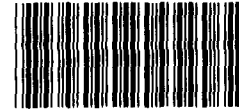


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**ALTERNATIVE FUELS
Experiences of Countries Using
Alternative Motor Fuels**

Statement of
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Before the
Subcommittee on Environment,
Energy, and Natural Resources
Committee on Government Operations
House of Representatives



Mr. Chairman and Members of the Subcommittee:

We are pleased to be here today to discuss the preliminary results of our review, conducted at this Subcommittee's request, on the experiences of Brazil, Canada, and New Zealand, which have implemented programs to encourage the use of alternative motor fuels. We will also discuss the results of a separate completed review of the Department of Energy's (DOE) progress in implementing the Alternative Motor Fuels Act of 1988.¹ The act calls for, among other things, the federal government to use alternative-fueled vehicles in its fleet. The Persian Gulf War, environmental concerns, and the administration's National Energy Strategy have greatly heightened interest in the use of alternative fuels in this country.

In summary, we found that each country was able, to some extent, to get motorists to use alternative fuels, although not without problems and setbacks. We also found remarkable consistency in the experiences and lessons reported. Collectively, on the basis of their experiences, consumers, along with government and industry officials, told us the following:

- Consumers' acceptance--both the private citizens' and fleet operators'--of alternative-fueled vehicles requires a price advantage over gasoline-fueled vehicles, convenient fueling, and comparable reliability and performance.

- Substantial involvement by industry is needed to ensure that the vehicle technologies, fueling infrastructure, and marketing framework are available to attract and retain alternative fuel consumers. In turn, industry needs to have reasonable prospects for a favorable economic return.

¹Alternative Fuels: Increasing Federal Procurement of Alternative-Fueled Vehicles (GAO/RCED-91-169, May 24, 1991).

-- Government needs to be the catalyst for encouraging consumers' use of and industry's involvement in alternative fuels by providing, among other things, leadership and a consistent commitment.

With respect to implementing the Alternative Motor Fuels Act, we found that because of technological readiness problems and market uncertainties, auto manufacturers have not provided DOE with the quantity, type, and size of alternative-fueled vehicles solicited. DOE has also experienced much higher than expected additional costs for procuring such vehicles and problems in placing them in all planned locations.

Before I address these issues in more detail, let me briefly provide some data on the alternative fuel programs in the countries we visited.

FOREIGN PROGRAMS

We selected Brazil, Canada, and New Zealand to review because they have organized alternative fuel programs in operation. The 1970s oil crises, with attendant price increases and fuel shortages, prompted the governments of Brazil, Canada, and New Zealand to look for opportunities to reduce their dependence on imported oil.

In 1975, faced with surplus sugar supplies and a heavy dependence on imported oil for the country's motor fuel needs, the Brazilian government initiated a program to convert domestic sugarcane into ethanol for use as a motor fuel. The government provided substantial subsidies for ethanol production along with other incentives and directed the government-owned oil company to provide ethanol fueling facilities and to keep gasoline prices higher than ethanol prices. (I will discuss examples of incentives in each country later. Also, see attachment I for a

summary of the types of incentives provided in each country.) Over the years, Brazil's difficulties with poor vehicle performance and an inadequate fuel supply have affected the use of alternative-fueled vehicles. Despite these problems, about 30 percent (4.2 million)² of Brazil's passenger vehicles were manufactured to operate only on ethanol. In addition, gasoline sold in Brazil contains up to 22 percent ethanol. (See attachment II for the estimated market penetration in each country by alternative fuels and vehicles using these fuels.)

In 1981, the Canadian government began encouraging the use of propane as a motor fuel by providing grants to consumers who converted their vehicles to run on propane. The program was built on the existing fueling network for propane. The peak number of conversions occurred in 1984, with 23,000 but the removal of government incentives and low oil prices led to a leveling off in the number of conversions. Today, about 140,000 vehicles (1 percent of the total fleet) use propane; of these, 85 percent can operate only on propane, and 15 percent can operate on propane or gasoline. Canada also started encouraging the use of natural gas as a motor fuel in the early 1980s. The government provided grants for converting vehicles to use the fuel and for installing fueling stations to sell it. These incentives for natural gas remain in effect today. Currently, there are about 27,000 natural gas powered vehicles in Canada; according to an industry official, 97 percent are dual-fueled vehicles, and 3 percent can use only natural gas.

