DIESEL TECHNOLOGY FORUM

DATE: July 15, 2015

TO: Floyd V. Vergara, Esq., P.E.
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California Air Resources Board

FROM: Allen Schaeffer
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SUBJECT: Comments for the July 8 Public Workshop to Discuss Cutting Petroleum Use in Half by 2030

On behalf of the Diesel Technology Forum I would like to submit these comments regarding the July 8th public symposium to discuss efforts to reduce petroleum consumption by 50 percent by 2030 as outlined by Gov. Brown in his January 2015 inaugural speech and codified by SB 350, (De Leon).

These comments apply primarily to the California's consideration of medium and heavy duty commercial vehicles and off road engines and equipment powered by diesel engines.

By way of background, the Diesel Technology Forum represents manufacturers of diesel engines, components, emission control devices and producers of ultra-low sulfur and bio-based diesel fuels[i]. Our members are the leaders in clean diesel engines, vehicles and technology that are committed to advancing state-of-the-art diesel equipment to reduce smog-forming pollutants and greenhouse gases while greatly improving fuel economy.

Summary

Diesel engines are the workhorse of California's economy. California has been a leader in progressive policies that today result in new technology diesel engines being near-zero in emissions. As California works to achieve the bold vison of reducing petroleum consumption, there are many opportunities to leverage the new near-zero emissions clean diesel technology for immediate progress toward climate and clean air goals. We urge you to prioritize petroleum reduction today – why wait?

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At present, however, the near-singular vision of wide-scale electrification of the transportation fleet by 2030 is built on many assumptions, with a much higher degree of uncertainty, particularly as it applies to medium and heavy duty vehicles and on and off road machines and equipment. In some cases, electrification of medium and heavy-duty commercial vehicles may never be technologically feasible or practicable on a wide scale basis.

The real-world rate of adoption and availability of both electric vehicles and infrastructure depend on many factors beyond government policies and incentives. In any case, the majority of the benefits from any such vision or strategy of full electrification are likely to accrue starting only in the outward most years.

In the interim, between now and a fully electrified future, we believe that California's strategy toward a 50 percent reduction in petroleum must take a much more balanced approach; one that places higher value on near-term, available and proven petroleum reduction strategies particularly in commercial vehicles and off road engines and equipment, which consume large quantities of petroleum.

California must reconsider policy, financial incentives and funding allocations that are today tipped largely in favor of alternative technologies and the regions and sectors of California most likely to benefit from those.

The current approach to advance electrification will likely result in widening gaps of disparity in air quality and technology for residents and regions in California where electrification may come late or not at all. More densely populated cities are already having access to newest and heavily subsidized technologies, while other parts of California wait decades or more to see any of the environmental and other benefits anticipated from the new technology.

Because diesel engines are so prevalent in California and play such a significant role in the economy, there are several specific actions regarding diesel engines, vehicles and equipment and their use that the state of California should consider to meet petroleum reduction, clean air and greenhouse gas reduction goals:

- New technology diesel engines that are near zero emissions are available today in both light-duty and on and off road heavy-duty applications. Taking immediate steps to accelerate their adoption by customers will have dramatic, immediate, positive impact on petroleum and greenhouse gas reductions as well as co-benefits of reduced criteria pollutants such as NOx and PM. By doing so, California would achieve cleaner air faster, more petroleum reduction sooner, and reduced emissions of GHG faster.

- Advanced biofuels such as renewable diesel that are drop-in replacements for petroleum diesel are available now and could lead to immediate reductions in CO_2 up to 90 percent on a lifecycle basis as well as reductions in NOx and PM .

- The cost-benefit of incentivizing the accelerated adoption of existing clean diesel technology and fuels to a near 100 percent penetration should be thoroughly analyzed and investigated and juxtaposed alongside benefits of longer-term and more speculative investments in more exotic technologies and fuels still in development that are many years from commercial deployment.

- Incentives in existing clean diesel technologies and low-carbon fuels would provide immediate real-world benefits to disadvantaged communities, most of which today have no legitimate access to wide-scale use of same.

- The Air Resources Board must identify, compare and consider petroleum reduction, climate and clean air benefits of enhancements to the operations and efficiency gains at the jobsite and farm as well as the goods movement infrastructure (port clearance and travel, dedicated truck lanes, congestion relief, vehicle access and configuration, platooning, and other operational measures).

Discussion

Diesel engines have made enormous advancements in reducing emissions and improving fuel economy, accruing large, measureable benefits to California today. The development of these clean air and fuel-saving technologies are due to the ongoing collaboration between industry and government regulators including the Air Resources Board.

