

Alternative FUELS

Volume 5, Number 2



Interstate Clean Transportation Corridor Project Under Way

by Bruce Reznik, Associate, Gladstein and Associates

Trucks that travel in the western United States will soon be able to operate clean-burning alternative fuel vehicles (AFVs) along the Interstate Clean Transportation Corridor (ICTC). The ICTC project is the first effort to develop clean transportation corridors to connect Los Angeles, San Bernardino, the San Joaquin Valley, Sacramento/San Francisco, Salt Lake City, Reno, and Las Vegas along routes 1-15, 1-80, and 1-5/CA-99. The ICTC team, headed by California-based Gladstein and Associates, plans to have commitments by early 1997 for 10 to 15 fueling sites located approximately 180 miles apart.

These sites will serve 250 new heavy-duty AFVs and 500 local

delivery vehicles. Their fuels will displace 4.7 million gallons of petroleum and mitigate more than 286 tons of pollution annually.

A coalition of public and private sponsors is now working with the ICTC project team to shape a strategic plan. According to project director Clifford E. Gladstein, "It is unrealistic to think that additional regulations will be adopted mandating the use of alternative fuels. We need to focus on getting industry and government representatives working together if we are going to succeed in developing economically self-sustaining alternative fuel markets."

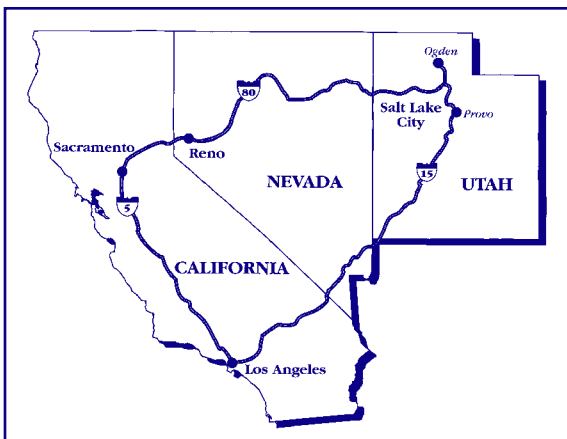
A unique aspect of the ICTC is the project's focus on heavy-duty vehicles. Gladstein noted that they are the last and biggest reservoir of potential emission reductions, and that even though other sources of air pollution receive most of the attention, the contribution of heavy-duty vehicles to this problem continues to grow.

One reason for the small number of heavy-duty AFVs

has been the shortage of engines to power them. This situation is quickly being remedied: several natural gas engines are being offered for commercial sale in 1996. Some long-haul fleets have begun to deploy heavy-duty AFVs that operate primarily on liquefied natural gas (LNG). JBK Trucking, which operates the largest LNG fleet in the world, reports significant cost savings with natural gas.

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Cost-competitiveness is critical to developing viable AFV markets. Fleets will not operate vehicles on alternative fuels if they cannot compete economically with diesel-powered vehicles. Today's alternative fuel trucks can compete, but their accomplishments have not been well publicized. Projects such as the ICTC should help change that.

The ICTC project focuses on long-haul trucks, but is not ignoring local AFV efforts. It is integrating its long-haul activities with activities in Clean Cities along the ICTC. According to Gladstein project manager Dennis Zane, "Focusing on coordinating long-haul activities with local delivery vehicles will allow alternative fuel vehicle infrastructure to be more fully utilized, making such stations more economically viable." He notes that there is already a great deal of AFV activity at the local

level, but that too many activities are being undertaken in isolation. He is convinced that developing an alternative fuel infrastructure requires that every project segment be analyzed in terms of its effects on every other segment; otherwise, there is a great risk of misallocating resources and making the already difficult task of developing AFV markets even harder.

