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Building an Environmentally & Socially Responsible Future

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Testimony of
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Before the
United States Senate Committee on Finance
Subcommittee on Energy, Natural Resources, and Infrastructure
Natural Gas Vehicles: Fueling American Jobs, Enhancing Energy Security, and Achieving Emissions Benefits

December 3, 2014

Chairman Bennet, Ranking Member Cornyn, and Members of the Committee:

Thank you for the invitation to testify today about the potential air quality benefits presented by natural gas vehicles.

My name is Rich Kassel, and I am a senior vice president at Gladstein, Neandross & Associates (GNA).[1] GNA is an environmental consulting firm specializing in low-emission, alternative fuel and advanced vehicle technologies, infrastructure, and fuels for on-road and off-road applications. For more than twenty years, GNA projects have helped demonstrate the feasibility of natural gas and other alternative fuels and advanced vehicle technologies in a wide range of applications.

Although I am testifying solely on behalf of GNA today, my testimony is based on our work with dozens of clients in every corner of the natural gas vehicle world, including:

- Companies that are converting their truck fleets from diesel to natural gas to cut their emissions and operating costs
- Class I railroads, marine vessel operators, and others that are investigating the potential use of natural gas to cost-effectively meet stringent EPA and/or international emissions standards that will be implemented in the next few years

[1] For more information, I can be reached at rich.kassel@gladstein.org or (646) 783-4090.

- Engine and other companies that make the equipment that powers natural gas vehicles
- Fuel companies and utilities that sell natural gas for transportation use
- Government agencies and non-profit environmental organizations that we work with across a wide range of transportation issues

More personally, I have been involved in natural gas vehicle issues since the 1990s, when I directed the "Dump Dirty Diesels" campaign for the Natural Resources Defense Council. In those days, there was no such thing as a "clean diesel." During that time, I helped develop some of the nation's first large-scale natural gas vehicle programs, including a program that brought hundreds of natural gas transit buses to New York City and the surrounding suburbs.

More recently and equally relevant to today's hearing, I co-chaired the task force that developed the Truck Replacement Program at the Port Authority of New York and New Jersey, which successfully eliminated the oldest, dirtiest port drayage trucks at the busiest port in the eastern U.S. through a series of targeted financial incentives.

Introduction and Summary

Natural gas vehicles provide clean, safe, cost-effective transportation across a wide range of vehicle types. Because most natural gas used in our country is produced here, using natural gas reduces our dependence on foreign oil and creates American jobs. Converting operations to natural gas often pairs an upfront capital cost for the vehicle, the fueling infrastructure, or both with considerable savings in fuel costs.

Switching to natural gas tends to be more cost-effective as the engine gets larger or as fuel consumption goes up. Thus, the most cost-effective natural gas applications tend to be found among truck fleets that use a great deal of fuel, or in high horsepower applications like mining, locomotives, and marine engines. For example:

- A long-haul truck travelling 120,000 miles annually may use 20,000 gallons of diesel per year (in contrast to a typical school bus, which drives 10 percent of those miles)
- A locomotive might use 250,000 gallons and a container ship can use more than 35,000,000 gallons per year.[2]

[2] Neandross, Erik. *Natural Gas Vehicles in California*. California Energy Commission Integrated Energy Policy Report Update Workshop. CEC Hearing Room, Sacramento, CA. 23 Jun. 2014. Conference

It is important to be clear that, with the implementation of EPA's Highway Diesel Rule,[3] Nonroad Diesel Rule,[4] and Locomotive and Marine Diesel Rule,[5] all new engines are certified to extremely clean levels, regardless of the fuel used. Particulate matter (PM) and nitrogen oxides (NOx) emissions from new heavy-duty, nonroad, locomotive, and large marine engines are certified at emissions levels that are more than 90 percent lower than the engines they replace.

