GREENER FLEETS:
FUEL ECONOMY PROGRESS AND PROSPECTS

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EXECUTIVE SUMMARY

Vehicle fleets are often drawn into efforts to improve the environmental performance of cars and trucks because fleets are managed in groups and are more easily regulated than individually owned vehicles. This report explores the role fleets have played and can play in raising the fuel economy of U.S. passenger vehicles. High fuel economy vehicles do not require properties specific to fleets, such as centralized refueling, to gain a foothold in the market, so a fleet strategy is not nearly so fundamental to promoting high fuel economy as it has been to promoting alternative fuel vehicles. On the other hand, advances in vehicle fuel economy in the fleet market are more readily transferable to the retail market, precisely because fuel economy improvements are not dependent upon features only fleets possess.

Fuel economy is one of the most important criteria for assessing a vehicle's environmental performance, because consumption of petroleum results in a large share of vehicles' adverse impacts. A variety of vehicles do relatively well on this score, most of them employing efficiency technologies that have evolved slowly over recent decades. Among conventional vehicles on the market, there are fuel economy differences of up to 40% between the efficiency leaders in a given vehicle class and the class average. Advanced technology vehicles such as hybrids are very efficient, but are still expensive. Numerous "conventional" improvements remain that can be packaged to raise a vehicle's fuel economy substantially without a major effect on purchase price.

Fleet practices and priorities depend heavily on fleet type. Rental vehicles turn over very rapidly and dominate fleet purchases of cars, but rental fleets have no motivation to conserve fuel. Government fleets pay attention to environmental performance and are the easiest to regulate, but turn over slowly and are subject to numerous and sometimes incompatible mandates. Commercial fleets, whose vehicles outnumber rental and government fleets' combined, take an interest in fuel economy but have not yet been drawn to any significant extent into coordinated efforts into promote fuel-efficient vehicles.

Each of these fleet types is attuned to a different degree to vehicle purchase considerations that could result in a preference for, or aversion to, fuel-efficient vehicles. These considerations include vehicles' purchase and operating costs and resale value, corporate agenda, ties to specific manufacturers, and existing laws and policies. In any case, fuel economy is not at present a sufficiently important factor in vehicle purchase to result in high fleet efficiency.

The most prominent efforts to date to promote green vehicles through fleet sales have been alternative fuel vehicle programs launched over the past decade to reduce reliance on imported fuels and improve air quality. The alternative fuel vehicle experience provides some insights into the promise of fleet approaches to improving fuel economy. Requirements of the Energy Policy Act of 1992 (EPAct) mandating purchase of increasing percentages of alternative fuel vehicles in federal, state, and alternative fuel provider fleets are leading to acquisition of a significant number of alternative fuel vehicles, though not in numbers sufficient to meet the requirements of the act. Moreover, fleets covered by the EPAct are only a small fraction of all fleets. Most states and some local governments have added their

own requirements for alternative fuel vehicle purchase to the federal mandates, and the DOE's Clean Cities Program has encouraged many voluntary participants across the country to join efforts to increase alternative fuel use in transportation. Nonetheless, cost and infrastructure issues have prevented alternative fuel vehicles from gaining a foothold in the general market, and even from claiming a major share of the fleet market. They currently make up about 3% of all fleet vehicles.

Efforts to increase fleet fuel efficiency are generally not well developed, but several are underway. At the federal level, Executive Order 13149 mandates modest increases in fuel economy and reductions in fuel consumption for federal fleets in the next few years. Various proposals have been made to allow certain efficient, advanced technology vehicles to be purchased in fulfillment of alternative fuel vehicle requirements, at both the federal and state levels. Large-scale production of fuel cell vehicles is still some way off, but hybrids may soon appear in considerable numbers and could dampen demand for alternative fuel vehicles in some scenarios. Few states have developed plans specifically to promote high fuel economy. It is local governments that have been most active in this regard, due largely to the work of the International Council for Local Environmental Initiatives. Cities whose procurement policies require purchase of fuel-efficient vehicles include Denver, Los Angeles, Portland (OR), and numerous smaller jurisdictions.

Fleets are not easy targets for efforts to expand the demand for fuel-efficient vehicles, but they do offer some promising opportunities. Recommended steps for interested parties to take advantage of those opportunities include

- Promote use of life-cycle costs, rather than purchase price, as a criterion in selecting vehicles.
- Support high resale values for fuel-efficient vehicles by extending any reductions in sales tax or other incentives to resale.
- Aggregate vehicle purchases among jurisdictions, while ensuring that this does not lead to a "lowest common denominator" approach.
- Engage fleet managers in efforts to raise manufacturers' prioritization of fuel economy. Fleet managers' focus on fuel economy of particular models with high fleet sales could be helpful.
- Avoid conflicts between fuel economy and other environmental transportation priorities. In particular, avoid incentives to promote high fuel economy vehicles that result in more driving, use of vehicles during peak hours, greater tailpipe emissions, etc.
- Consider allowing hybrids that are sufficiently clean and efficient to qualify for EPAct credit while expanding requirements to fleets not currently covered.
- Promote high fuel economy through both advanced technology vehicles and conventional, affordable vehicles.
- Consider ENERGY STAR®-type designations for vehicles and for fleet practices to attract fleets and raise public awareness of fuel economy issues.
- Expand vehicle criteria for "environmentally preferable products" under the EPA's pollution prevention program to include fuel economy.

