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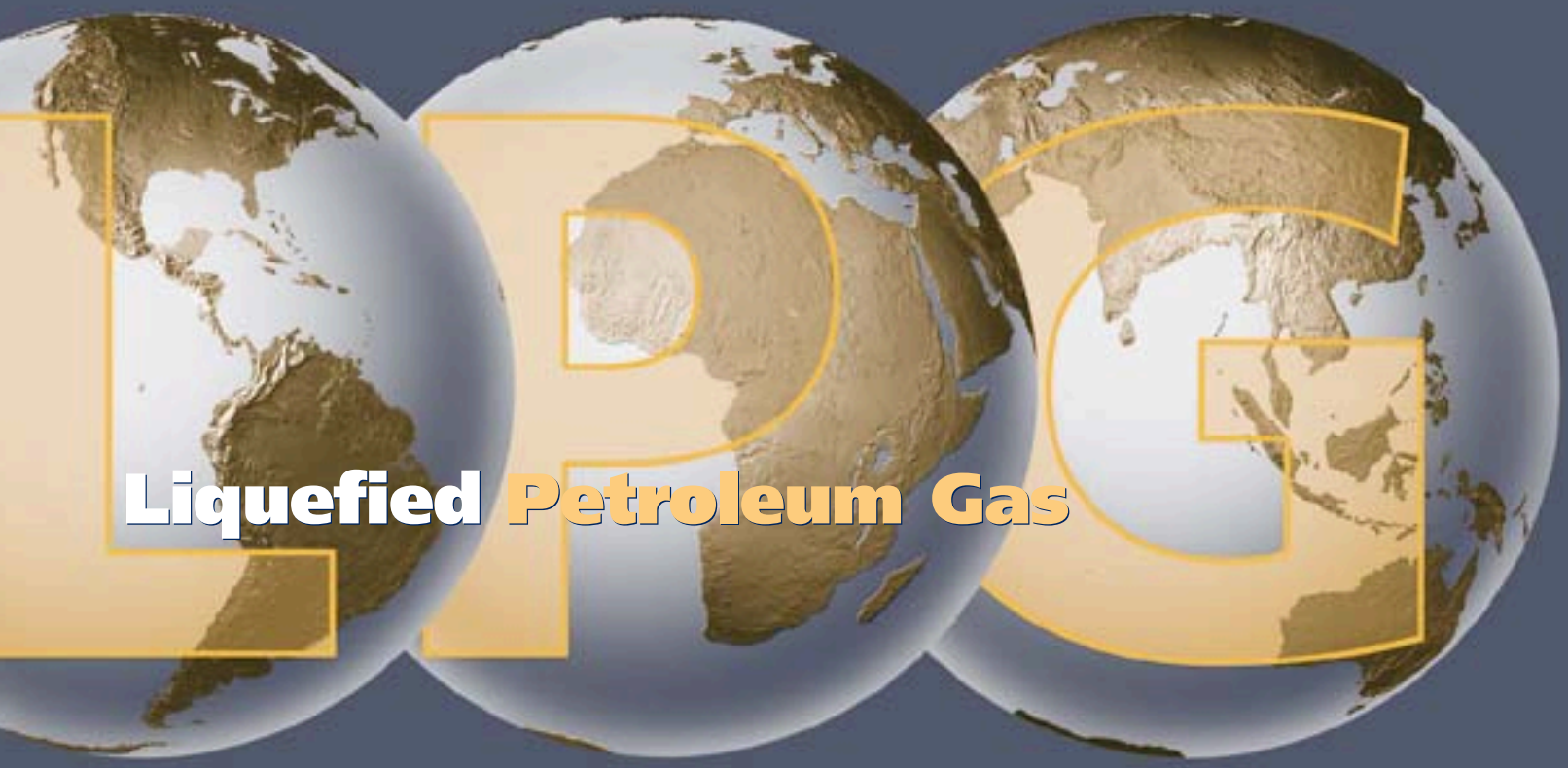
U.S. DEPARTMENT of ENERGY

ALTERNATIVE FUEL NEWS

An Official Publication of the Clean Cities Network and the Alternative Fuels Data Center
From the Office of Energy Efficiency and Renewable Energy



Liquefied Petroleum Gas

Around the World

PLUS:

AFVs in National Parks

Future AFV Conversions

INSIDE:

Fuel Economy Guide for '03

Dear Readers:

Last Friday was a bittersweet day. I visited my nearest natural gas refueling site for the last time and said goodbye to several friends who frequent the refueling site. I said goodbye to the commuter who drives his CNG Crown Vic into the city from Ashburn, Virginia, 50 miles away. He refuels every day on his way to work, because, as a driver of a clean fuel vehicle he is able to use the HOV lanes in Virginia and significantly reduce his commute time. He can't understand why everyone wouldn't want to drive an alternative fuel vehicle.

I said goodbye to the Pentagon limo driver who never could quite figure out why he had to inconvenience himself each time he refueled, by going to an out-of-the way site. And the Arlington Regional Transit (ART) driver who is happy to be doing the right thing, as long as he gets a good fill. All these and more are part of a special club that refuels with natural gas. We commiserate when the compressors are down and give the thumbs up when things are going right. But Friday I resigned from the club.

Now I am really part of an elite group, because I can refuel in my own driveway. Thanks to installation efforts by Washington Gas, my new FuelMaker unit hums in the evening so I can set off in the morning knowing that I am about as energy secure (barring a power outage) as any U.S. driver can be. And if you think that's alarmist thinking, take a look at the graph on the back cover.

In 2000, we imported 53 percent of the petroleum we used, mostly to fuel our transportation sector—and this amount continues to grow dramatically. To return imports just to that level by 2020 would take a major effort. Specifically, we'd need to increase the average fuel economy of new cars and light trucks on the road from today's average of 24.4 miles per gallon (mpg) to approximately 61 mpg.

Alternative fuels can help reduce that number to something more closely within reach. With a 10 percent AFV penetration among all on-road vehicles, the needed fuel economy average for conventional vehicles would fall from 61 mpg to a more achievable 49.4 mpg. By hitting both targets together, our daily petroleum consumption would return to year 2000 levels by 2020.

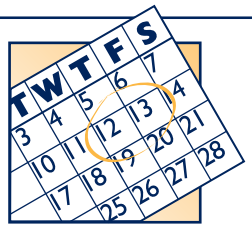
Nobody says that would be easy. With more than 286 million vehicles expected on U.S. roads in 2020, a 10 percent AFV penetration obviously would require giant steps forward from today's AFV population. Nor does returning to year-2000 petroleum consumption levels seem like energy nirvana, compared to the more optimistic scenarios we've heard for future transportation technologies.

But the reasons for alternative fuels are more compelling than ever. One is the fact that approximately 14 percent of our petroleum comes from the Middle East. With energy security so high on the list of national priorities, increasing BOTH fuel economy and alternative fuel use is critically important.

Small steps must precede big ones. All Clean Cities stakeholders deserve credit for what they've already done—and what they continue doing—to help move our nation to a cleaner, more secure energy future. And kudos to the commuter from Ashburn, the ART drivers, and all the other AFV drivers nationwide.