Consequently, the main challenge is to create mechanisms that accelerate (1) the retirement, retrofitting, or rebuilding of the millions of "dirty diesels" that remain in use, and (2) their replacement with cleaner engines that meet EPA's most current PM and NOx standards *in the most cost-effective manner possible*. According to our research, between roughly 7 and 8 million trucks are on the road today that predate EPA's PM standard, comprising roughly two-thirds of the trucks in use nationwide.[6] Choosing the most cost-effective approaches will accelerate the clean-up of these trucks by spreading the finite pool of investment dollars as widely as possible.

Across the goods movement spectrum, asset turnover is slow, and it will take decades to replace the existing generation of dirtier engines with the next generation of cleaner engines. This is true for trucks, locomotives, and ships—in other words, all of the

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Presentation; Gladstein, Neandross & Associates (2014). *LNG Opportunities for Marine and Rail in the Great Lakes, Gulf of Mexico, and Inland Waterways*. Santa Monica, CA.

[3] "Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements". Environmental Protection Agency. Federal Register Vol. 66, No. 12, January 18, 2001. http://www.gpo.gov/fdsys/pkg/FR-2001-01-18/pdf/01-2.pdf.

[4] "Control of Emissions of Air Pollution From Nonroad Diesel Engines and Fuel". Environmental Protection Agency. Federal Register Vol. 69, No. 124. June 29, 2004. http://www.gpo.gov/fdsys/pkg/FR-2004-06-29/pdf/04-11293.pdf.

[5] "Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression-Ignition Engines Less Than 30 Liters per Cylinder". Environmental Protection Agency. Federal Register Vol. 73, No. 126, June 30, 2008. http://www.gpo.gov/fdsys/pkg/FR-2008-06-30/pdf/R8-7999.pdf.

[6] GNA independent analysis, 2014 and EPA, Second Report to Congress: Highlights of the Diesel Emission Reduction Program, 2012 (hereafter, "EPA Second Report to Congress"), Figure 1, Page 7, accessed at http://www.epa.gov/cleandiesel/documents/420r12031.pdf. Since 2007, all new heavy-duty truck engines have had to meet a 0.01 g/bhp-hr PM standard. We estimate that there are 3.8 million trucks in use that were manufactured in 2007 or later, comprising 35.7 percent of the nation's truck fleet. These trucks would have been equipped with diesel PM filters that reduce PM by more than 90 percent, compared with engines that do not have these filters. We estimate that 6.9 million trucks on American roads (i.e., 64.4 percent) predate that standard, and therefore are unlikely to be equipped with diesel PM filters. EPA does not keep a current tally of trucks by model year, but previously projected that roughly 8 million pre-2007 trucks would be on the road in 2014 and roughly 7 million pre-2007 trucks would be on the road in 2015.

means by which goods are delivered from their point of manufacture to their point of sale or delivery. In nonroad niches like farming, construction, mining, and oil & gas development, turnover rates can be even slower.

Accelerating the pace of replacing this "legacy" fleet of engines and equipment is *the* critical factor in reducing the aggregate emissions from the transportation sector. Nobody drives an old, dirty truck because they prefer its smoking tailpipe or rattling engine. They do so because they cannot overcome the initial capital cost of a new truck.

Tax policies that accelerate the pace of turnover by helping fleets and other stakeholders get over the hurdle of high, upfront capital costs and into the most cost-effective long-term fleet strategies will go a long way towards reducing emissions across the entire transportation sector. Because of the unique economic characteristics of the natural gas vehicle market (i.e., higher upfront capital costs, lower ongoing fuel costs), tax policies that incentivize and accelerate the purchase of natural gas engines or equipment will provide particularly important means of accomplishing the economic, energy, and environmental objectives that will be achieved by replacing the entire legacy fleet.

In my testimony, I will highlight two areas of potential air quality benefits from the use of natural gas in a range of transportation applications. These are:

- Natural gas can provide lower "in-use" emissions than diesel—and even cleaner natural gas engines are on the way
- Lower fuel costs can accelerate the phase-out of the millions of remaining "dirty diesels" in trucking and other diesel vehicle niches

Natural gas can provide lower in-use emissions than diesel—and even cleaner natural gas engines are on the way

As I have noted above, all new engines are dramatically cleaner than the engines they replace, on a certification basis, regardless of the fuel used. However, in the real world, engines do not operate in the controlled environment of EPA certification tests. "In-use" data provide evidence that natural gas engines can perform better than comparable diesel engines in a number of scenarios.