INTRODUCTION

Willingly or otherwise, fleet vehicles have been in the vanguard of a variety of attempts to reduce environmental impacts of light-duty vehicles. Efforts to minimize tailpipe pollution and reduce oil consumption may target fleets because they represent a concentration and level of planning that are missing for personal vehicles. Fleets are often centrally purchased, fueled, maintained, and managed, and they may have fixed or predictable routes; and they have business reasons for making transportation choices that the public may not yet regard as in its interest. Fleets also represent coordinated buying power, either individually, in the case of large fleets, or in associations.

Beyond their relative tractability, fleets are potentially significant in such efforts due to the sheer number of vehicles belonging to them and to their role as a laboratory and showcase for new approaches to the selection and use of automobiles. The value of fleet-oriented strategies depends both on the fraction of fleet vehicles they affect and their transferability to non-fleet vehicles. Environmental fleet programs to date have not done especially well on either score. Whether fuel economy, in particular, is an environmental parameter on which fleets can exert a greater positive influence remains to be seen.

Fleet programs have often focused on tailpipe pollution to the exclusion of other environmental impacts of vehicles. Given the necessity of coming to grips with U.S. reliance on oil and production of greenhouse gases, it is important to understand how fleets have advanced, and could further advance, the goal of reducing passenger vehicles' energy use. Energy efficiency strategies include reducing fleet size, training drivers to drive more efficiently, improving tire or lubricant quality, and reducing miles traveled by the fleet. All of these can be important elements of making fleets greener. Perhaps the most important influence that fleets can exert on the energy efficiency of the U.S. vehicle stock as a whole, though, is through creation of a market for high fuel economy vehicles. For that reason, the role of fuel economy in fleets' choice of vehicles is the main subject of this report.

GREEN VEHICLES

Energy use is one ingredient of a broader concept of "green," or environmentally superior, vehicles. Production, use, and disposal of automobiles all result in major environmental impacts, as do highways, parking lots, and fuel production and distribution. Some impacts, such as production and disposal impacts, are fixed for a given vehicle. But others, such as emissions and infrastructure demands, have much to do with how the vehicle is used. Attributing a shade of green to the vehicle itself therefore ignores significant factors, but nonetheless it is a prerequisite for efforts to shift the market towards more sustainable vehicles, which is in turn a primary means of reducing the environmental impacts of transportation.

Defining Green Vehicles

Automobile manufacturing and disposal impacts begin with the extraction of the raw materials that go into the parts of an automobile; continue through the production of plastics,

batteries, and steel; and end with scrappage in a junkyard. Large quantities of materials of many types are used in the production of every car, and this results in significant air and water pollution. Mercury and other toxic materials are used in quantities sufficient to make cars a significant source of those materials and a hazard for workers. There has been considerable progress in increasing the recyclability of automobiles, improving the coating process, and (recently) eliminating mercury,[1] but other materials- and production-related problems remain untouched.

Aside from manufacturing and disposal impacts, the primary measures of a vehicle's greenness are fuel economy and rate of emissions of air pollutants. Motor vehicles' contribution to air pollution is the aspect of their environmental impact that has been subject to the greatest scrutiny and control to date. Regulated air pollutants associated with vehicles include lead, hydrocarbons, oxides of nitrogen (NO_x), carbon monoxide, and particulate matter. The extent of progress toward solving the problem of motor vehicle air pollution varies from pollutant to pollutant, with lead control nearly complete and control of particles among the least advanced at this point. Light-duty vehicle emissions of ozone precursors—largely hydrocarbons and NO_x—will fall, in theory, to a small fraction of 1975 levels after the new federal Tier 2 tailpipe regime, which starts in 2004, is fully implemented. The Tier 2 NO_x standard, for example, will be 2% of the 1975 standard.[2] However, deterioration of emissions controls over a vehicle's lifetime and shortcomings in testing procedures mean that caveats are warranted in translating this to real-world emissions improvements. Furthermore, in addition to regulated pollutants, there is a host of air toxics associated with gasoline and diesel fuel that governments and others are only now beginning to tackle. Nonetheless, on a per-vehicle basis, progress in reducing automobiles' contribution to air pollution (other than carbon dioxide) is substantial and ongoing.

Energy implications of automobile use similarly constitute a critical impediment to the sustainability of transportation trends worldwide. The United States' approach to this problem is far less developed than its campaign against traditional air pollutants. Fuel economy of the light-duty fleet has increased by 57% since 1975, when the Corporate Average Fuel Economy (CAFE) standards came into being.[3] But the post-1975 gains reduced passenger vehicle fuel consumption only briefly. The number of vehicle miles traveled has climbed steadily, and fuel economy has been falling since 1987, with the result that energy consumed by cars and light trucks in the United States grew 34% between 1975 and 1999.[4]

Several standards and rating systems for green vehicles have been developed. The Clean Car Campaign, for example, defines a green vehicle as one that is 1.5 times more fuel efficient than the average in its class, meets California's super-ultra-low-emission vehicle (SULEV)

[1] Manufacturers are phasing out use of mercury switches in new vehicles, and Maine recently adopted requirements for removal of these switches when vehicles are scrapped.