Shelley Launey, Director

Clean Cities Program
U.S. Department of Energy



Upcoming Conferences and Events

2002 Fuel Cell Seminar
November 18, 2002
Palm Springs, California
Contact: Courtesy Associates
202-973-8671
www.gofuelcell.com/shortCourse.html

Natural Gas Fuel Station Operation
December 2–3, 2002
Las Vegas, Nevada
Natural Gas Vehicle Institute
702-254-4180
www.ngvi.com

Electric Transportation Industry Conference
December 10–13, 2002
Hollywood Beach, Florida
Electric Vehicle Association of the Americas
202-508-5995
www.eticonference.com

For more conference and event information,
visit www.ccities.doe.gov/events_cgi.shtml

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LPG

Liquefied Petroleum Gas

Fueling Vehicles Around the World

World LP Gas Association

Alternative fuels strive to succeed on many scales including emission levels, economic costs, availability, and the potential to reduce oil consumption. Ranking highly by all such measures, particularly worldwide, is the fuel commonly called propane in United States.

Propane, liquefied petroleum gas, and LPG are interchangeable names for the same commodity. (Technically, however, propane is just one, predominant component in LPG, which often contains smaller amounts of butane, propylene, and butylenes.) Autogas is yet another label for the same fuel, used in Europe, Australia, and much of the rest of the world.

By whatever name, it is a fuel increasingly recognized worldwide as a clean, safe, and practical alternative to petroleum. According to the World LP Gas Association (WLPGA), some 29,000 automotive LPG fueling stations were operating worldwide in 2000. More than 7 million vehicles in 40 countries were LPG-fueled at that time, representing a 46 percent increase from two years earlier.

Such claims are difficult to verify, however, even in the United States. One reason is the lack of universal definitions. "Automotive use" may include off-road and industrial equipment such as forklifts. "Fueling stations" may serve only small domestic uses such as barbecue grills.

"Autogas" is sold alongside petroleum in the United Kingdom and much of Europe. Other top LPG-consuming countries include Italy, Poland, and the Netherlands.

LPG is a by-product of natural gas processing and crude oil refining. Worldwide, about 60 percent of LPG comes from gas processing, while crude refining produces 40 percent, according to the WLPGA. But the proportions vary widely among regions. More than 90 percent of worldwide LPG consumption is for cooking, heating, and other non-automotive purposes.

Leading Nations

Countries leading the way in the use of automotive LPG include South Korea, Japan, Australia, Turkey, and Italy. Also ranking in the top ten, according to the WLPGA, are Mexico, the United States, Poland, the Russian Federation, and the Netherlands. Nearly 6 percent of cars in the Netherlands run on LPG.

Australia imported its first LPG cylinders in the late 1930s, and it secured a domestic supply from oil and gas production in the late 1960s. With only 19 million people, Australia has become a world leader in automotive LPG. Its 550,000 LPG vehicles represent 4 percent of the country's fleet and account for approximately 8 percent of total fuel consumption.

Australia's automotive LPG industry has flourished largely because of the fuel's exemption from an excise tax that applies to gasoline and diesel. LPG conversion kits were tax exempt until 2000, and the commonwealth and state governments have offered grants for conversion or purchase of LPG vehicles. If its tax advantage over gasoline and diesel is maintained, according to the WLPGA, demand for automotive LPG is expected to continue growing by 4 percent per year.

Italy, with a population of about 60 million people, is home to more than 1.2 million LPG vehicles and accounts for 45 percent of Europe's automotive LPG consumption. Italy is also a leading producer and marketer of LPG-related equipment.

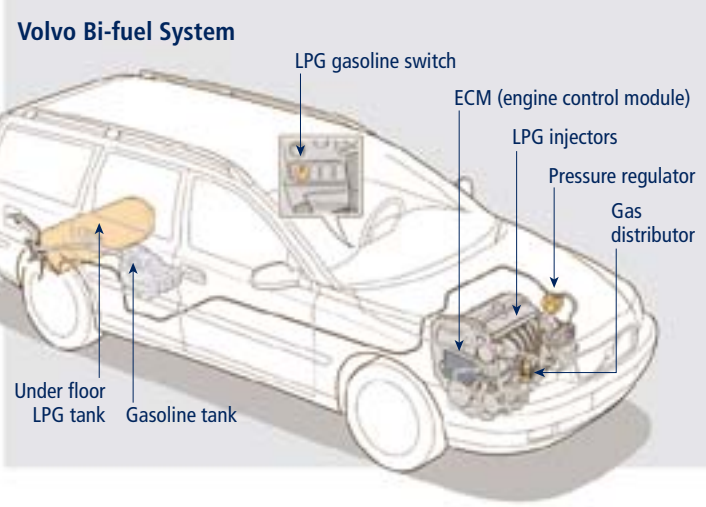
Regulations and fiscal policy make LPG an attractive option in Italy. In an effort to reduce harmful emissions, gasoline and diesel have been restricted. LPG vehicles, meanwhile, are allowed to operate during smog alerts that limit operation of conventional vehicles. Automotive LPG has an excise tax advantage over gasoline and diesel. The government subsidizes LPG conversion of buses, taxis, and some private vehicles.

LPG—A liquid gas?

Sometimes it is a liquid, and sometimes it is a gas. The benefits of LPG stem largely from its ability to change between the two phases. LPG is a gas at normal temperatures and pressures (the boiling point of propane at atmospheric pressure is about -45°C, for butane it is about -2°C). When subjected to modest pressure or cooling it becomes a liquid. The pressure in a storage tank keeps LPG liquid, and it becomes gas when released from the tank. The liquid form has an energy density 270 times greater than the gaseous form, making it efficient for storage and transportation as a liquid, while giving the benefit of a clean, gaseous fuel when burned.

A World of Options

LPG vehicles can be designed as such by original equipment manufacturers (OEMs), or converted from other fuel systems. A typical aftermarket conversion includes installing a new fuel tank, fuel pressure regulator, electric or vacuum-operated switches, and electronics. Until recently, the cost of an aftermarket conversion in the U.S. ranged roughly from $2,000 to $4,000. Such costs are rising, however, because of tougher emission certification requirements (see story, page 10).



Many OEMs offer LPG as an option—installed at the factory or converted at the time of purchase. In Europe, Volvo offers fully factory-assembled bi-fuel cars with equipment specifically designed and tested for Volvo. (Some of those cars also come with a compressed natural gas option.) Vauxhall Motors in the United Kingdom offers three models with a bi-fuel option. In the United States, a Ford bi-fuel pickup truck is available. Mitsubishi offers LPG passenger cars in Japan, where they are used primarily as taxis (95 percent of taxis in Japan use LPG).

More common than dedicated LPG vehicles are bi-fuel vehicles, storing gasoline and LPG in two separate tanks. Fuel is pressurized to about 300 pounds per square inch in the tank—about twice the pressure as in an inflated truck tire. LPG's lower pressurization requirement is sometimes cited as an advantage over other alternative fuel designs.

