



Testimony by
John Boesel, President and CEO of CALSTART
Before the Select Committee on
Energy Independence and Global Warming
On
*Constructing a Green Transportation Policy:
Transit Modes and Infrastructure*
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**Clean Transportation
Technologies and Solutions**

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Chairman Markey and Ranking Member Sensenbrenner, thank you for inviting me to testify before the Select Committee on Energy Independence and Global Warming this morning. This is a very timely hearing. We appreciate the opportunity to provide comments on the technologies and policies necessary to reduce emissions from medium- and heavy-duty vehicles.

After providing some background information on CALSTART, we will look at today's landscape and provide an overview of the leading technological solutions for this sector. Next, we will discuss the key policy drivers for this industry, including a look at incentive structures based on significant industry and fleet feedback. Finally, we will provide our vision of the framework of a bold and successful program to accelerate the development and deployment of clean, efficient, low-carbon medium- and heavy-duty vehicles.

In the midst of great economic and environmental challenges, we believe this vision can help America achieve significant benefits: increased competitiveness of our transportation companies and expanded green jobs; reduced costs and greater efficiency of our goods movement; significantly reduced dependence on foreign petroleum; and immediate and growing reductions of carbon from transportation, and world leadership in this arena.

What is CALSTART?

CALSTART is North America's leading advanced transportation technologies consortium. It is a fuel and technology neutral, participant-supported non-profit organization of more than 130 companies and agencies, dedicated to expanding and supporting a high-tech transportation industry that cleans the air, creates economic opportunity and reduces imported oil use and greenhouse gas emissions.

CALSTART serves as an unbiased, strategic broker to spur advanced transportation technologies, fuels, systems and the companies that make them. It works across four areas to expand and support this industry: operating technology development and demonstration programs with industry partners; consulting to ports, fleets and others on implementation of new fuels, vehicles and technologies; providing services to industry members to expand their capabilities; and supporting and guiding the creation of policies that increase the efficiency and reduce the emissions of U.S. transportation.

CALSTART plays a leading national role in facilitating the development of advanced propulsion systems and alternative fuels in the heavy-duty vehicle and transit industry. It helped create the capability for heavy-duty hybrid drive systems in transit buses in program partnerships with DARPA, and now leads efforts in advanced commercial vehicle hybrids, fuels cells, hydrogen and biofuels. Founded in 1992, CALSTART is headquartered in California but operates nationally and internationally in its programs.

Medium- and Heavy-Duty Vehicles: the Challenges and Opportunities

This is a critical time for the development and deployment of clean, low-carbon medium- and heavy-duty vehicle technologies in the United States and around the world. Warnings

OFFICES IN :

48 S. Chester Ave, PASADENA, CA 91106 • 626.744.5600 • FAX: 626.744.5610 | 1536 Wynkoop, Suite 600, DENVER, CO 80202 • 303.825.7550 • FAX: 303.825.7551
1160 Brickyard Cove, Suite 101, RICHMOND, CA 94801 • 510.307.8772 • FAX: 510.307.8706



about climate change from the scientific community are growing more serious and frequent, and transportation sector emissions are one of the core challenges. Transportation contributes a third of greenhouse gas (GHG) emissions in the U.S., as high as nearly 50 percent in some regions such as California. And because of their high mileage and fuel use, medium- and heavy-duty vehicles alone make up 7 percent of total GHG emissions. Additionally, despite significant progress, criteria air pollution from transportation remains a serious concern driven partly by population growth, goods movement and sprawl. Petroleum consumption and related emissions are expected to continue increasing in developing economies such as China and India, increasing world demand and competition. The past several months have seen almost unprecedented volatility in oil prices, contributing to economic difficulties in petroleum-dependent societies.

These challenges have certainly spurred progress and the beginnings of early adoption of clean transportation technologies, including promising developments in medium- and heavy duty vehicles. However, low oil prices coupled with a global economic recession are now threatening to disrupt – and stall – the very movement toward cleaner, more efficient technologies in the medium- and heavy-duty vehicle sector we most need.

