

1. Alternative-Fuels Policy

1.1 Policy Perspective

In the absence of new policy initiatives, U.S. oil consumption is expected to increase by 20 percent over the next 20 years, reaching 20.3 million barrels per day in 2010 (EIA, 1991, Table A-8). With two-thirds of the world's proved reserves and an increasingly large share of world oil production concentrated in the Persian Gulf region, the economic, environmental, and energy security implications of this scenario merit the attention of policymakers.

Several distinct types of policies are useful in addressing concerns related to these projected trends in oil use. For example, energy security can be addressed through the acquisition of strategic petroleum reserves, improved policy coordination with other reserve-holding nations, a reduction in the geographic concentration of world oil production, increased domestic oil production, reduced domestic oil consumption, and greater flexibility in domestic energy markets can each serve to reduce both the likelihood and impact of future oil price shocks.

A balanced approach will necessarily involve a mix of these policies. However, the important role of reductions in oil use and the fact that the transportation sector accounts for two-thirds of U.S. oil consumption, suggest the need to give especially careful attention to measures with the potential to reduce the use of petroleum-based motor fuels in a cost-effective manner.

1.2 Role of Alternative Motor Fuels

Given the concentration of U.S. oil consumption in the transportation sector, reducing transportation petroleum use is a potentially important part of any policy to reduce oil use. Alternative motor fuels can make a major contribution to reducing petroleum use in the transportation sector. Some alternative fuels, such as ethanol,

methanol from biomass or coal, compressed natural gas (CNG), and LP Gas, can be produced domestically; and their use represents, to a considerable extent, a substitution of domestic fuel for imported petroleum. Other alternative fuels, notably methanol from natural gas, may be imported. The use of such fuels would contribute to the diversification of U.S. energy sources.

1.3 Long-Term Plan for Commercialization of Alternative Motor Fuels

Section 400DD of the Alternative Motor Fuels Act of 1988 (Public Law 100-494) established the Interagency Commission on Alternative Motor Fuels and charged the commission with the requirement to develop "a long-term plan for the commercialization of alcohols, natural gas, and other potential alternative motor fuels."

The National Energy Strategy (NES), which addresses the production and use of all forms of energy, includes five initiatives that are intended to bring alternative motor fuels into the marketplace:

- Eliminate the 1.2-mile-per-gallon cap on corporate average fuel economy (CAFE) credits for flexible-fuel vehicles or diesel dual-fuel vehicles.
- Accelerate the purchase of new alternative-fuel vehicles (AFVs) for Federal fleets.
- Modify the clean-fuel-fleet concept to ensure the use of AFVs.
- Increase research and development on advanced biofuels technology.
- Increase research and development on AFVs.

It is through the NES, and specifically these five alternative-fuels initiatives, that the commission

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is fulfilling the requirement for the development of a long-term alternative-fuels plan. The Administration is already implementing those measures that do not require new legislation. To bring this plan to fruition, the Administration has also submitted legislation to Congress. We are working actively with Congress to ensure the enactment of our legislative proposals to promote the commercialization and use of cost-effective alternative-motor-fuel vehicles and fuels.

1.4 The National Energy Strategy

The NES is designed to achieve balance among our increasing need for energy at reasonable prices; our commitment to a safer, healthier environment; and our goal to reduce dependence by ourselves and our friends and allies on potentially unreliable energy sources. The NES involves both increases in production and reductions in oil use in all sectors of the economy. To achieve its goals, the NES includes major initiatives to bring cost-effective alternative motor fuels into the marketplace.

The development of alternative motor fuels is driven by expectations that technology and market developments will make such fuels economically attractive, national concerns about the level of U.S. oil consumption, and urban air quality problems associated with the transportation system. Greater reliance on cost-competitive alternative fuels can help to address these concerns while contributing to economic efficiency.

While large Federal and State subsidies have led to the use of ethanol as a blending agent in almost 10 percent of all U.S. gasoline, the widespread use of alternative fuels such as ethanol, methanol, natural gas, LP Gas, and electricity is hampered by a variety of structural, technological, and economic factors. Some of these are specific to each alternative fuel, while others are common to all these fuels. Some alternative fuels are significantly more expensive than gasoline. These can also require changes in how vehicles are refueled or recharged. Some AFV's are much more expensive than their gasoline-powered counterparts. They may also fall short in performance. Factors common to all fuels include the limited U.S. fuel distribution infrastructure and

the difficulty of introducing AFV's to the general public until alternative fuels are widely available. Notwithstanding recent interest in alternative fuels, researchers' experience with advanced AFV's is relatively limited, and they need additional data on such vehicles' performance, fuel economy, and emissions, especially for optimized vehicles in daily real-world service.

