**STATEMENT OF THE
MANUFACTURERS OF EMISSION CONTROLS ASSOCIATION
ON THE U.S. ENVIRONMENTAL PROTECTION AGENCY'S PROPOSED
RULEMAKING TO ESTABLISH 2017 AND LATER MODEL YEAR LIGHT-DUTY
VEHICLE GREENHOUSE GAS EMISSION STANDARDS AND CORPORATE
AVERAGE FUEL ECONOMY STANDARDS**

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The Manufacturers of Emission Controls Association (MECA) is pleased to provide comments in support of the U.S. EPA's proposed rulemaking to establish 2017 and later model year light-duty vehicle greenhouse gas emission standards and corporate average fuel economy standards. We believe an important opportunity exists to significantly reduce greenhouse gas emissions and improve fuel economy from passenger cars, light-duty trucks, and medium-duty passenger vehicles.

MECA is a non-profit association of the world's leading manufacturers of emission control technology for mobile sources. Our members have over 40 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.

The experience of our industry over the last 40 years vividly demonstrates the connection between vehicle emission regulation and economic development. Prior to 1970, our industry did not exist. But, with the enactment of the Clean Air Act in 1970, our industry has flourished, developing successive generations of technology to meet ever tightening regulatory standards. Since the introduction of the catalytic converter in 1975, more than 500 million light-duty vehicles have been sold in the United States equipped with exhaust and evaporative emission control technologies developed by our industry. This generated an estimated $250-$300 billion in economic activity since 1975. In 2010 alone, our industry generated $12 billion of economic activity and accounted for 65,000 U.S. jobs, mostly in manufacturing.[1] EPA's greenhouse gas emission standards on light-duty and heavy-duty vehicles are also aiding in the development of a thriving U.S. industry focused on a wide range of technologies that can reduce vehicle greenhouse gas emissions.

Controlling greenhouse gas emissions from the transportation sector is essential to the overall efforts to alleviate long-term impacts on the climate. As detailed in EPA's proposal, there are a large set of technology combinations that are available to reduce greenhouse gas

[1] Manufacturers of Emission Controls Association, "MECA Highlights Economic Benefits of Mobile Source Emissions Control Industry," March 11, 2011 press release (see www.meca.org).

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 gas 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. Auto manufacturers will also take advantage of synergies between advanced emission control technologies and advanced powertrains to assist in their efforts to optimize their performance with respect to both greenhouse gas and criteria pollutant exhaust emissions.

Future light-duty diesel powertrains will continue to use emission control technologies like diesel particulate filters, NOx adsorber catalysts, and selective catalytic reduction catalysts to meet EPA's light-duty exhaust emission standards. Emission control manufacturers are working with their auto manufacturer partners to further optimize these emission control technologies to be more effective at reducing criteria pollutants and play a role in reducing vehicle greenhouse gas emissions. Advanced diesel emission control technologies like particulate filters with lower backpressure characteristics, SCR catalysts with improved performance at lower exhaust temperatures, and SCR catalyst coated directly on particulate filter substrates are examples of emerging diesel emission control technologies that will allow future diesel powertrains to not only be as clean as gasoline engines from a criteria pollutant perspective, but deliver improved fuel consumption characteristics and lower greenhouse gas emissions. The use of diesel particulate filters also delivers significant reductions in black carbon emissions from diesel engines, a combustion emission that also has important climate change impacts.

For gasoline vehicles, direct injection technology enables gasoline engines to achieve greater fuel efficiency and is expected to be a dominant pathway to meeting future light-duty greenhouse gas emission standards. Again emissions controls ensure that these more fuel efficient gasoline engines meet tough EPA or California criteria emission regulations. Under stoichiometric conditions, three-way catalysts are used to achieve ultra-low emissions of NOx, HC and CO. Advanced high performance, three-way catalysts are available and will continue to evolve and be optimized to ensure that future gasoline direct injection engines will meet the toughest criteria pollutant emissions standards with minimal impacts on overall vehicle exhaust system backpressure and fuel consumption.

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. 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. MECA believes that EPA should lower gasoline fuel sulfur limits to a 10 ppm national average to allow NOx adsorber catalysts to be used on such vehicles in the future in order to provide additional options for improving the efficiency and reducing greenhouse gas emissions from gasoline vehicles.

Tightening of hydrocarbon and NOx emission standards over time with the parallel introduction of more effective emission control systems have resulted in lower emissions of N_2O and CH_4 from today's vehicles compared to older vehicles certified to less stringent hydrocarbon and NOx standards. The performance of advanced emission control technologies for advanced diesel, gasoline, and natural gas-fueled powertrains can also be optimized to minimize N_2O and CH_4 emissions from future light-duty vehicles consistent with the limits EPA set for these important greenhouse gas emissions in their first round of light-duty vehicle greenhouse gas emission standards.