ICTC sponsors and stakeholders gathered for a conference in Las Vegas to determine the focus of the project during the upcoming months. The conference joined national, state, and local decision makers in the air quality, energy, and transportation arenas with senior representatives from fleet operators, alternative fuel providers, and engine and vehicle manufacturers. The participants suggested that perhaps the greatest obstacle to developing alternative fuel markets is an

inconsistent legislative tax policy, which often disfavors AFVs.

The ICTC project team is already pursuing a legislative agenda at the federal, state, and local levels that will favor the use of alternative fuels. The agenda includes: (1) developing a tax structure that is advantageous to alternative fuels; (2) creating tax credits for heavy-duty AFVs; and (3) pursuing weight exemptions for interstate AFV trucks. The project team is also investigating opportunities for creating mobile-source air-emission-credit trading and using clean transportation efforts as part of general mitigation efforts for the region.

"Alternative fuels are not a luxury," asserted Gladstein. "They are a critical component of our strategy to meet clean air goals and lessen our reliance on foreign oil."

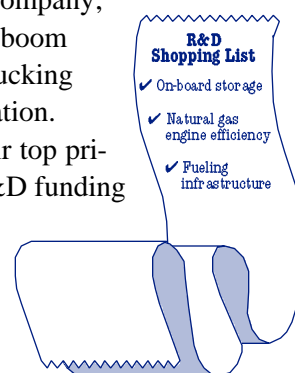
Congressional Task Force Addresses Natural Gas Vehicle R&D Concerns

by Heather Rowe, Legislative Assistant, The Natural Gas Vehicle Coalition

Congressman Ralph Regula (R-OH), chairman of the House Interior Appropriations Subcommittee, held a hearing on May 15 to discuss natural gas vehicle (NGV) R&D initiatives. NGV task force members Joe Barton (R-TX), Brian Bilbray (R-CA), and Mac Thornberry (R-TX) also attended.

The following people testified: Tom Gross, deputy assistant secretary at the U.S. Department of Energy; Robert A. Bell of ConEd, representing the gas industry R&D

initiative; Terry Cupp, representing USCAR-NGVTP; Michael Lutgen of MVE, Inc.; Vinod Duggal of Cummins Engine Company; and William Peerenboom of the American Trucking Association Foundation. They identified their top priorities for NGV R&D funding as on-board storage, natural gas engine efficiency, and fueling infrastructure.



Representative Bilbray expressed support for more NGV R&D to address current air quality and energy security issues. Bilbray explained that, even though funding for hybrid/electric R&D is important, the federal government should see the "here and now" potential of NGV technologies and seek to eliminate regulations and obstacles that prevent it from maturing as a viable market alternative.

Midwest Ethanol Demonstration Project Continues down the Road

Can an ethanol-fueled heavy-duty truck stand up to highway maintenance work? In early 1993, the Nebraska Department of Roads and the American Trucking Association (ATA) Foundation, under the direction of its vice president William Peerenboom, entered into a 3-year program that should help answer that question. Various grain boards are sharing the costs of the project (estimated at \$471,808) with the Department of Energy's (DOE) National Renewable Energy Laboratory (NREL), the ATA Foundation, and the Nebraska Department of Roads.

The program compares emissions, mileage, and durability data from two Navistar International Model F-5070 trucks powered by Detroit Diesel 5V92 engines that have been converted to operate on E95, a blend of 95% gasoline and 5% ethanol, with data from a similarly configured diesel truck.

The two ethanol trucks were used in 1995 for snow removal and other road maintenance. The fuel cost an average of \$1.52 a gallon, and mileage averaged 2.27 miles per gallon. The most persistent problem was fuel filter plugging, which stalls the engines without warning.

Each week, highway maintenance truck operators fill out a log sheet showing miles driven, fuel and oil consumed, and general performance for each day the trucks were used. These sheets are submitted monthly to ATA and forwarded to NREL for comparison with all trucks in DOE's

On-Road Development Program. Information about ethanol-powered trucks is especially relevant in Nebraska, because it is located in a region that is a primary source of ethanol feedstocks.