What are some of the technologies and fuels that can address needed reductions? There are extremely promising low carbon, high-efficiency solutions becoming available and making their first push into the truck and bus market from US companies. We've measured this progress from our on-the-ground work in these sectors and with the companies bringing them forward. We believe these solutions can grow and be the first of a new generation of technologies and fuels with a thoughtful, longer term policy and assistance structure. Some of the more promising options are outlined below:

- **Hybrid Trucks** – in electric, hydraulic and plug-in variants – are just entering first production in North America, thanks in part to our Hybrid Truck Users Forum (HTUF) program, a partnership with the US Army National Automotive Center (NAC) which accelerates commercialization and builds user and market demand. Four major American truck makers (Navistar, Peterbilt, Freightliner and Kenworth), several smaller truck providers and an array of driveline and component suppliers are in the early market stage. Hybrid vehicles have been validated in both lab and real-world testing to reduce fuel use – and carbon emissions – by 20-50 percent in medium and heavy-duty work truck duty cycles. US manufacturers currently lead the world in heavy hybrid technologies, unlike hybrids in passenger cars. The biggest barrier is low production volumes that lead to high incremental costs.
- **Natural Gas & Biomethane** are gaseous fuels that together can provide both immediate benefits and a pathway to steadily reduced greenhouse gas emissions without added vehicle and infrastructure changes in the future. Natural gas is a proven clean domestic fuel with carbon emissions as much as 20 percent less than conventional diesel. The first major truck companies are now adding natural gas engine offerings because of emission and climate concerns at port and urban regions. Biomethane is the renewable form of natural gas which can be produced from municipal solid waste, landfill gas, animal manure and other wastes. It can be significantly lower in climate impacts than natural gas, yet can be blended with and used in place of the fuel. Europe has been an early leader but the US has significant opportunities to make waste into fuel from urban and farm sources if the barriers to production can be reduced.
- **Biofuels** have been shown capable of both offsetting petroleum and reducing greenhouse gas emissions, with the level of benefits directly linked to what the biofuel is made from, and how it is made: feedstock and process are critical. While first stage biofuels provide in most cases meaningful greenhouse gas reductions, they are as



important as stepping stones to the next generation of biofuels which will utilize waste materials and more energy efficient production processes, contributing to significant cuts in GHG. US innovators are among the world leaders in the new biofuel technologies but run the risk of losing out to strategies more supportive of research and development and setting clearer market signals for high petroleum prices.

- **Hydrogen** progress in key early market segments, including promising opportunities in heavy urban transit buses, has been more pronounced than is often reported. Indeed, the heavier bus segment has offered a more realistic launch platform for development and steady improvement of fuel cell, blended-fuel engines and other systems using hydrogen. When derived from bio-based sources, including wind and solar generation, hydrogen has the ultimate potential to nearly eliminate carbon emissions and increase energy efficiency. The technology has moved beyond prototypes in the transit market and can grow from this initial niche, but still suffers from very high costs from the early stage technology, the need for continued operational improvement and the need for continued investment in the core systems.
- **Improving Conventional Engines and Vehicles** offers a rich area for steady carbon reductions over the next decade through increased thermal efficiency of engines, thermal energy recovery, advanced aerodynamics, lighter-weight materials, optimized powertrain designs, higher-efficiency components and auxiliaries and reduced operational idling. Medium and heavy-duty vehicles show the potential for 50 percent and greater reductions in fuel use and carbon emissions from this suite of improvements. However, current price signals, investments in development and regulatory goals are insufficient at present to drive these improvements.

Spurring Progress: The Crucial Role of Policy

The role of public policy in creating and sustaining the conditions necessary for the successful and widespread deployment of efficient, low-carbon medium- and heavy-duty vehicles cannot be overstated. With low oil prices and a struggling economy, the role of policy – and a suite of tools ranging from smart regulation and long term goals, incentives and investments – takes on even greater importance. Comprehensive and proactive public policies are necessary for the industry's growth and can help drive innovation and industry growth in these key ways:

- Creating a favorable business and investment environment and development certainty through clear and consistent regulations and goals
- Increasing market demand through standards, partnerships and purchase incentives
- Providing financial support through R&D funding, loan guarantees and project finance, direct investment, tax breaks, and other avenues

For now, the clean medium and heavy duty vehicle industry needs targeted assistance and policies to overcome market barriers. These policies should be technology neutral, rewarding high performance against goals, innovation, and efficiency. In time, given the right market conditions, the high-efficiency, low-carbon truck industry can be expected to pass through this initial transition period and to thrive without direct assistance. The United States has the opportunity to become a world leader in this sector. Missing out on this opportunity would be a significant loss to our economy and our environment.

