Statement
of the
Manufacturers of Emission Controls Association
on the
New York State Department of Environmental Conservation's Proposed Revisions to Part 248, Use of Ultra Low Sulfur Diesel Fuel and Best Available Retrofit Technology for Heavy-Duty Vehicles

December 4, 2008

The Manufacturers of Emission Controls Association (MECA) is pleased to provide testimony in support of the New York State Department of Environmental Conservation's (NYSDEC) "Proposed Revisions to Part 248, Use of Ultra Low Sulfur Diesel Fuel and Best Available Retrofit Technology for Heavy-Duty Vehicles." The proposed revisions will require the use of ultra-low sulfur diesel (ULSD) fuel and Best Available Retrofit Technology (BART) on heavy-duty diesel vehicles owned by, operated by or on behalf of, or leased by state agencies and state and regional public authorities by December 31, 2010 (phased-in). We believe that the proposed regulation presents a balanced and flexible approach to reducing harmful emissions from in-use heavy-duty diesel vehicles to protect the health and welfare of the people of New York.

MECA is a non-profit association of the world's leading manufacturers of emission control technology for motor vehicles. MECA member companies have more than 35 years of experience and a proven track record in developing and commercializing exhaust emission control technologies. A number of our member companies have extensive experience in the development, manufacture, and commercial application of emission control technologies for diesel engines.

Our members' experience includes the development of retrofit emission control technologies that can be used to obtain significant reductions in particulate matter (PM) and nitrogen oxide (NOx) emissions from existing on-road and off-road diesel vehicles. These retrofit technologies include diesel particulate filters, flow-through filters, diesel oxidation catalysts, closed crankcase filters, low-pressure exhaust gas recirculation, selective catalytic reduction, and lean NOx catalysts, as well as technology solutions that combine one or more of these devices. Our member companies are responsible for verifying many of the retrofit technology options shown on the U.S. Environmental Protection Agency's (EPA) and California Air Resources Board's (ARB) lists of verified retrofit technologies for on-road and off-road diesel engine applications. MECA member companies also continue to work closely with vehicle and engine manufacturers on the improvement and development of emission control technologies to meet the requirements of EPA's 2007/2010 heavy-duty highway rule and EPA's Tier 4 nonroad rule.

Benefits of Using Ultra-Low Sulfur Diesel (ULSD) Fuel

The proposed revisions to Part 248 require (as of February 12, 2007) the use of ultra-low sulfur diesel (ULSD) fuel for all heavy-duty diesel vehicles used by the state. Reducing the sulfur level in diesel fuel has direct benefits in terms of reducing PM emissions and also is beneficial to engine durability. In addition, ULSD fuel enables the use and optimization of PM, NOx, and toxic hydrocarbon (HC) emission control technologies on diesel engines. The direct benefits of ULSD fuel, as well as its benefits in enabling effective emission control technology, have been well-documented by both EPA and ARB.

Best Available Retrofit Technology (BART) Options to Reduce Emissions from Heavy-Duty Diesel Vehicles

MECA supports the compliance requirements under Part 248 that seek to make use of the cleanest available retrofit technology that has been verified by either the EPA or ARB verification programs. The Best Available Retrofit Technology (BART) selection process provides an effective approach to maximizing PM and NOx emission reductions from heavy-duty diesel vehicles used by the state, while at the same time providing flexibility to vehicle owners in choosing whether to retrofit their heavy-duty vehicle with an applicable verified technology, replace the vehicle with a 2007 model year or newer vehicle, replace the vehicle with an alternative fuel vehicle/engine, or retire the vehicle/engine from service.

The EPA and ARB verification procedures define the emission reduction performance and ensure the durability of retrofit technology devices. Our members have already verified a number of retrofit technology products using these verification procedures (see the current EPA verification list here: www.epa.gov/otaq/retrofit/verif-list.htm, and the current ARB verification list here: www.arb.ca.gov/diesel/verdev/vt/cvt.htm). The majority of these verified products have focused on existing on-road diesel engine applications and these verified technologies are already being successfully used in transit fleets, school buses, refuse hauler fleets, and highway trucks in many regions of the U.S., including in New York. Several retrofit devices for off-road applications have also been verified and MECA expects additional technology options for off-road diesel engines to be verified in the near future.

Control technologies available today that can be used to reduce PM and NOx emissions from in-use, heavy-duty diesel vehicles include:

Diesel Particulate Filters (DPFs) – Diesel particulate filters are filters that physically trap particles in the engine exhaust before they leave the tailpipe. As exhaust gases pass through the filter, PM is trapped. Removing PM deposited in the filter (i.e., regeneration of the filter) is accomplished by either passive or active means. The applicability of passively or actively regenerating retrofit filter technologies strongly depends on the duty cycle of the vehicle, the corresponding exhaust temperatures that are generated, and the engine-out PM emissions. High-efficiency wall-flow DPFs can reduce PM emissions by up to 90 percent or more (a Level 3 device under the proposed regulation's "Verification Classifications for Diesel Emission Control Strategies"). The need to clean up the diesel legacy fleet has been recognized in the U.S. and around the world with over 250,000 heavy-duty vehicles having been retrofitted with high-

efficiency wall-flow DPFs. To meet EPA's 2007 heavy-duty engine PM standards, essentially all new, on-road heavy-duty diesel engines are now equipped with high-efficiency DPFs.