When not at work, the trucks were displayed at several parades and shows, such as Nebraska City's Midwestern Biomass Conference and Grand Island's farm-oriented Cornhusker Harvest Days.

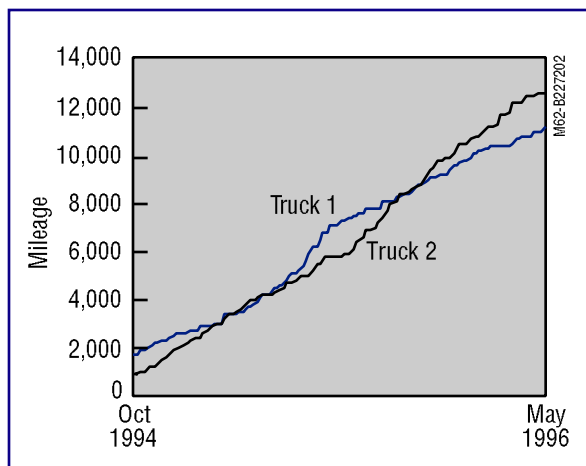


American Trucking Association/PIX04223



American Trucking Association/PIX04224

Ethanol fueled heavy-duty trucks perform highway maintenance in Nebraska



Mileage accumulated on the trucks since October 1994

Caterpillar Introduces New Dual-Fuel Engines

by Jim McNamara, Staff Reporter, American Trucking Association

Caterpillar Inc., and Power Systems Associates (PSA), a leading California heavy equipment and engine seller, have introduced the first in a line of alternative fuel truck engines that use a diesel pilot to burn natural gas or propane. The engines are designed for regional truck operations and trucks and buses that operate in urban and emission-sensitive areas. Other potential uses include public works vehicles and refuse trucks. The engine combines the best features of diesel and alternative fuels and provides operators with great flexibility.

The dual-fuel technology offers operators performance similar to diesel power and the emissions benefits of burning natural gas or propane, and has the potential for lower operating costs compared to those of most dedicated alternative fuel configurations, according to Caterpillar. Instead of using spark

plugs to ignite natural gas or propane as many alternative fuel engines do, the Caterpillar dual-fuel engines use a small amount of diesel to ignite a large amount of another fuel in a compression ignition or diesel ignition setting. Electronically controlled, multipoint, sequential-port injection valves are installed to deliver the natural gas or propane. The standard electronic diesel fuel system remains, so the engine actually has two fuel injection systems. Special components also include an air:fuel ratio control valve and sensors. Of course, the vehicle will require separate tanks for the diesel and the alternative fuels. Local Caterpillar dealers will handle the warranties for the electronic dual-fuel system components.

The gas or propane is injected on the piston downstroke or expansion stroke. The diesel pilot charge is injected near the top of the

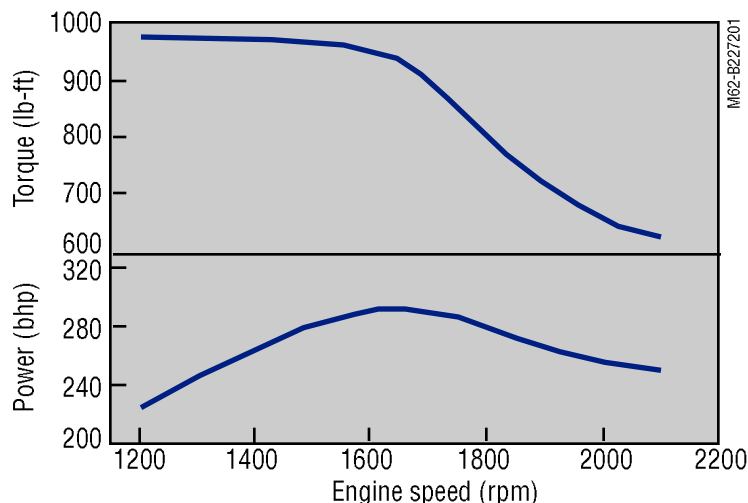
compression stroke. In typical situations, 85% of the fuel burned is natural gas, with somewhat lower substitution rate for propane.