[2] Office of Mobile Sources, 1999, *Emission Facts: The History of Reducing Tailpipe Emissions,* EPA420-F-99-017, http://www.epa.gov/oms/consumer/f99017.pdf, Washington, DC.: U.S. Environmental Protection Agency, Office of Mobile Sources.

[3] K. Hellman and R. Heavenrich, 2001, *Light-Duty Automotive Technology and Fuel Economy Trends: 1975 Through 2001*, EPA420-R-01-008, Washington, D.C.: U.S. Environmental Protection Agency, p.8.

[4] S. Davis, 2001, *Transportation Energy Data Book,* Edition 21, Oak Ridge, Tenn.: Oak Ridge National Laboratory, Table 2.6.

tailpipe emissions standards, and is cleanly manufactured using non-toxic, recyclable materials.[5] Maine and New Hampshire have voluntary programs in which dealers place "clean car" labels on vehicles that meet the California low-emissions vehicle (LEV) standard and achieve at least 30 miles per gallon. *ACEEE's Green Book®: The Environmental Guide to Cars and Trucks*[6] rates vehicles using a single combined score based on fuel economy, emissions of pollutants regulated under the Clean Air Act, and estimated manufacture and disposal impacts. These and other systems share certain basic principles, but differ somewhat in their conclusions about specific vehicles.

The Role of Alternative Fuel Vehicles

The most extensive efforts to date toward greener fleet vehicles have focused on alternative fuels. Alternative fuels can offer reductions in emissions of regulated air pollutants, air toxics, and greenhouse gases relative to gasoline. Emissions attributable to use of a given fuel are heavily dependent on how the fuel is produced and used, and whether one considers "full-fuel-cycle" or "in-use" emissions.

Table 1 summarizes key features of several alternative fuels.[7] Those most widely used today in alternative fuel vehicles are liquefied petroleum gas (LPG, largely propane) and compressed natural gas (CNG). Relative to gasoline, both fuels reduce in-use particulate matter of up to 10 microns in size (PM_{10}) significantly and in-use hydrocarbons to varying degrees.[8] LPG gives some in-use NO_x reduction, while NO_x emissions associated with CNG are not generally agreed upon. CNG costs less than gasoline in many areas of the country, and both CNG and LPG have a distribution infrastructure in place.

Ethanol use in all vehicles is currently 1 billion gallons per year, many times greater than propane or natural gas use. This is due to ethanol's role as a gasoline additive in blends of 10% or less. Ethanol use by alternative fuel vehicles, now largely in an 85% ethanol blend (E85), is still low. Ethanol has the advantage of being a non-fossil-based fuel, but crop and fuel production and transportation consume a considerable amount of fossil fuel. Ethanol is expensive (though the high cost is offset by various subsidies), cannot be transported by pipeline due to its corrosiveness, and is not widely available.

[5] The manufacturing component of the standard calls more specifically for "1) best-in-class painting/coating practices, 2) the elimination of heavy metals and other substances of concern, and 3) design for recyclability and maximum use of recycled materials." Clean Car Campaign, 2002, "About the Campaign," http://www.cleancarcampaign.org/aboutccc.shtml, Ann Arbor, Mich.: Clean Car Campaign.

[6] J. DeCicco and J. Kliesch, 2002, *ACEEE's Green Book®: The Environmental Guide to Cars and Trucks,* Washington, D.C.: American Council for an Energy-Efficient Economy.

[7] There is significant disagreement on the quantification of several attributes of alternative fuels discussed here; we have relied heavily on results from Argonne's GREET model. With few exceptions, however, the qualitative implications about the relative merits of the various fuels that follow from the figures shown in Table 1 are widely accepted.

[8] For the pollutants discussed here, fueling and in-use emissions are the most relevant from a human health perspective, in that they typically occur near where people breathe. Full-fuel-cycle emissions can be significant as well, however, because ozone formation (from VOC and NO_x) and transport are regional phenomena.

Table 1. Characteristics of Selected Alternative Fuels

Fuel	Extent of usage in 2000, in million gasoline gallon equivalents[9]	Energy content in Btu/gallon[10]	Full-fuel-cycle petroleum use (on a per-mile basis), as % of conventional gasoline[11]	Incremental vehicle cost relative to gasoline vehicle[12]	Fuel price per gallon in 2000[13]	Urban emissions of key pollutants (on a per-mile basis), as % of conventional gasoline[14]	Full-fuel-cycle GHG (on a per-mile basis), as % of conventional gasoline[11]
Conventional gasoline	157,000	115,500	100%	$0	$1.35	VOC: 100% NO_x: 100% PM_{10}: 100%	100%
LPG	250	84,000	39.4%	$3000–$4000	$1.38[15]	VOC: 35.0% NO_x: 80.2% PM_{10}: 57.9%	85.8%
CNG	104.5	33% of gasoline value at standard tank pressure[16]	0.5%	$3500–$6000	$0.58–$1.05 per gasoline gallon equivalent[15]	VOC: 22.5% NO_x: 153.0% PM_{10}: 57.3%	85.0%
Ethanol in E85 (derived from corn)	3.4	81,925	30.6%	negligible	$1.30–$1.38	VOC: 79.3% NO_x: 83.4% PM_{10}: 68.3%	78.2%
Methanol in M85 (derived from natural gas)	1.5	65,775	26.1%	$300–500	$1.73–$2.10	VOC: 79.7% NO_x: 81.7% PM_{10}: 68.5%	97.1%
Electricity (battery EV)	1.7	Dependent on mix of fuels used in generation	1.8%	High	$0.04/kWh, equivalent to $1.20 per gallon	VOC: 0.4% NO_x: 8.5% PM_{10}: 6.9%	69.0%
Biodiesel in B20	33.5[17]	115,818	74.5%[18]	none for B20	$1.50-$1.60[19]	VOC: 38.4% NO_x: 125.1% PM_{10}: 91.7%[18]	70.6%[18]