To date, the real-world experience with DPFs in both OEM and retrofit heavy-duty vehicle applications has been very positive. Through millions of miles of operation, DPFs continue to provide high reductions in PM emissions with very few operational problems. 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 the U.S. can be met.

Flow-Through Filters (FTFs) – Flow-through filters employ catalyzed metal wire mesh structures or tortuous flow, metal foil-based substrates with sintered metal sheets to reduce diesel PM. Technologies verified to date employ catalysts and/or fuel-borne catalysts to oxidize diesel soot as the exhaust flows through these more turbulent flow devices. Flow-through filters are capable of achieving PM reductions in the range of 30 to 75 percent (a Level 2 device) depending on engine operating characteristics.

Diesel Oxidation Catalysts (DOCs) – A typical DOC is a stainless steel canister installed in the exhaust system much like a muffler. The canister contains a honeycomb-shaped substrate that is coated with catalytic metals such as platinum or palladium. As exhaust gases pass through the honeycomb structure, pollutants and particulate matter are chemically oxidized to harmless gases. Diesel oxidation catalysts can reduce PM emissions by 20 to 40 percent (a Level 1 device) depending on the amount of soluble organic material that is associated with the engine-out PM emissions. Over 250,000 off-road vehicles and equipment, including mining vehicles, skid steer loaders, forklift trucks, construction vehicles, and stationary engines, as well as over 50 million diesel passenger cars in Europe and over two million trucks and buses worldwide, have been equipped with DOCs.

Crankcase Emission Controls – Crankcase emissions can be a significant source of PM from uncontrolled, turbocharged engines. An example of a crankcase emission control technology is the use of a multi-stage filter designed to collect, coalesce, and return the emitted lube oil to the engine's sump. These systems have the capability to virtually eliminate crankcase emissions (up to 25 percent of a vehicle's total PM). Crankcase emission control systems can be combined with DPFs or DOCs. Closed crankcase filter systems have been successfully retrofit on a variety of highway vehicles, including school buses, transit buses, and trucks. In addition, EPA's 2007 highway rule and Tier 4 regulations for off-road diesel engines require that engine manufacturers employ crankcase emission controls on all new diesel engines.

Low-Pressure Exhaust Gas Recirculation (EGR) – EGR involves recirculating a portion of an engine's exhaust back to the charger inlet. In most systems, an intercooler lowers the temperature of the recirculated gases. The cooled recirculated gases lower combustion temperature in the engine and reduce NOx formation. Low-pressure EGR systems are used in retrofit applications. Diesel particulate filters are always used in a low-pressure EGR system, ensuring that large amounts of particulate matter are not recirculated to the engine. Retrofit EGR systems are capable of achieving NOx reductions of 40 percent or more. This technology has

been successfully used in retrofit applications for trucks and buses. Over 2,000 systems have been installed worldwide.

Selective Catalytic Reduction (SCR) – An SCR system uses a metallic or ceramic washcoated catalyzed substrate and a chemical reductant to convert NOx to molecular nitrogen and oxygen in oxygen-rich exhaust streams like those encountered with diesel engines. In mobile source applications, an aqueous urea solution is usually the preferred reductant. As exhaust and reductant pass over the SCR catalyst, chemical reactions occur that reduce NOx emissions. In typical on-road heavy-duty applications, an SCR catalyst is usually combined with a DOC or a DPF for reductions in both diesel PM and NOx. SCR can reduce NOx emissions by up to 70 percent or more and PM emissions by 20 to 40 percent. SCR has been used to control emissions from select mobile sources, including trucks, marine vessels, and locomotives. Several emission control manufacturers are currently working to verify retrofit systems that combine an SCR catalyst with a DPF to achieve significant reductions in both NOx and PM emissions for both on-road and off-road diesel applications.

Lean NOx Catalysts (LNCs) – Lean NOx catalysts have similarities with DOCs in that the converter canister contains a substrate coated with catalytic materials. A liquid reagent or reductant introduced upstream of the converter allows the catalyst to reduce NOx emissions. Typically, the diesel fuel itself is used for this purpose. NOx reductions of 25 percent or more have been demonstrated. Lean NOx catalysts can also be combined with DPFs to simultaneously reduce both NOx and PM emissions. This LNC+DPF technology has been verified for on-road heavy-duty diesel engines and should be verified for off-road heavy-duty diesel engines in the near future.

Vehicle maintenance is also an important aspect of any successful diesel retrofit program. Proper engine/equipment maintenance helps to ensure that retrofit emission control technologies can operate at their peak performance levels over extended years of operation. For example, regular maintenance of wall-flow filters to remove accumulated ash is necessary to keep engine backpressures at acceptable levels. MECA would ask the NYSDEC to consider appropriate measures to encourage heavy-duty vehicle owners and operators to perform required maintenance on their vehicles.

