COMMENTS OF THE
MANUFACTURERS OF EMISSION CONTROLS ASSOCIATION
ON CALIFORNIA AIR RESOURCES BOARD'S PROPOSED
AMENDMENTS TO THE SMALL OFF-ROAD ENGINE REGULATIONS:
TRANSITION TO ZERO EMISSIONS

November 29, 2021

The Manufacturers of Emission Controls Association (MECA) would like to provide comments in response to the California Air Resources Board's (CARB) proposed rulemaking to amend the Small Off-Road Engine (SORE) standards and transition to zero emissions. We commend 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 to reduce emissions from SORE. We acknowledge the directive to fully electrify this sector of equipment by 2035, where feasible, in compliance with Executive Order N-79-20 and AB-1346. However, we offer a pathway for this category of engines and equipment, similar to staff's Alternative 2, that utilizes a balanced approach to achieve feasible near-term emission reductions while transitioning the small engine sector to electric equipment on a timeline that recognizes the economic challenges for suppliers and end users. This modified timeline continues to drive electrification of small commercial and residential equipment, where it is already more cost-effective, and allows low emission engines in the hardest to electrify (e.g., larger horsepower, commercial) categories. Extending the end-of-sale of combustion SORE to 2030 would provide industry an opportunity to recover the investment made to develop and deploy the low emission technology. We believe that an important opportunity exists for California to demonstrate lower emissions from SORE and provide a blueprint for federal standards to follow.

MECA is an industry trade association of the world's leading manufacturers of clean mobility technology. Our members have nearly 50 years of experience and a proven track record in developing and commercializing emission control, efficiency and electric technology for a wide variety of on-road and off-road vehicles and equipment in all world markets. Our members provide the engine and aftertreatment technologies that enable small off-road engines to meet stringent NOx, HC, CO and PM emission standards and battery materials and power electronics to enable CARB's electrification goals. Our industry has played an important role in the environmental success story associated with all mobile sources in the United States by offering a complete portfolio of emission control and electric technology. For 45 years, MECA has continually supported CARB's efforts to develop innovative, technology-advancing, regulatory programs to deal with air quality and climate challenges.

Hundreds of millions of people in the U.S. still breathe unhealthy air, and many live in California, including 12 million residents in regions that are in ozone and/or PM nonattainment that would benefit from a lower NOx limit on SORE. Furthermore, SORE operate in all communities and result in localized exposure to air pollution. Because a large part of the emissions inventory from SORE is represented by commercial equipment emissions, it is imperative that cost effective strategies are explored. To this end, when the SORE regulatory activities began over five years ago, MECA and our members supported the technical demonstration work and the regulatory process with hardware and information.

Technologies are Commercially Available

Engines and aftertreatment systems can be designed and optimized to simultaneously reduce emissions of HC, NOx, CO and PM. The types of technologies that will enable these lower emission limits to be met include electronic fuel injection (EFI), improved spark control, secondary air introduction, and advanced catalysts based on experience from passenger car formulations. Larger engines in the SORE category can benefit from the use of oxygen sensors and closed loop control of air-to-fuel ratios. In some cases, this will involve redesign of engines from today's carbureted fuel delivery.

Catalyst technology for small spark-ignited (SI) engines draws from the years of successful experience in the U.S. with three-way catalytic converters applied to light-duty gasoline cars and trucks. Catalyst technology has also been successfully applied to a wide variety of non-handheld equipment and generators (e.g., lawn mowers, motor scooters, and marine generators). In many cases, these catalyst systems have been specifically engineered to provide high reductions of HC and NOx emissions, as well as reductions in CO emissions. The successful application of catalysts to these smaller gasoline engines has required the engineering of exhaust systems that effectively manage exhaust component temperatures, provide for efficient packaging of the catalyst within the exhaust system, include consideration for the safe operation of the engine in the environment, and have adequate mechanical and catalytic durability. New catalyst formulation and volume adjustments can be designed for each engine application as well as reducing oil consumption to ensure catalysts meet new emission standards at today's maximum durability requirements.

There is a wide range of electric small equipment technology in the market place for residential applications, and the preference of non-commercial users to buy this technology, based on its convenience and low maintenance, has resulted in relatively high penetration (>50%) of residential ZEE. Conversely, CARB's survey conducted by Cal State Fullerton has shown a much smaller penetration (1%) of commercial ZEE. This demonstrates that businesses face challenges in meeting all their commercial needs with the use of ZEE. Given there are several models of commercial ZEE available for purchase, the low penetration is not because it is not technologically feasible, but rather it is likely due to the inability of the equipment to fully perform the needed tasks for an entire day of work while meeting the capital cost requirements for (especially small) businesses.