A recently published study conducted by California's South Coast Air Quality Management District (SCAQMD) and West Virginia University found that three-way catalyst stoichiometric natural gas vehicles emit significantly lower NOx emissions than

diesel vehicles in refuse, goods movement, and transit applications.[7] (The diesel vehicles were equipped with selective catalytic reduction, or SCR, emission controls). This finding was particularly pronounced in operations like port drayage and refuse applications, which involve periods of considerable idling. In these applications, natural gas trucks emitted 91% lower and 20% lower NOx emissions, respectively, than comparable SCR-equipped diesel trucks. Interestingly, the tailpipe exhaust global warming potential (i.e., including both carbon dioxide and methane emissions) of the natural gas vehicles was also lower than the diesel vehicles—by 22% for refuse trucks and by 6% for the goods movement application.

Looking ahead, we see several areas of optimism for even greater environmental performance from natural gas engines in the transportation sector:

- Harrison Clay of Clean Energy Renewable Fuels is testifying today about the potential for using renewable natural gas (RNG). RNG is the only alternative fuel available in commercial quantities today that can meet 100 percent of the fuel requirements of a full-sized tractor-trailer truck, achieve a 90 percent greenhouse gas reduction compared to diesel, leverage existing natural gas infrastructure, and be cost-effectively sold at a substantial discount to current diesel prices.
- A new generation of natural gas engines is being developed for high horsepower transportation applications such as locomotives, mining equipment, and ships. We expect these engines to use high-pressure direct injection engines or comparable technologies that will enable them to meet EPA's upcoming Tier 4 standards while offering the potential for up to 25% greenhouse gas emissions reductions. We expect to see these engines in the marketplace in or near 2017. Indeed, one locomotive manufacturer has already reported that their natural gas locomotives reduce greenhouse gas emissions by 20% compared to their comparable diesel engine, and exceeds current EPA Tier 3 emission standards.[8]
- In the marine sector, new EPA and International Maritime Organization (IMO) requirements have dramatically cut the amount of sulfur allowed in the marine fuel used by large category 3 (C3) ships used in the Emission Control Area (ECA) that extends 200 nautical miles from most of the U.S. coastline. Since natural gas has only trace amounts of sulfur, it can be a less expensive way to

[7] Carder, Daniel et al. Center for Alternative Fuels, Engines, & Emissions West Virginia University (2014). *In-Use Emissions Testing and Demonstration of Retrofit Technology for Control of On-Road Heavy-Duty Engines*. Prepared for the South Coast Air Quality Management District (Contract No. 11611).
[8] Lenz, Marti. *EMD Locomotives: Pulling Freight with Natural Gas*. High Horsepower Summit. Ernest N. Morial Convention Center, New Orleans, LA. 9 Oct. 2014. Conference Presentation.

comply with these sulfur limits over the long run than the competing compliance strategy that involves switching to a higher-cost, low-sulfur distillate or diesel fuel and adding an additional emissions control technology such as scrubbers or SCR. This is especially true in the case of vessels that operate solely within the ECA.

- Recently, California adopted optional low NOx exhaust emission standards for highway truck and bus engines that are 50 to 90% cleaner than EPA's current standard.[9] Natural gas engines are already on the path to meeting the low NOx requirements without the use of additional emissions control technologies. For example, the 2013 model year Cummins ISL G natural gas engine is already certified at 35% below EPA's NOx standard and 50% below its PM standard.[10] We understand that natural gas engines that emit 90% below the current EPA NOx standard are already being tested and will be commercially available in the 2017-2018 timeframe.[11] These natural gas engines will play an important role in meeting California's current and future ozone targets, and are likely to play an important role in other nonattainment areas, especially after the recently proposed National Ambient Air Quality Standard for ozone is finalized and implemented.