[9] U.S. Department of Transportation, 2002, *Report to Congress: Effects of the Alternative Motor Fuels Act CAFE Incentives Policy,* Table IV-4, Washington, D.C.: U.S. Department of Transportation (except as noted)
[10] M.Q. Wang, 1999, *GREET 1.5 Transportation Fuel-Cycle Model*, Volume 1, Fig. 6.1, Argonne, Ill.: Argonne National Laboratory, Center for Transportation Research, Table 3.3. Lower heating values used.
[11] M.Q. Wang, 2001, "GREET v. 1.6 (beta) Fuel Use and Emissions Model," (computer spreadsheet) Argonne National Laboratory, Center for Transportation Research.
[12] EPA, 2002, "Fuels and Fuel Additives, Alternative Fuels," *Fact Sheets on Fuel Information,* EPA420-F-00-032 et seq, http://www.epa.gov/otaq/consumer/fuels/altfuels/altfuels.htm#fact, Washington, D.C.: U.S. Environmental Protection Agency.
[13] U.S. General Accounting Office, 2000, *Energy Policy Act of 1992: Limited Progress in Acquiring Alternative Fuel Vehicles and Reaching Fuel Goals*, GAO RCED-00-59, Washington, D.C.: U.S. General Accounting Office, p. 28 (except as noted)
[14] These "urban emissions" estimates are default values from Wang, GREET v. 1.6 (beta) and represent fueling, in-use, and other emissions that typically affect the area of vehicle use directly.
[15] Prices reflect the reduced federal excise tax for these fuels.
[16] GAO, *Energy Policy Act of 1992*, p.28.
[17] B. Yacobucci, 2001, *Alternative Transportation Fuels and Vehicles: Energy, Environment, and Development Issues,* Order Code RL30758, Washington, D.C.: Congressional Research Service, p. 6.
[18] For "long-term" B20 vehicle; relative to *reformulated* gasoline.
[19] EPA, 2002, *Clean Alternative Fuels: Biodiesel,* EPA420-F-00-032, Washington, D.C.: U.S. Environmental Protection Agency.

The low energy density of nearly all alternative fuels relative to gasoline results in reduced driving ranges or greater tank capacity requirements for the vehicles they fuel. This problem is particularly severe for CNG, which has an energy density only a fraction of that of gasoline, even when highly compressed. The energy-related advantages of LPG, CNG, and ethanol over gasoline lie in their ability to replace petroleum and, to a lesser degree, reduce emissions of greenhouse gases.

Electric vehicles' environmental impacts vary according to the source of the electricity they run on and the properties of their batteries, but the lack of tailpipe emissions makes electric vehicles generally superior from a human health perspective. Sales remain very low due to their limited range, high battery costs, and long charging times. Today only one full-sized electric vehicle—the Toyota RAV4 EV sport utility—is mass-produced. Important niche markets continue to evolve, however. Implementation of California's Zero Emissions Vehicle (ZEV) mandate, the popularity of the neighborhood electric vehicle, and improvements in battery technology will strongly affect the electric vehicle market in the coming years.

Hydrogen-fueled vehicles have achieved new prominence recently, due in part to the federal government's decision to make fuel cells the centerpiece of its light-duty vehicle research and development program ("Freedom Car"). Major cost, longevity, and fuel issues must be resolved before the technology reaches a mass market, which will take a minimum of 15 years. The environmental performance of fuel cell vehicles will depend in large part on the source and production method of the hydrogen used to fuel them. As light-duty fuel cell vehicles proceed toward commercialization, certain fleets will be among the early users due to financial or policy interests in the new technology. More importantly, fuel cell vehicles are likely to need access to an alternative fuel infrastructure (whether for hydrogen or for another non-petroleum fuel), which typically only fleets have.

What Else Is Green?

Alternative fuels are one approach to reducing vehicles' environmental impacts. But while there is great appeal to domestically-produced fuels with good environmental performance, alternative fuels have not made sufficient headway regarding cost and availability barriers to demonstrate their viability for the general public. Substantial oil savings and pollution reduction also can be achieved through improvements to gasoline vehicles.

A wide range in fuel economy exists among vehicles available today. Each vehicle class contains conventional vehicles with fuel economies significantly higher than the class average. The most efficient midsize sport utility vehicle (SUV), for instance, has a fuel economy 40% higher than the average midsize SUV. Among midsize cars, the most efficient has fuel economy 22% higher than average.[20]

Features such as transmission type, 2- vs. 4-wheel drive, and engine size account to some extent for the variations in fuel economy within vehicle class. Even fixing these functionality-related features, however, the range of efficiencies is wide. Moreover, if buyers

[20] Hellman and Heavenrich, *Light-Duty Automotive Technology and Fuel Economy Trends*, Table 4.

were to choose vehicles having only the capabilities they need, the additional gain in fuel economy would be considerable.