In concert with support of research and development programs to develop engines that can use alternative fuels, Federal support can help to improve the understanding of the fuels, reduce the cost of producing the fuels, and address legitimate market barriers that impede the penetration of cost-competitive fuels into the marketplace. The NES is intended to speed the introduction of alternative fuels and AFV's between 1995 and 2010. The Strategy proposes several concurrent actions to encourage vehicle manufacturing, access to vehicle refueling, and new fuel supplies. These policies are described below.

1.4.1 Incentive for Production of Alternative-Fuel Vehicles

This initiative provides for the elimination of the 1.2-mile-per-gallon cap on CAFE credits for alternative-fuel-flexible or dual-fuel economy credits for alternative-fuel-flexible or dual-fuel vehicles. The Alternative Motor Fuels Act of 1988 provides CAFE credits for vehicles operated on either alcohol or natural gas. Dedicated AFV's receive an unlimited fuel economy credit, but they may be limited to niche markets. Production of flexible-fuel or dual-fuel vehicles, however, results in a CAFE credit that is limited to 1.2 miles per gallon initially and then declines to 0.9 miles per gallon. This incentive is unlikely to stimulate the manufacture of more than a few hundred thousand flexible-fuel vehicles per year. As a consequence, fuel-economy credits for AFV's would have little effect on energy use for at least two decades. Removing the cap on CAFE credits for flexible- and dual-fuel vehicles should provide a significant incentive for manufacturers to produce vehicles that could operate on alcohol or natural gas, as well as on conventional fuels, establishing the capacity for a large market for future U.S. alternative-fuel production and distribution.

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1.4.2 Larger Federal Alternative-Fuel Fleet

The Federal Government will accelerate its purchase of new AFV's, in order to act ahead of the 1995 deadline, set by the CAAA, to begin such purchases. The Government purchases 44,000 light-duty vehicles per year and operates a civilian fleet of 200,000 cars and light trucks. Large annual Federal purchases, especially if executed in cooperation with State and local initiatives, will increase incentives for auto manufacturers to produce a wider variety of optimized AFV's that use a range of alternative fuels, including natural gas, ethanol, methanol, LP Gas, and electricity. Large Federal purchases also would encourage manufacturers to produce vehicles that meet Federal and State fleet specifications.

1.4.3 Alternative-Fuel Fleets

The Clean Air Act Amendments of 1990 (CAAA) provide significant new requirements for the use of clean-fuel vehicles. The NES proposes a modification of the clean-fuel-fleet concept to ensure use of alternative-fuel vehicles (which are not required by the CAAA's clean-fuel-fleet program) and to expand the program nationwide.

The CAAA require that, in 21 urban areas, fleets of 10 or more cars and light-to-medium trucks meet stricter emissions standards. These fleets would, under this proposed initiative, be required to purchase AFV's starting in 1995 (10 percent, growing to 90 percent by 2000). These purchase requirements would also be extended to heavy trucks (excluding over-the-road class 8 trucks) and to all other urban areas. However, in urban areas not covered by requirements of the CAAA, only fleets of 20 or more vehicles would be affected. Bus fleets would be required to begin purchase of alternative-fuel buses in 2000.

This program will emphasize use of public refueling so as to not require fleet operators to install refueling facilities that are not cost effective. Combined with the incentive to encourage manufacture of AFV's by the Federal fleet, these alternative-fuel fleet requirements are expected to stimulate the widespread introduction of AFV's and the availability of alternative fuels at public refueling stations.