Filling an LPG vehicle is similar to filling a gasoline vehicle, except that a tighter connection is made between the hose and vehicle tank to prevent the pressurized fuel from escaping. In most countries where LPG is a vehicle fuel, it is sold alongside gasoline and diesel at traditional fueling stations. LPG is also available at dedicated LPG fueling stations.

Critical Mass

According to the WLPGA, successful automotive LPG market depends on achieving critical mass in the LPG market. Critical mass is defined in several ways. The number of vehicles must be large enough to show fuel providers that LPG is a viable business. The fuel must be widely available and convenient to consumers. The market must be large enough to ensure an adequate supply of equipment and mechanics trained to convert and maintain LPG vehicles. And the market must be sustainable so that OEMs are willing to develop LPG vehicles.

In many countries with large automotive LPG markets, government policies have been key to creating a market. France, for example, is one of Europe's fastest growing LPG markets. That country allows LPG vehicles to operate during periods of high air pollution when driving restrictions are imposed on other vehicles. South Korea is the world's largest automotive LPG consumer. According to the Korea Gas Safety Corporation, more than 10 percent of all registered vehicles in Korea are LPG-fueled. LPG's recent rapid market growth in South Korea resulted from a large excise tax advantage over gasoline and diesel (which the government recently decided to reduce).

Japan, the world's second largest automotive LPG market, offers grants for conversion or purchase of LPG vehicles and installation of filling stations.

For more information…

World LP Gas Association: www.worldlpg.com. World organization provides information on worldwide LPG use and links to world LPG organizations. The Global Autogas Industry Network provides information specific to automotive LPG.

Propane Education & Research Council: www.propanecouncil.org. U.S. organization provides information on LPG use, including use as automotive fuel.

Propane Vehicle Council: www.propanegas.com/vehicle/. U.S. membership organization promotes automotive LPG use.

Clean Alternative Fuels—Propane: EPA fact sheet provides information on LPG availability, emission characteristics, affordability, performance, safety, and maintenance. Available online at **www.epa.gov/otaq/consumer/fuels/altfuels/propane.pdf**.

Q&A:
John Millhone

Clean Cities is now under the Weatherization and Intergovernmental Program umbrella. John Millhone hopes to see alternative fuels integrated with other important DOE initiatives.

DOE's Office of Energy Efficiency and Renewable Energy (EERE), led by Assistant Secretary David Garman, was reorganized in July. Among the results is a new home for the Clean Cities Program. It is now part of EERE's Office of Weatherization and Intergovernmental Program (OWIP)—a diverse portfolio of entities that also includes the Energy Star Program, ReBuild America, and the Inventions and Innovation program.

John Millhone heads OWIP. He has a diverse background as a journalist, director of the Iowa and Minnesota state energy offices, and manager of the buildings and international programs in EERE. The staff of Clean Cities has not changed. Millhone spoke recently with AFN about the Clean Cities Program.

Why is Clean Cities part of the Weatherization and Intergovernmental Program? Can you explain the reasoning behind this change?

The goal of Assistant Secretary David Garman is to streamline EERE, reducing the management overhead and creating a closer, more responsive connection with our customers. Most of the EERE programs focus on research and development. The mission of OWIP is to take the products of these other offices such as alternative fuel vehicles and deploy them to our state, local, and public and private customers. By bringing these deployment activities together, we believe we can strengthen their impact.

How will this affect Clean Cities funding and direction?

I expect the direct funding support by DOE for Clean Cities will continue as it has in the past. The basic direction also will remain steady. Our strategy will be to strengthen these efforts by attracting additional allies through closer coordination between Clean Cities and our other outreach programs with states and communities and the private sector. For example, if we're talking to a group of cities about the ReBuild America program, we can say, "While you're considering actions that will make a difference to your environment, you really ought to also consider our Clean Cities Program."

Clean Cities stakeholders have invested a lot in the program. Should they expect DOE to continue supporting them?

The Clean Cities stakeholders should expect a broadening of DOE's support. OWIP is launching a coordinated effort to package DOE's efficiency and renewable programs to the American people. ReBuild America and Energy Star is in the buildings sector, the Inventions and Innovation Program is in the industrial sector, and Clean Cities is in the transportation sector. Clean Cities will be an essential element in this campaign to connect through our Regional Offices with states and communities. A specific objective will be to strengthen the state and community support for the Clean Cities coalitions to enable them to become more self-supporting and a permanent part of our transportation systems.

Please compare Clean Cities to other OWIP programs, or to grant-giving government programs in general, in terms of purpose, scope, and effectiveness.

OWIP includes both financial assistance and technical assistance activities. A major financial assistance activity is the Weatherization Assistance Program, which provides funds to improve the energy efficiency of low-income housing through 970 local community action agencies. Another financial assistance activity is the State Energy Program, which provides the basic support for state energy offices. Our Gateway programs combine financial and technical assistance. Clean Cities is one of these combined programs. The broad purpose of all of these programs is to

achieve the U.S. objectives of improving energy efficiency and reducing dependence on imported oil. This can be done most effectively if we coordinate these efforts. For example, we intend to use our financial support for the state energy offices to make the states more aware of the Clean Cities Program to build state support for the Clean Cities coalitions. State energy offices need to better understand the benefits that Clean Cities brings to their communities. I intend to encourage the SEOs to contribute to the sustainability of those coalitions that need help in becoming viable organizations.

Your background includes a great deal of international experience. Does Clean Cities have an important role to play beyond the United States?

For the past eight years, I've had international assignments as a senior fellow at Battelle's Advanced International Studies Unit and as director of DOE's Country Studies Program and the U.S. Initiative on Joint Implementation. On these assignments, I've become directly familiar with the severe air quality problems in most of the world's major urban areas. When other countries and cities hear of the U.S. Clean Cities Program, they ask, "How can we get a Clean Cities Program in our cities?" We've tried to help some cities initiate a program. Our funding for international efforts is very limited, but we're exploring ways where we might get the resources to address this international need.

Climate change is a global problem, so all countries should have an interest in controlling greenhouse gas emissions. Based on your work internationally, are developing countries concerned about GHGs?

To be candid, the attitude of many developing countries is that the problem was created by carbon emissions from developed countries. They see efforts to limit their carbon emissions as a means to hold them back economically. In my view, we need to address that issue directly. We should show them that they can leapfrog some of the technology-development processes that developed countries have gone through, and go directly to processes that are more sustainable. For example, they might avoid some of the costs of constructing a petroleum infrastructure if they choose natural gas or hydrogen. To be most cost-effective, alternatives will have to have some kind of carbon-emissions trading process. Developing countries will have something to gain by being leaders in technologies that reduce greenhouse gas emissions. If countries choose to have lower carbon emissions and there is a trading program, they would earn credits that would be helpful to their further development.

Clean Cities is built on a few leaders effectively showcasing new technology with the hope that other users will follow. What makes this process work best, or not work?

I heartily agree that Clean Cities is built on the enthusiasm and commitment of a few leaders. This was vividly apparent to me when I attended the Clean Cities Conference in Oklahoma City. I have great admiration for Shelley Launey, who leads our Clean Cities Program, and her staff and contractors who have a contagious enthusiasm that is shared with the leaders of the Clean Cities coalitions. Good people make good programs and that's the resource we need to build on. My approach will be to support these leaders while also seeking to help create a stronger state and community infrastructure that will sustain this enthusiasm and these programs for the long haul.

