**STATEMENT
OF THE
MANUFACTURERS OF EMISSION CONTROLS ASSOCIATION
ON THE U.S. ENVIRONMENTAL PROTECTION AGENCY'S ADVANCED
NOTICE OF PROPOSED RULEMAKING FOR REGULATING GREENHOUSE
GAS EMISSIONS UNDER THE CLEAN AIR ACT**

DOCKET ID NO. EPA-HQ-OAR-2008-0318

November 26, 2008

The Manufacturers of Emission Controls Association (MECA) is pleased to provide comments in support of the U.S. EPA's Advanced Notice of Proposed Rulemaking for Regulating Greenhouse Gas Emissions Under the Clean Air Act. We believe an important opportunity exists to significantly reduce greenhouse gas emissions from mobile sources.

MECA is a non-profit association of the world's leading manufacturers of emission control technology for mobile sources. Our members have over 30 years of experience and a proven track record in developing and manufacturing emission control technology for a wide variety of on-road and off-road vehicles and equipment, including extensive experience in developing emission controls for gasoline and diesel light-duty vehicles in all world markets. Our industry has played an important role in the emissions success story associated with light-duty vehicles in the United States, and has continually supported efforts to develop innovative, technology-forcing, emissions programs to deal with air quality problems.

INTRODUCTION

Anthropogenic activities, particularly the burning of fossil fuels, have changed the composition of the atmosphere in ways that threaten dramatic changes to the global climate. Signs of climate change are evident worldwide and additional changes will have serious impacts on our nation's future. Although transportation is a vital part of the economy and is crucial for everyday activities, it is also a significant source of greenhouse gas (GHG) emissions. Some of the important greenhouse gas emissions from fossil fuel combustion from mobile sources include: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), and black carbon. Climate change is also impacted negatively by higher ground-level ozone emissions. Ozone levels are in turn linked to hydrocarbon and NOx emissions from mobile and stationary sources.

Since the beginning of the industrial revolution, concentrations of CO_2 have increased by nearly 30%, methane concentrations have more than doubled, and nitrous oxide concentrations have increased by approximately 15%. Emissions from the transportation sector contribute about 33% of the CO_2 emissions in the U.S. and accounts for 96% of the radiative-forcing effect from transportation sources. A majority of anthropogenic CO_2 emissions come from combustion of fossil fuels. Despite improvements in vehicle engine efficiency, transportation energy use is expected to grow by 48% between 2003 and 2025. As such, controlling greenhouse gas emissions from the transportation sector is essential to the overall efforts to alleviate long-term impacts on the climate.

There are a large set of technologies that can significantly reduce, either directly or indirectly, mobile source emissions of CO_2, N_2O (as well as other NOx emissions), CH_4, and black carbon. Our comments focus on available exhaust emission control technologies and the impacts these technologies can have on greenhouse gas emissions. In addition, our comments address a number of issues raised by EPA in their Advanced Notice of Proposed Rulemaking with respect to mobile sources and greenhouse gas emissions.

AVAILABLE TECHNOLOGIES TO REDUCE MOBILE SOURCE GHG EMISSIONS

Carbon Dioxide (CO_2)

As the largest source of U.S. greenhouse gas emission, CO_2 from fossil fuel combustion has accounted for approximately 79% of global warming potential (GWP)-weighted emissions since 1990, growing slowly from 77% of total GWP-weighted emissions in 1990 to 80% in 2006. Of the total, transportation activities accounted for 33% of CO_2 emissions from fossil fuel combustion in 2006. The overall rise in U.S. GHG emissions primarily reflects increased emissions of CO_2 as a result of increasing fossil fuel combustion. Over 60% of the CO_2 emissions resulted from gasoline consumption for personal vehicle use and the remaining emissions came from other transportation activities, including combustion of diesel fuel in heavy-duty vehicles. In 2003, about 81% of transportation GHG emissions in the U.S. came from on-road vehicles, with light-duty vehicles accounting for 62% of total transportation emissions. Heavy-duty vehicles were responsible for 19% of total transportation emissions and nonroad vehicles accounted for 16% of all transportation GHG emissions in 2003. There are a large set of technology combinations that are available to reduce greenhouse gas emissions from passenger vehicles and light-duty trucks, including fuel efficient, state-of-the-art and future advanced gasoline and diesel powertrains.