Lower fuel costs can accelerate the phase-out of the millions of remaining "dirty diesels" in trucking and other diesel vehicle niches

Even without tax incentives, lower fuel prices are shifting some truck and other transportation niches to natural gas. As noted above, the key factor is using enough fuel to overcome the initial capital cost of switching to natural gas.

For a number of large, national fleets, the higher upfront cost of natural gas project development can be mitigated on a reasonable timetable, given the long useful life and high fuel consumption of the vehicles, thereby allowing the fleets to reap long-term cost savings. GNA estimates that a heavy-duty truck travelling 57,000 miles per year can see an annual fuel cost savings of $11,400, at a price spread of $1.50 per diesel-gallon-

[9] California Air Resources Board. *Public Meeting to Consider Five Regulations or Regulatory Amendments to Reduce Greenhouse Gas and NOx Emissions for On-Road Medium- and Heavy-Duty Trucks.* Monthly Board Meeting, Item 1. Sacramento, CA. 12 Dec. 2013.

[10] California Air Resources Board, Executive Order A-021-0588 for engine family DCEXH0540LBH, December 2012.

[11] Neandross, Erik. *Natural Gas Vehicles in California*. California Energy Commission Integrated Energy Policy Report Update Workshop. CEC Hearing Room, Sacramento, CA. 23 Jun. 2014. Conference Presentation.

equivalent (DGE). This would yield a simple payback timeframe of 4.4 years.[12] Indeed, GNA has surveyed more than 200 fleets across the country, which collectively operate almost 60,000 vehicles. From this work and our other research, we estimate that the average pay back of a truck in a regional goods movement operation can be as short as 2.2 years (in contrast, a lower-mileage utility truck can take four times as long to become cost-effective).[13]

Calculations like this have helped a number of large truck fleets commit to natural gas. Thus, UPS committed to purchasing 1,000 NGVs in 2014, 90 percent of Waste Management's new fleet purchases are fueled by natural gas each year, and Frito-Lay has committed to replacing its entire heavy-duty fleet with compressed natural gas (CNG) in 3 years.[14] At a more regional level, Kwik Trip, a convenience store chain in the Midwest, has found that their investment in CNG trucks gives them a 48% cost advantage compared to diesel, which continues to drive additional vehicle purchases.[15]

Unfortunately, for smaller fleets, the hurdle of initial capital costs remains a severe barrier to entry, preventing the investment in natural gas technologies that could clean up their fleet and lower their long-term operating costs. This underscores the importance of effective policy and grant funding opportunities to accelerate the turnover rate of these aging fleets to advance air quality goals.

It is worth noting the cost savings possible with using liquefied natural gas (LNG) in certain high horsepower applications. At a fuel price spread of $1.38 per DGE, LNG costs 41 percent less than diesel on an energy-equivalent basis.[16] Therefore, despite a capital investment in the millions of dollars for a cargo ship or ferry, payback may only take 3-5 years due to the significant fuel cost savings.[17] Converting a dry bulk ship operating in the Great Lakes can offer more than $1 million in annual fuel cost savings and a payback period of only 3.3 years, assuming an annual diesel usage of 1.35

[12] Gladstein, Neandross & Associates (2014). *Wyoming LNG Roadmap*. Santa Monica, CA.
[13] Information gathered by GNA during fleet surveys and other research in 2013.
[14] Neandross, Erik. *Natural Gas Vehicles in California*. California Energy Commission Integrated Energy Policy Report Update Workshop. CEC Hearing Room, Sacramento, CA. 23 Jun. 2014. Conference Presentation.
[15] Exel Gord. *NGV Fuel Economy.* Alternative Clean Transportation Expo. Long Beach Convention Center, Long Beach, CA. 6 May 2014. Conference Presentation.
[16] Gladstein, Neandross & Associates (2014). *Wyoming LNG Roadmap*. Santa Monica, CA.
[17] Gross, Leif. *LNG Engine Solutions for Today's Ships.* High Horsepower Summit. Ernest N. Morial Convention Center, New Orleans, LA. 9 Oct. 2014. Conference Presentation.