Should Clean Cities support hybrid technology?

Clean Cities should have a fairly inclusive approach, to look at transportation systems that are alternatives to the conventional internal combustion engine. I recognize each AFV has unique characteristics, and in terms of efficiency they vary somewhat. But they're all improvements over conventional transportation. I don't want to get into the pattern of trying to include some and not others. That said, it does not appear that hybrids need special support to gain consumer acceptance. We view our role as one of education, helping consumers understand the benefits of hybrid technology. We developed "Technology Snapshots" for each commercial hybrid as it entered the market and we include information about hybrids on our Web-based *Consumer Buyers Guide.* But our grant money is reserved for alternative fuel vehicles where the barriers and challenges for market penetration are steeper.

What have you learned in your first few months on the job?

I've learned that Clean Cities is more complicated than I originally supposed. I had lumped all alternative fuels together and I'm learning that there's a rich diversity of alternative fuels, each with its unique features and applications. My original approach was to think in broad terms about improving the energy efficiency and reducing the dependence on petroleum in our cities and districts. Now I'm more aware of the specific contribution that Clean Cities is making to addressing this challenge. And I've also learned that the people I've met in Clean Cities work hard and have fun working together. I'm looking forward to joining our Clean Cities partners in this important work.

National Parks Showcase Alternative Fuel Vehicles

Yellowstone became the world's first national park in 1872. In 1916, the National Park Service (NPS) was created with a mandate to conserve national parks and monuments and provide for their enjoyment in a way that "will leave them unimpaired for the enjoyment of future generations."

More than 80 years and 300 designated areas later, the NPS is visited by hundreds of millions of U.S. and international visitors each year. Clearly, the parks are being enjoyed today, but the impact of ever-increasing automobile traffic is threatening their enjoyment by future generations. One solution: alternative fuel vehicles (AFVs). Through the efforts of the U.S. Departments of Energy (DOE) and Interior (DOI), individual parks, and public- and private-sector partners, AFVs have been implemented in national parks across the country.

Ford

Corporate involvement: A ranger poses with Ford TH!NK Neighbor electric vehicles at Golden Gate National Recreation Area. The National Park Foundation facilitated Ford's gift of 500 TH!NK Neighbors to California national, state, and local parks. DaimlerChrysler is planning a donation of its GEM electric vehicles to California parks. "We want national parks to be examples of sustainability," said Ray Murray, partnership coordinator for the NPS' Pacific West Region. "When visitors see sustainable practices such as AFV use in the parks they're more likely to emulate these practices when they go home. We're very grateful for the contributions from Ford and DaimlerChrysler and the help of the National Park Foundation."

Ford

Born again clean: A newly restored red bus, powered by liquefied petroleum gas (LPG), returns to Glacier National Park. Glacier's iconic red tour buses, which had operated since the 1930s, were retired owing to age and wear in 1999. Ford Motor Company, the National Park Foundation, the NPS, and concessionaire Glacier Park Inc. partnered to restore the buses. The restored buses returned in 2002 with a new bi-fuel LPG system. According to Ford, the buses are 93 percent cleaner than the original ones. "Restoring these buses allows us to perpetuate a wonderful tradition, while moving into the future with clean-burning AFVs," said Dave Dahlen, Glacier's chief of interpretation. Ford, CleanFUEL USA, and the Propane Education & Research Council funded the installation of a public LPG fueling station right outside of the park.

AFV efforts were bolstered in 1999, when DOE and DOI officially inaugurated the Green Energy Parks program. The program's goals are to promote energy efficiency and renewable energy and increase the use of alternative fuels throughout the park system, while educating visitors about the impact of conventional energy use and ways that renewable energy technology can reduce that impact. DOE's Clean Cities Program

Constructive partnership: An NPS ranger speaks about Lake Mead National Recreation Area's new CNG fueling station. DOE's Clean Cities Program, the NPS, Southwest Gas, and FuelMaker collaborated to implement the six-unit station, which is used by 11 NPS CNG pickup trucks. "When national parks use AFVs, they do it to keep the parks green and clean," said Ernie Oakes, Clean Cities regional program manager. The Bureau of Reclamation has spoken with the NPS about the possibility of fueling its vehicles at the station in the future.

addresses the AFV aspect of the partnership and has contributed to numerous projects, from an electric utility vehicle at Puerto Rico's San Juan National Historic site to a CNG station at Washington's Lake Roosevelt National Recreation Area.

The positive effects of AFVs extend beyond park boundaries. For example, when Channel Islands National Park first started using biodiesel there were no biodiesel suppliers in Ventura County, California. The increased demand for biodiesel due to the park's use caused a local marine fueling station to be reconfigured to pump 100-percent biodiesel (B100), which made the fuel available to the boating public. Now, one local fuel supplier is providing B20 at three locations in the county along with one B100 pump. Private vehicles and commercial and municipal fleets are beginning to use biodiesel, and the increased demand has other suppliers interested in opening biodiesel stations. "National parks are not islands," said Kent Bullard, maintenance supervisor at the park. "If we minimize our environmental impact, the beneficial effects spill over into the community."

PIX 07330

Preserving the view: Alternative fuel buses stand before the view they help preserve at Grand Canyon National Park. Compressed natural gas and liquefied natural gas shuttle buses are the workhorses among the park's many AFVs. They serve two shuttle bus-only scenic routes and are boarded by millions each year. "The whole focus of the NPS is to provide wonderful places for this and future generations," said Jim Tuck, transportation director at the park. "The clean air and the view at Grand Canyon are a big part of the resource. AFVs produce no smell and no visible smoke. Using them is the right thing to do."

PIX 10023

A win-win situation: LPG shuttle buses take on passengers at Zion National Park. From April to October, visitors to the Zion Canyon Scenic Drive—the park's most heavily visited route—are required to park their vehicles and take a shuttle bus. "In addition to reducing emissions, the shuttle buses have relieved traffic congestion and eliminated parking frustrations," said Ron Terry, Zion's chief of interpretation. "The reduction in motor vehicle noise has even brought wildlife back along the route. More than 90 percent of the written comments we receive about the shuttle system are positive."

National Park Service

Making it official: Yellowstone's assistant superintendent Frank Walker speaks about the park's commitment to clean air and alternative fuels. On September 18, an area comprising three national parks and parts of three states was officially designated as the Greater Yellowstone-Teton Clean Cities Coalition. One of the coalition's major concerns is reducing the impact of vehicle emissions on visibility, which is important for the area's tourism economy. Its immediate goal is to expand alternative fuel infrastructure and vehicle use, with a focus on a multi-season alternative fuel park vehicle. To Walker's right is a stationary fuel cell that will supply electric power to park offices.