The 3176B now available with the dual-fuel setup is a 10-liter engine that weighs 1,985 pounds, is rated at 275–350 horsepower, and has up to 1,050 foot-pounds of torque. Other dual-fuel Caterpillar engines available are the 7.2-liter mid-range 3126G and the 10-liter C-10. The 12-liter C-12 will be available in late 1996, and the 14-liter 3406EG is under development and will be unveiled in 1997.

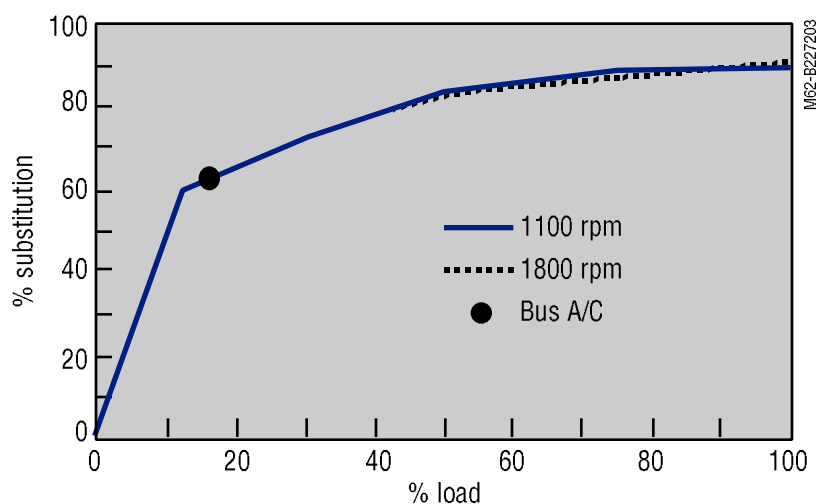
The engines share a number of characteristics with diesels, which make them easier to fit into vehicle applications and fleet operations. They have the same heat rejection as diesel, which means cooling is not a big problem, and they are compatible with engine compression brakes. They also use Caterpillar's electronic engine diagnostics and fleet management information systems.

In areas where methane or propane costs are low, dual-fuel engines are economically attractive, and initial capital costs are low compared to other dedicated alternative fuel vehicles. Also, if the operator should ever run out of natural gas—or propane—he will be able to drive the vehicle home using full dual diesel backup. The engine also uses 100% diesel when it is warming up. The engine can be converted back to 100% diesel for resale, which enhances resale value in some markets.

Torque and Power Curves for the 3176B Dual-Fuel Engine



CNG Substitution
10 Liter, 350 hp
2.5 g NO_x Calibration



For more information regarding these engines, call Kevin Campbell, PSA's North American alternate fuels business manager, at 800-344-5333, or visit Caterpillar's World Wide Web home page at <http://www.cat.com>

Report Details Gas Composition Issues for Natural Gas Vehicles and Fueling Stations

by Scott Schaedel, Marketing and Planning Analyst, Institute of Gas Technology

In research sponsored by the Gas Research Institute, the Institute of Gas Technology (IGT) has issued a topical report entitled *Gas Composition Issues and Implications for Natural Gas Vehicles and Fueling Stations*, which overviews gas composition issues related to natural gas for vehicles, recent research, and field experience. The report will help fuel providers, original equipment manufacturers (OEMs), and other members of the industry formulate responses to emerging challenges and issues.

Cost-effective solutions have been identified for most technological challenges that face natural gas as an engine fuel. Remaining issues

can be resolved through the active collaboration of all stakeholders, including transporters, distributors, fuel providers, and OEMs, in the natural gas vehicle market. Gas distributors and fuel providers need to ensure acceptable fuel quality; manufacturers of engines, vehicles, and components must design products that can anticipate and tolerate variations.