million gallons.[18] In the rail sector, we estimate that an operation that utilizes 150,000 diesel gallons per year could see an annual fuel cost savings of more than $100,000 per locomotive per year, yielding a payback timeframe of 7 years.[19]

The role of tax incentives to accelerate fleet turnover through the use of natural gas; specific recommendations

At GNA, we believe that well-framed tax policy can help engine manufacturers, fuel suppliers, end-users, and other key stakeholders overcome the challenges imposed by the higher upfront capital costs of natural gas vehicles, equipment, and infrastructure. Effective tax policy can help end-users reduce the time necessary to achieve a positive return on their investments and ultimately see lifetime savings over comparable diesel operations.

Doing so will not only help the bottom line of the companies that take advantage of a cost-effective natural gas approach, but will accelerate the clean-up of the existing legacy fleet by reducing its overall cost. This, in turn, will bring cleaner air to America's cities and towns more quickly and reduce our overall health costs. Indeed, EPA estimates that every dollar invested in retiring the legacy fleet yields up to $18 in health benefits.[20]

Earlier this month, GNA joined a number of industry stakeholders in a letter to the Chairmen and Ranking Members of the Senate Committee on Finance and the House Committee on Ways and Means. This letter is attached hereto and made a part hereof as Appendix 1. It summarizes our views of the key tax incentives that would be desirable to incentivize the use of natural gas vehicles for many reasons, including to accelerate the retirement of the legacy fleet that I have discussed above.

The letter recommends the following:

- We support the retroactive reinstatement and extension of the expired Alternative Fuel Excise Tax Credit and the Alternative Fuel Vehicle Refueling property credit, as currently proposed in S. 2260.
- We support efforts to correct the highway excise tax treatment of LNG to eliminate existing disincentives in new LNG trucks and fueling stations. The

[18] Gladstein, Neandross & Associates (2014). *LNG Opportunities for Marine and Rail in the Great Lakes, Gulf of Mexico, and Inland Waterways*. Santa Monica, CA.
[19] Gladstein, Neandross & Associates (2014). *Wyoming LNG Roadmap*. Santa Monica, CA.
[20] EPA Second Report to Congress, page 9.

correct tax treatment should be based on the energy content of a diesel gallon, rather than on a per-gallon basis, as found in proposed S.1103.

- We encourage you to update the value of the Alternative Fuel Excise Tax Credit for LNG so this credit is also based on the energy content of a diesel gallon, rather than on a per-gallon basis.

It is worth noting that adopting the two LNG recommendations would create policy consistency and restore the competitive balance between CNG, LNG, and diesel as transportation fuels, as well as raise several million dollars in new revenue annually.

Conclusion

For more than twenty years, GNA has worked with our clients and all stakeholders to develop and implement cost-effective solutions to our country's transportation, air pollution, and energy challenges. Today, we see a number of niches where natural gas can play an enhanced role in meeting these challenges in an increasingly cost-effective way. In particular, we believe that natural gas vehicles can play an important role in accelerating the retirement and replacement of the legacy truck fleet.

The hurdle of upfront capital costs remains an impediment in many settings, despite the promise of significant long-term fuel cost savings. Thus, we support the use of targeted tax policies to help fleets and others overcome these upfront hurdles as expeditiously as possible. Our recommended changes to the tax code are outlined above.

Thank you for the opportunity to testify today. I am happy to answer any questions you may have, or to provide additional information on any of the topics discussed herein.