New Zealand initiated its alternative fuel program in 1979 to reduce the country's dependence on imported oil. The government provided financial incentives to consumers both for converting

²The available vehicle and fuel-use estimates for Brazil, Canada, and New Zealand are neither precise nor consistent, and, therefore, we are presenting estimates that seem to best indicate the general extent of use in each country.

vehicles to run on natural gas or propane and to industry for developing a fueling network. The initial pace of converting vehicles was slow, however, and in 1983, the government increased incentives to consumers. By the height of the program, about 146,000 vehicles had been converted to use natural gas or propane. In 1985, the government reduced incentives to consumers because of governmentwide austerity efforts, and conversions fell off sharply. To encourage the private sector to continue the program, the government, in 1986, provided about \$2 million to the natural gas industry. Industry was slow to react, only recently initiating marketing efforts, and the number of conversions and the use of alternative fuels decreased steadily, with only a temporary resurgence following the Persian Gulf War. Currently, there are about 105,000 converted vehicles (6 percent of the total fleet) operating in New Zealand.

FACTORS AFFECTING CONSUMERS' ACCEPTANCE

Now, I would like to discuss a number of factors that affect consumers' use of alternative fuels in these countries. Numerous people in each country told us that consumers want a price advantage, convenient fueling, and the assurance that alternative-fueled vehicles would provide the reliable performance they are accustomed to with their gasoline-fueled vehicles. Fleet operators agree that these same issues are also important to them.

Price Advantage

Government market interventions and lower taxes on alternative fuels have helped create a significant price difference between gasoline and alternative fuels. For example, in Brazil's program, the price of ethanol was initially set at 59 percent of gasoline; the current price of ethanol is about 75 percent of the price of gasoline. Consumers in Canada and New Zealand are able to buy

natural gas for about 50 to 60 percent of what they would pay for gasoline.

The fuel price advantage needed to recoup expenses related to purchasing vehicles using alternative fuels or converting vehicles to use such fuels counterbalances the possible disadvantages of using these vehicles, including reductions in range, power, and trunk space and problems with cold starts. As part of our review, we surveyed 475 Vancouver consumers who recently converted vehicles to use natural gas. Of the respondents, 92 percent said that saving money on fuel was the major reason they converted their vehicles, and only 25 percent said that they would convert their vehicles if the price of natural gas and gasoline were the same.

The governments in each country also provided a variety of financial grants, low-interest loans, and tax incentives to consumers who were willing to convert their vehicles or to purchase newly manufactured vehicles. For example, Brazilian consumers initially received a tax break, paying a 35-percent tax on new ethanol-powered vehicles rather than a 45-percent tax on gasoline-powered vehicles. Canada provided reduced taxes on alternative-fueled vehicles and \$400 to \$500 in grants for converting vehicles, and New Zealand offered low-interest loans and up to \$200 in such grants. According to government and industry officials, financial incentives were very important in consumers' initial and subsequent decisions to purchase vehicles using alternative fuels. A New Zealand government official cited a marketing survey showing that the low-interest loans were the reason for 75 percent of the early vehicle conversions.

Convenient Fueling

Various government and industry officials in each country emphasized that consumers need to know alternative fuel supplies will be reliable, easy to locate, and easy to use. We were told

that consumers' need for a reliable fuel supply was illustrated dramatically in Brazil when an acute shortage of ethanol fuel existed in late 1989 and early 1990. To obtain fuel, drivers with ethanol-powered vehicles endured long lines while gasoline-powered vehicles passed by. Brazilian industry officials and experts said that consumers' confidence in ethanol fuel supplies was so undermined that sales of new ethanol-powered vehicles plummeted. Industry statistics indicated that sales dropped from about 50 percent to less than 5 percent of all new car sales within 1 year. An industry official in Brazil said that the principal lesson learned was that just one disruption can undermine consumers' confidence in the entire program.