Research sponsored by the natural gas industry and others is the basis for resolving gas composition issues, which include developing fuel composition specifications and technical guidelines for fueling station designers and operators. This research has documented regional and seasonal

gas composition variations, evaluated the implications of variations in gas composition for fueling station and vehicle systems, and supported development of component improvements and other cost-effective solutions. OEMs and fuel providers must compromise to arrive at the most cost-effective solutions.

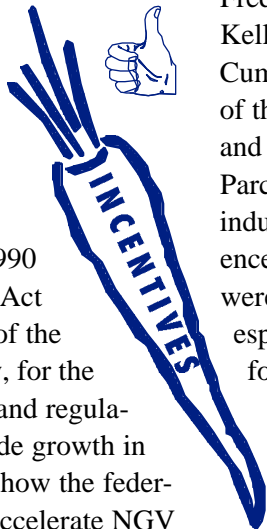
The report also examines compressor oil carryover, moisture content, and elevated levels of hydrocarbons, and provides economic analyses and general guidelines to help evaluate alternative approaches to and relative costs of fuel issues.

For a copy of the report, call IGT at 312-890-6448.

NGVC Testifies before House Oversight and Investigation Committee

by Heather Rowe, Legislative Assistant, The Natural Gas Vehicle Coalition

Natural Gas Vehicle (NGV) Task Force chair Joe Barton (R-TX) held a hearing on May 30 before the House Oversight and Investigation Committee on the federal government's role in implementing the Clean Air Act Amendments of 1990 and the Energy Policy Act of 1992. The purpose of the hearing was to identify, for the record, the legislative and regulatory barriers that impede growth in NGVs, and to suggest how the federal government might accelerate NGV use. The following members of Congress attended the hearing: Brian Bilbray (R-CA), Sonny Bono (R-CA), Michael Crapo (R-ID), Jim Greenwood (R-PA), Ron Klink (D-PA), Mac Thornberry (R-TX), and Bob Wise (D-WV).



Witnesses who testified included Natural Gas Vehicle Coalition chair Fred Abrew, Ken Kelley of Jack B. Kelley Inc., Tina Vujovich of Cummins Engine Co., Kyle Simpson of the U.S. Department of Energy, and representatives from United Parcel Service, and the auto leasing industry. There were obvious differences in each testimony, but there were also surprising similarities—especially with respect to the need for reduced cost and expanded infrastructure and the need for clear, definitive incentives as opposed to mandates. In his testimony, Abrew recommended that the following practices be adopted:

- General economic incentives such as creation of a market for NGV emissions credits

- Targeted, temporary tax incentives that focus on credits rather than deductions



- Enactment of H.R. 3315, which would tax liquefied natural gas at the lower compressed natural gas rate for purposes of federal motor fuels excise tax.

Kyle Simpson announced the Administration's support of H.R. 3315, which will improve the bill's chances of enactment this year.

Representative Barton and others expressed their support for incentive-based solutions to the problems that face the NGV industry, and continued to assert their opposition to mandates.

DOE Biodiesel Research and Development Program: Next Steps Include Seeking Industry Partnerships in the Heavy-Duty Sector

Dr. Raymond Costello, Office of Fuels Development, U.S. Department of Energy and Janine Finnel, Senior Energy/Environmental Analyst, Dyncorp

The U.S. Department of Energy's (DOE) Office of Fuels Development (OFD) is responsible for developing an alternative fuels program that will lead to the displacement (and eventual substitution) of imported

petroleum-based liquid fuels with fuels derived from domestic renewable resources such as biomass. Oil must be displaced to insulate the trucking industry from price shocks and supply uncertainties that stem

from foreign control of petroleum resources. The trucking industry is the prime mover of goods and is, like the rest of the transportation sector, completely dependent on petroleum-based fuels.