1.4.4 Increased Research and Development on Alternative-Fuel Vehicles

The Federal Government has proposed enhanced research and development on batteries and electric vehicles to move initial commercialization of electric vehicles up to the mid-1990's. Electric vehicles are an environmentally attractive alternative to conventional vehicles, especially in urban areas. Research could accelerate the development of battery concepts that could improve both near-term and long-term commercial competitiveness for electric vehicles. Efficient, durable, and safe batteries that can provide acceptable driving ranges for urban travel are essential for widespread market acceptance of electric vehicle technology. A consortium of vehicle manufacturers, battery developers, and utilities, along with the Department of Energy, is being formed to support an aggressive research and development program to make major advances in battery technology. The program will focus on extending electric vehicles' driving range up to 200 miles on a single charge, increasing battery specific energy and specific power, and improving electric propulsion technology.

The Government is continuing research and development on gas turbine engines. Compared with conventional gasoline engines, ceramic gas turbine engines could be 30 to 40 percent more efficient, could operate with high performance with a variety of alternative fuels, could have very low emissions, and could have reduced maintenance requirements. Worldwide, eight vehicle manufacturers have extensive research programs on gas turbine technology with the U.S. auto industry. The advanced gas turbine could also be used in long-haul trucking.

The Government is also continuing research and development on low-heat-rejection diesel engines for use in heavy-duty trucks, using temperature-resistant ceramic parts to achieve up to 22 percent more efficiency than conventional diesel engines. Continued research and development on ceramic material design, processing, and testing is critical to both gas turbine and low-heat-rejection diesel engine research.

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The Department of Energy is performing research on fuel-cell vehicles to produce cost-effective alternatives over the long term. Originally developed as power supplies for electric utilities and space stations, fuel cells are now being applied to transportation. Fuel-cell technology could improve fuel economy 70 to 80 percent over conventional engines and could reduce noise. Fuel-cell-powered vehicles could provide an ultraclean technology that could be less expensive than other attainment strategies for areas that have not attained Federal ozone standards. Several fuel-cell concepts, such as the proton exchange membrane, are being investigated. Possible applications in urban buses appear very attractive, though they are not commercially viable at this time. Fuel-cell vehicles are a candidate for accelerated development.

The Federal Government will accelerate efforts started under the Alternative Motor Fuels Act of 1988 and give them additional support. Because AFV's are only now being tested in significant numbers under real-world conditions, data on their performance, fuel economy, and emissions are incomplete. Specific areas where additional data and analysis are needed are environmental emissions from vehicles using alternative fuels, full fuel-cycle costs of alternative fuels compared with fossil fuels, and agricultural impacts stemming from large-scale biomass production. The newly established Alternative Fuels Data Center at the Solar Energy Research Institute will collect and analyze data on alternative-fuels utilization from Federal and State fleets. The Alternative Fuels Utilization Program will encourage research on improving the costs, efficiency, and performance of AFV's.

1.4.5 Advanced Biofuels Technology

The Federal Government will accelerate research into biomass conversion technologies with a goal of identifying cost-competitive alcohol-fuels technology by the year 2000. Domestically produced liquid fuels from biomass, particularly from nonfood agricultural products, could provide the Nation with significant energy security benefits while strengthening its rural economies. Clean-burning alcohol fuels produced from nonfood biomass constitute a renewable and sustainable alternative for dwindling domestic petroleum

reserves. Alcohol fuels can be used as blends in today's vehicles, and they can be used in pure form in flexible-fuel vehicles or dedicated alcohol vehicles powered by internal combustion engines, new gas turbines, or fuel cells.

The costs of producing alcohol fuels from biomass have dropped significantly, reducing the plantgate price of ethanol from \$3.60 per gallon in 1980 to \$1.27 per gallon in 1990, which is equivalent to a wholesale gasoline price of \$1.65 per gallon, taking into account ethanol's lower energy content per gallon and its greater efficiency. For comparison purposes, the average wholesale price of gasoline (excluding taxes) was about \$0.76 per gallon in 1989. This progress has come through successful research and development on improved alcohol yields, faster production systems, increased alcohol concentrations, and improved enzymes and microbial systems. Accelerated research on enzymatic hydrolysis technologies for ethanol production is expected to further reduce ethanol production costs. As researchers come to understand and perfect enzymatic conversion processes for ethanol, emphasis will shift toward combining the separate steps into an integrated process through development of continuous processing and construction of a process development unit and a semicommercial engineering development unit. Early, limited introduction of these new technologies, using low-cost feedstocks, such as municipal and agricultural wastes, may be possible.