While careful selection among vehicles on the market today can make a big difference in fuel use, these vehicles by no means reflect the full fuel economy potential of existing technologies. A recent ACEEE study showed that aggressive implementation of conventional technologies could raise average new car and light truck fuel economy from the current 24 miles per gallon to 41 miles per gallon at a cost far less than the value of the fuel saved.[21] The analysis assumes no change in size and power relative to today's vehicles, and does not rely on increased penetration of diesel or hybrid vehicles. It does assume accelerated introduction of advancements appearing in the market today, such as cylinder deactivation, variable valve timing, high-strength lightweight materials, and continuously variable transmission.

Auto manufacturers are acknowledging that some degree of improvement is achievable. Chrysler recently announced that by using incremental engineering changes, it could raise fuel economy by 25% in a Dodge Durango SUV,[22] and other manufacturers have made similar statements. Even in hybrid vehicles, gains in fuel economy have been due in part to conventional technology improvements.

Advanced Technology Vehicles

Fuel-efficient cars run the gamut from conventional to high tech. Advanced technology vehicles promise fuel savings beyond what can be achieved through less radical changes. However, these vehicles typically are more costly on a dollar-per-gallon-saved basis, partly because technologies cost more in the early stages of adoption, even if the technology is not intrinsically expensive. The ACEEE study cited in the previous section found that hybrid technologies, while achieving much greater fuel savings than the conventional technology packages, would cost more than twice times as much per gallon of fuel saved.

While the high cost of hybrids remains an obstacle to their gaining a real foothold in the market, there is industry-wide acknowledgement that they will play an important role in the coming years. In addition to the Toyota Prius, the Honda Civic Hybrid, and Honda Insight that are available today, Ford, General Motors, and Daimler Chrysler have all announced plans to put a hybrid SUV and/or pickup on the market by model year 2004.

As mentioned previously, fuel cell vehicles are much discussed at present, and may indeed represent the future of transportation, but cannot be regarded as a real option today. Fuel cell costs will need to drop by an order of magnitude before the vehicles they power will approach the cost of a conventional vehicle.

[21] J. DeCicco, F. An, and M. Ross, 2001, *Technical Options for Improving the Fuel Economy of U.S. Cars and Light Trucks by 2010–2015*, ACEEE-T012, Washington, D.C.: American Council for an Energy-Efficient Economy, p.25.

[22] *Automotive Fleet*, 2002, "Chrysler Researches Engineering that Could Increase Fuel Efficiency," http://www.fleet-central.com, *Automotive Fleet*, June 18.

Fuel Economy and Tailpipe Emissions

Reducing a vehicle's fuel consumption can help to lower tailpipe pollution, although high fuel economy and low emissions do not automatically go hand in hand. They are sometimes competing priorities, as ongoing debates about the role of diesel for light-duty vehicles illustrate. Diesels are far more efficient than their gasoline counterparts—typically in the vicinity of 30%—but emit much more NO_x and particulate matter. Federal Tier 2 exhaust and evaporative standards will treat diesel and gasoline vehicles equally for the first time, and auto manufacturers are striving to produce diesels clean enough to fit into the program. Whether they will succeed is not yet clear.

Even considering gasoline vehicles alone, the relationship between emissions reduction and fuel economy increases is not straightforward. Dramatic cuts in gasoline tailpipe pollution have been achieved in recent decades through a host of combustion and exhaust after-treatment technologies largely unrelated to fuel economy improvements, and per-mile emissions of regulated pollutants have declined by a far greater factor than fuel consumption has. Some important ties between high fuel economy and low emissions remain, however. Performance of after-treatment devices deteriorates over the life of the vehicle, and as this happens, the pollution reductions achieved simply through burning less fuel become more important. Furthermore, "upstream" emissions (i.e., emissions produced during production and distribution of fuel) are directly proportional to the amount of fuel the vehicle uses, and are a large fraction of total emissions of some of the most important pollutants. For example, for a typical car today, over 40% of NO_x emissions occur upstream.[23] This percentage will only increase as the Tier 2 standards are phased in beginning in 2004, so that fuel economy will become a larger factor in determining a vehicle's cleanness.

FLEET VEHICLES AND FUEL ECONOMY

Assessing fleets' potential as an avenue to improved efficiency requires detailed information about fleets' makeup.

Fleet Statistics

In 2000, 12.3 million passenger vehicles were registered to fleets of ten or more.[24] This is 5.6% of the 221 million vehicles registered in that year.[25] The environmental impact of fleet vehicles is greater than this percentage may suggest, because they are driven more than personal vehicles. For example, the average car was driven 12,000 miles in 2000,[26] while

[23] Wang, *GREET 1.5 Transportation Fuel-Cycle Model*, Volume 1, Fig. 6.1.

[24] Bobit Publications, 2001, *Automotive Fleet 2001 Fact Book and Buyer's Guide*, Torrance, Calif.: Bobit Publications, pp.12-13. For purposes of this discussion, a fleet is a group of vehicles owned or leased by a single entity. Adding fleets of 5–9 vehicles would increase the number of vehicles covered by 23%, or 2.8 million vehicles.

[25] Office of Highway Policy Information, Federal Highway Administration, 2001, *Highway Statistics 2000*, HPPI-40, Washington, D.C.: U.S. Department of Transportation, Table VM-1 and Bobit, *Automotive Fleet 2001*, pp. 12–13. The fleet and total vehicle numbers are not precisely comparable; a safer estimate of fleets' vehicle share would be 5–6%.