Increasing production of first- and second-generation bio-based diesel fuels has the potential to further offset petroleum consumption and improve the emission performance of new technology diesel engines and even older in-use engines. While enormous advancements have been made to refine engines, emissions after-treatment technologies and increase the quality of bio-based fuel, California could greatly benefit from the adoption of more of these clean air and fuel saving technologies today.

Analyzing the immediate-term benefits that would accrue to California of greater adoption of new on- and off-road vehicles and equipment would prove a worthwhile exercise. To that end, we request that the Air Resources Board undertake the following analysis:

- Examine the benefits to California of increasing the share of new Class 3-8 diesel vehicles and Tier 4 compliant off-road equipment over the next three, five, ten

and fifteen year periods, in terms of petroleum use and criteria pollutant reduction, as well as air toxics benefits and short lived climate pollutants such as black carbon, that would accrue.

For example, what are the petroleum reduction and clean air benefits that would accrue by 2020, 2025 and 2030, if an accelerated turnover of existing medium and heavy duty diesel vehicles resulted in penetrations of fifty, seventy five or one hundred percent of the medium- and heavy-duty fleet powered by a new engine, or an engine that meets the model year 2010 and newer emission standard?

- What are the benefits to the Central Valley and other agricultural regions of replacing existing engines and equipment with the latest Tier 4 near-zero emissions equipment? What is the magnitude and temporal profile of such a strategy and how does it contribute to clean air compliance as well as petroleum reduction?

- In addition to the previous two requests, what are the additional regional and local benefits of expanded use of second generation renewable diesel fuel in these new technology diesel engines?

- In addition, CARB should evaluate its current and existing policies and programs that could increase the uptake in new vehicles and equipment to provide immediate benefits for all Californians. Such policies changes might include:

    - Amending eligibility requirements for the Carl Moyer Program, to enable acquisition of new technology engines as a viable project rather than only incentivizing compliance above the existing standards,
    - Changing the tax code, i.e. waiving state sales taxes on the purchase of 2010 emissions-compliant machines, trucks and equipment, and
    - Using revenue from the Greenhouse Gas Reduction Fund for purchase rebates for the latest on- and off-road vehicles and equipment.

Such policy innovations would reduce petroleum consumption and provide immediate clean air benefits for all Californians.

Broaden the Focus

Increasingly, efficiency gains and reductions in fuel consumption are concepts that are now well beyond the traditional model of changes to just the vehicle, machine, engine or fuel composition. Rather, today's leaders in diesel technology look broadly at the use of

the vehicle or machine on the road or at the jobsite. CARB must also change its mindset to be able to calculate, consider and encourage fuel saving strategies that go beyond engines, vehicles and equipment to provide further clean air and petroleum reduction benefits.

For example, on the trucking side, improved roads, reduced traffic congestion and other infrastructure improvements along with changes to the way transportation assets are used have enormous untapped potential to greatly contribute to clean air, climate and petroleum reduction goals. Nationally, the SmartWay program managed by the U.S. Environmental Protection Agency (EPA) that brings together transportation providers and their customers to share business practices to improve fuel efficiency, has greatly contributed to a reduction in petroleum use and clean air benefits. In California, efforts have been underway in the ports of Los Angeles and Long Beach to consider a truck appointment system to alleviate dray truck congestion and reduce fuel use.

Off road engine and equipment makers are deploying advanced integrated command and control guidance and automation systems to enable their machines to work using less fuel, less idle time, communicate with other equipment on the jobsite and utilize GPS for precision guidance. These strategies all reduce petroleum consumption and emissions as well. For example, the Federal Highway Administration estimates that the use of advanced GPS systems and three-dimensional modeling on job sites can enhance equipment productivity by 50 percent while reducing fuel use and equipment idling that cuts carbon emissions by 40 percent.[ii]

Advanced Diesel Technologies Are On the Road and At Work Today Providing Clean Air and Benefits to All Californians

Thanks to the decades-long collaboration between industry and regulators, including the Air Resources Board (ARB), the latest clean air and fuel savings technologies have been developed and deployed in on- and off-road applications in California. The regulatory pathway established jointly by the U.S. Environmental Protection Agency (EPA) and the ARB has resulted in the cleanest in-use vehicles and equipment in California. Emissions milestones established for model year 2010 heavy-duty vehicles resulted in a 98 percent reduction in emissions of particulate matter and oxides of nitrogen relative to a vehicle manufactured in 1988.

