective catalytic reduction (SCR) systems. Further advances that have been made for NOx control to meet the next generation of low NOx emission standards adopted by California and proposed by EPA will also benefit H2ICE by bringing criteria pollutants and PM down to near-zero levels on par with upstream electricity generation emissions.

With respect to GHGs, H2ICE utilizes the exact same hydrogen as FCEVs and therefore emits nearly zero CO_2 from the tailpipe. Furthermore, lifecycle emissions will be zero if renewable hydrogen is sourced as a fuel. It should be noted that European heavy-duty CO_2 regulations will assess H2ICE as having zero tailpipe CO_2, on par with FCEVs, within the VECTO model that is used for compliance with European heavy-duty vehicle GHG regulations. While CARB has a long-standing position that only zero tailpipe vehicles will enable California to meet both criteria emission and GHG emission goals, there is a case to be made for allowing compliance with ACF through vehicles with near-zero levels of all emissions in the transition to FCEVs, especially but not limited to situations when ZEVs are not available in certain specialized or hard to electrify applications. This would allow fleets to buildout their hydrogen fueling needs and transition seamlessly to FCEV trucks as they become available.

California has a long history of utilizing a combination of regulation and incentivization to achieve air quality and climate goals. For example, new heavy-duty truck emissions have been significantly reduced by setting engine emission standards while in-use truck emissions have been cleaned up by retrofit, repower and replacement projects though the Carl Moyer program. It is important that these two approaches are maintained together in the future, especially as CARB plans to implement requirements on fleets to purchase electric heavy-duty vehicles. In the past, the in-use fleet rule implementation timeline had to be revised due to economic hardship experienced by fleets during a previous economic recession. Incentive funding will continue to play an important role, especially if fleets are affected by current and future negative economic conditions.

As the battery electric and fuel cell electric truck markets mature, in order to continue to drive technology innovation toward lower emitting trucks, we support revisiting the Zero Emission Powertrain (ZEP) requirements to establish performance standards for the batteries and components on electric trucks. This would drive innovation in electric truck component development and ensure the most cost-effective overall emission reductions and the most affordable trucks for California. Examples of performance standards for electric vehicles could include battery performance and durability standards as well as range requirements, which have recently been included along with other ZEV assurance measures in CARB's ACC II. CARB has the opportunity to provide confidence to consumers who have limited experience with electrified technologies in the commercial vehicle sector. Furthermore, performance standards also provide consumer protections to those who invest in these technologies. We have witnessed over the history of transportation regulations and incentive programs, that performance standards lead to continued progress in the development of cost-effective robust technologies to ensure the cleanest and most efficient vehicles and equipment.

In conclusion, MECA commends California's leadership to reduce emissions of criteria and climate pollutants. The heavy-duty transportation sector is responsible for a major portion of California's emissions inventory, and CARB has made great strides towards future reductions in emissions from this sector through the recently adopted Omnibus and ACT regulations. There are significant opportunities to continue to reduce criteria and greenhouse gas emissions from medium- and heavy-duty engines and vehicles through the application of innovative technologies and fuels, including all-electric trucks. We believe the inclusion of additional compliance pathways will strengthen this proposal by enabling fleets to adopt cost effective low-to-zero carbon and criteria vehicle options currently not allowed by ACF. This will advance complementary technologies that can deliver early GHG reductions and greater contribution to curbing climate change.

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