Reliable Performance

Officials in each country also indicated that consumers' acceptance of alternative-fueled vehicles depends to a great extent on the perception that in quality, reliability, and performance, the vehicles compare favorably to gasoline-powered vehicles. When consumers have perceived otherwise, this has reduced their willingness to convert their vehicles to use alternative fuels or purchase vehicles using these fuels. For example, consumers experienced vehicle performance problems from poor-quality conversions early in Canada's and New Zealand's programs and with early ethanol-powered vehicles in Brazil. This left a negative perception, causing consumers in some cases to convert their vehicles back to use gasoline, according to industry and government officials in Canada. This negative perception, we were told, persisted long after the problems with conversions were corrected. Government, industry, and academic officials in New Zealand told us that the steady decline after 1985 in the number of vehicles converted to use natural gas was due, at least in part, to the poor quality of conversions early in the program.

Fleet Operators' Perspective

Like other consumers, fleet operators are also looking for a price advantage, convenient fueling, and reliable vehicle performance when using alternative fuels. According to fleet managers, however, one unique obstacle is getting their drivers to accept and use alternative fuels, particularly in dual-fueled vehicles. The managers said that fleet drivers have no incentive to accept the reduced range, power, passenger or trunk space or other limitations that can accompany the use of alternative fuels. Fleet managers told us that they need to monitor drivers' use of alternative fuels, or, as one manager observed, the use of the alternative fuel would have slowly been replaced by the use of gasoline.

The programs we studied did not specifically mandate that commercial fleets use alternative-fueled vehicles, but considerable use by commercial fleets has developed. Fleet managers told us that one advantage in targeting fleets would be the ease of reaching the relevant decision-makers, compared to reaching individual vehicle owners. One notable disadvantage managers raised, however, is that fleets may not contribute much to developing and expanding a retail fueling infrastructure because fleet operators often want the financial savings and increased productivity of using their own fueling stations.

INDUSTRY'S PERSPECTIVE

In each country, we learned that industry's involvement was important in developing the technologies to ensure vehicle quality, the fueling infrastructure, and marketing approaches to selling these products. In addition, we learned that the prospects for economic gain and a stable business environment will greatly influence industry's commitment to alternative fuels and willing participation in efforts to promote them. We also found that in

many cases, the governments had a role to play to facilitate industry's involvement.

Providing High-Quality Vehicles

Industry and government officials in the countries we visited said that industry needs to take a leading role in ensuring the quality and reliability of alternative-fueled vehicles. The poor-quality conversions of vehicles to use natural gas, which were serious impediments in both Canada's and New Zealand's early programs, illustrate this point. Initially, the installers of conversion kits had little experience, which resulted in shoddy conversions and consumers' diminished interest in these vehicles. To combat these problems, governments in both countries, with industry's help, developed standards and regulations for conversions. In New Zealand, the natural gas industry established an industry research center that also developed improved conversion technologies.

Developing a Fueling Infrastructure

Developing the fueling infrastructure for alternative fuels was a major concern in the countries we studied. We found that industry's efforts, along with government assistance, were important in developing the infrastructure. However, the process is slow. Even in Brazil--where the state owns the distribution system--it took 3 to 5 years to ensure that ethanol was available throughout the country. When Canada began its natural gas program in 1983, no fueling infrastructure existed. Installation of natural gas fueling facilities is very costly--the estimates we obtained ranged from \$200,000 to \$350,000 (Canadian dollars), depending on the size of the station. Government grants of \$50,000 were made available for such facilities. To get the oil companies with prime fueling station locations involved, the gas utilities also offered economic and technical assistance--such as

guaranteeing a certain level of fuel sales or providing maintenance services. Some of Canada's gas utilities also helped finance the installation of convenient natural gas home fueling units, now being marketed to private and fleet consumers.