Implicit in federal and state greenhouse emission analyses is the ability of these advanced powertrain options to meet the applicable criteria pollutant emission standards, such as CO, NOx, and non-methane organic gases (NMOG). All of these advanced, light-duty powertrain options combined with the appropriately designed and optimized emission control technologies can meet all current and future federal and state criteria emission requirements. In this manner, advanced emission controls for criteria pollutants enable advanced powertrains to also be viable options for reducing greenhouse gas emissions. A range of powertrain technologies, including engine turbochargers, exhaust gas recirculation systems, advanced fuel systems, variable valve actuation technology, advanced transmissions, hybrid powertrain components, and powertrain control modules that can be applied to both light-duty gasoline and diesel powertrains to help improve overall vehicle efficiencies, reduce fuel consumption, both of which can result in lower CO_2 exhaust emissions. In many cases, the application and optimization of advanced emission control technologies on advanced powertrains can be achieved with minimal impacts on overall fuel consumption.

Light-duty diesel powertrains will see increased interest in North America because of their high fuel efficiency and relatively lower greenhouse gas emissions compared to gasoline engines (on the order of 20-40% higher fuel efficiency and 10-20% lower CO_2 emissions for diesel engines compared to comparable gasoline engines). Advanced emission controls for controlling diesel particulate emissions and NOx emissions from diesel engines allow light-duty diesel engines to achieve comparable criteria pollutant emission levels to gasoline engines.

Significant criteria emission reductions from diesel vehicles can be achieved through the use of several technologies, including:

Diesel Particulate Filters (DPFs)

Diesel particulate filters (DPFs) remove particulate matter in diesel exhaust by filtering exhaust from the engine. DPFs can achieve up to, and in some cases, greater than, 90% reduction in diesel particulate matter (PM). The basis for the design of wall-flow particulate filters is a ceramic honeycomb structure with alternate channels plugged at opposite ends. As the gases pass into the open end of a channel, the plug at the opposite end forces the gases through the porous wall of the honeycomb channel and out through the neighboring channel. The porous wall and the filter cake of particulate matter that forms within and on the surface of the wall serve as the filter media for particulates. Since the filter can fill up over time by developing a layer of retained particles on the inside surface of the porous wall, the accumulated particles must be burned off or removed to regenerate the filter. This regeneration process can be accomplished with a variety of methods including both active strategies that rely on generating external sources of heat (e.g., fuel burners, fuel dosing strategies that utilize fuel combustion over a catalyst, electrical elements, intake air throttling) and passive strategies that utilize catalysts that are displayed directly on the filter element or upstream of the filter.

In addition to wall-flow ceramic particulate filters, exhaust filters are also available based on metal substrates that utilize sintered metal filtering elements and tortuous flow paths for directing the particulate-containing exhaust gases through the sintered filter element.

To date, more than five million DPFs have been installed on light-duty diesel vehicles operating in Europe. New “clean diesel” light-duty models that are already available in the U.S. or will be introduced in the coming years will be equipped with DPFs to meet EPA or ARB emission standards for diesel PM. Nearly all new heavy-duty diesel engines starting with the 2007 model year in the U.S. are equipped with diesel particulate filters to comply with EPA emission standards for diesel PM.

Selective Catalytic Reduction (SCR) and Lean NOx Adsorber Catalysts for Diesel Engines

Selective catalytic reduction (SCR), lean NOx adsorber catalysts, and combinations of these two technologies can be used to significantly reduce NOx emissions from diesel vehicles. SCR system uses a chemical reductant, usually urea solution, to convert nitrogen oxides to molecular nitrogen and oxygen-rich exhaust streams like those encountered with diesel engines. Upon thermal decomposition in the exhaust, urea decomposes to ammonia which serves as the reductant. As exhaust and reductant pass over the SCR catalyst, chemical reactions occur that reduce NOx emissions to nitrogen and water.

Lean NOx adsorber catalysts have characteristics similar to the catalytic converters used on gasoline, stoichiometric engines but with the addition of materials that adsorb NOx under typical lean engine operations. As the lean NOx adsorber catalyst fills up with adsorbed NOx, a short oxygen deficient or fuel rich regeneration cycle is needed to displace the adsorbed NOx and reduce the NOx over available precious metal catalyst sites using hydrocarbon and CO reductants that are available during this rich regeneration step. These lean NOx adsorber catalysts can also adsorb SOx species that may be present in the exhaust and therefore require ultra-low sulfur levels in the fuel to maximize their performance for reducing NOx. In addition to frequent short NOx adsorber regeneration cycles, these catalysts must also be less frequently purged of adsorbed sulfur species.