To remedy this situation, OFD is examining the use of biodiesel in heavy-duty trucks. Biodiesel is made from vegetable and waste oils, oil sludge, and animal fats. It can be used either as a neat fuel or as a blending agent. Compared to petroleum diesel, it has the potential to improve performance in safety, health, and environmental protection. It contains no sulfur, is low in particulate emissions, is more biodegradable, and contributes no net carbon dioxide to the atmosphere. Furthermore, its use requires few modifications to conventional diesel vehicles, provides power similar to diesel, and can be distributed through the diesel fuel infrastructure.

Some issues still need to be resolved, especially biodiesel's relatively higher cost (to a trucking industry with narrow profit margins), but an increased demand for biodiesel will increase the economies of scale and significantly reduce costs. Biodiesel can be used as a neat fuel, but current economics favor its use as a blended fuel. Additionally, conventional diesel engines and emissions systems will need to be modified to reduce oxides of nitrogen emissions.

Through the National Renewable Energy Laboratory (NREL), DOE

is working to expand biodiesel production in the United States. Currently the high cost of feedstocks remains the greatest obstacle to market penetration, as about 75% of the production cost is associated with the feedstock itself. (The cost of biodiesel produced from virgin soybean oil in the United States is \$2.50–\$3.50 per gallon.) NREL is examining several conventional technology options such as waste grease for producing biodiesel from low-cost feedstocks at the pilot scale. In addition, NREL is studying new conversion processes, such as the development of enzymatic catalysts, which promise to reduce costs even further.

DOE is developing partnerships with other government agencies, the private sector, and other organizations to gather additional research data and demonstrate the potential for biodiesel as an alternative fuel. For example, a Biodiesel Working Group has been formed: it comprises NREL, the National Biodiesel Board, the American Petroleum Institute, the Energy and Environmental Studies Institute, and biodiesel producers. The group is examining the total fuel cycle effects of biodiesel versus petroleum diesel with regard to net

energy balance and environmental emissions. DOE is also cost-sharing biodiesel development testing with industry and is expanding efforts to include Cooperative Research and Development Agreements. A demonstration project funded through DOE's Sustainable Technology Energy Partnership Program in Chicago will produce biodiesel from food waste oils and greases for use by the Chicago Transit Authority and the American Sighting Bus Company. In addition, DOE's Regional Biomass Energy Program has funded numerous educational biodiesel projects that demonstrate highway (trucks, buses), non-highway (marine, rail) and off-road (farm, construction) uses of biodiesel.

One of the most positive signs for the biodiesel industry is the emergence of several private firms that distribute biodiesel to the marketplace. As this industry grows, DOE is interested in collaborating with trade associations in the heavy-duty trucking industry to examine potential biodiesel refueling sites along "clean corridors" for heavy-duty vehicles, particularly in states that have developed or are developing incentives for the use of clean fuels.



Nebraska Soybean Board/PIX04231

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IN TRUCKING 

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The aim of **Alternative Fuels in Trucking** is to inform fleet owners and operators, equipment suppliers, government officials, and other interested parties about important developments in the use of alternative fuels in heavy-duty trucks. Suggestions and comments are welcome and may be directed to the National Alternative Fuels Hotline at 800-423-1DOE. Views expressed by guest authors are their own, and not those of ATAF, DOE, or NREL.

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How to Reach Us

- To speak to a human being, call the National Alternative Fuels Hotline at 800-423-1DOE.
- The AFDC World Wide Web address is <http://www.afdc.doe.gov>
- The *Alternative Fuels in Trucking* newsletter is available on the WWW at <http://www.afdc.doe.gov/1/trknews> It is available on-line 2 or 3 weeks before the newsletter is mailed.

Bonus

with this Issue!

The National Renewable Energy Laboratory has prepared a case study on heavy trucks for the U.S. Department of Energy, included as a bonus with this issue of *Alternative Fuels in Trucking*. The case study, *Running Refuse Haulers on Ethanol: The Archer Daniels Midland Experience*, describes the results from the demonstration of these line-haul trucks. Stay tuned for more case studies as results continue to become available.



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