Federal News

CHANGING COURSE:
AFV Conversions After Option 3

Following this year's regulatory changes by EPA, many converters are now doing business as Small Volume Manufacturers

Converting gasoline vehicles to run on gaseous fuels was once the domain of shadetree mechanics. That changed with the passage of government AFV mandates such as the Energy Policy Act of 1992 (EPAct), which mandated AFV purchases by federal and state agencies. The conversion business grew rapidly throughout the 1990s, often filling AFV needs unmet by original equipment manufacturers (OEMs). New parts suppliers and service providers sprang up, and utilities and other fuel suppliers began offering conversions as a way to create new customers.

In response to the growth, the U.S. Environmental Protection Agency (EPA) tightened its AFV conversion rules several times in the late 1990s. One catalyst for tighter control was an ill-fated tax incentive program in Arizona beginning in 1999. Many drivers with no apparent intention to use alternative fuels installed bi-fuel systems, incentivized by generous tax breaks that cost the state millions. A good deal of substandard conversion work was done, alongside high-quality work by conscientious providers. Stricter standards then raised the costs of certification and drove some companies out of business.

Last year, the industry encountered another hurdle. EPA declined to extend Option 3 of its long-standing Mobile Source Enforcement Memorandum, known as Memo 1A. The decision eliminated one way of three ways—generally considered the least demanding—in which conversion companies could gain EPA emissions certification for their products and services. (See AFN Volume 6, No. 1, page 13; or **http://afdcweb.nrel.gov/ documents/altfuelnews/6_1 federal_afv.html**). As a result, the AFV conversion industry continues to change, as reflected in recent comments by these key industry players.

Technocarb

Surviving players in the conversion game will be fewer and bigger. That's the expectation of Frank Breeden, national sales manager of Technocarb, a Canadian company with its U.S. operations based in Arizona. Techocarb sells conversion kits to fleet operators, fuel suppliers, auto dealers, and individuals.

"Certification has become very trying," says Breeden. Companies selling conversion kits must effectively duplicate emissions test procedures conducted by OEMs, he says. As an illustration, Technocarb is working toward certification for a kit to convert Ford's 5.4 liter V8 engine to CNG fueling—but only in the F150 and F250 pickup trucks. Certifying a kit for the same engine when used in Ford full-size vans would require $70,000 worth of additional dynamometer testing. Technocarb can't justify the expense, Breeden says.

With the higher costs of certification, many smaller suppliers and service providers have already dropped out of business—usually without a public proclamation, says Breeden.

Who will be left doing conversions? The most reliable customers for Technocarb products historically aren't pure conversion service providers. "Ideally they have some other significant source of revenue aside from conversions," he says. For example, Northwest Propane Gas (see below) converts buses to run on propane, but its core business is operating LPG fueling facilities in Texas. Auto dealers have also been good customers, selling conversions as part of a broader business.

Northwest Propane Gas

Northwest Propane Gas sells fuel to state agencies and school districts throughout Texas. For the state's Department of Transportation alone, it maintains 130 private LPG fueling stations. The company also provides AFV conversion services—or did so until recently, when Option 3 expired.

"We went from doing 800-1,000 conversions per year to none at all," says company official Tim Wood. Northwest Propane Gas is standing by as its two conversion kit suppliers, Technocarb and Bi-Phase, seek EPA certification for kits used frequently by Northwest Propane. But even when certification comes, it won't be doing conversions in the volume it once did, says Wood. Fewer customers can afford the price of a conversion kit, which is expected to go approximately from $2,000 to $6,000 as a result of higher certification expenses.

Partly in response to the anticipated rise in conversion costs, the company is working to reduce the number of school bus platforms commonly converted to propane in Texas. In the past, it routinely dealt with as many as 15 different school bus platforms. Working with bus supplier Bluebird, it hopes to establish the 8.1 liter V8 engine from General Motors as an unofficial standard among school districts, ensuring that certified parts and service are always available.

Northwest Propane Gas is a distributor of kits made by Technocarb and Bi-Phase, but the market is nearly nonexistent. Meanwhile, its technicians keep busy with non-automotive work, converting forklifts, power generators, and even lawn mowers to run on propane.

Natural Fuels Company

Natural Fuels Company, based in Denver, was acquired in 2000 by Blue Energy from Public Service Company of Colorado (a large utility now called Xcel Energy). Natural Fuels sells CNG at 35 public and 10 private access locations in Colorado and Wyoming. Until approximately 1998, it was also heavily involved in converting light-duty vehicles to run on CNG. Now its vehicle shop does mostly NGV service and repair, and about 50 conversions per year.

Two factors put an end to high-volume CNG conversions, says Natural Fuels market manager John Gonzales. After EPA regulatory changes in late 1997 toughened certification procedures for CNG conversions, fewer kits were available.

At the same time, CNG offerings from OEMs were expanding. New vehicles included the Honda Civic GX as well as Ford's bi-fuel and dedicated CNG trucks and vans, and truck and car platforms from General Motors. Also, Dodge was re-entering the market with CNG fuel vans. Natural Fuels currently is focused on joint marketing with OEMs of light and heavy-duty vehicles, and providing conversion options for certain vehicles not available with CNG fueling from the automakers.

DRV Energy

DRV Energy of Oklahoma City does CNG and LPG conversions of light-, medium-, and heavy-duty trucks. Business has fallen off greatly, but with so much pent-up demand, company president Sheri Vanhooser expects a rebound. "I'm getting an unbelievable number of calls from customers, especially on the propane side," she says.

DRV has survived through diversification of services. The few systems that have been certified make it possible to convert the 6.0 liter and 8.1 liter engines from General Motors. The company installs compressors at fueling stations. It also does service and warranty work for auto dealers, and anticipates emission testing work for government clients on its in-house chassis dynamometer.

"One problem we have is that by the time we get through the certification process, sometimes we're almost into a new model year," says Vanhooser. Customers are less interested when eligible vehicles are a year old. A partial answer is better communication by the conversion company, telling its suppliers how many kits will be needed and when.

DRV service manager Lloyd Roberts recalls Arizona's AFV problems beginning in 1999. "Virtually every company in the business had somebody in the state selling kits, doing conversions, or doing training," he says. Much of the work was below par. EPA's more aggressive control of conversions was an inevitable result of such abuses. "What gave the industry a black eye was shoddy work by a lot of smaller companies that aren't even around anymore," says Roberts. Careful compliance with the law is what keeps surviving companies valuable to their customers.

Clean Cities Program
U.S. Department of Energy

The Clean Cities Program's technical advisor is Dennis Smith, based in Washington D.C. Before joining DOE, Smith ran the AFV program at Atlanta Gas Light Company, a major utility performing conversions and advanced emissions testing.

"Having an emissions lab on-site was critical to ensure that the conversions were high quality, meeting EPA standards," Smith said. The company's "OEM type of approach" added to the cost of conversions, and made it difficult it to compete with smaller companies that skimped on compliance training.

As AFV product offerings from automakers increased in the 1990s, Atlanta Gas Light phased out vehicle conversions. "We'd been trying to develop an overall market for natural gas as a vehicle fuel, and vehicle conversions were just a part of the puzzle," Smith recalls.