SCR catalyst and lean NOx adsorber catalysts for diesel combustion strategies are capable of reducing NOx emissions from 70 to 90%. SCR catalysts are already widely used on late model trucks operating in Europe to control NOx (>300,000 trucks) and will be used by most heavy-duty engine manufacturers to comply with EPA's 2010 heavy-duty, on-road NOx emission standards. Lean NOx adsorber catalysts have already seen applications on a few light-duty diesel vehicles sold in Europe and Japan and will be used on smaller new "clean diesel" light-duty diesel engines that will be available here in the U.S. and Japan. The 2009 model year VW Jetta includes a lean NOx adsorber catalyst system for achieving EPA's Tier 2, Bin 5 and California's LEV II LEV NOx emission standards. The 2007 Dodge Ram pick-up, powered by a Cummins diesel engine, became the first heavy-duty vehicle to meet EPA's 2010 on-road, heavy-duty emission standards (three years in advance of the 2010 standards) by using an advanced emission control system that featured a diesel particulate filter and a lean NOx adsorber catalyst.

An early version of Mercedes' BlueTec technology combined a lean NOx adsorber catalyst with an SCR catalyst on the Mercedes E320 sedan first offered for sale in the U.S. in October 2006. Honda has reported on its efforts to combine lean NOx adsorber catalysts with SCR catalysts on the same substrate for future light-duty diesel vehicles that will be sold in the U.S. and Japan. These combined NOx adsorber/SCR systems rely mostly on the NOx adsorber catalyst for NOx reductions with the SCR catalyst serving as a NOx "clean-up" catalyst. Ammonia is produced during the regeneration of the NOx adsorber catalyst and can then be used by the SCR catalyst as an internal source of reductant without the need for external urea injection ahead of the SCR catalyst.

Gasoline Direct Injection Technology

For gasoline vehicles, direct injection technology enables gasoline engines to achieve greater fuel efficiency. In a gasoline direct injection engine, gasoline is directly injected into the cylinder the same way as in a diesel engine. Gasoline direct injection permits more fine-tuned control of the amount of fuel injected as well as control of injection timing independently from valve timing. Gasoline direct injection engines can reduce CO_2 emissions in a number of ways, including better "breathing" efficiency, higher compression ratio, the potential for lean operation and reduction of pumping losses. Gasoline direct injection offers CO_2 emissions reductions ranging from 5% to 20% depending on how it is implemented and the base engine to which it is compared. Again emissions controls ensure that these more fuel efficient gasoline engines meet tough EPA or ARB criteria emission regulations:

- Under stoichiometric conditions, a three-way catalyst can significantly reduce emissions of NOx, HC and CO. The use of three-way catalyst allows for simultaneous conversion of HC, CO, and NOx produced during the combustion of fuel in a spark-ignited engine. Three-way catalyst reduces these air pollutants by up to 99+ percent. The active catalytic materials are present as thin materials on the internal walls of a ceramic or metallic honeycomb substrate. The substrate typically provides a large number of parallel flow channels to allow for sufficient contact area between the exhaust gas and the active catalytic materials without creating excess pressure losses. In 2005, 100% of new cars sold in the U.S. were equipped with a catalytic converter, and worldwide over 90% of new gasoline cars sold had a catalyst.
- Under lean combustion conditions, similar emission control technologies used on diesel vehicles can be used to reduce emissions from lean, gasoline direct injection powertrains. These include particulate filters to reduce PM emissions, and SCR and/or lean NOx adsorber catalysts to reduce NOx emissions.

As stated previously, lean NOx adsorber catalyst performance has a high degree of sensitivity to fuel sulfur levels. The current EPA fuel sulfur limits for gasoline (30 ppm average, 80 ppm cap) are too high to allow lean NOx adsorber catalysts to be a viable NOx control strategy for fuel efficient, gasoline lean-burn engines that employ direct fuel injection technology. EPA should seriously consider lowering gasoline fuel sulfur limits to allow NOx adsorber catalysts to be used on such vehicles in order to provide additional options for reducing greenhouse gas emissions from gasoline vehicles. NOx adsorber catalysts are already commercially used on gasoline lean-burn light-duty vehicles in Europe and Japan because these markets have gasoline fuel sulfur levels available with a maximum sulfur limit of 10 ppm. California will begin to enforce a 20 ppm fuel sulfur cap on gasoline beginning in 2012 and EPA should consider a similar fuel sulfur cap for the rest of the U.S. in this same timeframe.