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. Engine operating strategies and emission control catalyst formulations, however, often need to be optimized depending on fuel composition to ensure that criteria pollutant emission standards are met. It is also important that specifications associated with any low carbon fuel should be compatible with the use of available exhaust emission control technologies.

Current U.S. light-duty CAFE/greenhouse gas emission requirements both use the FTP and highway fuel economy test cycles with specified weighting to determine a vehicle's fuel economy. The current weighting puts a larger emphasis on fuel consumption (or greenhouse gas emissions) during urban driving (FTP test cycle) than highway driving (highway fuel economy test cycle). EPA recently switched 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 and optimization of powertrain options that will be used to meet any future greenhouse gas emission or fuel economy standards. Work is already underway in Geneva, Switzerland under the United Nations GRPE harmonization umbrella to bring forward a new light-duty vehicle test cycle for use in quantifying real world greenhouse gas emissions. EPA and California should utilize test cycles for the purpose of measuring and controlling vehicle greenhouse gas emissions that are representative of real world driving patterns.

MECA also believes that EPA's proposed advanced technology vehicle credits should be expanded to include other ultra-low GHG vehicle technologies beyond battery electric vehicles, plug-in hybrids, and fuel cell electric hybrids. MECA believes that it is important for these advanced technology vehicle credits to be technology neutral in order to provide a more level playing field that encourages vehicle manufacturers to put into the market a range of technologies that can offer significant reductions in GHG emissions. Examples of other types of advanced vehicles that should also be considered for such credits are dedicated natural gas vehicles or vehicles that employ carbon emission capture strategies. MECA believes that it is too early in the development process for EPA to pick advanced technology vehicle "winners." MECA urges EPA to expand the vision of advanced technology vehicle credits in its final rule with a more technology neutral approach.

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.

MECA believes that further reductions of hydrocarbon and NOx emissions from the existing light-duty vehicle fleet can be achieved by revising the current EPA aftermarket converter performance requirements. California has 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 eliminates the sale of older aftermarket converter products that have modest performance standards and a limited 25,000 mile warranty, and requires that higher performance and more durable OBD-compliant aftermarket converter products be used on both non-OBD and OBD-equipped vehicles (ARB implemented their revised aftermarket converter requirements 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.

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. A recent study published in a 2009 issue of *Nature Geoscience* (vol. 2, 2009) by researchers from the NASA Goddard Institute and Columbia University found that black carbon is responsible for 50% of the total Arctic warming observed from 1890 to 2007 (most of the observed Arctic warming over this timeframe occurred from 1976 to 2007).

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 as high as 4,500 times higher than that of CO_2 on a per gram of emission basis. To meet EPA's 2007-2010 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. Current California and EPA light-duty emission standards for diesel particulate matter also require the use of a high efficiency DPF on new light-duty diesel vehicles.

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 programs 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. California has already tackled black carbon emissions from existing mobile sources through its ambitious Diesel Risk Reduction Plan and their associated regulatory initiatives that target the reduction of diesel particulate emissions from existing diesel engines over the next fifteen years. In many of these California regulatory programs existing diesel engines will need to be retrofit with high efficiency DPFs or replaced/repowered with engines that are equipped with high efficiency filters by OEMs. Similar regulatory programs could be implemented within other states or by EPA to reap the public health and climate change co-benefits associated with reductions in black carbon emissions. Incentive funding programs like California's Carl Moyer program or the federal Diesel Emission Reduction Act (DERA) also can be used as a strategy for mobile source retrofit programs at the state or federal level that target black carbon reductions. Incentive funds for filter retrofits might also be generated by a state or national greenhouse gas cap-and-trade programs.

In summary, 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, nitrous oxide, and black carbon. In the case of gasoline vehicles, additional climate change benefits could be obtained by lowering federal gasoline fuel sulfur levels to enable the use of lean NOx adsorber catalysts on gasoline lean-burn engines. MECA commends EPA for taking important steps to reduce greenhouse gas emissions and improve fuel economy from light-duty vehicles. Our industry is prepared to do its part and deliver cost-effective, advanced emission control technologies to the market.

CONTACT:
Joseph Kubsh
Executive Director
Manufacturers of Emission Controls Association
2020 14th Street North
Suite 220
Arlington, VA 22201
Tel.: (202) 296-4797
E-mail: jkubsh@meca.org