Aggressive, Innovative Marketing of Fuels and Vehicles

In all three countries, it became apparent that industry's involvement in selling alternative-fueled vehicles to consumers was key to the program. Industry and government officials emphasized that marketing these fuels and vehicles requires an aggressive, creative effort by industry. For example, Vancouver's gas utility has developed a conversion package that offers consumers a price advantage and quality. Consumers pay \$1,399 for a conversion that costs \$2,000 because the utility combines its financial incentives and low-interest financing with the government grant for conversions.

In contrast, New Zealand's natural gas and fuel distribution industries initially relied on the government to develop and sustain natural gas markets. When the government reduced its support, neither industry moved aggressively, and natural gas sales and the number of conversions declined steadily. The natural gas industry has recently started to target fleets and market natural gas with aggressive advertising campaigns to change natural gas's image.

Establishing a Favorable Business Environment

According to industry and government officials, industry is most likely to provide alternative-fueled vehicles and alternative fuels if there is a reasonable prospect for a profitable and sustainable market. For example, we were told that auto manufacturers have been reluctant to market new alternative-fueled

vehicles in Canada or New Zealand because of the limited new car market in these countries. Also, a Canadian auto manufacturer expressed concern that new dual-fueled propane vehicles would be subject to warranty and emission standards that were not required of converted vehicles. According to Canadian government officials, the conversion shops were able to provide converted vehicles more cheaply and quickly than could new car dealers.

GOVERNMENTS' PERSPECTIVE

In each country, government was a catalyst for action on alternative fuels. Government and industry officials told us that in looking back on their experiences, they now see the importance of government action in removing the financial, technological, and attitudinal barriers to alternative fuels and in providing a consistent commitment to these fuels.

Being a Catalyst for Action

When Brazil, Canada, and New Zealand decided that alternative fuels could help reduce the countries' dependence on oil, the governments sought to galvanize consumers' and industry's support by publicizing the problem and the importance of alternative fuels. For example, in Brazil and New Zealand, industry officials told us that the governments appealed to the public's patriotic sentiments to use a domestic fuel (ethanol in Brazil, and natural gas in New Zealand). The Prime Minister of New Zealand appeared on television to urge the use of natural gas from offshore gas fields.

Removing Barriers

Alternative fuels face financial, technological, and psychological barriers, according to a Canadian government official and an alternative fuel consultant. In the countries we reviewed, the government financial incentives I discussed earlier were

important in dealing with these barriers and motivating consumers and industry to move from gasoline to alternative fuels. It is worth noting that such incentives also benefitted industry because they increased demand for alternative-fueled vehicles.

Providing a Consistent Commitment

Although the level of support the government provided for alternative fuels differed in each country, we heard the message from government, industry, and consumers that it is as important for the government to sustain its commitment to the public and industry as it is to make the commitment in the first place. When the crisis atmosphere subsided after the 1970s oil shocks and the costs of government incentives accumulated, all three governments reduced the level of their support, and consumers in New Zealand and Brazil responded by turning away from the use of alternative fuels. For example, New Zealand's government promoted natural gas so strongly that when incentives were reduced, consumers' confidence in the program was undermined because the changes were perceived as government's abandonment of alternative fuels. Natural gas sales and vehicle conversions declined steadily soon after, according to a New Zealand gas industry official. In Brazil, the government promised the public to continually subsidize ethanol to ensure its supply. However, government subsidies to producers were not maintained, and according to government and industry officials, severe shortages of ethanol resulted. When the supply shortages that I discussed earlier occurred, many consumers switched back to gasoline.

PROGRESS IN IMPLEMENTING THE ALTERNATIVE MOTOR FUELS ACT OF 1988

Now I would like to discuss DOE's progress in implementing the Alternative Motor Fuels Act of 1988. DOE is the lead agency responsible for implementing the act, working in conjunction with

other federal agencies. My discussion will focus on the federal demonstration program involving light-duty vehicles, one of the major programs under the act.