But alternative fuel selections from OEMs are still quite limited, he says. Many fleets with special needs must still rely on aftermarket conversion systems. "The quality of these systems is supposed to be as good as OEM vehicles, and many of them are," says Smith. Some AFV conversion systems use the same components and suppliers that serve OEMs. "But tightening emissions and conversion regulations are a way of life now. In part, the higher prices of conversions in the future reflect the fact that a lot more testing is required of everyone in the business."

Still, government regulators acknowledge that even the largest conversion companies don't have emission-testing resources like those of major automakers. Nor do they have the benefit of knowing the design of OEM fuel systems in advance of each new model year, says Smith. EPA recognized those factors last year, when it worked with Clean Cities to streamline the remaining routes to certification. The application process was simplified, testing requirements were eased, and many fees were reduced or eliminated. The process continues to evolve, with additional improvements expected in response to suggestions by applicants.

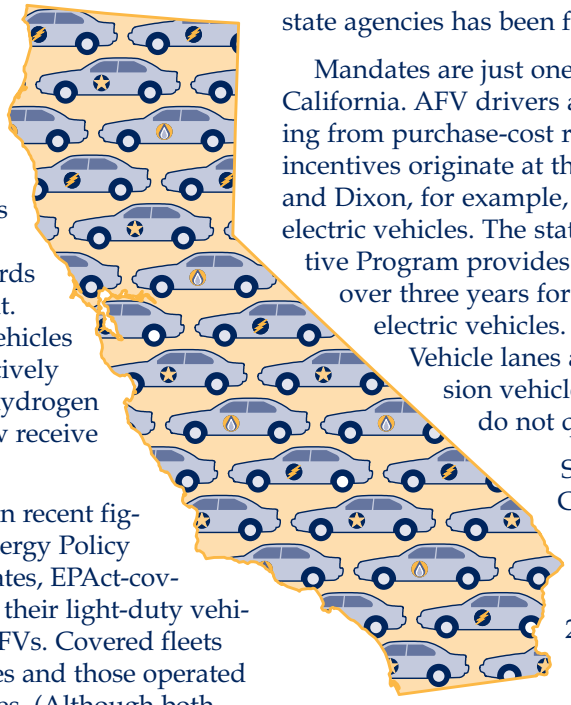
Dear Manufacturer...

In a memo dated August 29, 2002, EPA clarified regulatory changes stemming from the expiration of Option 3. The document answers many questions about emission testing, data collection requirements, fees, and warranty liability. It lists an online source of EPA guidance letters (called "Dear Manufacturer letters"). The memo clarifies the role of a Small Volume Manufacturer of Alternative Fuels Conversions, a legal designation that differentiates aftermarket converters from OEMs. Titled "Certification Guidance for Alternative Fuel Converters," the memo can be viewed at **www.epa.gov/OMS/cert/dearmfr/ccd0212.pdf**.

From the States

EPAct, State and Local Incentives Keep AFVs Cruising in California

California has long been a leader in fashion and culture, particularly car culture. That's evident in its widespread use of AFVs, perhaps because of a population more accepting of change than some others. It is also attributable to a legacy of auto emissions regulation dating back several decades.



The California Air Resources Board (CARB) was formed in 1967, preceding the U.S. Environmental Protection Agency and the federal Clean Air Act of 1970. Its earlier start is what gives Californians the legal right to set their own auto emissions standards independent of the federal government. CARB's mandate for zero-emissions vehicles (ZEVs), first enacted in 1990, has effectively pushed development of electric cars, hydrogen fuel cells, and even hybrids which now receive "partial ZEV credit."

California's AFV success is evident in recent figures measuring its compliance with Energy Policy Act of 1992 (EPAct) mandates. In all states, EPAct-covered fleets must satisfy a percentage of their light-duty vehicle acquisitions with the purchase of AFVs. Covered fleets include those operated by state agencies and those operated by certain fuel providers, mostly utilities. (Although both fleets are required to purchase AFVs, only the fuel provider fleets are required to use an alternative fuel.) These so-called "S&FP" fleets are further defined by various factors. For more information, visit **www.ott.doe.gov/epact/state_fleets.shtml#covered**.

In 2001, California's S&FP fleets, taken together, exceeded their EPAct mandate by 9 percent, as follows.

	AFVs required	AFVs purchased	Percent of requirement
State Agencies	1,079	1,280	119%
Fuel Providers	422	356	84%
Total	1,501	1,636	109%

In 2000 and 1999, California's S&FP fleets reached combined compliance rates of 107 percent and 72 percent, respectively, of their EPAct mandates. No S&FP fleets in California have ever been out of compliance, having made up shortfalls with EPAct credits earned in earlier years. (AFVs purchased before EPAct took effect in some cases have earned as many as five credits per vehicle. California currently holds a reserve of more than 3,500 credits, each worth one new vehicle.) Shortfalls were also erased in some cases with credits purchased from other covered fleets.

California is taking steps to make sure AFV fleet operators truly use alternative fuels, particularly in bi-fuel vehicles that can also run on gasoline. A task force including all state agencies has been formed with that objective.

Mandates are just one part of the AFV success story in California. AFV drivers are rewarded with "carrots" ranging from purchase-cost rebates to free parking. Many incentives originate at the local level. The cities of Vacaville and Dixon, for example, provide $5,000 toward the lease of electric vehicles. The state's Zero Emission Vehicle Incentive Program provides rebates of as much as $9,000 over three years for the purchase of freeway-capable electric vehicles. California's High-Occupancy Vehicle lanes are open to "inherently low-emission vehicles" including most AFVs. Hybrids do not qualify.

Several bills passed recently by California lawmakers demonstrate a strong commitment to cutting petroleum use and auto emissions. First came Assembly Bill 2076, directing three state agencies to develop a plan to reduce petroleum consumption statewide by 10 percent by 2005. A big part of the plan will be the use of alternative fuels—as well as smaller vehicles, fewer trips, better vehicle maintenance, more fuel-efficient tires, and hybrids. Separately, Assembly Bill 1170 calls for a plan to reduce petroleum use specifically by state agencies.

In July, amid controversy, state legislators passed Assembly Bill 1493, setting limits on the level of greenhouse gas emissions such as carbon dioxide permissible by passenger cars and light trucks. The standards are set to take effect with model year 2009. The move was regarded by opponents as an "end-run"—a de facto mandate to raise fuel efficiency, circumventing the federal government's role in setting Corporate Average Fuel Economy (CAFÉ) standards.

Assembly member Fran Pavley of Woodland Hills, California sponsored AB1493. "It's been a long hard fight, but by the stroke of the Governor's pen, California is again in the forefront of the fight for a cleaner environment," Pavley said in a press release.

One of three state agencies developing California's petroleum-reduction plan is its Department of General Services. That agency has long been active in cutting petroleum

consumption. It requires 25 percent of new state gasoline vehicles to be rated as Ultra-Low Emissions Vehicles (ULEV) or better. It is currently working with natural gas suppliers to simplify the purchase of CNG by state fleets through a standardized credit-card billing architecture.

California has taken steps to cut pollution not just from cars, but also from trucks, boats, locomotives, and off-road and stationary sources. Now in its third year, the state's Carl Moyer Memorial Air Quality Standards Attainment Program has received more than $100 million in state funding to aid development of low-emission heavy-duty engines. Alternative fuels are given higher priority under the program.