Diesel-electric and gasoline-electric hybrid vehicles, that combine either a diesel or gasoline engine with elements of an electric-drive powertrain, offer a range of CO_2 emission reduction possibilities, and again advanced emission controls allow these powertrains to meet even the toughest criteria emission regulations.

Emission controls for gasoline and diesel engines are also generally compatible with low carbon, alternative fuels (e.g., gasoline blends with renewable ethanol or biodiesel blends) that can provide additional reductions in mobile source greenhouse gas emissions. However, it is important that specifications associated with any low carbon fuel should be compatible with the use of available exhaust emission control technologies.

Light-Duty Vehicle Test Cycles

In the ANPR, EPA draws attention and asks for comments on the issue of test cycles for light-duty vehicles for the potential purpose of regulating greenhouse gas emissions. Current U.S. light-duty CAFE requirements use the FTP and highway fuel economy test cycles with appropriate weighting to determine a vehicle's fuel economy. The current weighting puts a larger emphasis on fuel consumption during urban driving (FTP test cycle) than highway driving (highway fuel economy test cycle). In the ANPR, EPA notes their recent switch to a 5-cycle approach for light-duty vehicle fuel economy labeling. The rulemaking documents associated with EPA's new fuel economy label requirements provide important information and data that supports the choice of this 5-cycle approach as more representative of how vehicles are driven by U.S. vehicle owners compared to the current CAFE 2-cycle requirement. MECA believes that any regulatory requirements associated with greenhouse gas emissions should be based on real-world driving or usage patterns in order to ensure that regulatory standards reflect actual vehicle operations and deliver the greenhouse gas emission reductions that are needed. Vehicle manufacturers and emission control technology manufacturers need a valid test cycle for greenhouse gas emission to engineer and evaluate vehicles consistent with how they are used by the public. The weighting of the test cycle between urban and highway driving modes will have a significant influence on the choice of powertrain options that will be used to meet any future greenhouse gas emission or fuel economy standards.

Black Carbon

Black carbon is a major component of particulate matter emissions from mobile sources and is believed to have a significant net atmospheric warming effect by enhancing the absorption of sunlight. Black carbon is a mix of elemental and organic carbon emitted by fossil fuel combustion, bio-mass burning, and bio-fuel cooking as soot. Black carbon is a dominant absorber of visible solar radiation in the atmosphere. Anthropogenic sources of black carbon are transported over long distances and are most concentrated in the tropics where solar irradiance is highest. Because of the combination of high absorption, a regional distribution roughly aligned with solar irradiance, and the capacity to form widespread atmospheric brown clouds in a mixture with other aerosols, emissions of black carbon are thought to be the second strongest contribution to current climate change, after CO_2 emissions. According to scientists at the Scripps Institute of Oceanography and University of Iowa, soot and other forms of black carbon could have as much as 60% of the current global warming effect of carbon dioxide. Black carbon plays a major role in the dimming of the surface and a correspondingly large solar heating of the atmosphere. For example, the retreat of the Himalayan-Hindu Kush glaciers is one of the major environmental problems facing the Asian region. The glacier retreat has accelerated since the 1970s and several scientists have speculated that solar heating by soot in atmospheric brown clouds and deposition of dark soot over bright snow surfaces may be an important contributing factor for the acceleration of glacier retreat.

It is estimated that 70% of the black carbon emissions from mobile sources are from diesel-fueled vehicles, with the assumption that 40% of gasoline PM is black carbon and 60% of diesel PM is black carbon. Up to 25% 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. The black carbon concentration and its global heating will decrease almost immediately after reduction of its emission. For these reasons and the growing body of scientific evidence that links black carbon emissions with climate change, MECA believes that EPA should include black carbon emissions as part of its overall greenhouse gas emission control strategy.