According to research commissioned by the Diesel Technology Forum, 120,429 of the Class 3-8 vehicles in operation in California in 2014 meet the latest emissions standards set for model year 2010. These vehicles include everything from large vocational pickups to busses and first responder vehicles, urban delivery trucks and large Class 8 tractors. Since 2010, they have provided substantial fuel savings and emission reduction benefits in California by eliminating:

- 120,000 tons of NOx
- 580,000 tons of carbon emissions
- 1.4 million barrels of crude oil consumption

Current research suggests that new heavy-duty clean diesel vehicles are achieving emissions well below the maximum allowable levels. According to the "Advanced Combustion Engine Study (ACES): Phase 2" research conducted by the Southwest Research Institute and the Coordinating Research Council, heavy-duty clean diesel engines result in real world emissions below the regulated threshold[iii]. This study analyzed the emissions from three heavy-duty on-road engines manufactured in 2010 and found that emissions of PM were more than 80% below the 2010 requirement and emissions of NOx 60% below the standard.

While natural gas is viewed as a clean alternative to diesel in heavy-duty applications, clean diesel and natural gas engines display almost identical emissions profiles. In many cases, a clean diesel engine and a comparable natural gas engine emit nearly identical levels of NOx and PM. According to a recent study commissioned by the non-profit, Boston-based Clean Air Task Force, a diesel engine and a comparable natural gas engine both manufactured in 2010 resulted in indistinguishable emissions relative to a comparable diesel engine manufactured in 2000[iv].

California also stands to benefit substantially from the first-ever fuel economy rule for heavy-duty vehicles. We are already 18 months into the Phase 1 fuel economy requirement for Class 3-8 vehicles. The U.S. EPA and the U.S. Department of Transportation estimate that these rules will reduce carbon emissions by 270 million tons and reduce the consumption of petroleum by 530 million barrels of crude oil before the rule expires in 2014. California stands to benefit the most from fuel savings technologies already hitting the marketplace as the state is home to the largest heavy-duty fleet in the country.

Off-road equipment including construction, agricultural, forestry, mining, marine and locomotives now must meet similar clean air requirements. New engines manufactured beginning in 2014 must meet similar emission reduction requirements according to the "Tier 4" milestone. Emissions of NOx and particulate matter follow a similar path of on-road engines to near-zero. Engine and equipment manufacturers also are deploying advanced fuel saving technologies along with productivity and safety enhancements that further improve consumption of fuel from the latest off-road equipment.

Diesel's Capacity for Bio-based Fuel Enhances Petroleum Reduction and Further Clean Air Benefits

The diesel engine is unique in its ability to operate on various fuels beyond traditional petroleum-based diesel fuel. In fact, over a century ago the diesel engine was originally

conceived as operating on a fuel derived from peanut oil. Today, not much has changed. New technology diesel engines and older engines that may still be in-use can operate on high quality bio-based fuel that further add to diesel's petroleum reduction and clean air accolades.

Bio-based diesel fuel is traditionally blended into petroleum fuel much like ethanol in gasoline. Unlike ethanol used primarily in gasoline passenger vehicles, most heavy-duty diesel engines can operate on higher blends of high-quality bio-based diesel fuel up to twenty percent.

First- and second-generation bio-based diesel fuel is derived from a variety of feedstocks, including industrial and agricultural waste such as plant oils, animal fats, used cooking oils, algae and even waste paper. The EPA considers first-generation biodiesel an advanced biofuel capable of reducing carbon emissions by at least 50 percent, while second-generation renewable diesel is capable of reducing carbon emissions by 90percent and can be used at higher blend levels. Renewable diesel fuel is being sold now at retail outlets in California at 98.5 percent blend levels.

Nationwide, first-generation biodiesel production has expanded to over 1.2 billion gallons in 2014. The proposed federal Renewable Fuel Standard would see this expand to almost 2 billion gallons by 2017.

Consumption of bio-based diesel fuel in California is expanding exponentially. According to the California Energy Commission (CEC), over the three years from 2010 to 2013, consumption of first-generation biodiesel has expanded from 5 million gallons to 49 million gallons, an 880 percent increase.

California is also unique in its demand for second-generation renewable diesel. According to the CEC, consumption of renewable diesel has expanded from 2 million gallons in 2010 to 136 million gallons in 2013. Renewable diesel is derived from similar feedstocks as biodiesel but, due to production characteristics, results in a clean hydrocarbon leading to further reduction in criteria pollutants, including NOx, along with up to a 90 percent reduction in carbon intensity.