For more information on the various types of available retrofit emission control technologies for heavy-duty diesel vehicles, see the MECA white paper entitled "Retrofitting Emission Controls On Diesel-Powered Vehicles" available at: www.meca.org/cs/root/diesel_retrofit_subsite/useful_documents/useful_documents.

Costs of Diesel Retrofit Devices

For a typical on-road heavy-duty diesel vehicle, wall-flow diesel particulate filters are currently being sold for about $9,000 to $11,000 per filter for passive filters and about $11,000 to $20,000 for active filters. Flow-through filters cost approximately $5,000 to $7,000. The average diesel oxidation catalyst cost ranges from $500 to $2,000 per vehicle. Closed-crankcase filters cost about $700. A low-pressure exhaust gas recirculation system with a DPF costs in the range of $18,000 to $20,000. The cost of a selective catalytic reduction system with a DPF is

expected to be in the range of $25,000 to $35,000. A system combining a lean NOx catalyst with a DPF costs from $15,000 to $20,000. For larger diesel engines, retrofit costs can be higher than noted above. In addition, more complex diesel engines and equipment (e.g., specialized off-road engines) can involve higher costs. To determine the actual cost of a particular retrofit emission control device for a specific vehicle or fleet, vehicle owners should consult directly with an emission control technology vendor (for a list of retrofit technology vendors, go to MECA's diesel retrofit website at: www.meca.org/cs/root/diesel_retrofit_subsite/manufacturers/list_of_manufacturers).

Diesel Retrofit Devices and Warranty Coverage

Regarding the use of diesel retrofit devices and warranty coverage, it is important to point out that vehicle/engine manufacturers do not have the legal authority to "approve" the use of specific retrofit devices for use on their in-use, heavy-duty diesel vehicles/engines. Federal law sets forth requirements for warranties and contains a number of provisions to prevent vehicle/engine manufacturers, dealers, and others from unjustly denying warranty coverage. Under the Magnuson-Moss Warranty Act, a manufacturer (e.g., an engine manufacturer) cannot void a warranty (an engine warranty) based on the use of non-OEM parts (such as a third-party diesel retrofit device) unless it is specifically prohibited in the warranty and the manufacturer must be able to show a valid reason for the prohibition. In other words, the engine manufacturer must be able to prove that the diesel retrofit device caused/will cause a failure. If this cannot be shown, the warranty must be honored as written. In many cases, engine manufacturers have provided letters to retrofit technology manufacturers indicating that their engine warranty is not voided by installation of a retrofit device. (For a helpful guide on the Magnuson-Moss Warranty Act, go here: www.ftc.gov/bcp/conline/pubs/buspubs/warranty.htm#Magnuson-Moss. The applicable section is the "Tie-In Sales" Provisions section. For additional information on vehicle warranty claims and the use of diesel retrofit devices, see the Special Equipment Market Association's website at: www.sema.org/main/semaorghome.aspx?ID=50096.)

Global Warming and the Use of Diesel Retrofit Technologies

It is estimated that 70 percent of the black carbon emissions from mobile sources are from diesel-fueled vehicles, with the assumption that 40 percent of gasoline PM is black carbon and 60 percent of diesel PM is black carbon. Up to 25 percent of the carbon footprint of a heavy-duty diesel truck is associated with black carbon exhaust emissions. Since black carbon particles only remain airborne for weeks at most compared to carbon dioxide, which can remain in the atmosphere for more than a century, removing black carbon would have an immediate benefit to both global warming and public health.

Black carbon from diesel vehicles can be significantly reduced through emission control technology that is already commercially available. High-efficiency wall-flow DPFs on new and existing diesel engines provide nearly a 99.9 percent reduction in carbon emissions. During the regeneration of DPFs, captured carbon is oxidized to CO_2, but this filter regeneration still results in a net climate change benefit since the global-warming potential of black carbon has been estimated to be about 4,500 times higher than that of CO_2 on a per gram of emission basis. Because older diesel engines can emit significant amounts of PM, there are important

opportunities to reduce black carbon emissions through diesel retrofit programs, such as these proposed revisions to Part 248, that make use of retrofit DPF technology.

Conclusion

In closing, we commend the NYSDEC for its leadership in proposing these important legislative revisions that will provide significant health and welfare benefits for the people of New York. MECA supports the mandatory use of ultra-low sulfur diesel fuel for heavy-duty diesel vehicles used by the state to help reduce PM emissions and to enable the effective use of retrofit technologies. MECA further supports requiring the use of Best Available Retrofit Technology (BART) as an effective means to ensure that the cleanest retrofit technology available is always used on heavy-duty diesel vehicles operating in the state. Our industry will continue to develop and deliver verified retrofit technologies to achieve significant reductions in PM and NOx emissions from existing diesel vehicles. If the proposed revisions are adopted, we look forward to working with state officials and other interested parties to help make this program a success.

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