Methanol from biomass costs about \$2.50 per gallon on a gasoline-equivalent basis in 1980, but research on advanced gasifiers has brought the estimated cost of producing methanol from biomass down to about \$1.15 per gallon. Methanol-from-biomass costs are expected to decrease because of future improvements in gasification technology, synthesis gas conditioning, and gas product cleanup.

Cooperative research carried out by the Departments of Energy and Agriculture on feedstock and alternative fuels is expected to accelerate development of diverse energy crops for both ethanol and methanol. Additional research on oilseeds and microalgae may yield new feedstocks for diesel fuel and oils from biomass. Research on advanced genetic technology to

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enhance energy content and to maximize desirable feedstock components of such crops as fast-growing poplar trees and perennial grasses could help improve productivity and reduce costs. In addition, Federal research on the development and processing of coproducts can improve the economics of producing liquid fuels from biomass. Cost reduction through accelerated research could bring ethanol and methanol to commercial readiness by the year 2000 under Current Policy Base case oil prices, leading to alcohol production of 5 to 6 quads (2.5 million to 4 million barrels per day) by 2030.

1.5 Effect of National Energy Strategy Initiatives on Oil Use

These five measures will make a significant contribution to reducing petroleum use in the

transportation sector through substitution of alternative motor fuels for gasoline and diesel fuel. Implementation of these measures results in a projected substitution of alternative fuels (including oxygenates) for 2.2 million barrels per day of gasoline and diesel fuel by 2010 under the scenario used in the NES analysis. Accordingly, the NES meets the requirements of the Alternative Motor Fuels Act for a long-term plan to encourage the widespread use of alternative transportation fuels.

Reference

1. U.S. Department of Energy. Energy Information Administration. *Annual Energy Outlook 1991*. Washington, D.C.: U.S. Department of Energy, March 1991. [DOE/EIA-0383(91)]

2. Progress Report on the Implementation of Programs Required by the Alternative Motor Fuels Act of 1988

2.1 Introduction

The Alternative Motor Fuels Act of 1988 (Public Law 100-494, AMFA) was signed into law on October 14, 1988. As stated in the AMFA, its purpose is as follows:

- To encourage the development and widespread use of methanol, ethanol, and natural gas as transportation fuels by consumers
- To encourage the production of methanol, ethanol, and natural-gas-powered motor vehicles

Congress has recognized that displacement of energy derived from imported oil with alternative fuels will help to achieve energy security and improve air quality. In passing the AMFA, Congress desires to assist clean-burning, nonpetroleum transportation fuels to reach a threshold level of commercial application and consumer acceptability at which they can successfully compete with petroleum-based transportation fuels.

The AMFA directs the Department of Energy (DOE) to undertake a number of actions and to work with other Federal agencies, most notably the General Services Administration (GSA), the Department of Transportation (DOT), and the Environmental Protection Agency (EPA), to implement its provisions. The AMFA also provides for an active role for industry, as well as for State and local governments.

This chapter summarizes the activities that DOE is taking to implement those sections of the AMFA for which DOE is responsible. This chapter also highlights actions taken by other agencies for those activities for which they are responsible. In fiscal year (FY) 1990, \$4.5 million was appropriated by Congress to initiate implementation of the AMFA, and \$6.8 million was appropriated in FY 1991.

2.2 Requirements of the AMFA

As noted above, the AMFA sets forth a number of actions to be carried out by DOE with the assistance of other Federal agencies, State and local governments, and industry. The three major programs that were established by DOE beginning in FY 1990 are as follows:

- The Alternative-Fuel Federal Light-Duty Vehicle Program
- The Truck Commercial Application Program
- The Alternative-Fuels Bus Testing Program

The AMFA also required an Interagency Commission on Alternative Motor Fuels and a U.S. Alternative Fuels Council reporting to the commission to be established.

In addition, the AMFA directs DOE and other designated agencies to prepare several studies and reports to Congress; addresses warranty provisions for light-duty vehicles procured by the Federal Government; offers vehicle manufacturers corporate average fuel economy (CAFE) incentives for producing alcohol- and natural-gas-powered vehicles; and amends the automobile labeling section of the Motor Vehicle Information and Cost Savings Act.