[26] FHWA, *Highway Statistics 2000*.

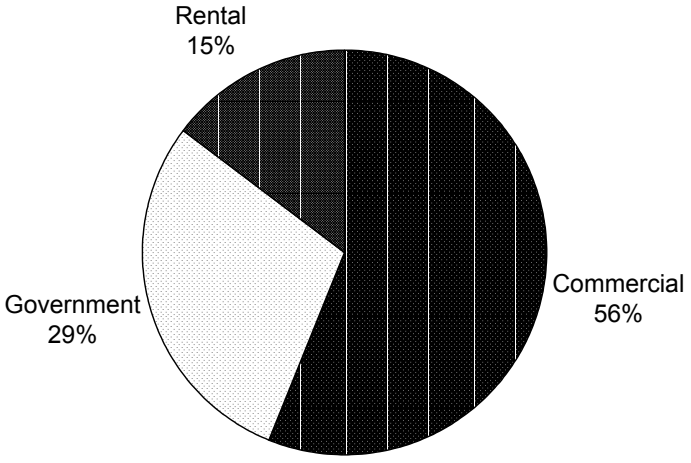
survey data suggests that the average business fleet car was driven close to 23,000 miles.[27] Government fleet vehicle mileage is much lower (federal cars averaged 12,895 miles in 2000[28]) but business vehicles are far more numerous. A reasonable estimate is that fleets are responsible for about 10% of passenger vehicle miles driven.

Fleets' share of the new vehicle market is greater still, because fleets keep vehicles a short time in comparison to the general public and therefore replace them much more frequently. Fleet vehicles comprised 19.7% of model year 2000 car registrations and 12.3% of truck registrations (classes 1–5). In all, over 2.7 million of the 17 million model year 2000 passenger vehicles, or 15.9%, were registered to fleets. Some vehicle classes show far higher fleet shares: 28.2% for compact cars, for example, and 33.5% for full-size cars. Fleet sales are even greater for individual models. In the case of the high-volume Ford Taurus, for example, there were as many model year 2000 units registered to fleets—172,000—as to individuals.[29]

This high share of the new vehicle market, as well as fleets' disproportionate purchase certain classes and models suggest the potential for fleets' purchasing practices to influence manufacturers' offerings. In particular, fleet demand in principle could greatly enhance auto makers' interest in environmental performance and is sufficient to generate economies of scale needed to bring down costs of new technologies. Furthermore, the rapid turnover of (non-government) fleet vehicles implies rapid introduction into the U.S. vehicle stock of features and technologies that fleets choose to purchase, through resale to the public.

Yet fleets are heterogeneous in many crucial respects, and to assess their theoretical market influence based on aggregate numbers is to ignore the wide variety of needs and priorities of the various fleet types. How a vehicle is selected, financed, used, and resold depends on the nature of the enterprise to which it belongs.

Figure 1: Fleet Vehicles in Service, 2001



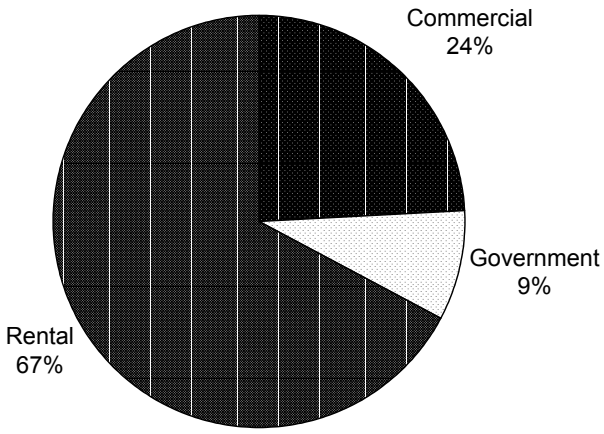
Data from Bobit, *Automotive Fleet 2001*, pp. 12–13

Rental Fleets

One out of five new cars in the United States is purchased by a rental company. Rental vehicles, overwhelmingly cars, are 15% of fleet vehicles on the road, but two-thirds of all new fleet vehicles (see Figures 1 and 2). In a typical 6–9 month stint with a rental

[27] Bobit, *Automotive Fleet 2001*, pp. 58–59.
[28] W. Rivers, 2001, *FY2000 Federal Fleet Report*, www.gsa.gov/vehiclepolicy, Washington, D.C.: General Service Administration, Federal Vehicle Policy Division, p. 15.
[29] Figures in this paragraph are from Bobit, *Automotive Fleet 2001*, pp. 35–36, 41–42.

Figure 2: New Fleet Vehicle Registrations, 2000



Source: Bobit, *Automotive Fleet 2001*, pp. 34, 36

company, a car accumulates over 30,000 miles, several times what an average car would travel in the same period.[30]

A few companies dominate the car rental business: the seven U.S. rental companies that own over 50,000 cars account together for 89% of all rental cars in the nation.[31] All but one of these companies is owned by, or buys cars primarily from, one of the Big Three U.S. manufacturers.