Can Carbon Trading or Taxes Shift Transportation? Not Alone

At this point in the commercialization process, stable, long-term price and regulatory signals are absolutely essential. Companies and investors require stable incentives and regulatory signals to make the business case for developing new technologies, while consumers require long-term signals to alter their purchase decisions and permanently change their behavior. Short-term subsidies and overly flexible or short-lived regulations



do not provide the certainty necessary to justify large scale investments. Similarly, short-term incentives are unlikely to produce lasting change in consumer behavior.

The recent oil price fluctuations clearly illustrate the importance of price signals in driving investment decisions and consumer choices. High gas prices in 2007 and 2008 led to investments in alternative fuels, fueling infrastructure, and vehicles. Now, however, there is a real danger that low oil prices and a struggling economy will halt the progress being made on the clean transportation front. Technologies and investments that were promising to investors and attractive to consumers with diesel over \$4.00 a gallon do not look as good with prices around \$2.00. Without long term price signals for both investors and consumers, it will be difficult to transition the nation toward clean, low carbon fuels and vehicles.

It is vitally important that any comprehensive program to reduce carbon emissions include the transportation sector. If the federal government enacts a cap and trade program, transportation fuels should be included at the outset. This will help to create a partial price signal and provide an indication to the trucking industry that the country is moving toward cleaner, more efficient, lower-emitting vehicles. Similarly, a carbon tax could help send a partial signal to the marketplace, both users and manufacturers. Regardless of the actual mechanism chosen to reduce carbon emissions, the key is to put a price on carbon and to do it in a transparent manner. Providing information about both the end goal and the plan and schedule for getting there will allow companies, investors, and consumers to make long-term investment decisions.

However – and unfortunately - we do not expect climate legislation alone to be sufficient to drive transformational change in the transportation sector. The impact on fuel prices is expected to be relatively small at the outset and is not expected to influence purchase decisions and technology investments in the medium- and heavy-duty sector.

Complementary policies will be necessary. Some regulation-based policies have been suggested, are in operation elsewhere or are under development, such as low-carbon fuel standards, establishing strong national fuel economy rules and greenhouse gas tailpipe standards. All could be implemented alongside and support a carbon tax or cap and trade system. Beyond these regulatory frameworks, however, there remains a strong need for a comprehensive suite of policies, investments and strategies to move high efficiency, low carbon medium- and heavy-duty vehicles more quickly to the market.

Needed Key Incentives and Policies

The targeted and strategic use of public funds is necessary to accelerate the development and deployment of efficient, low-carbon vehicles, fuels, and infrastructure, and provides significant benefits to the nation in both spurring additional, early carbon reductions and growing US technology and “green” manufacturing jobs.

- Therefore: We believe auction revenues from a cap and trade system or tax receipts from a fuel or carbon tax should provide a significant and reliable source of funding reinvested into the next generation of transportation carbon reduction solutions. Medium- and heavy-duty transportation is often overlooked in policy structures such as these, but deserves investment both because of its contribution and its carbon reduction and economic benefits.

Additional investments are needed at all stages of the commercialization process, from basic research and development to demonstration and deployment. Recognizing the need for public investment in this space, CALSTART worked alongside other California stakeholders to enact a high tech and fuel investment program (Assembly Bill 118) that will invest \$200M per year over seven years in new transportation technology and fuels at the state level. Replicating this program at the national level – with a commensurate



investment and over a similar time frame – would help reduce transportation-related carbon emissions while supporting the growth of high-quality “green jobs” in the United States.

R&D – development stage: There is a clear need to increase public investment in the development of clean and efficient vehicle and fuel technologies. The public sector has traditionally played a significant role in early stage technology development, and the need for this public investment is increasing as the financial crisis deepens and private companies cut back on risky long term investments. Specific needs for the medium- and heavy-duty sectors include:

- Improved system integration and manufacturability
- Reduced energy storage costs specific to commercial vehicle designs
- Electrified and advanced components (to enable even greater fuel economy gains in all trucks by reducing engine load and enabling start-stop operation)
- Improved thermal efficiency and thermal recovery
- Advanced aerodynamics
- Fuel-optimized and downsized engines, advanced combustion schemes, power generation, light-weight materials, and advanced control systems.