2.3 Program Status

2.3.1 Alternative-Fuel Federal Light-Duty Vehicle Program—Section 400AA

The objective of this program is to ensure that the maximum practicable number of passenger automobiles and other light-duty vehicles acquired annually for use by the Federal Government shall be alternative-fuel vehicles. An interagency agreement between DOE and GSA was negotiated and signed in FY 1990 to procure

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alternative light-duty vehicles for the Federal fleet. A total of \$2,945,000 has been transferred from DOE to the GSA for the purchase of alternative-fuel light-duty vehicles. This procurement process resulted in the placement of 65 General Motors and Ford methanol fuel-flexible vehicles and 16 control vehicles in the Federal fleet beginning in March 1991, a contract for procurement of 50 compressed natural gas (CNG) Chrysler vans, as well as funding for ethanol vehicles and additional methanol and CNG vehicles. In July 1991, a solicitation was issued for 20 to 200 ethanol vehicles, and another solicitation for additional methanol fuel-flexible vehicles and CNG vehicles is anticipated in the fall of 1991.

A review was completed to determine the locations and accessibility of alternative-fuel dispensing facilities and to identify those Federal agencies that are interested in participating in this program. This review focused on 13 geographical locations. These included the nine severe ozone nonattainment areas (Los Angeles, New York, Chicago, Houston, Milwaukee, Baltimore, Philadelphia, San Diego, and Hartford), as well as Denver, Detroit, Phoenix, and Muskegon (Michigan). The four geographic locations selected for the initial 65 methanol vehicles participating in this program included Los Angeles (8 General Motors Lumina and 4 Ford Taurus), San Diego (6 Lumina and 5 Taurus), Washington, D.C. (8 Lumina and 15 Taurus), and Detroit (5 Lumina and 15 Taurus). In addition, four unmodified gasoline-fuel vehicles (2 Lumina and 2 Taurus) from the original

equipment manufacturers (OEM's) were placed at each of the four locations (16 total) as controls to develop comparative operating data between conventional gasoline vehicles and alternative-fuel vehicles. The primary criteria for placement of additional vehicles will continue to include air quality attainment status and the availability of alternative-fuel infrastructure. Although a high altitude site, such as Denver, was initially considered, the vehicle manufacturers indicated that additional vehicle performance-related development work remained to be done before they would consider putting methanol flexible-fuel vehicles in high altitude sites. Some of the Federal agencies currently participating in the program and operating one or more of the initial 65 methanol flexible-fuel vehicles are shown in Table 1.

Data from these fleets are now being generated, transmitted, and analyzed by the Alternative Fuels Data Center (AFDC) at the Solar Energy Research Institute (SERI).

Future procurements are already well along and should result in the acquisition of 300 to 400 additional alternative-fuel vehicles operating within the Federal fleet in FY 1992, placing the light-duty program slightly ahead of schedule.

2.3.2 Truck Commercial Application Program—Section 400BB

The objective of this program is to encourage the use of alcohol and natural gas fuels by estab-

Table 1. Federal Agencies Participating in the Alternative-Fuel Federal Light-Duty Vehicle Program

| | | |
|---|---------------------------------|---|
| Environmental Protection Agency | Department of Transportation | Consumer Product Safety Commission |
| Department of Agriculture | Office of Personnel Management | Department of Veterans Affairs |
| Department of Energy | General Services Administration | Department of State |
| Department of Labor | Treasury Department | Small Business Administration |
| Department of the Interior | Department of Justice | Department of Housing and Urban Development |
| Department of Health and Human Services | Defense Contract Administration | U.S. Army |
| U.S. Navy | U.S. Marine Corps | U.S. District Court |
| Defense Logistics Agency | U.S. Postal Service | |

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lishing and conducting heavy-duty vehicle commercial application projects, operating in "real world" environments.

An assessment of project opportunities was made in FY 1990, yielding two CNG/heavy-duty projects. A cooperative project was established with the California Energy Commission to conduct a CNG/heavy-duty truck demonstration project utilizing line-haul vehicles. The engines used in this project represent three heavy-duty engine families with attendant engine family units operating on conventional diesel fuel. These vehicles will have dedicated routes that are supported with CNG refueling structures at each end of the line. This project is exemplary in that it shows cooperation and cost sharing on the part of the natural gas industry, heavy-duty engine manufacturers, and State and local government agencies. Heavy-duty engine transient dynamometer data will be developed on the alternative-fuel unit, and heavy-duty chassis dynamometer data will be developed on both the alternative-fuel and diesel-fuel units. The first CNG-powered engine unit for this project is currently undergoing final inspection and testing at the engine manufacturer's facility.