The Clean Cities Program has been a big part of California's AFV success, and vice versa. A dozen coalitions, including some of the program's most active, are located in the state. Stakeholders in southern California's Coachella Valley include SunLine Transit, one of the nation's most progressive AFV-deploying transit agencies. The Coachella Valley coalition will host the ninth annual Clean Cities Conference in Palm Springs in May 2003.

Oakland and Ford Create Public CNG Station with Private Funds

Oakland International Airport is the site of a new public access CNG station, thanks to a grant from Ford Motor Company. The station was opened with a ribbon-cutting ceremony in July, followed by an Advancing the AFV Choice event sponsored by the East Bay Clean Cities Coalition.

Oakland Airport director Steve Grossman spoke at the station unveiling.

The new CNG station is operated by California-based ENRG, one of the nation's leading suppliers of vehicular CNG and a strong Clean Cities stakeholder. (The company received one of the program's 2002 Clean Cities National Partner Awards (see **www.ccities.doe.gov/pdfs/partner_awards_02.pdf**.)

The new CNG station will operate on "24-7" basis, and will serve public and private fleets as well as individual motorists. Fleet customers include many taxis, shuttles, and refuse trucks. The Port of Oakland, which runs the airport, has ruled that ground transportation fleets serving the airport must be at least 50 percent AFVs by July 2003.

"What's remarkable about the station is that it was financed without federal funding," said Roxanne Dempsey, regional Clean Cities Program manager. Dempsey spoke at the event, and praised all sponsors of the event and project partners.

Annabell Cook of American Honda chats with Norm Stone (wearing cap) and Brian Pepper, both of Pacific Gas and Electric.

Ford Motor Company kick-started the project with a $150,000 grant. Oakland auto dealer S&C Ford, another sponsor, has sold all CNG taxis and most of the CNG shuttles serving the airport. Long-term partners include ENRG, Pacific Gas and Electric, the Port of Oakland, and East Bay Clean Cities.

The day's Advancing the AFV Choice event drew light-duty vehicles from Ford, GM, and DaimlerChrysler's GEM unit. Also displayed were refuse trucks, transit buses, and other heavy-duty vehicles from various municipalities. "The event was well attended and we had a lot of positive comments from attendees,"said Chris Ferrara, East Bay Clean Cities coordinator.

Online Tool Kit Aids Marketing of Alternative Fuel Airport Shuttles

A new information package available on the Clean Cities Web site facilitates the marketing of AFVs in airport shuttle applications. The *Airport Shuttle Outreach Tool Kit* is designed for people involved in marketing AFVs, alternative fuels, and AFV-related equipment and services as well as those involved in airport operations, environmental issues, and fleet operations.

The *Airport Shuttle Outreach Tool Kit* is available online at **www.ccities.doe.gov/toolkit**. The documents are formatted as Adobe Acrobat PDF files and are easily printed and assembled into a three-ring binder.

Tiger Teams Help Coalitions Solve Technical Problems

When Clean Cities coalitions encounter obstacles to implementing alternative fuel projects, help is available. Tiger Teams are made up of technical experts from DOE, the National Renewable Energy Laboratory, and private industry. Experienced with many alternative fuel vehicle platforms and niche markets, Tiger Teams can help solve vehicle and infrastructure problems. So far, they have:

- Developed facility specifications to help the Washington Metropolitan Area Transit Authority in Washington, D.C., incorporate CNG transit buses into its fleet.
- Produced the "AFV Transit Training Resource Guide," which points AFV transit managers and maintenance personnel to sources of AFV-related education and training.
- Conducted two AFV workshops for Texas truckers.
- Analyzed the feasibility of a universal card reader designed to allow fleet drivers to purchase alternative fuels at multiple sites with a single credit card.
- Developed an "Alternative Fuel School Bus Proposal Tutorial" to help states and school districts prepare effective proposals for AFV funding.

Projects that are planned or in progress include:

- California AFV/Fuel Infrastructure Workshop. Discussions have been held to coordinate the workshop with SCAQMD and other interested parties in southern California. The meeting will be probably be held in December 2002.
- Metro Atlanta CNG Transit. Meetings have been held with key stakeholders to increase understanding of infrastructure issues related to CNG bus expansion in that region.

Tiger Teams can also help evaluate potential opportunities for new alternative fuel projects. They are particularly interested in projects that may affect numerous coalitions. For more information about Tiger Teams, or to apply for Tiger Team assistance, visit **www.ccities.doe.gov/tiger.html**.

Clean Cities Grants Boost E85 and Driver-training Projects

Clean Cities has awarded several grants to advance E85 infrastructure development and train fleet drivers in the use of alternative fuel vehicles (AFVs). The grants were part of DOE's Broad Area Announcement solicitations for 2002.

The National Ethanol Vehicle Coalition (NEVC) received a grant for E85 infrastructure development and promotion. NEVC will establish at least 25 E85 fueling stations nationwide. The group will develop local promotional strategies to advance the use of existing E85 sites and establish a regional and national E85 promotional campaign. It will also establish a national registry of E85 owners, which will be used to help identify potential fueling sites.

Maryland Public Television received a grant for productions about the benefits of E85, which will be broadcast on *MotorWeek*. A weekly television magazine series, *Motorweek* airs on Public Broadcasting System stations nationwide. Clean Cities sees the *MotorWeek* segments as an opportunity to educate the public and fleet buyers about the benefits and availability of E85.

The Natural Gas Vehicle Institute, operated by Thomason & Associates, received a grant to provide driver training to EPAct-covered federal and state fleets as well as appropriate local government and private fleets. Using its own successful natural gas vehicle training program as a model, the organization will develop manuals to help increase the use of other alternative fuels.

More information about Clean Cities Broad Area Announcements grants is available at **www.ccities.doe.gov/baa_sol02.shtml**.

Make plans now to attend the 9th National Clean Cities Conference and Exposition, to be held May 19–23 at the Wyndham Palm Springs Resort in Palm Springs, California. For information, please visit www.ccities.doe.gov/palm_conference.shtml.

From the Automakers

2003 Fuel Economy Guide Now Available in Print and on the Web

This fall the U.S. Department of Energy and the U.S. Environmental Protection Agency jointly released the Model Year 2003 Fuel Economy Guide. Published annually at the start of the new model year, the guide displays fuel economy data for light-duty vehicles, including passenger cars and most pickup trucks and sport utility vehicles. Additions to this year's version include annual fuel cost data for each vehicle and a new advanced technology section featuring fuel cell vehicles.

Unveiled simultaneously with the print guide was its counterpart web site, located at **www.fueleconomy.gov**. The web site features fuel economy, emissions, and safety data for new and used vehicles, as well as fuel-saving tips for drivers. A dynamic site, www.fueleconomy.gov offers a customizable annual fuel cost calculator and allows side-by-side comparisons of up to three vehicles at a time. Search mechanisms also enable users to find vehicles according to manufacturer, class, and miles per gallon.