Demonstration and validation – pre-production stage: successful and transparent demonstrations can help to “unlock” the environmental and economic benefits of new vehicle and fuel technologies by proving their viability in real world situations and speed user feedback to more quickly design production systems. Public investment and partnerships can help to overcome this barrier and bring these technologies from lab to market. It is important that the demonstrations are public and that analysis of technology performance is shared. Pilot programs can be used for the demonstration and validation of vehicles and infrastructure. For example, CALSTART is working with a number of California transit properties to secure funding for the Zero emission Transit User Group (Z-TUG), which would provide valuable real world testing and analysis of zero-emission transit bus technologies. Other potential pilot programs include:

- Local designation where there is a high level of truck activity (near a port or transfer location):
- Farming region, with potential link to fuel source
- A designated “Clean Transportation Corridor” program
- Construction Equipment

Purchase incentives – early market stage: new technologies in the early stages of market deployment tend to cost more than the business case of fleet owners allow them to pay. Smart and targeted purchase incentives, aligned with policy goals, can help technologies get through this transition period by accelerating deployment and increasing demand. As demand and production volumes increase over time, and as the innovation cycle continues with process improvements and movement up the learning curve, purchase costs can be expected to come down and the need for incentives should disappear.

- Therefore: As a first step, we recommend extending and augmenting the existing but expiring tax credits for high-efficiency, low-carbon hybrid trucks. Current tax credits for such trucks sunset at the end of 2009. Their implementation was originally delayed by the IRS and now need to be extended by three years to match introduction timelines, and enhanced to change fleet purchase behavior.
- Additionally, we recommend a simple and streamlined rebate program going forward. Though tax credits are valuable in encouraging deployment, rebates can be even more direct and effective in the commercial vehicle market. An up-front rebate will encourage fleet purchase and ensure participation by state, county and municipal fleets that are currently excluded from tax-based programs.



CALSTART has worked with other industry stakeholders through the Hybrid Truck Users Forum (HTUF) to develop a simple, streamlined purchase incentive program for hybrid trucks. We envision extending this program to give purchasers of advanced high efficiency and low carbon medium and heavy duty vehicles rebates based on demonstrated increases in fuel efficiency. The rebates would be determined on a sliding scale based on the fuel efficiency gain of the particular model, as verified by EPA testing procedures (see Table 1). California’s Air Resources Board is proposing a similar program, funded at \$26 million dollars, as part of its funding plan under AB 118 for FY 2009-2010.

Table 1: Rebates to Purchasers of High-Efficiency Commercial Trucks (first year level)

Vehicle Weight	Demonstrated Fuel Efficiency Gain			
	20%	30%	40%	50%
8,500 – 10,000 lb	\$5,000	\$7,500	\$10,000	\$12,500
10,001 – 14,000 lb	\$10,000	\$15,000	\$20,000	\$25,000
14,001 – 33,000 lb	\$15,000	\$20,000	\$25,000	\$30,000
	10%	20%	30%	40%
>33,000 lb truck	\$20,000	\$27,500	\$32,500	\$40,000

Our experiences suggest that the best way to encourage the development and deployment of high-efficiency, low-carbon vehicle technologies in the medium- and heavy-duty sector is through a cooperative, comprehensive, multi-year investment program. The success of our Hybrid Truck Users Forum (HTUF) in accelerating the development and deployment of hybrid trucks demonstrates the value of this approach.

- For this reason, CALSTART also believes an increase in the budget for the Army’s National Automotive Center (NAC) to allow it to continue and expand its leadership work in this HTUF effort is an effective tool to maintain innovation.

While HTUF has keenly focused for the past several years on hybrid truck technology, it is expanding its work to support high-efficiency trucks, particularly those overlapping areas of development and deployment that support both enhanced, improved hybrids and fundamentally improved conventional trucks. Additionally, the merger of high-efficiency trucks with low carbon fuels is a critical next step, providing a “multiplier” affect that increases the impact of both strategies immensely.

- Similarly, we believe that the National Fuel Cell Bus program should be continued and expanded under the oversight of the Federal Transit Administration, but guided with a more low carbon, technology-neutral focus.

The Next Step: A Bold and Coordinated Approach

We welcome and support all efforts to move these promising and vital technologies forward. But we also believe the most effective and rapid progress can come from a major, coordinated and targeted national program.

With support from key industry stakeholders such as Eaton, Navistar, Freightliner, ArvinMeritor, Azure Dynamics, Bosch Rexroth and FedEx, CALSTART has developed a framework for a U.S. High Efficiency Advanced Truck Technology (US HEATT) program to support the rapid adoption of new truck technologies that will provide multiple benefits for the nation. US HEATT calls for a significant multi-year year investment in purchase incentives and research, development, and demonstration. The US HEATT approach calls for a comprehensive, multi-year \$1.5 billion program targeting aggressive outcomes for developing and deploying commercial vehicle products that significantly reduce carbon.