Government Fleets

Unlike rental vehicles, government vehicles represent a much larger percentage of fleet vehicles on the road than of new fleet purchases. This reflects government vehicles' relatively slow turnover rate. As noted above, they have about the same annual mileage as personal vehicles, and are kept much longer than any other fleet vehicles. Eighty-five percent of government fleet vehicles are owned, rather than leased, by the government. Nearly three-quarters are light trucks.[32] Over half of all government vehicles belong to local fleets, with the remainder split roughly equally between the federal government and the states. Governmental vehicles are typically the first ones subject to a legal mandate.

Commercial Fleets

Commercial fleets, which include business, utility and taxi fleets, make up over half of all fleet vehicles in use. As a group, they are evenly divided between cars and trucks. As indicated above, commercial fleet vehicles are driven nearly twice as many miles annually as personal vehicles and kept for about 60,000 miles. Businesses purchase more than 5% of all new midsize cars, a significant market share. For individual models, the commercial share can be up to 40% of all sales of that model, as is the case for the Dodge Intrepid. In contrast to rental company and government vehicles, most commercial fleet vehicles are leased. In addition, many are managed by professional fleet management companies.

Procurement Issues Related to Fuel Economy

The considerations driving vehicle purchase and operation practices for fleets differ from those for individuals, and in some respects the case for fuel economy is easier to make for fleets. Many fleet owners are more sensitive to transportation costs than the typical car or

[30] Conversation with Terry O'Day, EV Rental, July 30, 2002.
[31] Bobit, *Automotive Fleet: 2001,* p. 86.
[32] Bobit, *Automotive Fleet: 2001,* p. 12–13.

truck buyer, and the desire to cultivate a green image may play a role in fleets' vehicle choice as well. Furthermore, some classes of fleets are subject to legal requirements not applicable to individuals. At the same time, there are also obstacles to buying fuel-efficient vehicles that are specific to fleets.

Cost Considerations

Survey results indicate that purchase price is consistently among the top criteria in fleet vehicle choice. There is no fixed relationship between fuel economy and price within a vehicle class, and fuel-efficient vehicles can be relatively inexpensive. For example, a Saturn SL gets several more miles per gallon than a Chevrolet Cavalier and is on average $2000 less expensive. If it features new technology, however, a higher fuel economy vehicle often does cost more. The incremental cost may be compensated in fuel savings, in which case such a vehicle would do well in a life-cycle-based cost comparison. Fleets may consider capital and operating costs separately, however, as when procurement, management, and fuel payments are handled by different personnel. As a result, higher purchase costs alone can eliminate a vehicle from consideration.

Manufacturers offer fleets model-specific discounts of up to $2500, so a comparison of retail prices does not necessarily give an accurate picture of which vehicles are most economical for fleets.[33] Manufacturers give volume discounts as well, and as a result fleets are less varied with respect to both manufacturer and model than they would be in the absence of discounts. This works against fuel economy, in that selecting a vehicle according to its intended use facilitates selection of a fuel-efficient vehicle. Furthermore Honda, which manufactures several environmentally superior and advanced technology vehicles, has no fleet program, and in particular offers no fleet incentives. Honda sales to fleets are consequently negligible.

Fuel economy is a less important factor than purchase price in fleets' vehicle procurement. Certain fleets have no direct financial interest in fuel economy. This is true of car rental companies, whose customers pay fuel costs. The remaining fleets regard fuel economy as a significant but second-tier concern. A recent survey conducted by the National Association of Fleet Administrators (NAFA), for example, showed the following ranking of criteria in choosing a vehicle model, in decreasing order of priority: job suitability, initial cost, safety record, repair record/serviceability, and delivery time/warranty program. Following these criteria, and assigned moderate priority, were company image, vehicle country of origin, depreciation, and fuel economy. Seventy-three percent of respondents reported that high fuel costs in 2001 would not affect 2002 purchases at all, while 17% reported they would switch to more fuel-efficient vehicles, and 5% said they would reduce their fleet size.[34]

[33] The Cavalier, mentioned above, currently carries an incentive bringing its purchase price much closer to the Saturn purchase price, and the less-efficient Cavalier is in fact the far more popular fleet vehicle.

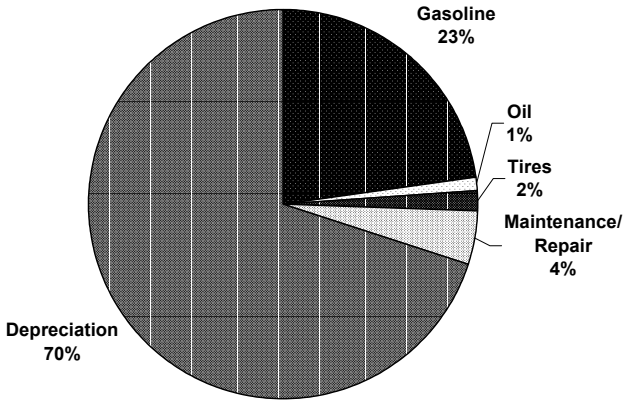
[34] *Fleet Executive,* 2002, "2002 Model Year New Vehicle Acquisition Survey: Business As Usual for Fleet Selector Lists," *Fleet Executive,* January, p. 5. Survey does not include rental fleets. An earlier NAFA survey suggests that government fleets place higher value on fuel economy (see S. Miaou, P. Hu, and J. Young, 1992, *Fleet Vehicles in the United States: Composition, Operating Characteristics, and Fueling Practices,* ORNL-6717, Oak Ridge, Tenn.: Oak Ridge National Laboratory).