Black carbon from diesel vehicles can be significantly reduced through emission control technology that is already commercially available. High efficiency diesel particulate filters (DPFs) on new and existing diesel engines provide nearly 99.9% reductions of 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 global warming potential of black carbon has been estimated to be about 4500 times higher than that of CO_2 on a per gram of emission basis. 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. It is estimated that the installation of DPFs will reduce PM emissions from U.S. heavy-duty diesel vehicles by 110,000 tons per year. Because older diesel engines emit significant amounts of PM, there are also significant opportunities to reduce black carbon emissions through diesel retrofit programs that make use of retrofit DPF technology. The number of vehicles retrofitted, the number of programs, and the interest in new program for DPFs have grown significantly over the past few years with more than 250,000 DPFs installed as retrofits to date in a variety of world markets. Retrofit filters can provide large benefits in human health through reductions in diesel PM and climate change benefits through reductions in black carbon emissions on both existing, on-road and off-road diesel engines.

Since EPA's latest set of standards for new diesel engines (light-duty, on-road, off-road, commercial marine, and locomotive) have set technology-forcing PM standards that will largely be met through the use of diesel particulate filters, EPA should determine effective policies for encouraging or requiring the use of retrofit filters on existing diesel engines as a means of not only providing health-base benefits but also climate change benefits associated with black carbon reductions. EPA needs to finalize its proposed rulemaking for existing stationary diesel engines that would designate diesel exhaust as a hazardous air pollutant (HAP) and mandate that these stationary engines be retrofit with diesel particulate filters. Mandatory particulate matter reductions could also be considered for goods movement activities in a manner similar to the regulatory actions that California has adopted as part of its Diesel Risk Reduction Plan. If mandates are not workable, then EPA and the federal government should consider providing significant financial grants or loan programs that would provide more wide scale opportunities for retrofitting the millions of existing diesel engines that operate today in the U.S. with filter technologies. As an example, the current Diesel Emissions Reduction Act included in the 2005 Energy Act was authorized at $200 million per year for five years but has only seen appropriations of about $50 million in FY 2008.

Nitrous Oxide (N_2O)

While total N_2O emissions are much lower than CO_2 emissions, N_2O is approximately 310 times more powerful than CO_2 at trapping heat in the atmosphere. One of the anthropogenic activities producing N_2O in the U.S. is fuel combustion in motor vehicles. In 2006, N_2O emissions from mobile source combustion were approximately 9% of total U.S. N_2O emissions. It is estimated that the N_2O emissions account for about 2% of the total GHG emissions from a typical light-duty vehicle. N_2O is emitted directly from motor vehicles and its formation is highly dependent on temperature and the type of emission control system used. Temperatures favorable for N_2O formation are achieved inside catalytic converter systems, especially during cold-start conditions when engine temperatures are lower.

Catalyst efficiency and age are also important factors in N_2O formation. At higher efficiencies and lower ages, N_2O formation is lower. In addition to direct N_2O emissions, NOx emissions from mobile and stationary sources have a significant impact on atmospheric N_2O levels. On late model light-duty gasoline vehicles, modern three-way catalyst-based emission control technology is effective at controlling nitrous oxide emissions. Tightening of NOx emission standards over time with the parallel introduction of more effective emission control systems have resulted in lower emissions of N_2O from today's vehicles compared to older vehicles certified to less stringent NOx standards. The performance of NOx emission control technologies for diesel vehicles such as SCR catalysts and lean NOx adsorber catalysts can also be optimized to minimize N_2O emissions from diesel engines.

Methane (CH_4)

According to the United Nation's International Panel on Climate Change (IPCC), methane is more than 20 times as effective as CO_2 at trapping heat in the atmosphere. Over the last 250 years, the concentration of CH_4 in the atmosphere has increased by 148%. Methane is a byproduct of imperfect fuel combustion. Methane emissions from mobile sources are emitted from exhaust from vehicles using hydrocarbon fuels, but the anthropogenic contribution of road transport to the global methane inventory is less than 0.5%. Emissions of CH_4 are a function of the type of fuel used, the design and tuning of the engine, the type of emission control system, the age of the vehicle, as well as other factors. Although CH_4 emissions from gasoline vehicles are small in terms of global warming potential when compared to N_2O emissions, they can be high in natural gas-fueled vehicles, as methane is the primary component of natural gas.