In implementing the act, DOE must work with other federal agencies to ensure that the maximum practical number of passenger automobiles and light-duty trucks acquired annually for the federal fleet be powered by alternative fuels. Such vehicles are to be powered by alcohol (ethanol or methanol) or natural gas, or by one of these alternative fuels and gasoline (dual-fueled vehicles). Data collection is an important part of this program. DOE must (1) assess how these vehicles perform in cold weather and at high altitude; (2) determine their fuel economy, safety, and emissions; and (3) compare their cost of operation and maintenance with that of conventional gasoline- and diesel-powered passenger automobiles and light-duty trucks.

Status of Demonstration Program

In May 1990, DOE, acting through the General Services Administration (GSA), issued its first solicitation to procure up to 200 alternative-fueled compact sedans. The solicitation targeted 23 locations for placing the vehicles, including areas with cold weather and at high altitude.

DOE, however, was only able to obtain 65 vehicles under this solicitation. Officials from the auto manufacturers that provided these vehicles stated that they could not provide more vehicles because of insufficient notice, and DOE officials told us they could not provide more notice because of normal delays in the appropriation process. Also, DOE was only able to buy dual-fueled alcohol vehicles. According to auto manufacturers responding to the solicitation, the technology for the other vehicle types sought was not yet far enough along to produce such vehicles. In addition, DOE was only able to purchase midsize sedans, which cost

more than the desired compact sedans. Auto manufacturers told us that they would only produce midsize vehicles for this contract because they already had production plans in place for producing such vehicles.

Finally, DOE was able to place the vehicles in service in only 4 of the 23 planned locations. None of the four is at high altitude.³ According to DOE's program manager, many locations were not chosen because (1) auto manufacturers could not provide skilled mechanics there--who were knowledgeable about alternative fuel technology and who could fulfill warranty obligations in servicing the vehicles--and (2) GSA had trouble finding federal agencies willing to take the vehicles, primarily because of a lack of fueling stations. The 65 vehicles purchased to date have recently been placed in service; thus, test data are just beginning to be collected.

In December 1990, DOE, again acting through GSA, issued a second solicitation to procure up to 200 natural gas powered or dual-fueled natural gas light-duty trucks and compact vans. According to a GSA contracting official, as of April 5, 1991, GSA had awarded a contract to Chrysler Corporation, the only auto manufacturer that bid on the solicitation, for 50 natural gas powered vans. According to this official, the auto manufacturers did not provide all 200 solicited vehicles because some manufacturers felt the technology was not ready, and before increasing production, Chrysler desired to produce a limited number of vehicles for the first production run to determine how they perform. These vans are scheduled for delivery sometime during January to March of 1992. Auto manufacturers informed us, in April 1991, that they do not have plans to produce dual-fueled natural gas vehicles, primarily because of design problems.

³The four locations are Detroit, Michigan; Los Angeles and San Diego, California; and Washington, D.C.

On July 15, 1991, GSA issued a third solicitation to procure up to 300 ethanol-powered or dual-fueled ethanol compact sedans. The solicitation targeted 21 possible locations for placing the vehicles, areas that have air quality problems. According to the solicitation, a minimum of 5 vehicles will be placed at each location selected. Responses to this solicitation are due by August 15, 1991.

Future Light-Duty Vehicle Procurement

With respect to future procurements, in May 1990, DOE informed the House Committee on Appropriations that it planned to procure each year after 1990, 1,000 to 2,000 alternative-fueled light-duty vehicles as additional alternative fuels and vehicles become available. However, the DOE director and manager of the alternative motor fuels program told us that on the basis of current authorized funding levels, the estimate of 1,000 to 2,000 vehicles per year is not realistic. This is primarily because the incremental costs and future maintenance costs for such vehicles are much higher than expected. (See attachment III for more information on incremental costs.) With current spending levels, DOE projects it will be able to purchase only about 1,500 such vehicles through 1995.

