WRITTEN STATEMENT
OF THE
MANUFACTURERS OF EMISSION CONTROLS ASSOCIATION
ON THE U.S. ENVIRONMENTAL PROTECTION AGENCY'S PROPOSAL TO REVISE THE NATIONAL AMBIENT AIR QUALITY STANDARDS FOR NITROGEN DIOXIDE
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The Manufacturers of Emission Controls Association (MECA) is pleased to provide testimony in response to the U.S. EPA's request for public comment on the Proposal to Revise the National Ambient Air Quality Standards for Nitrogen Dioxide (Docket ID No. EPA-HQ-OAR-2006-0922). MECA firmly believes that the emission control technologies for mobile sources that will be needed to help meet the most stringent standards under discussion for nitrogen dioxide are currently available. These nitrogen oxides (NOx) emission control technologies for mobile sources are being used today on on-road and non-road applications in the U.S. and other major marketplaces in the world.

MECA is a non-profit association of the world's leading manufacturers of emission control technology for motor vehicles. Our members have decades of experience and a proven track record in developing and manufacturing emission control technology for a wide variety of on-road and non-road vehicles and equipment. A number of our members have extensive experience in the development, manufacture, and application of PM and NOx emission control technologies for both new and existing engines. These companies have developed control technologies for gasoline, diesel, and alternative-fueled engines.

MECA will defer to the health experts to determine the appropriate nitrogen dioxide levels for the national ambient standards given that they are not within our area of expertise. The Clean Air Act requires that these standards be set to protect the public health with an adequate safety margin. However, MECA offers comments here regarding the technological feasibility of emission control technologies for mobile source engines that are available to meet the EPA proposed ambient standards for NO_2.

A number of strategies employing advanced emission control technologies exist to significantly reduce NOx emissions from mobile sources to achieve the most stringent nitrogen dioxide ambient standard under consideration by EPA and other stakeholders.

The U.S. EPA has already put in place important regulatory programs for reducing PM and NOx emissions from new on-road and non-road diesel engines beginning with the 2007-2010 heavy-duty highway engine emission program, followed by the Tier 4 non-road diesel emission regulations that will be phased in over the 2008-2015 timeframe. Both of these regulatory programs will rely on a systems approach that combines advanced diesel engine technology, the use of ultra-low sulfur diesel fuel, and advanced diesel exhaust emission control technologies to achieve 90+% reductions in both PM and NOx emissions compared to new on-road and non-road diesel engines certified to the previous rounds of EPA emission regulations

(e.g., EPA's 2002-2004 on-road, heavy-duty diesel standards and EPA's Tier 3 non-road diesel standards). Diesel exhaust emission control technologies that are expected to play a major role in complying with both EPA's future emission standards for new engines include diesel oxidation catalysts (DOCs), diesel particulate filters (DPFs), closed crankcase filters (CCFs), selective catalytic reduction catalysts (SCR), and NOx adsorber catalysts. MECA believes that further reductions in NOx emissions from new heavy-duty on-road and off-road diesel engines beyond the 2010 on-road and Tier 4 off-road requirements will be possible through the combinations of more advanced diesel engines with advanced diesel exhaust emission control technologies including SCR and/or NOx adsorber catalysts. Additional tightening of NOx standards for both on-road heavy-duty and off-road new diesel engines beyond the 2010 heavy-duty highway and Tier 4 off-road diesel emission standards should be considered by EPA as an additional strategy that could further reduce NO_2 levels across the country.

Selective Catalytic Reduction (SCR) technology is a proven NOx control strategy. SCR has been used to control NOx emissions from stationary sources for over 20 years using either ammonia or urea injection ahead of the SCR catalyst to serve as the reductant that reacts with NOx in the lean diesel operating environment. Stationary demonstrations range from diesel back-up generators, gensets and stationary engines used on large construction cranes. MECA has summarized this stationary diesel engine experience in a case study report available at: http://www.meca.org/galleries/default-file/Stationary%20Engine%20Diesel%20Retrofit%20Case%20Studies%200807.pdf.

