STATEMENT OF THE
MANUFACTURERS OF EMISSION CONTROLS ASSOCIATION
ON THE AIR RESOURCES BOARD'S
PROPOSED REGULATION FOR IN-USE ON-ROAD VEHICLES

December 12, 2008

MECA is pleased to provide testimony in support of ARB's proposed in-use on-road diesel vehicle standards. We believe that the proposal presents a balanced, fair, and flexible approach that will achieve significant particulate matter (PM) and nitrogen oxide (NOx) emission reductions in a cost-effective manner. MECA members are committed to deliver the technologies that will be needed to meet the emission reduction targets by the implementation date of this regulation in 2010.

MECA is a non-profit association of the world's leading manufacturers of emission control technology for motor vehicles. Our members have over 35 years of experience and a proven track record in developing and manufacturing emission control technology for a wide variety of diesel and gasoline on-road and off-road vehicles and equipment. A number of our members have extensive experience in the development, manufacture, and application of PM and NOx control retrofit technologies. MECA members are responsible for many of the verified retrofit technologies presently included on ARB's list of verified technologies.

Our members have invested and continue to invest significant resources in developing and verifying diesel retrofit technologies for the whole range of in-use diesel engines currently operating in California, including on-road, off-road, and stationary sources. To date, the majority of the retrofit technologies verified have targeted on-road diesel engines. Adopting this regulation as proposed will provide manufacturers with a level of certainty in the market for retrofit technologies for on-road vehicles so they can focus resources on verifying technologies specific to this category of vehicles and engines. New products are continually added to ARB's list of verified technologies. Several manufacturers are closely engaged in verifying integrated retrofit technology with ARB and these efforts should lead to additional commercial, verified combined NOx and PM reduction technologies prior to the implementation dates of this rule. Beginning in 2009, tighter regulations on retrofit technology will require lower NO_2 emission from retrofit devices. In order to obtain a plus designation, a PM retrofit device can emit no more than 20% higher NO_2 than the baseline engine-out emissions. Manufacturers have been active in re-verifying retrofit PM reduction technologies to the plus designation to comply with this change in regulation.

The availability of VDECS is predicated on efficient and effective retrofit verification protocols. MECA and its members have been actively engaged with ARB staff throughout the verification regulation development and subsequent amendments to the regulation. We continue to believe that more can be done to further streamline the verification process by continuing the cooperative effort to harmonize the application and test plan approval process with U.S. EPA in an effort to move toward true reciprocity of the two processes. The workload will continue to increase as verification maintenance of existing verified devices will combine with the demand

for new verifications of advanced integrated technology solutions. More and more verified devices will enter the in-use compliance phase of the verification process. Existing devices will need to be re-verified to comply with the recently adopted unidirectional flow requirements. These verification maintenance functions will demand resources above and beyond those needed for new verifications. We urge ARB to increase their verification staff in order to efficiently deliver proven retrofit technologies to the significant California market created by ARB's Diesel Risk Reduction Plan.

Technologies to Reduce Diesel PM and NOx Emissions

The "ARB Technical Support Document for In-Use On-Road Diesel Vehicles" provides a summary of emission control technology options available to reduce PM and NOx emissions from existing on-road vehicles. MECA offers some additional comments regarding the technological feasibility and retrofit experience with these devices to meet diesel emission reduction goals. MECA has recently provided stakeholders with documents on diesel retrofit technologies, such as "Retrofitting Emission Controls on Diesel-Powered Vehicles" and a variety of retrofit case study reports. These documents are available on MECA's diesel retrofit web site at: www.dieselretrofit.org.