On light-duty gasoline vehicles, modern three-way catalyst-based emission control technology is effective at reducing all hydrocarbon exhaust emissions including methane. Tightening of hydrocarbon emission standards over time with the parallel introduction of more effective emission control systems have resulted in lower emissions of methane from today's vehicles compared to older vehicles certified to less stringent standards. Catalyst designs can also be optimized in concert with engine control strategies to oxidize methane exhaust emissions from motor vehicles, including vehicles that operate exclusively on natural gas or bi-fuel vehicles that can operate on either natural gas or gasoline. EPA could also consider including methane in future hydrocarbon vehicle or equipment emission standards (as is currently done in Europe, as opposed to non-methane-based hydrocarbon vehicle or equipment standards) as a strategy to directly limit methane emissions from mobile sources.

Ground-Level Ozone

There is a significant linkage between ground level ozone concentrations and climate change impacts. One example was detailed by a group of researchers from the United Kingdom in a 2007 *Nature* publication. In this work, ground-level ozone was shown to damage plant photosynthesis resulting in lower carbon dioxide uptake from plants that have been exposed to higher levels of ozone. Other studies have shown that increasing average annual temperatures are likely to result in even higher levels of ozone in the environment. Emission reductions aimed at lowering ambient ozone levels, such as lower emissions of volatile organic compounds (VOCs) and NOx, will have a positive impact on climate change, as well as human health. Policies that aim to reduce ambient ozone levels may also become more necessary and important to either mitigate the climate change impacts of ground level ozone or to mitigate higher ozone levels that result from climate change. To that end, EPA's future actions on climate change must still include strategies that will provide lower ambient ozone levels across the U.S. Earlier in 2008, EPA revised the national ambient air quality standard for ozone downward and states will be challenged to put together implementation plans for meeting these new ozone standards in the coming year. Even though EPA has finalized aggressive criteria emission standards for many mobile source categories that began their implementation in this decade and continue into the next decade, there are still opportunities for further reductions in hydrocarbon and NOx emissions from new mobile source categories that should be a part of the tools that EPA can offer states for meeting the new ozone standard and perhaps even lower ozone ambient levels that will be driven by climate change and human health impacts.

MECA believes EPA should consider future regulatory actions on the following mobile source categories:

1. Tighter emission requirements for replacement gasoline vehicle catalytic converters

EPA has not revised its requirements for replacement converters for gasoline vehicles since 1986. Three-way catalytic converter technology has improved significantly in the 20+ years since this last action on aftermarket converters. California will be implementing new regulations starting in January 2009 that will require a higher performance level and durability requirement for these aftermarket converters. These new California regulations are estimated to reduce hydrocarbon and NOx emissions from existing light-duty vehicles operating in the state by over 30 tons/day. EPA should quickly follow California's lead with a national aftermarket converter program that has equivalent performance levels to those adopted by California.

2. Tighter emission standards for new light-duty vehicles

EPA's recently-issued 2007 Vehicle and Engine Compliance Activities Report indicates that light-duty vehicle manufacturers are meeting existing Tier 2 emission standards with a large compliance margin. California is moving forward with another round of light-duty vehicle emission standards that will aim to push all light-duty vehicles into significantly lower emission certification levels, on average, sometime in the next decade. Emission control technology options for both light-duty gasoline and diesel vehicles are either available or evolving to allow all new light-duty vehicles to perform at exhaust emission levels at or near the current Tier 2, Bin 2 limits. EPA should finalize a Tier 3 light-duty vehicle emission program that would require significant further reductions of hydrocarbon and NOx emissions, with implementation in the 2015 timeframe.

3. Tighter NOx standards for new heavy-duty, on-road engines

EPA's 2010 heavy-duty, on-road engine program requires NOx emission limits of 0.2 g/bhp-hr. Advanced diesel engines with improved combustion and air handling systems have shown the potential of achieving engine-out NOx emission levels of at least 0.5 g/bhp-hr. Continued evolution of diesel engine technology combined with state-of-the-art SCR catalyst systems that combine SCR catalysts coated directly on PM filter substrates should allow for NOx emission performance significantly below the EPA 2010 standard. EPA should seriously consider another round of NOx emission reductions from heavy-duty on-road engines that would be implemented in the 2016 timeframe.