Another cooperative project with the New York State Energy Research and Development Authority involves six CNG-powered packer trucks that will operate for the New York City Department of Sanitation. Heavy-duty engine transient dynamometer data will be developed on this engine family by a SERI subcontractor. The engine installation will be designed and completed by Crane Carrier Corporation, the original equipment manufacturer for the packer trucks. Crane Carrier will also build three diesel-powered units for the Department of Sanitation to establish a baseline for the Cummins L-10 engine family. The New York City Department of Environmental Protection will conduct periodic heavy-duty chassis dynamometer tests on the CNG-powered and control engines. Initiation of this project awaits delivery of the CNG-powered engines from Cummins. In FY 1992, this alternative-fuel operation will be expanded to include three methanol-powered packer trucks with Detroit Diesel Corporation (DDC) engines and a similar number of diesel-powered units from the same engine family.

A project will be initiated with the Illinois Department of Energy and Natural Resources with FY 1991 funding that features heavy-duty truck operations with two industrial concerns utilizing ethanol as fuel. This project will initially use two DDC heavy-duty engine families, four ethanol-powered units and one diesel-powered unit at each industrial site. Illinois' proposal is due at SERI on September 13.

The American Trucking Associations Foundation/Trucking Research Institute is under contract (FY 1991 funding) to identify other heavy-duty truck/alternative-fuel project opportunities that may be amenable to DOE participation on a cost-sharing basis. The objective of this project is to develop and collect information on other diverse alternative-fuel/heavy-duty truck projects that use OEM trucks to establish an emissions, performance, and durability data base for a broader scale of engine manufacturers and engine families than those that are currently supported by DOE projects. This effort also represents an opportunity for more direct participation by the trucking industry. The Trucking Research Institute's survey has currently identified project opportunities involving 80 alternative-fuel-powered truck units. The Trucking Research Institute indicates that this number can be expected to double before the end of 1992.

Data generated from all of these projects will be sent to SERI for validation, analysis, and incorporation into the AFDC.

2.3.3 Alternative Fuels Bus Testing Program—Section 400CC

The objective of this program is to assist State and local government agencies in the testing in urban settings of buses capable of operating on alcohol and on natural gas fuels. In particular, the intent is to generate information on emissions, durability, safety and health, fuel economy, and other issues that industry and other organizations need to supply and operate buses fueled with alcohol and natural gas fuels in commercial environments.

Because DOT's Urban Mass Transportation Administration (UMTA) is the agency most closely

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involved in urban transit buses, it has been assigned a lead role for this project by an inter-agency agreement between DOE and UMTA. This project has been integrated with UMTA's existing Clean Air Program. The Clean Air Program consists of an alternative-fuels initiative, which currently includes 300 buses in 50 locations nationwide, a methanol bus demonstration program, which has involved approximately 60 buses in seven locations, and a clean-diesel-system program, which will initially involve 400 buses to demonstrate the effectiveness of particulate traps on diesel buses. For FY 1990, \$300,000 was transferred to UMTA to initiate data collection activities. In FY 1992, \$600,000 was transferred to UMTA for continued support of data collection activities.

Currently, data are being generated and transmitted to the AFDC at SERI for processing and analysis. An initial assessment of information and data collected by other past and current alternative-fuel bus demonstrations has been completed. Four transit authorities, including those in Seattle, Los Angeles, Denver, and New York, have been selected to gather more detailed operating, maintenance, and emission data.

In a supporting development, DDC became the first heavy-duty engine manufacturer to achieve emission certification of an alternative-fuel engine. The DDC 6V-92 turbocharged and after-cooled methanol urban bus engine meets all the requirements of the 1993 U.S. EPA Urban Bus Standards as set forth in the Clean Air Act Amendments of 1990 and the 1991 California regulations. The engine was certified on both 100 percent methanol (M-100) and 85 percent methanol/15 percent unleaded gasoline (M-85). Under DOE and commercial sponsorship, this certification will be extended to ethanol during September-December 1991. Development of the DDC methanol engine began more than 10 years ago as a program started by General Motors and was supported in part by DOE.