Both PM and NOx control technologies are being demonstrated today on on-road applications in California and elsewhere. For over 30 years, on-road diesel engines have been equipped with exhaust emission control technology – initially with diesel oxidation catalysts (DOCs) and followed later by diesel particulate filters (DPFs). DPF retrofit devices have been installed on vehicles and equipment on over 250,000 engines worldwide. Since 2007 every new diesel vehicle sold in the U.S. or Canada has been equipped with a high efficiency diesel particulate filter as required by U.S. EPA's 2007/2010 on highway regulation. This represents over 800,000 new trucks operating on DPFs mostly in the U.S. In 2010 the same new highway trucks will be required to reduce NOx emissions by 90% relative to pre-2007 requirements and will be equipped with NOx control technologies such as lean NOx trap catalysts, urea-SCR and high flow EGR systems.

A number of advanced emission control technologies exist today to significantly reduce PM and NOx emissions from medium and heavy-duty on-road diesel engines. These include diesel particulate filters (DPFs), diesel oxidation catalysts (DOCs), selective catalytic reduction (SCR), NOx adsorbers, lean NOx catalysts, exhaust gas recirculation (EGR) and crankcase filters (CCF).

Diesel Particulate Filters – Diesel particulate filters (DPFs) are commercially available today. When used in combination with ULSD, high-efficiency DPF technology can reduce PM emissions by over 90 percent, ultra-fine carbon particles by up to 99+ percent and, depending on the system design, toxic HC emissions by up to 80 percent or more. Over 250,000 on-road and off-road heavy-duty engines worldwide have been retrofitted with passively or actively regenerated DPFs. In addition, over five million new passenger cars have been equipped with DPFs in Europe since mid-2000. Significant investments in DPF production capacity have been made and will be expanded in the future to ensure that DPF demands for both new vehicles and retrofit applications in North America can be met. The operating and durability performance of

DPFs has been very impressive. For example, a growing number of on-road DPF-equipped heavy-duty vehicles have been successfully operating for millions of miles.

Flow-through filter technologies are also available for diesel retrofit applications. These "partial" filters make use of wire mesh supports or tortuous metal substrates that employ sintered metal sheets. These metal substrates can be catalyzed directly or used in combination with an upstream catalyst to facilitate regeneration of soot deposits. Four partial filter designs have been verified by ARB as Level 2 PM reduction technologies. These partial filter designs are less susceptible to plugging and can offer PM reduction efficiencies in the 50-75 percent range depending on engine operating conditions and the soluble fraction of the PM. Some of these partial filter designs have also been shown to operate over long periods of time without the need for ash cleaning associated with engine lubricant consumption. Several original equipment manufacturers (OEM) in Europe are employing high level EGR and flow-through filters to comply with Euro-5 standards.

Development work is underway to further enhance the performance of filter system designs. For example, work continues on developing and implementing additional filter regeneration strategies that will expand the applications for retrofitting DPFs. Development work on filter materials and designs to further enhance filter system durability and to further reduce backpressure are under development. Manufacturers are also developing DPF options that minimize NO_2 emissions in systems that make use of NO_2 for filter regeneration.

Selective Catalytic Reduction (SCR) – SCR technology is a proven NOx emission control strategy. SCR has been used to control NOx emissions from stationary sources for over 20 years. More recently, it has been applied to select mobile sources, including trucks, marine vessels, and locomotives. In 2005, SCR using a urea-based reductant was introduced on a large number of on-road diesel heavy-duty engines to help meet the Euro 4 heavy-duty NOx emission standards. There are now more than 300,000 SCR-equipped trucks operating in Europe. SCR has been identified by several engine manufacturers as their chosen strategy for complying with future on-road heavy-duty diesel engine emission standards in both the U.S. and Japan (in the 2009-2010 timeframe). Several auto manufacturers are also developing and commercializing SCR systems for light-duty diesel vehicles that are being sold in California and across the U.S. A major heavy-duty engine manufacturer recently achieved over seven million miles of durability demonstration testing on 2010 technology engines employing SCR and DPF emission control technologies. Applying SCR to diesel-powered engines provides simultaneous reductions of NOx, PM, and HC emissions.