MECA Proposal for SORE

We believe that currently available engine technologies and aftertreatment can be deployed by 2025 to meet the tight emission limits proposed by staff in Alternative 2. Extensive experience in meeting these lower limits derives from the automotive and LSI sectors, and we believe that the emission limits presented at the June 2020 workshop and included as part of Alternative 2 in the proposal, are achievable for the equipment that may be difficult to electrify by 2024. Furthermore, MECA previously worked with the Consumer Product Safety Commission to demonstrate the ability of generators to meet low CO emission limits through the application of closed-loop EFI, engine calibration and catalysts. These generators are commercially available today and can serve as examples how other types of equipment can meet more stringent emission standards.

Following the last CARB SORE workshop, MECA provided an alternative proposal (Table 1) to CARB staff in response to the timeline associated with Alternative 2 in the SRIA and ISOR.

With the exception of the handheld equipment, we believe that the emission limits are achievable at current maximum durability requirements for each category of engine beginning with MY 2025. We continue to suggest that CARB consider interim emission standards for certain SORE that are challenging to electrify, such as the larger horsepower equipment, evidenced by low levels of ZEE penetration. We requested an additional year (MY 2025 start) to begin implementing the tighter emission standards as well as an extension of the zero-emission compliance date to MY 2030. During this time, a parallel path of further market penetration of ZEE is likely as consumer preferences continue to shift and cost parity is achieved for additional equipment types. This start of implementation is consistent with our request for a minimum of three years after finalization of the regulation before the new standards take effect. This lead time is necessary for suppliers of engine components and catalysts to work with their customers (SORE OEMs) to perform the necessary engineering analysis, component design and durability testing validation to commercialize the engines and aftertreatment systems to deliver emission reductions.

Table 1. Emission Standard and Durability Concept for Consideration

Engine Displacement	Current emissions standards (g/kWh for exhaust; g HC/day for evap)			New emissions standards (g/kWh for exhaust; g HC/test for evap)		
	HC+NOx Exhaust	Diurnal	Durability (hours)	HC+NOx Exhaust	Diurnal + Hot Soak	Durability (hours)
<50 cc, handheld	50	NA	50/125/300	25	0.50	300
50-80 cc, handheld	72	NA	50/125/300	15	0.60	300
<225 cc, non-handheld	10	1.0	125/250/500	6	0.60	500
225-825 cc	8	0.95+ 0.056 *capacity	125/250/500/1000	3	0.70	1000
≥825 cc	8	1.20+ 0.056 *capacity	125/250/500/1000	0.8	0.70	1000

We believe both new SORE emission standards as well as ZEE sales requirements should be phased in, based on the model that CARB has followed for all other mobile source regulations. For example, the Low-NOx Omnibus provisions strike a suitable balance between stringency and phase-in time to allow suppliers and OEMs to design, develop and demonstrate technology that is durable and feasible. CARB's Advanced Clean Truck Regulation complements the Omnibus by providing a phase-in timeline for sales of zero-emission heavy-duty equipment. Recently, CARB staff have indicated in the Advanced Clean Cars II workshops that light-duty cars will be subject to tighter emission standards while increasing sales of ZEVs will be required between 2026 and 2035. A phase-in approach and slight extension of the final implementation date for ZEE SORE will allow CARB to address the Governor's EO and achieve NOx reductions from all SORE equipment while recognizing small business challenges to adopting ZEE in all commercial applications by 2024.

Costs to Meet Alternative 2 Emission Limits

The use of EFI along with advanced catalyst technology have been documented as readily available and cost effective technologies to reduce emissions from small engines in the proposed rulemaking by the Consumer Product Safety Commission (CPSC) in 2016

(https://www.govinfo.gov/content/pkg/FR-2016-11-21/pdf/2016-26962.pdf). The CPSC rulemaking proposed low-CO engines and provided estimates for technologies and costs to achieve reduced CO emission limits. The docket cites EPA cost estimates for EFI for Class I and one- and two-cylinder Class II generator engines as $94, $79 and $85, respectively, while accounting for cost savings due to removal of the carburetor on the conventional generator. Catalyst costs for generator engines were estimated in the same proposed rulemaking as $10-$20. We have confirmed these costs in discussions with MECA members.

Although the CPSC rulemaking was focused on low CO emissions through the use of oxidation catalysts to reduce personal exposure in poorly ventilated spaces, the application of three-way catalysts (TWC) together with closed-loop controlled EFI has been effectively used to reduce NMHC+NOx emissions to ultra-low levels in passenger cars. Similarly, fuel injection and TWC technology combined with air aspiration for cooling has been demonstrated to be effective at reducing emissions from small engines. For the SORE Alternative 2 proposal, we approximate the cost of catalysts needed to meet the emission limits proposed by CARB in Alternative 2 (or in our Table 1 above). Catalyst costs scale with the size of SORE. For example, catalysts for handheld equipment engines are projected to cost less than $10 while riding mower engine catalysts are projected to cost less than $100. Overall, the cost to add EFI and advanced catalysts to meet the emission targets in CARB's Alternative 2 would be approximately $200 for the largest SORE. This is in the ballpark of costs reported by CPSC in their 2016 regulatory proposal.