CALSTART believes the industry and the nation would benefit from a high profile program built on these parameters:

- First, a commitment to target, support and fund over a multi-year period the steps required to achieve commercialization: R&D; Demonstration and Validation; and Purchase Incentives. To get maximum effect, an integrated strategy encompassing all three is needed.
- Second, government's role and risk should be different at each stage, but a portfolio approach as to how much funding to apply to each stage, and a commitment to do so consistently over several years, would be most beneficial to the market. It would focus industry technology investments and engineering resource allocation as well as signal to private investors where to extend their investment into innovation in new technology. Such signals can often leverage as much private resource as direct governmental funding.
 - Research and development might rightly make up 15-20% of such a total government partnership portfolio, with pre-production demonstration, testing and validation for an additional 5-10%. We see the need for meaningful purchase incentives, declining over time, making up as much as 70-75% of this overall portfolio.
- Third, it is highly important that research, development and demonstration activities be designed and operated to encourage competition, innovation and new players. Past efforts in some agencies have been closed to any but a handful of manufacturers and suppliers, a constraint unlikely to speed new approaches. Additionally, a commitment to spur action and achieve aggressive outcomes would add energy to the program. We can envision a multi-year commitment to achieve 40-50% fuel economy gains as an average across all new trucks as a starting point for discussion.
- Fourth, such a program structure would ideally be led by a partnership that sees the value of and desires action to occur. Given the likely growing concerns with reducing foreign oil imports for energy security, the need for greater fuel efficiency to save truck operators money and secure jobs, and the need for significant carbon reductions in the future, a multi-year program would be ideal as a clarion call to and a signal of commitment and action.
- Fifth, the level of investment should be commensurate with the needs and the challenge. This can serve as a framework for the effort needed to ensure U.S. manufacturing technology leadership and meeting its energy security and greenhouse gas emissions goals.

Environmental and Economic Benefits of Swift Action

The rapid development of a comprehensive program to support high efficiency, low carbon trucks would have multiple benefits

Keeping America Competitive: By moving ahead boldly now, domestic truck manufacturers and component suppliers can maintain their competitive advantage. Clearly, the nation's auto industry has been hurt by its failure to look to the future and strive for technological leadership. With this program, U.S. medium and heavy-duty manufacturers and suppliers could become global leaders in advanced truck technology, resulting in greater exports and an improved balance of trade.

Lowering Operating Costs for Trucking Fleets: American trucking fleets have been hard hit by increased oil prices. Incentive funding would help fleets purchase technology that will either reduce or eliminate their dependence on oil. Indeed, some fleets have had to use their capital purchase budgets to pay for the increase in their operational budgets because of fuel spikes. Ironically, this even further reduces their ability to buy the new technologies they need to save fuel – and reduce operational costs. Greater efficiency in this sector



will both ease the pain felt by the trucking industry and make U.S. industry more competitive as a whole.

Securing America's Future by Reducing Dependence on Oil: The commercial trucking sector uses more than 20 percent of the oil consumed in the transportation sector. It's an amount roughly equivalent to what's imported from the Middle East. Even before sales slowed greatly in the passenger car market, goods movement was the fast growing sector in the transportation field. Over a 10-year period, a well-designed program could result in a 30 percent or greater reduction of oil usage. This could result in savings of over \$50 billion per year in payments for imported oil.

Cutting Greenhouse Gas Emissions and Setting a Positive Global Example: Lower carbon fuels and reduced oil consumption will result in fewer greenhouse gas emissions. The U.S. would be demonstrating global leadership by showing how advanced technology can cost-effectively reduce greenhouse gas emissions from the goods movement sector and spurring exports. Commercializing more efficient truck technology would be even more significant in other countries where the percentage of commercial vehicles is much greater than in the U.S. Commercial vehicles represent about 25 percent of the total U.S. vehicle population. In China, Brazil, and Mexico, commercial vehicles represent more than 50 percent of their vehicle populations.

We believe the time for action is now. We can build single year investments, driven by economic necessity, into a targeted, multi-year effort that sends strong and unambiguous signals to American industry, investors and vehicle users that improved efficiency and lower carbon are critical, provide assistance to that industry to build the new technologies needed on a faster pace than they can manage alone helping them stay or become world leaders, and grow the next generation of high quality "green technology" jobs the nation needs in the coming low carbon world.

Thank you for this opportunity to present our ideas and we would be pleased to answer questions and serve as a resource to the committee.