Statement of the

DIESEL TECHNOLOGY FORUM

Before the

United States Senate

Committee on Environment and Public Works
Subcommittee on Clean Air and Nuclear Safety

Hearing on Black Carbon

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Washington DC

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INTRODUCTION

Good Morning. My name is Allen Schaeffer and I serve as Executive Director of the Diesel Technology Forum, a not-for-profit educational group representing the nation's leading diesel engine, vehicle and equipment manufacturers, fuel refiners and suppliers, and those that manufacture emissions control technology as well as allied organizations.

We appreciate the opportunity to appear today before the Subcommittee today and would like to address the following issues relative to diesel technology and emissions of black carbon and particulate matter:

- The importance of diesel technology to the global economy and issues related to black carbon emissions;
- The new generation of clean diesel technology and what it offers in terms of fuel savings and emissions reductions and how it is being accepted;
- The availability and effectiveness of strategies to reduce emissions from existing engines; and
- The impacts of new technology and upgraded existing engines and equipment regarding emissions of particulate matter/black carbon, nitrogen oxide emissions.

A. Diesel Technology Plays a Key Role in the Global Economy and a declining role in black carbon emissions

Today's hearing is focused on emissions of black carbon and cost-effective technologies strategies and federal programs with the highest potential to reduce black carbon emissions. One of the technologies at the center of today's hearing is diesel technology-- that is diesel engines, fuels and equipment. As such a focus, it is important to understand the significance of diesel power to the US economy.

Because of its unmatched combination of power, performance and energy efficiency, diesel technology is the workhorse of the US and global economy, powering over 90 percent of commercial trucks, more than three-fourths of all transit buses, 100 percent of freight locomotives and marine work boats and two-thirds of all farm and construction equipment. Diesel engines are also relied upon for back up emergency electrical generators, stationary pumps and other industrial equipment.

- Diesel is the power behind the US economy contributing $480 billion annually in the forms of engines, equipment and fuels with a significant influence on 16 sectors of the economy from Agriculture to Wholesale Trade.
- Diesel is a job engine in every state, and account for about 1.25 million jobs-- engineering, manufacturing, servicing in every state of the U.S.
- Diesel is a productivity multiplier: $1 earned by diesel enables another $4.50 of added value elsewhere in the economy; and finally
- Diesel is an export powerhouse -- Diesel engines, fuel and equipment are high-value U.S. exports (5 times the average export value), accounts for 4.4 percent of all exports ($46.2 Billion).

1. Diesel engines are a declining contributor to black carbon emissions

According to the 2012 EPA Black Carbon Report to Congress, the US accounts for about eight percent of global black carbon emissions. Of that, 52 percent comes from mobile sources, and 93 percent of that is attributed to diesel engines. EPA projects this percentage will decline 86 percent by 2030 "largely due to controls on new diesel engines."[1]

Our testimony will focus on technologies designed to reduce particulate matter emissions-- of which black carbon is a component--, from diesel engines and incentives to reduce particulate matter emissions from existing diesel engines applied across the wide spectrum of diesel applications here in the United States.

B. The New Generation Of Clean Diesel Technology Delivers Dramatic Reductions In Particulate Matter And Other Emissions; is Widely Accepted And Being Rapidly Deployed In Key Sectors Of The Economy;

[1] "Report to Congress on Black Carbon. Department of the Interior, Environment, and Related Agencies Appropriations Act, 2010." March 2012. P.8. http://www.epa.gov/blackcarbon/2012report/fullreport.pdf

For the last thirteen years, the diesel industry has been on a journey to reduce emissions to near zero levels. Today I am pleased to report that we have arrived at our destination. Engines manufactured today to meet current U.S. Environmental Protection Agency (EPA) emissions requirements result in dramatic reductions in particulate matter and other criteria pollutants including oxides of nitrogen.