2.3.4 Alternative Fuels Data Center

The primary purpose of the AFDC located at SERI is to collect, analyze, and disseminate information on the operation of alternative-fuel vehicles. The AFDC will provide unbiased and

accurate information on alternative fuels and alternative-fuel vehicles to government agencies, private industry, research institutions, and other interested organizations. The AFDC is collecting and analyzing data from the 65 methanol and 16 control light-duty vehicles, including mileage accumulation, drivability, fuel consumption, fuel analyses, oil analyses, and exhaust emissions. Data on maintenance, dynamometer performance, health and safety issues, and other parameters will be collected and analyzed as they become available. Data from four sites operating alternative fuel urban buses chosen for indepth data collection are also being collected by the AFDC, and the number of sites is anticipated to expand to seven in 1992. The AFDC uses an Oracle relational data base management system along with a statistical software package capable of providing statistical, graphic, and textual information to users. The data base has been designed as a multiuser network with remote accessibility controlled by log-in identification. The AFDC began operations in early 1991 and is anticipated to be fully operational, including remote accessibility capability, by October 1991.

2.3.5 Interagency Commission on Alternative Motor Fuels

In April 1989, the Secretary of Energy appointed the Deputy Secretary of Energy to be the Secretary's designee to, and Chairman of, the Interagency Commission on Alternative Motor Fuels. Members of the interagency commission include representatives of the Departments of Energy, Transportation, Labor, Defense, Agriculture, as well as the EPA, GSA, and the U.S. Postal Service. The commission's functions include the following:

- Coordinating Federal agency efforts to develop and implement a national alternative-motor-fuel policy.
- Ensuring the development of a long-term plan for the commercialization of alcohols, natural gas, and other potential alternative motor fuels.
- Ensuring communication among representatives of all Federal agencies that are involved

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in alternative-motor-fuel programs or that have an interest in such programs, and

- Providing for the exchange of information among persons working with, or interested in working with, the commercialization of alternative motor fuels.

2.3.6 U.S. Alternative Fuels Council

The chairman of the interagency commission has also established a U.S. Alternative Fuels Council that reports to the interagency commission about matters related to alternative fuels. The council is composed of four members of Congress and 16 persons from outside the Federal Government. Public meetings were held in Washington, D.C., in May 1990; San Diego, California, in June 1990; Detroit, Michigan, in August 1990; Philadelphia, Pennsylvania, in December 1990; Denver, Colorado, in February 1991; Washington, D.C., in May 1991; and Kansas City, Missouri, in September 1991. At the December 1990 meeting, the council urged the Federal Government to adopt a goal of 25 percent of all vehicle miles traveled in 2005 to be traveled by alternative-fuel vehicles. At the February 1991 meeting, the goal was delayed until 2010 after a review of the preliminary scenario, which would have required too many alternative-fuel vehicles to be produced by 2009.

2.3.7 Studies and Reports

This project element has been established to undertake several studies mandated by the AMFA and to prepare reports to Congress on the findings of such studies. These include studies on the following:

- Alternative-fuel light-duty vehicle performance, fuel economy, safety, emissions, and operating and maintenance costs
- Disposal of alternative-fuel light-duty vehicles
- Natural-gas-to-methanol processing plants
- The environment
- Electric vehicles

- Impacts on residential energy prices

Although DOE has a significant role in each of these studies, the lead responsibility for each varies as shown in Table 2.

Four of these studies have been completed and reports have been submitted to Congress. The electric vehicle report titled *Federal Regulations Needing Amendment to Stimulate the Production of Electric/Solar Vehicles* was completed in January 1990, as required by Section 7 of the AMFA. The residential energy prices report titled *Impacts on Home Heating Costs of Incentives for Alternative Fuels Vehicles* was completed in November 1989, as required by Section 9 of the AMFA. The natural gas-to-methanol plants report titled *Assessment of Costs of Producing Methanol from Unutilized Domestic Natural Gas* was released for public comments in July 1990, transmitted to Congress on September 30, 1990, and published as a technical report in July 1991. The light-duty vehicle disposal report was completed in July 1991. The environmental study report is in draft form and is undergoing review. The light-duty vehicle operations progress report is scheduled to be released in March 1992.