Since 1977, federal law has required automobile dealers to prominently display print copies of the guide and make them available to the public at no charge. The Fuel Economy Guide is available at public libraries and credit unions nationwide. Copies of the guide can be downloaded and printed from www.fueleconomy.gov. Official printed copies, which will be available later this fall, can be ordered from the National Alternative Fuels Hotline at 1-800-423-1DOE or via email from hotline@afdc.nrel.gov.

IRS Confirms $2,000 Hybrid Tax Deduction

Hybrid vehicles including Honda's Insight and Civic qualify for the federal government's $2,000 "clean burning fuel" tax deduction, the Internal Revenue Service announced recently.

Federal tax law allows a deduction to be claimed for the incremental cost of motor vehicle equipment that uses a clean fuel; the electric power component of a hybrid vehicle is one example of a clean fuel. But hybrid vehicle buyers previously had difficulty determining the exact amount of the deduction because they did not know the incremental cost of a particular vehicle's clean fuel equipment. The IRS resolved this problem in May by publishing Revenue Procedure 2002-42.

2003 Honda Civic hybrid

Honda

Revenue Procedure 2002-42 specifies a process by which manufacturers certify the incremental cost of a hybrid vehicle's electric motor and related equipment. If the IRS approves the certification, taxpayers can rely on it to claim a one-time "clean fuel property vehicle" deduction in the year the vehicle is first used.

The tax deduction is taken as an adjustment to income (line 32, IRS form 1040), and taxpayers need not itemize deductions to claim it. The deduction applies for tax year 2002 and the previous two years for which hybrid vehicles were available. An amended tax return can be filed to claim the deduction for a past year. Current law phases out the clean fuel tax deduction during tax years 2004–2006. Because current hybrid vehicles are certified as being primarily gasoline powered, they are not eligible for the electric vehicle tax credit (IRS form 8834).

AFVs for '03

Ford

The new model year's array of light-duty AFVs is now online at the Alternative Fuel Data Center. Ford's popular F-150 pickup truck continues with bi-fuel capability (both gasoline/CNG and gasoline/LPG), as well as dedicated CNG fueling. More AFVs for '03 are listed at **www.afdc.doe.gov/pdfs/my2003_afvs.pdf**.

Alternative Fuels Data Center
National Renewable Energy Laboratory
1617 Cole Blvd., MS/1633
Golden, CO 80401-3393

Holding the Line on Imported Oil with AFVs and Improved Fuel Economy

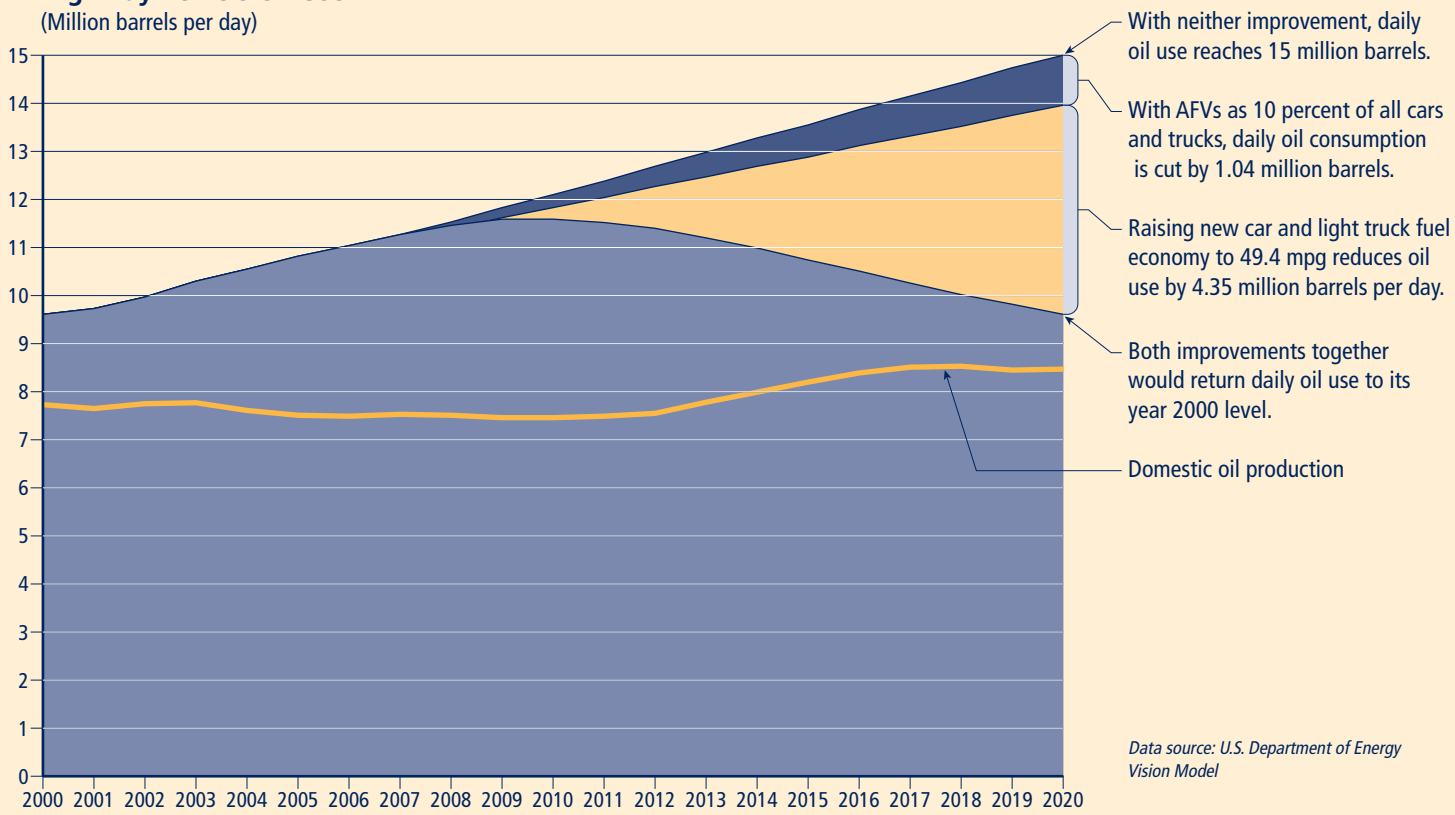
Highway vehicles in the United States account for consumption of approximately 10 million barrels of oil per day. Without significant changes, that figure is projected to reach 15 million by the year 2020. But we can hold oil imports to year 2000 levels with two key improvements:

- Make AFVs 10 percent of the vehicle population.
- Gradually raise the fuel economy of new gasoline cars and light trucks to an average of 49.4 mpg.

With steady progress toward both goals, U.S. highway oil consumption would keep climbing until approximately 2010. But it would then level off and decline, eventually returning to the year 2000 level, below 10 million barrels per day.

Even with both improvements, U.S. highway oil use would still exceed our total domestic oil production capacity, which currently stands at 7.75 million barrels per day. For additional perspective and commentary, see page 2.

Highway Vehicle Oil Use
(Million barrels per day)



Data source: U.S. Department of Energy Vision Model