A number of on-road diesel demonstrations have been done with combination SCR+DPF retrofit systems. There are over 50 such systems currently operating in California on utility vehicles, transit buses, trash trucks and on-highway Class 8 trucks. The applications span the range from 1998-2006 MY engines including EGR-equipped engines. In some of these applications these SCR + DPF equipped retrofit systems have achieved over 80% NOx reduction. There are nearly 300 SCR + DPF retrofit devices operating on medium and heavy-duty on-road vehicles in Europe.

Volvo AB, in the summer of 2004, launched 27 diesel transit buses in Sweden that are

operating with a combined SCR+DPF system to reduce PM and NOx emissions below the European Euro 5 heavy-duty emission limits that came into force in 2008. The U.S. Department of Energy's APBF-DEC program included the evaluation of two different combined SCR+DPF systems on a 12-liter heavy-duty diesel engine. These results included the operation of these two different SCR+DPF systems for 6,000 hours of durability with emission performance near the EPA 2010 heavy-duty on-road emission limits.

Lean NOx Catalyst (LNC) Technology – This technology is also known as hydrocarbon-SCR because it relies on diesel fuel as the reductant over a zeolite catalyst in a similar way as ammonia SCR relies on a urea reductant. ARB has already verified one technology option that combines a lean NOx catalyst with a diesel particulate filter to achieve 25 percent NOx reduction with Level 3 particulate control on a wide variety of on-road heavy-duty engines. This combined PM+NOx retrofit technology has already been successfully applied to thousands of engines operating in California.

Low-Pressure EGR – This technology is being successfully demonstrated in retrofit applications on trucks, buses, and other applications. Over 2,000 systems are running worldwide. Low-pressure EGR has demonstrated a NOx control capability in the range of 30 to 60 percent. ARB has verified two low-pressure EGR+DPF systems with up to 50 percent NOx reduction for a range of on-road and stationary diesel engines.

Proper integration of emission control technology on on-road vehicles and equipment is important for three reasons: 1) to ensure the system is installed at the appropriate place in the exhaust system to optimize effectiveness, 2) to ensure the system physically fits in the available space, and 3) to ensure safety. Over 30 years of experience in integrating emission control technologies on a variety of diesel and spark-ignition vehicles and equipment ranging from <25 hp to over 750 hp provides a clear indication that emission control technology can be successfully integrated on a wide range of vehicles to meet ARB's proposed standards and ensure the safety of the vehicle operator and others. In addition, exhaust emission control technology has been integrated on to vehicles to address special operating concerns and environments. For example, where equipment is used in explosive operating environments, such as underground coal mines, emission control technology has been designed to meet special surface temperature requirements. Surface temperature measurements conducted by MECA members have demonstrated that DPF surface temperatures are no higher than the OEM mufflers and in some cases actually lower. As for OEM installed mufflers, surface temperature issues are often addressed by the use of heat shielding in cases where vehicle operators or maintenance personnel may inadvertently come in close proximity to hot surfaces. Further clarification by ARB of criteria used in granting exemption from retrofit requirements for applications or installations deemed to be unsafe would be useful to ensure that implementation of the proposed regulations are accomplished with minimal administrative delays or judgments.

An important requirement for installing emission control technology on on-road vehicles is to ensure that the device can withstand the vibration and/or extreme operating conditions associated with the operation for hundreds of thousands of miles at highway speeds. Emission control technology can be designed, installed, and operated to provide effective, reliable, and durable performance under these extreme conditions.

Conclusion

In closing, we commend the Air Resources Board for its continuing efforts to provide the people of California with healthy air quality and for demonstrating true leadership in this innovative regulatory program that will significantly reduce PM and NOx emissions from in-use on-road diesel vehicles operating in the State. We also wish to thank the ARB staff for its willingness to work closely with all interested parties and for its tireless efforts to develop effective implementation strategies. Our industry pledges its continued support and commitment to ensure that the desired emission reductions outlined in the Proposed Regulation for In-Use On-Road Diesel Vehicles are effectively achieved within the time frame specified in the proposal.

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