4. Tighter emission standards for new on-road motorcycles

EPA's 2010 and California's 2008 emission standards for on-road motorcycles are still not equivalent to either EPA's Tier 2 or California's LEV II vehicle emission standards. The larger on-road motorcycles that make-up the majority of motorcycle sales in the U.S. should be required to meet exhaust emission standards that are equivalent to today's vehicle emission standards. Closed-loop three-way catalysts teamed with advanced fuel injection and engine controls should allow on-road motorcycles to perform on an emissions basis that is equivalent to today's light-duty vehicles.

5. Tighter emission standards for off-road motorcycles and ATVs

Current emission standards for both of these mobile source categories can be met without the use of three-way catalysts. This technology can easily be applied to these off-road motorcycles and ATV engines and provides additional, significant reductions of hydrocarbons and NOx. The standards for these off-road vehicles should be at least as stringent as EPA's 2010 on-road motorcycle standards.

6. Tighter emission standards for outboard marine SI engines

This is another mobile source category that can benefit from the implementation of catalytic exhaust control technology for further reducing HC and NOx emissions. There are challenges for implementing catalysts on outboard marine gasoline engines, but sound engineering designs and mounting strategies should allow catalysts to be used on these engines.

7. Tighter emission standards for SI engines used in handheld, non-handheld, and larger off-road equipment

EPA recently finalized new exhaust and evaporative emission standards for Class I and Class II SI engines used on non-handheld equipment. When originally proposed, these standards were based on the use of catalytic converters to meet tighter Phase 3 HC+NOx exhaust emission standards. Engine manufacturers continue to improve and evolve engine designs for handheld and non-handheld equipment applications and in even larger applications of off-road SI engines (e.g., generators, fork lifts). Recently finalized Class II engine exhaust standards now appear to be achievable with only engine and fueling modification, without the application of catalysts. Further reductions of hydrocarbon and NOx exhaust emissions are technically feasible from all of these mobile source categories by combining available catalytic converters with improved engine designs. California has already put in place significantly lower HC+NOx emission standards for off-road gasoline engines >25 hp compared to EPA's 2007 standards for these same engines. MECA asks EPA to review the available technologies for all these classes of off-road SI engines and set future standards that combine catalytic controls with best-in-class engine technologies.

SUMMARY

Looking ahead, transportation greenhouse gas emissions are forecast to continue increasing rapidly, reflecting the anticipated impact of factors such as economic growth, increased movement of freight by trucks, ships, and rail, and continued growth in personal travel. The transportation sector is the largest source of domestic CO_2 emissions, producing 33% of the nation's total in 2006. There are significant opportunities to reduce

greenhouse gas emissions from the transportation sector through the design of fuel efficient powertrains that include advanced exhaust emission controls for meeting even the most stringent criteria pollutant standards. MECA believes that advanced emission control systems have a critically important role in future policies that aim to reduce mobile source greenhouse gas emissions. These emission control technologies allow all high efficiency powertrains to compete in the marketplace by enabling these powertrains to meet current and future criteria pollutant standards. In nearly all cases, these fuel-efficient powertrain designs, combined with appropriate emission controls, can be optimized to either minimize fuel consumption impacts associated with the emission control technology, or, in some cases, improve overall fuel consumption of the vehicle. This optimization extends beyond carbon dioxide emissions to include other significant greenhouse gases such as methane and nitrous oxide. In the case of gasoline vehicles, additional climate change benefits could be obtained by lowering gasoline fuel sulfur levels to enable the use of lean NOx adsorber catalysts on gasoline lean-burn engines.

Any EPA actions to reduce greenhouse gas emissions from light-duty vehicles needs to employ test cycles that reflect real-world usage of these vehicles to ensure that reductions are meaningful and target driving modes that have the largest impacts on fuel use.

Diesel particulate filters are particularly effective at removing black carbon emissions from diesel engines and effective climate change policies should include programs aimed at reducing black carbon emissions from existing diesel engines through effective retrofit programs that implement filters on the full range of in-use diesel engines operating in the U.S.

Ground level ozone also has a strong linkage to climate change. EPA needs to continue its efforts to review and adjust criteria pollutant programs for all mobile sources going forward to not only provide needed health benefits from technology-forcing emission standards but also the co-benefits these emission standards have on climate change.

CONTACT:
Joseph Kubsh
Executive Director
Manufacturers of Emission Controls Association
1730 M Street, NW
Suite 206
Washington, D.C. 20036
Tel.: (202) 296-4797
E-mail: jkubsh@meca.org