APPENDIX A

November 7, 2014

The Honorable Ron Wyden
Chairman, Committee on Finance
United States Senate
Washington, DC 20510

The Honorable Orrin Hatch
Ranking Member, Committee on Finance
United States Senate
Washington, DC 20510

The Honorable Dave Camp
Chairman, Committee on Ways and Means
United States House of Representatives
Washington, DC 20515

The Honorable Sander M. Levin
Ranking Member, Committee on Ways and Means
United States House of Representatives
Washington, DC 20515

Dear Chairmen Wyden and Camp and Ranking Members Hatch and Levin,

We, the undersigned, understand that the United States Senate Finance Committee and the United States House of Representatives' Ways and Means Committee may soon initiate efforts to extend expired and expiring tax incentives. The Congress has long recognized the importance of fuel diversity in the American economy, and we thank you for your past support for natural gas as a transportation fuel. Increased use of natural gas vehicles helps address several public policy goals simultaneously – including increasing U.S. jobs and reducing greenhouse gases, urban pollution, and dependence on imported oil. We would like to bring our interests and concerns to your attention as you begin your deliberations.

Alternative Fuel Tax Credit Extensions

We support the retroactive reinstatement and extension of the expired Alternative Fuel Excise Tax Credit (26 USC §§ 6426 and 6427) and the Alternative Fuel Vehicle Refueling property credit (26 USC § 30C). These alternative fuel and infrastructure credits incentivize individuals and businesses to increase use of natural gas as an alternative transportation fuel. These provisions are currently proposed for retroactive reinstatement and extension in the S. 2260 and H.R. 5559.

LNG-Diesel Excise Tax Fix

We also support efforts that correct the highway excise tax treatment of LNG. LNG competes with diesel fuel as a transportation fuel for use in heavy duty vehicles. The federal highway excise tax on both diesel and LNG is set at 24.3 cents *per gallon*. However, because LNG has less energy *per gallon* than diesel fuel, on an energy equivalent basis LNG effectively pays 170 percent of the diesel rate. The current highway excise tax treatment of LNG is a disincentive to investment in new LNG trucks and fueling stations, and should be corrected to encourage capital investments.

We request that the highway excise tax on LNG be changed so that it is imposed on the *energy content* of a diesel gallon (known as a diesel gallon equivalent), as proposed in S. 1103, bipartisan legislation introduced by Senators Michael Bennet (D-CO) and Richard Burr (R-NC), a version of which was included in the Senate-passed Highway bill, H.R. 5021, The Preserving America's Transit and Highways Act, and H.R. 2202, bipartisan legislation introduced by Congressmen Mac Thornberry (R-TX) and John Larson (D-CT).

Alternative Fuel Tax Credit Fix[1]

Finally, similar to the LNG excise tax, we encourage you to alter the value of the Alternative Fuel Excise Tax Credit (26 USC §§ 6426 and 6427) for LNG so that the credit is based on the *energy content* of a diesel gallon and not on a per gallon basis. Correcting both the LNG excise tax treatment and the excise tax credit treatment at the same time creates policy consistency and would restore the competitive balance between LNG, CNG and diesel as transportation fuels. Furthermore, according to a Joint Committee on Taxation review, making these two changes simultaneously would raise $9 million in new revenue.

We appreciate your consideration of our request.

cc: Members of the Senate Finance Committee
Members of the House Ways and Means Committee

Sincerely,

Trade Associations:

American Gas Association
American Public Gas Association
American Trucking Associations
National Association of Truck Stop Operators
National Waste and Recycling Association
NGVAmerica
Truck Renting and Leasing Association

Coalitions, Companies and Organizations:

Agility Fuel Systems
AGL Resources
ANGI Energy Systems, LLC
Blu. LNG
Center Point Energy
Chart Industries
Clean Energy Fuels
Coalition for Renewable Natural Gas
Cummins Westport
Encana
Gladstein, Neandross & Associates
Linde
Luxfer Gas Cylinders
Mack Trucks
Noble Energy
Ryder
Sempra Energy
Shell Oil Co.
Tenaska
Titeflex
Trillium
UPS
Volvo Trucks
Waste Management
Westport Innovations

[1] Attachment (Joint Committee on Taxation Memorandum dated April 2, 2014)