Bio-based diesel fuels have great potential to add to the already impressive fuel savings and emission performance of new technology diesel engines. These fuels also help reduce emissions from older in-use engines, vehicles and equipment in California that may not be deployed with the latest advanced engine and aftertreatment technologies.

When it comes to displacing petroleum, reliance on bio-based diesel fuel will be important. The CEC estimates that by 2020, the state will consume 400 million gallons of renewable diesel and 177 million gallons of biodiesel. <u>In total, bio-based diesel fuels will displace 3.6 billion gallons of petroleum-based diesel fuel.</u>

Further Advances in Renewable Fuels

While first- and second-generation bio-based fuels are available today, producers are hard at work developing the next generation of fuels. Some are developing micro-organisms capable of feeding on carbon emissions to generate clean diesel fuel, while others are using algae to do much the same work. These feedstocks are out of the laboratory and scaling up to deliver clean diesel fuels.

Policies Are Needed to Encourage Greater Adoption of New Technology Diesel

On- and off-road vehicles and equipment deployed with the latest clean air and fuel savings technologies are providing benefits to California today. Greater immediate benefits including reduction of petroleum use, NOx and greenhouse gas reductions, are at hand if vehicle and equipment owners were encouraged to adopt more of this equipment today. According to research commissioned by the Diesel Technology Forum, just under 30 percent of Class 3-8 vehicles in operation in California meet or exceed the model year 2007 emissions standard while only 13 percent of Class 3-8 vehicles in operation meet or exceed the stricter model year 2010 standard.

While California has adopted strict policies to reduce emissions from the heavy-duty fleet, other states have a higher market penetration of new technology diesel engines. For example, Indiana leads the country with more than 60 percent of its Class 3-8 heavy-duty diesel fleet powered by an engine that meets or exceeds the model year 2007 emissions standard.

The ARB and the CEC have much technical expertise providing incentive funding to encourage adoption of emerging technologies. Much of this funding is designed to develop unproven technologies or increase market penetration of available but nascent technologies. For example, according to the CEC, $54.4 million has been provided for the purchase of 2,735 natural gas trucks. Despite funding provided to this technology, natural gas vehicles make up less than 2 percent of the heavy-duty truck fleet, or about 13,000 vehicles in California. Another $74.6 million has been provided for advanced truck technology demonstration projects. While public funding has been provided for testing of electric and battery-electric applications, these technologies are not yet available or ready for commercial use.

Prioritize Petroleum Reduction Today – Why Wait?

A greater share of public funds should be set aside today to encourage the adoption of clean air and fuel savings technologies that are available today and have been proven in the market place, alongside funding to test nascent or emerging technologies. Changes to the tax code to encourage the adoption of the latest vehicles that meet strict emission standards could also help speed along the turn-over in the heavy duty fleet to provide substantial progress toward petroleum reduction goals. Such policies include

waiving state sales tax or the inclusion of bonus depreciation for the purchase of a new vehicle.

Other existing policies, particularly those used to promote adoption of advanced off-road technologies, could be altered to encourage greater use of Tier 4 compliant equipment. Off-road engines and equipment generally remain in use much longer than on-road vehicles due to their longer lifecycles, presenting challenges when it comes to promoting the adoption of the latest clean air and fuel savings technology.

The Carl Moyer Program has been an enormously successful program helping to encourage off-road equipment owners purchase advanced technologies that exceed regulatory requirement. However, with the successful roll-out of the Tier 4 standards for most off-road equipment in 2014 and 2015, these engines are now at near-zero emissions, meaning that available equipment in the market place today does not exceed the latest regulatory requirement.

This criteria of incentivizing compliance above the standard was a valuable strategy over the last decade, but today this criteria hampers the acquisition of newer technology rather than enabling the introduction of newer technology. The program should be amended to expand the eligibility requirement to include the latest clean air and fuel savings technologies.

The state should set aside substantially more funds from Greenhouse Gas Reduction Fund (GGRF) to help incentivize the purchase of the latest clean air and fuel efficient on- and off-road technologies to generate immediate term benefits. The FY 2014-2015 funding plan for transportation and sustainable communities through the GGRF does not include off-road engines and equipment as an eligible category beyond passenger rail.

Very few of the funds provided through the GGRF are allocated to medium- and heavy-duty vehicles. The few funds that are allocated flow to truck demonstration projects that provide no immediate benefits for impacted communities or incentivize hybrid and all-electric technologies that have not been commercially accepted in the marketplace. The use of a portion of GGRF to incentivize the latest commercially accepted engine and vehicle technologies will provide immediate, cost-effective clean air and petroleum reduction benefits.