Beginning in 2000, EPA established a regulatory pathway for highway diesel engines to reach near zero emissions in a ten year period. In 2004, regulations were also established for the many categories of off-road diesel engines and equipment setting forward a similar set of emissions goals. Thanks to the adoption and widespread availability of ultra-low sulfur diesel fuel beginning in 2006, engine manufacturers were able to deploy innovative emission control solutions to radically reduce particulate matter and oxides of nitrogen emissions.

Across the wide spectrum of new diesel engine applications, particulate matter emissions have now reached near-zero levels.

As shown in **EXHIBIT 1**, for heavy duty on-road commercial trucks and buses, particulate matter and oxides of nitrogen emissions have decreased 98 percent relative to an engine manufactured in 1988. For example, an engine manufactured in 1988 emitted 0.6 grams of particulate matter/brake-horsepower-hour (g/bhp-hr); (EPA's standard unit for HD emissions measurement). EPA regulations in place for engine model year 2007 that mandated new clean diesel standards, required 0.1 (g/bhp-hr) and 2010 emissions standards require 0.01 g/bhp-hr for particulate matter – a significant advancement towards near zero emissions. In 2010, the final component of the EPA emissions regulations was implemented that resulted in near-zero emissions for nitrogen oxides (NOx).

1. New Clean Diesel Engines are Rapidly Gaining Ground in the Trucking Industry

Not only are these new engines near zero emissions but they are also gaining acceptance in the trucking industry and delivering tangible clean air benefits today. According to data recently compiled by R.L. Polk and depicted in **EXHIBIT 2,** almost one-in-three heavy duty trucks deployed across the wide spectrum of heavy duty on-road applications today is now of 2007 or newer vintage of clean diesel standards. These engines are found on highways and in communities and towns today in the form of heavy-duty work trucks, buses, fire trucks, short-haul and long-haul trucks and tractor combinations.

- According to research commissioned by the Diesel Technology Forum, these heavy duty on-road engines that meet or exceed 2007 U.S. EPA clean diesel emissions criteria have already contributed to a reduction of 27,000 tonnes of particulate matter and almost 1 million tonnes of oxides of nitrogen.

Significant emissions benefits are achieved for emissions other than particulate matter. A decade long pursuit to improve fuel economy and achieve greenhouse gas emissions reductions, including carbon dioxide (CO2) are also being realized in the heavy-duty on-road sector. The first ever fuel economy and greenhouse gas reduction requirements for commercial vehicles and engines were adopted in 2011 for model year 2014 to 2018 and some truck and engine

manufacturers are already meeting these requirements a year early. Significant fuel savings and greenhouse gas emissions will be achieved thanks to investment in innovative technologies.

- According to research commissioned by the Diesel Technology Forum, fuel economy and emissions control technologies deployed on trucks beginning in 2007 reduced fuel consumption by 560 million gallons of fuel, or 13 million barrels of crude oil and reduce CO2 emissions by 5.7 million tonnes. We expect these fuel savings and emissions reductions to continue with new investments in innovative engine, emissions and vehicle designs.

Similarly impressive emission reduction gains, including black carbon associated with particulate, have been achieved in the heavy duty off-road population of engines found in construction, agricultural, mining, maritime and other applications. Given the wide diversity in engine size and applications in the off-road sector, EPA regulations adopted in 2004 provided for a gradual phase-in of these clean diesel requirements according to a tiered approach beginning with smaller size engines several years ago.

The final phase of the so-called Tier 4 emissions requirements has already been met with the smaller and highest volume off road engines and equipment. Beginning January 1 2014, these near-zero standards will also be met by the larger engines manufactured beginning in 2014 and 2015 as shown in **EXHIBIT 3**. These Tier 4 final engines are used for example in very large earthmoving machines and marine work boats.

C. Efforts to Replace and Retrofit the Population of Existing Engines Contributes to Significant Emissions Reductions

Diesel engines are known for their durability and reliability, and it is not unusual to see vehicles and equipment with engines purchased a decade ago, or even earlier, still in service, and of value to those who own and use this equipment in their businesses.