Finally, an example of a currently available generator and low-CO version of a generator with the same specifications was found to corroborate the cost estimates above. The low-CO generator with EFI and closed loop control has an MSRP of $1165 (https://www.ryobitools.com/products/details/46396022912) while the standard generator has an online price of $1059 (https://www.homedepot.com/p/DEWALT-7-000-Watt-Gasoline-Powered-Electric-Start-Portable-Generator-PM0167000-02/303467252). For an additional comparison, a slightly lower powered Ryobi generator, which is the same make as the low-CO generator shown above, has an online price of $849 (https://www.homedepot.com/p/RYOBI-6-500-Watt-Gasoline-Powered-Portable-Generator-with-CO-Shutdown-Sensor-RY906500S/305311298). The cost difference between the low-CO generator and the other two generators ranges from $106 to $316, which is equivalent to a 10-37% increase in cost.

Under the original regulatory scope CARB staff outlined and initiated a demonstration program to define two important elements needed to inform the SORE ISOR. First, SORE equipment would be retrofitted with engine and aftertreatment technology to demonstrate technological feasibility to meet more stringent emission standards. Second, zero emission equipment would be benchmarked to demonstrate the ability of various equipment types to meet the performance and durability needs of end users, especially commercial landscapers. Unfortunately, the two-year pandemic combined with decommissioning the El Monte laboratory made this task difficult within the timeframe of the rule.

Over the past 50 years, demonstration programs, research and targeted testing have been used to provide necessary data that form the backbone of every regulatory effort at both CARB and EPA. These data give industry and end-users the confidence that technologies will be available and will be cost effective while meeting the performance needs of customers. Demonstration programs also provide industry with examples of technology pathways that can be used to estimate the costs of meeting more stringent standards. Prior CARB and federal SORE

rulemakings included equipment teardowns to develop incremental technology costs of tighter emission standards.

In contrast to previous CARB rulemakings, the SORE SRIA does not include cost estimates based on a bottom-up analysis of incremental technology installed on a baseline engine in order to meet proposed stringent emission standards. In the justification for this proposal, SORE staff applied a different methodology based on comparing manufacturer suggested retail prices (MSRP) of the most comparable currently available equipment. Available models were used to represent either baseline or future, low emissions equipment, representative of Alternative 2. Furthermore, where categories of professional SORE equipment that met Alternative 2 standards were not available, a single adjustment factor across different SORE equipment categories was used. The disparity in cost estimation methodologies between this proposal and prior analyses has resulted in a significant incremental difference of greater than an order of magnitude (e.g., $200 (CPSC) versus $6,000 (CARB) for commercial generators).

Because the same incremental cost factor derived for a generator was applied to several other types of equipment, the cost to meet Alternative 2 was overestimated, and this likely led staff to conclude that Alternative 2 was less cost effective than the proposed alternative. This resulted in staff rejecting Alternative 2. MECA suggests that CARB staff determine if a review of Alternative 2 is warranted given these industry-provided cost estimates are much lower than those assumed in the original analysis.

Conclusion

MECA appreciates CARB's standard regulatory development process that allows for stakeholder input over the course of the rulemaking. Given the diversity of SORE, especially for the commercial equipment sector, as well as the economic considerations for small businesses, we support a balanced SORE regulation based on Alternative 2 with a modified timeline, as outlined in our comments. Such an approach would quickly electrify equipment that is already cost effective in the market, such as residential SORE, while reducing emissions starting in 2025 from the harder to electrify, larger horsepower equipment. This would provide time for these challenging applications to evolve to being fully electric by 2030. We believe that such a parallel approach achieves near term emission reductions more cost effectively than Alternative 1 while making significant progress toward the 2035 electrification goals of EO N-79-20 and AB-1346. MECA members are committed to supplying components that deliver emission reductions and electrification through a slightly extended implementation timeline that supports the technology investment and transition. Finally, we believe that CARB has an opportunity to set more stringent emission standards for gasoline-powered SORE that could serve as an example for EPA to develop federal standards.

CONTACT:
Rasto Brezny
Executive Director
Manufacturers of Emission Controls Association
2101 Wilson Blvd., Suite 530
Arlington, VA 22201
Tel.: (202) 296-4797
E-mail: rbrezny@meca.org