Look Beyond Vehicles and Engines to Consider Policies that Provide a Low-Cost Path to Reduce Fuel Use and Improve Air Quality

While engine, vehicle and equipment manufacturers continue to invest in developing and bringing to market innovative fuel sipping and clean air technologies, policy makers should look beyond traditional vehicles, equipment and emissions standards when considering policies to reduce petroleum use and improve air quality. For example,

maintaining transportation infrastructure can have an enormous impact in alleviating congestion. The Urban Mobility Report published by the Texas Transportation Institute estimates that in 2012, American motorists and truckers spent an extra 5.5 billion hours stuck in traffic and consumed an extra 2.9 billion gallons of fuel while going nowhere.[v] Many of the latest fuel savings technologies will not provide much benefit when vehicles are stuck in traffic.

Changes to business practices by the goods movement industry have enormous potential to further reduce congestion related fuel consumption and make better productive use of expensive transportation assets. According to the SmartWay program administered by the EPA, smarter and more efficient business practices have contributed to reducing petroleum consumption by 120 million barrels of crude oil and carbon emissions by over 51 million tons while eliminating 780,000 tons of NOx since 2004.[vi] The SmartWay program seeks to bring together shippers, logistics providers and transportation carriers to share knowledge about business practices to reduce fuel use including efforts to reduce idle times, promote better driving habits for truckers and improve overall freight efficiency.

In the ports of Los Angeles and Long Beach, efforts are underway to consider a truck appointment system to stagger drayage truck arrival times of the roughly 16,000 trucks that call the port each day and diminish long lines of idling trucks. These are just a few examples of innovative ways to make efficient use of expensive transportation assets that save businesses in both fuel cost and other transportation related costs and have enormous potential to contribute to petroleum reduction, clean air and carbon reduction goals in California.

Summary

Diesel engines, vehicles and equipment have undergone a successful transformation to near zero emissions today thanks to collaboration between regulators and industry partners. New technology diesel engines in on- and off-road applications are exponentially cleaner and more efficient than equipment manufactured a few decades ago. The clean air and petroleum reduction capabilities of diesel is further improved given clean diesel's capacity to operate on very low carbon intensity bio-based fuels that are increasingly available today.

While these technologies are available in on- and off-road applications today, greater adoption of the latest proven clean diesel engines could provide greater immediate term clean air benefits for all Californians while also helping to contribute to petroleum reduction. We encourage ARB to undertake an analysis of immediate term benefits that would accrue to California from expanded adoption of new vehicles and equipment along with expanded use of renewable diesel fuel. We also encourage the ARB and

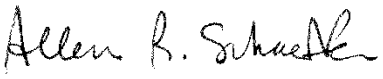
other agencies to consider policies to promote greater adoption of these proven technologies. We encourage you to consider:

- Amending eligibility requirements for the Carl Moyer Program for the purchase of new Tier 4 compliant off-road equipment
- Supporting changes in tax policy to encourage the purchase of new on- and off-road equipment including a waiver of sales tax or use of bonus depreciation
- Use of auction revenue through the Greenhouse Gas Reduction Fund to help provide immediate term benefits to communities through greater adoption of the latest on- and off-road technologies

As the Air Resource Board, the legislature and other stakeholders consider efforts to reduce petroleum, we encourage everyone to also look beyond engines, fuels and vehicle technologies and also consider the state of transportation infrastructure and how we all use transportation assets to help meet California's clean air and climate goals.

Please feel free to contact us with any questions or concerns at (301) 668-7230.

Sincerely,



Allen Schaeffer
Executive Director

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[i] For a full list of current members visit www.dieselforum.org/members
[ii] http://www.fhwa.dot.gov/everydaycounts/edctwo/2012/3d.cfm
[iii] http://www.healtheffects.org/Slides/AnnConf2013/Khalek-TuesPM.pdf
[iv] "Clean Diesel versus CNG Buses: Cost, Air Quality, & Climate Impacts". http://www.catf.us/resources/publications/files/20120227-Diesel_vs_CNG_FINAL_MJBA.pdf
[v] *2012 Annual Urban Mobility Report*. Texas A&M Transportation Institute. http://mobility.tamu.edu/ums/
[vi] SmartWay Partnership Benefits. http://www.epa.gov/smartway/about/documents/basics/420f14034.pdf