In the course of developing cleaner diesel engines and fuels, many modern emission control technologies were found also to be suitable for deployment on existing vehicles and equipment. Owners of existing diesel powered vehicles and equipment could dramatically reduce emissions, including particulate matter, by investing in these devices without scrapping the entire vehicle or equipment.

“Diesel retrofit” has become a term of art reflecting a number of strategies and choices for modernizing and upgrading existing diesel engines. The term has come to encompass efforts to retrofit existing engines with modern emissions control devices, repower older equipment or vehicles by purchasing a new engine or rebuilding a new engine to meet newer standards or refueling the equipment to operate on clean fuels. In some instances, the term also incorporates scrapping the vehicle or equipment and purchasing new.

Congressional leaders recognized as early as April 2004 the value and potential of clean diesel technology and the opportunity for upgrading existing engines. A diverse array of 32 groups came together to provide input on what was to become the Diesel Emissions Reduction Act (DERA) in 2005, authorizing up to $200 million annually. At last count, almost 1,000 groups

and organizations have signed on in support of this program.

DERA has improved America's air quality by modernizing older diesel engines and equipment through engine replacements and retrofits. According to EPA's Second Report to Congress, funding appropriated between 2008 and 2010 retrofitted, repowered or replaced over 52,000 older engines found on a wide variety of applications from school buses, long haul trucks, construction equipment and even ferryboats.[2] Diesel particulate filters and oxidation catalysts were the most popular technology choice among vehicle and equipment owners comprising almost half of all chosen emission reduction technologies. Retrofit funding provided between 2008 and 2010 resulted in over 12,000 tons of particulate matter emissions reduced and over 200,000 tons of NOx – an impressive achievement that provides real air quality benefits to almost every community.

There is still a viable opportunity and role for federal efforts to incentivize continued equipment modernizing and upgrading activities. While DERA was never intended to modernize and upgrade all existing engines and equipment, there are still many opportunities today where federal funding assistance could accelerate introduction of low-emissions technologies in key uses or geographic regions. Additionally, DERA has provided federal funds in a competitive process that encourages the private sector and states and localities to also provide funding matches. By doing so, DERA has been able to leverage roughly three dollars in non-federal funding for every federal dollar to generate air quality benefits.

In addition to the DERA program, a provision included in the Congestion Mitigation and Air Quality Program (CMAQ) authorized under federal surface transportation spending legislation signed into law in July 2012, allows that states with particulate matter non-attainment areas may spend up to 25% of their CMAQ allocation to retrofit construction equipment used in federal highway projects. This program has the potential to provide significant additional retrofit funding to targeted regions with air quality concerns and may also provide substantial and tangible air quality benefits.

D. Acquisition of New Technology and Upgrading of Existing Diesel Engines Reduce Particulate Emissions/Black Carbon

The introduction of new engines and retrofitted older engines results in impressive reductions of black carbon, a component of particulate matter, a short lived climate pollutant that contributes to global warming. As mentioned earlier, new clean diesel engines emit 98% less particulate matter compared to an engine manufactured in 1988. Thanks to cleaner diesel engines, some researchers estimate that particulate matter emission reductions from diesel engines in the U.S. may mitigate up to 15% of the U.S. contribution to a warming planet.

Black carbon, also known as soot, is thought to have a net warming effect on the earth by absorbing light and turning that energy into heat. It also is believed to darken the surfaces of ice

[2] Second Report to Congress: Highlights of the Diesel Emissions Reduction Program, US EPA December 2012. http://www.epa.gov/cleandiesel/documents/420r12031.pdf

and snow when deposited on them, reducing their ability to reflect light while increasing heat absorption and melting.