More recently, SCR systems have been applied to mobile sources, including trucks, off-road equipment, and marine vessels. Applying SCR to diesel-powered engines provides simultaneous reductions of NOx, PM, and HC emissions. Open loop SCR systems can reduce NOx emissions from 75 to 90 percent. Closed loop systems on stationary engines have achieved NOx reductions of greater than 95 percent. Modern SCR system designs have been detailed for mobile source applications that combine highly controlled reductant injection hardware, flow mixing devices for effective distribution of the reductant across the available catalyst cross-section, durable SCR catalyst formulations, and ammonia slip clean-up catalysts that are capable of achieving and maintaining high NOx conversion efficiencies with extremely low levels of exhaust outlet ammonia concentrations over thousands of hours of operation.

The majority of heavy-duty engine manufacturers are offering urea-SCR systems in highway truck applications to comply with Euro IV and V emission regulations in Europe, with more than 500,000 of these European SCR-equipped trucks already in service. The majority of engine manufacturers here in North America have announced their intentions to introduce combined DPF+SCR system designs for complying with EPA's 2010 heavy-duty highway emission standards. DOC+SCR systems are also being used commercially in Japan for new diesel trucks by several engine manufacturers to comply with Japan's 2005 standards for new diesel trucks. Several technology providers are developing and demonstrating retrofit SCR systems for both on-road trucks and off-road equipment that combine SCR catalysts with either DOCs or DPFs. In these highway diesel engine applications that combine catalyst-based DPFs or DOCs with SCR catalyst, vehicles are operated on ultra-low sulfur diesel fuel to enable the use of catalysts to achieve significant and durable PM reductions.

Since the mid-1990s, SCR technology using a urea-based reductant has been safely installed on a variety of marine applications in Europe, including auto ferries, cargo vessels, military ships, and tugboats, with over 300 systems installed on engines ranging from approximately 450 to over 10,000 kW. Many of these systems reduce NOx emssions from their vessels to under 1 g/kWh with some applications operating at below 0.5 g/kWh NOx. The marine diesel SCR experience includes installation on both large 2-stroke and 4-stroke marine diesel engines. In most applications, vessels equipped with SCR systems have been successfully operated on marine fuels with up to 1.5% sulfur levels (15,000 ppm). SCR systems on stationary engine applications have seem some limited operation on fuels with sulfur levels as a high as 3.5% (35,000 ppm S).

NOx adsorber technology is another available NOx control strategy that can reduce NOx emissions from new diesel engines. NOx adsorber catalysts are currently being used commercially in light-duty gasoline direct injection (GDI) engines sold in Europe and Japan and on several light-duty and heavy-duty diesel vehicles currently sold in the U.S. Additional light-duty diesel introductions are expected for the U.S. market that will employ NOx adsorber catalysts for complying with either the ARB LEV II or the EPA Tier 2 light-duty vehicle emission limits. NOx emission control technologies are also under development that combines NOx adsorber catalysts and SCR catalysts to provide high efficiency NOx reductions without the need for an additional reductant (e.g., urea).

The emergence of "clean diesel" light-duty vehicles in the U.S. that employ DPFs, SCR catalysts, and/or NOx adsorber catalysts, and the significant number of near-zero tailpipe and evaporative emission light-duty gasoline vehicle models that have been certified to date by ARB as partial-zero emission vehicles (PZEVs, more than 40 current models) or super ultra-low emission vehicles (SULEV) provides strong evidence that new light-duty vehicles sold in the U.S. are capable of achieving NOx exhaust emissions below EPA's fully phased-in Tier 2 fleet average NOx limit of 0.07 g/mile. As a strategy to comply with a more stringent nitrogen dioxide standard, EPA should develop a Tier 3 light-duty vehicle program that uses available advanced emission control technologies for both exhaust and evaporative emissions to achieve further reductions in hydrocarbon and NOx emissions in new passenger cars and light-duty trucks. ARB is already developing a LEV III light-duty program that will push light-duty vehicles toward a SULEV or Tier 2, Bin 2 fleet average emission level in the middle of the next decade. EPA should follow California's lead and develop a Tier 3 light-duty emission program that reduces the fleet average NOx emission standard to the range of 20-30 mg/mile, equivalent to the current Tier 2, Bin 2 or Tier 2, Bin 3 NOx emission limits.