2.3.8 Program Plan

The initial *Alternative Motor Fuels Act of 1988 Program Plan* was developed and issued by DOE in January 1989. The plan outlined the overall management organization, strategy, and approach to implement each element of the program, detailed activity descriptions, work breakdown structures (WBS), and an overall schedule to accomplish all work activities. The plan was subsequently revised in May 1989 and was revised and reissued in August 1990 to reflect accomplishments to date, to provide a more current timetable for each activity, and to incorporate the roles of new organizations involved in the implementation of the program. The plan has always been intended to be flexible, and, therefore, it is subject to change as events warrant.

The overall management of the program has been established in the DOE Office of Alternative Fuels, under the Deputy Assistant Secretary for Transportation Technologies, and management

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Table 2. Lead and Supporting Agencies for Studies and Reports

| Study | Lead Agency | Supporting Agency | Status |
|--------------------------------|-------------|-------------------|-------------|
| Light-Duty Vehicle Operations* | DOE | EPA/DOT | In Progress |
| Light-Duty Vehicle Disposal* | GSA/DOE | — | Complete |
| Electric Vehicles | DOT | DOE/EPA | Complete |
| Residential Energy Prices | DOE | DOT | Complete |
| Natural Gas-to-Methanol Plants | DOE | — | Complete |
| Environmental Study | EPA | DOE/DOT | Draft |

* These studies are part of the Federal Light-Duty Vehicle Project.

responsibilities have been assigned to program managers within the Fuels Utilization and Data Analysis Division. One of the key responsibilities inherent to the success of this program has been the frequent and close coordination effort with other participating agencies, notably GSA, DOT, and EPA, as well as with various industry participants and State and local governments.

The current program plan reflects the establishment of a program entity to serve as the focal point for the results of the Federal light-duty, commercial truck application, and bus testing projects. The AFDC, operated by SERI, is responsible for the orderly acquisition, analysis, and dissemination of all data generated during the course of the demonstration projects. In addition, it is intended to be a repository for complementary sources of analogous data that may be generated by other Federal agencies, as well as cooperating State and local alternative-fuel programs.

The plan also includes the development of a heavy-duty engine emissions testing facility at West Virginia University. This facility has been designed as a transportable dynamometer to measure the major heavy-duty engine exhaust compounds according to EPA transient test procedures. The impetus for this facility is the lack of sufficient independent laboratories that are capable of measuring emissions from heavy-duty engines according to EPA's procedures. The

laboratory facility can be transported to a test site located at, or nearby, the home base of the vehicles to be tested. The laboratory consists of two major units: a power-absorber unit mounted on a flatbed trailer and an emissions testing unit located in a separate, enclosed instrument trailer that is parked near the power absorber. The facility construction and assembly has been completed and on-site checkout will be completed by the end of FY 1991. The facility will then undergo correlation testing with EPA's emissions laboratory in Ann Arbor, Michigan.

The strategy adopted for purposes of this plan is designed to meet both the intent and spirit of the AMFA in encouraging the commercial production of methanol, ethanol, and natural-gas vehicles and the widespread use of these fuels by consumers in the transportation sector. The plan has been developed from the perspective of the needs of the interested parties and reflects the experience gained in the AMFA and other alternative-fuel transportation programs to date. Key features of the strategy include an effort to make maximum use of other Federal, State, and local government projects as well as private-sector initiatives. This is accomplished not by duplicating previous or ongoing efforts, but by complementing those efforts, where appropriate, in which data and other informational needs exist but are not being met. In addition, industry participation has been actively solicited to gain a better insight into industry's needs as well as to

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leverage industry's ongoing efforts to maximize the benefits of the program to the greatest extent possible. Hopefully, this will result in a self-sustaining industry that will continue to expand once the AMFA program has ended.

Separate approaches, associated WBS, and schedules were developed for each of the demonstration programs. The principal elements of the light-duty Federal vehicle WBS include planning and assessments, light-duty vehicle procurement, vehicle operations assessment, and vehicle disposal assessment. The WBS elements of the

Truck Commercial Application Program include a technical and application assessment and commercial application implementation, and the bus WBS elements include initial planning and assessment and testing implementation.

In general, all three demonstration programs are progressing in accordance with the overall plan. In addition, the plan is scheduled to be revised again at the beginning of FY 1992, which marks the halfway point of the originally authorized 4-year AMFA program.