Thanks to the introduction of clean diesel technologies, U.S. black carbon emissions are expected to fall precipitously. As noted previously, the EPA estimates that, as of 2005, prior to the introduction of clean diesel technology, 52% of U.S. black carbon emissions were attributable to diesel engines. Forest fires, biomass burning such as wood stoves and residential heating comprise much of the remaining source of black carbon emissions. Globally cook stoves, furnaces and forest fires are the largest contributor to black carbon. EPA estimates that black carbon emissions will decline by 86% due largely to diesel emissions regulation in place for new engines and the continued retrofit of older engines.[3]

The California Air Resources Board (CARB) also concluded that strict diesel emissions standards including those for particulate matter and retrofit activities contribute to a significant decrease in black carbon emission in California. By 2015, CARB estimates that on- and off-road diesel equipment and vehicles will represent less than 9% of particulate matter emissions. Residential heating and road dust will contribute more to soot emissions. Thanks to the rapid adoption of clean diesel technologies, diesel engines will fall from the 6th largest contributor in soot emissions in 2010 to the 12th largest by 2015.[4]

Climate scientists estimate that clean diesel technologies deployed in California alone may mitigate global warming effects by 5% to 15%.[5] The success of diesel emission reduction strategies in the U.S. has not gone unnoticed by the international community. In part based on the success of reducing black carbon emissions from diesel engines in the U.S. the United National Environment Program (UNEP) is working with partners across the globe to urge the adoption of clean diesel fuel and engines.

E. Conclusions

Diesel engines play a key role in the US and global economy. The U.S. is a leader in emission reduction strategies that improve air quality and in turn may reduce the impact of global warming. Thanks to investments in cleaner fuels, engines and emission control technologies, diesel emissions have fallen by orders of magnitude to near zero levels. These advances have reduced the contribution of diesel engines to black carbon emissions dramatically and further reductions are projected by the US EPA thanks to the adoption of new clean diesel technology.

[3] P.8. "Report to Congress on Black Carbon. Department of the Interior, Environment, and Related Agencies Appropriations Act, 2010." March 2012. http://www.epa.gov/blackcarbon/2012report/fullreport.pdf

[4] California Air Resource Board, California Emissions Projection Analysis Model

[5] California Air Resources Board, Symposium: "Black Carbon Reductions in California and its Implications for Regional and Global Climate Change Mitigation". Veerabhadran Ramanathan, Ph.D. and Lynn M. Russell, Ph.D. July 23, 2013

While new engines are meeting near-zero emissions levels, incentives in place can help the owners of existing equipment improve emissions as well, and there are further opportunities for the federal government to encourage and incentivize continued progress.

The US is a leader in clean diesel technology and our investments in these technologies have not gone unnoticed in markets overseas. Diesel technology is one of the most export intensive industries comprising over 4% of U.S. exports or $46.2 billion. One in four diesel engines manufactured in the U.S. is ultimately destined for a market overseas.

Investment in clean diesel technologies continues as engine, vehicle and equipment manufacturers and fuel producers work to further reduce emissions and in the case of highway vehicles, meet aggressive new targets for fuel efficiency improvements and CO2 reductions.

Thank you for the opportunity to appear today and I would be happy to answer any questions.

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(Exhibits Follow)