Due to the long operating lives of diesel engines, it will take decades for older, "dirtier" on-road and non-road diesel engines to be replaced with the mandated newer "cleaner" engines. Given the health and environmental concerns associated with diesel engines and because existing on-road and non-road diesel engines make up a significant percentage of the diesel pollution inventory, there is an increasing interest in retrofitting the existing legacy fleet of on-road and non-road diesel engines as a means of complying with federal or state ambient air quality standards for NO_2. MECA believes that proven retrofit technologies including combinations of DOCs or DPFs with SCR catalysts, lean NOx catalysts, NOx adsorber catalysts, or low pressure EGR, are emerging to deliver significant reductions in PM and NOx emissions from existing on-

road and non-road diesel engines. MECA member companies are already investing considerable resources in expanding the number and scope of verified retrofit technologies that can provide significant reductions of PM and NOx emissions to existing diesel vehicles and equipment. MECA believes that additional incentives through significantly increased funding for EPA's National Clean Diesel Campaign or mandatory in-use, vehicle emission regulations to reduce both PM and NOx emissions are necessary to accelerate the retrofit of the older, in-use on-road and off-road diesel engines. A strong national retrofit program would provide significant reductions to both PM and NOx (including NO_2) emissions from the millions of existing on-road and off-road diesel engines that are employed on a daily basis across the country.

MECA believes that further reductions of NOx emissions from the existing light-duty vehicle fleet can be achieved by revising the current EPA aftermarket converter performance requirements. California has recently revised their aftermarket converter requirements for light-duty, gasoline vehicles by requiring a higher level of emission performance and longer durability standards. ARB's regulation will eliminate the sale of older aftermarket converter products that have modest performance standards and a limited 25,000 mile warranty, and require that higher performance and more durable OBD-compliant aftermarket converter products be used on both non-OBD and OBD-equipped vehicles starting in January 2009. These ARB-approved OBD-compliant aftermarket converters are warranted for 50,000 miles based on the use of a more aggressive, high temperature, accelerated engine-aging protocol compared to the vehicle durability demonstration currently required by EPA for approved aftermarket converter products. EPA has not updated its aftermarket converter requirements since 1986 and with more than three million aftermarket converters sold per year across the U.S. (based on surveys completed by MECA with aftermarket converter manufacturers), significant additional reductions of hydrocarbon emissions, including toxic hydrocarbon emissions, and NOx emissions could be achieved with a national aftermarket converter policy that made use of the same higher performance OBD-compliant aftermarket converters available in California.

Closed-loop, three-way catalyst-based systems are already being used on large, spark-ignited, off-road engines to meet ARB's and EPA's 2004 3.0 g/bhp-hr HC + NOx standard. Closed-loop, three-way catalyst systems will also be the primary technology pathway for meeting the EPA and ARB 2007 exhaust emission standard of 2.0 g/bhp-hr HC + NOx. Retrofit kits that include air/fuel control systems along with three-way catalysts have been sold into the LPG-fueled fork lift industry for installation on uncontrolled engines (an LSI application) for nearly 10 years. In both new engine and retrofit applications, these closed-loop three-way catalyst systems have shown durable performance in LSI applications, consistent with the excellent durability record of closed-loop three-way catalyst systems used in automotive applications for more than thirty years. MECA believes that advanced three-way catalyst technology based on automotive applications can provide a cost-effective, durable, high performance solution for controlling NOx and HC emissions from new and existing large spark-ignited engines used in off-road applications.

Other off-road spark-ignited engines including those used on ATVs, off-road motorcycles, snowmobiles, and a variety of small engine applications are contributors to mobile-source NOx emissions. MECA believes that hydrocarbon and NOx emissions from these off-

road gasoline engines can be significantly reduced by adopting tighter regulations that employ the use of advanced three-way catalysts for these mobile sources. On-road motorcycles are now widely using three-way catalysts in the U.S. to comply with ARB's 2008 and EPA's 2010 exhaust emission standards. However, the exhaust emissions of these catalyst-equipped on-road motorcycles will still be at levels considerably higher than late model, light-duty cars and trucks. Additional HC + NOx reductions can be obtained from on-road motorcycles through the use of advanced engine and emission control strategies employed on today's light-duty vehicles.

Conclusion

In closing, we believe that numerous strategies are available to further reduce NOx emissions from mobile source engines to meet the most stringent NO_2 ambient standards under discussion by EPA experts and others. Once appropriate health-based standards are in place, our industry is prepared to do its part and deliver these cost-effective, advanced emission control technologies to the market.

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