At this time, however, uncertainty exists about the future spending levels and thus the number of alternative-fueled vehicles that will be procured for the federal fleet. The administration's National Energy Strategy calls for the federal government to accelerate its purchase of such vehicles. In addition, a recent executive order on federal energy management directs DOE to acquire under the act the maximum practical number of such vehicles by the end of model year 1995. DOE officials told us, however, that they are in the process of developing a plan for implementing this order. This plan is expected to be developed by September of this year.

OBSERVATIONS

In summary, Mr. Chairman, we believe that the experiences of the three countries we reviewed that are using alternative-fueled vehicles provide useful insights the Congress could consider as it deliberates on the administration's National Energy Strategy and other legislative proposals to encourage the use of alternative fuels. Also, our work reviewing DOE's progress in implementing the Alternative Motor Fuels Act of 1988 revealed several related issues that the Congress could consider in debating alternative fuel proposals. These issues include (1) the extent to which federal purchases of alternative-fueled vehicles should be accelerated before data are collected on how well such vehicles perform, and (2) resolving problems in placing federal vehicles, given the limited number of fueling and repair stations and lack of incentives to build such facilities. In the final analysis, the extent to which alternative fuels are competitively priced with gasoline will determine their use.

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This concludes my prepared statement. I will be pleased to respond to any questions you or Members of the Subcommittee may have.

BRAZIL'S, CANADA'S, AND NEW ZEALAND'S
ALTERNATIVE FUEL INCENTIVES

Government incentives to consumers	Brazil	Canada	New Zealand
Grants for vehicle conversion		X	X
Loans or favorable loan terms for vehicle conversion	X		X
Reduced taxes on fuels		X	X
Reduced taxes on vehicles	X	X	
Government incentives to industry			
Grants or tax breaks for fueling facilities		X	X
Subsidies for alternative fuel production and distribution	X		X
Industry incentives to consumers			
Grants or loans for vehicle conversions		X	X

ESTIMATED CURRENT MARKET PENETRATION OF
ALTERNATIVE-FUELED PASSENGER VEHICLES IN
BRAZIL, CANADA, AND NEW ZEALAND

Number of Vehicles in Thousands

<u>Country</u>	<u>Total fleet size</u>	<u>Alternative fueled-vehicles</u>	
		<u>Number</u>	<u>Percentage of fleet</u>
Brazil	14,000	4,200	30
Canada	14,000	167	1
Natural gas		27	
Propane		140	
New Zealand	1,800	105	6
Natural gas		50	
Propane		55	

ESTIMATED CURRENT ALTERNATIVE FUEL SALES AS
A PERCENTAGE OF ALL MOTOR FUEL SALES

<u>Country</u>	<u>Alternative fuel sales as a percentage of total sales</u>
Brazil	27
Canada	3
New Zealand	6

SUMMARY OF INCREMENTAL COSTS OF PROCURING
IN 1990 MIDSIZE ALTERNATIVE-FUELED VEHICLES

Table III.1: Incremental Costs Per Alternative-Fueled Vehicle
Procured in 1990

<u>Cost component</u>	<u>Cost</u>
Average price of midsize alternative-fueled vehicle	\$14,130
Less: Typical price for GSA of compact vehicle in 1990	<u>7,730</u>
Incremental vehicle cost	\$ 6,400 ^a
Plus: Additional incremental operating expenses (see table III.2)	<u>1,890</u>
Total	<u>\$ 8,290</u>

^aThe average cost of the alternative fuel components for the Luminas and Taurus procured in 1990 was \$2,250 and is included in the incremental vehicle cost.

Source: GSA.

Table III.2: Additional Incremental Costs of Alternative-Fueled
Vehicles

<u>Cost component</u>	<u>Cost</u>
Fuel	\$1,080 ^a
Maintenance and repair	360 ^b
Disposal	<u>450^c</u>
Total	<u>\$1,890</u>

^aBased on driving 12,000 miles per year, and an additional 3 cents per mile for fuel, for 3 years.

^bBased on driving 12,000 miles per year, and an additional 1 cent per mile for repairs over GSA's fleetwide average of 5 cents per mile, for 3 years.

^cGSA expects to receive \$450 less when vehicle is sold.

Source: GSA.