EXHIBIT 1

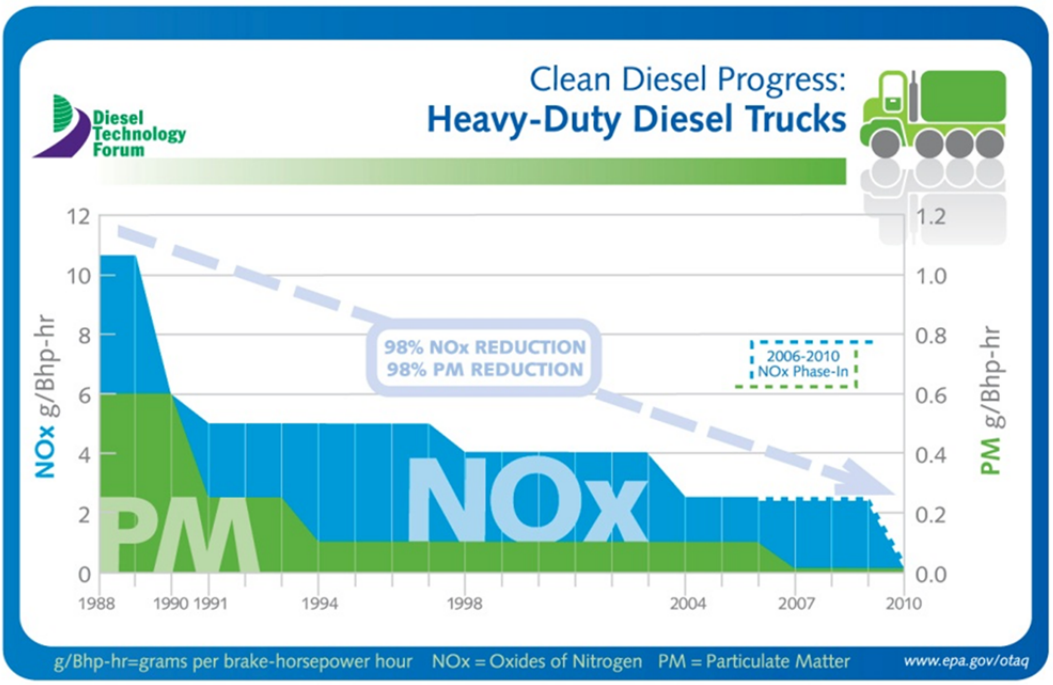

EXHIBIT 2

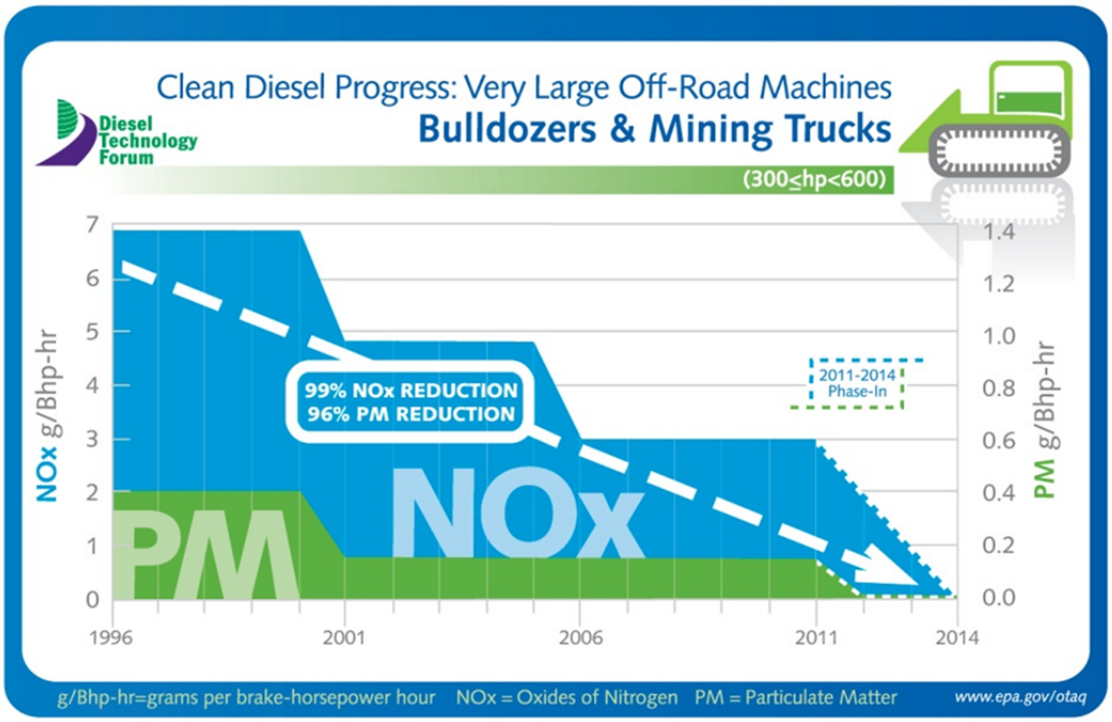

Exhibit 3

29% of all heavy-duty trucks on the road are 2007 and newer

... and 11 % are 2010 and newer

2010 model or newer have near-zero emissions *(NOx + PM)*