Fuel costs are in any case a significant portion of total fleet vehicle costs. For a commercial vehicle, fuel expense is typically about three-quarters of fleet operating and maintenance expenses (see Figure 3). If capital costs are brought into the calculation as vehicle depreciation, fuel represents close to one-quarter of total costs.[35] Thus a 20% reduction in fuel costs (a 25% increase in fuel economy) would provide 5% savings in total vehicle costs, which is comparable to a typical fleet discount on the vehicle purchase cost.

Fuel savings can offset the higher purchase price of an efficient advanced technology vehicle, especially one that accumulates miles quickly. Because fuel savings are discounted over time, a fuel-efficient vehicle that is driven more than average will recover any purchase cost increment in fewer miles. Assuming, for example, a $2000 cost increment for a vehicle that increases fuel economy from 22 miles per gallon to 33 miles per gallon, and an 8% annual discount rate for fuel savings, a 12,000 mile-per-year driver needs over 120,000 miles and 10 years to regain the incremental cost, while the 23,000 mile-per-year fleet vehicle is paid back in 103,500 miles and 4.5 years. Also, since a vehicle's depreciation is based on age as well as on miles driven, a vehicle driven more than average depreciates less over a given number of miles than would an average vehicle.

The resale value of used vehicles is another important financial parameter for fleet managers. Fuel savings beyond the years of ownership accrue to the original owner only to the extent that high fuel economy is reflected in the resale price. Thus, unless the used vehicle market values fuel economy, the financial rationale for purchasing a fuel-efficient vehicle is strongest for those who accumulate the most miles before selling their vehicles. Fleets are not typically among them. An additional concern is that advanced technology vehicles may be penalized in the resale market due to their unfamiliarity, since reliability may not be well documented, and mechanics may not be prepared to service the vehicle. The importance of these issues depends upon the resale mechanisms employed by the fleet, auction being most common for governments and selling to employees most popular among business fleets.[36]

Figure 3: Costs for a Mid-Size Car—Commercial Fleet



Source: Bobit, *Automotive Fleet 2001*, p. 59

Resale value is a concern of manufacturers as well. Honda is not active in the fleet market because it places a high priority on the resale value of its vehicles, which it

[35] Bobit, *Automotive Fleet 2001*. These figures, based on survey data, are averages over a midsize fleet car "lifetime" of 57,175 miles, the average number of miles in service according to this survey. Fuel costs will be lower for governmental and other fleets receiving volume discounts on fuel.
[36] Miaou et al, *Fleet Vehicles in the United States*.

believes would be adversely affected by placing large numbers of them in fleet use.[37] While not all manufacturers attach such importance to resale value directly, it is a major consideration in fleet purchasing and cannot be ignored.[38]

The various cost considerations relevant to fleets can be integrated through a life-cycle analysis, assuming the fleet owner's accounting practices are amenable to this approach. For businesses, and to some extent for government, use of a life-cycle cost analysis in selecting vehicles is gaining currency.[39] This practice should work to the advantage of high fuel economy vehicles.

Corporate Agenda

For fleets as for the general public, vehicle choice considerations go well beyond cost issues. If a fleet owner wants to advance the cause of green vehicles for business or policy reasons, that goal will be reflected in vehicle choices. A company with a stake in advanced vehicle technologies or alternative fuels, for example, is among the likely first users of that technology or fuel. Government fleets may choose green vehicles to achieve environmental goals, both by reducing impacts directly and, more importantly, by helping to expand the market for these vehicles. Such considerations may take precedence to some extent over issues of cost and unfamiliarity of a new technology.

Public image plays a role as well, and a corporation cultivating an image of environmental responsibility is a good candidate for green vehicle purchases. The more obvious the vehicle's green credentials, the more useful for this purpose, so vehicles that are identifiably non-standard will be most appealing, given that there is currently no accepted designation for green vehicles. Indeed, apart from the purchase of a hybrid, the most obvious statement purchasers can make about fuel economy now is a negative one: purchasing over-sized vehicles. While some fleets now avoid doing this, those seeking to convey a sense of affluence may not.

Preference for U.S. Manufacturers

The percentage of fleet vehicles made by U.S. manufacturers is much larger than their percentage of the retail market. Among cars, Big Three models accounted for 82% of all model year 2000 fleet registrations, but only 55% of all sales (fleet and retail) in 2000.[40] There are several explanations for this. Fleets that purchase from a single manufacturer to reduce costs will tend to buy from U.S. manufacturers because their offerings cover the full range of vehicle types. Furthermore, some fleets have an explicit or tacit policy of "buying American."

[37] Telephone conversation with John Watts, American Honda Motor Company, May 21, 2002.

[38] See, for example, Steve Finlay, 2002, "SUVs: Problem Children of Used-Vehicle Industry," http://wdb.wardsauto.com/ar/auto_suvs_problem_children_3/index.htm, *Ward's Auto: Dealer Edition Newsletter,* May 21. Also Bobit, *Automotive Fleet 2001*.

[39] Automotive Fleet, 2002, "How to Pick the Right Vehicle for Your Selector," *Automotive Fleet,* July, p. 40.

[40] Ward's Communications, 2001, *Ward's Motor Vehicle Facts & Figures 2001*, Southfield, Mich.: Ward's Communications, pp. 15-18 and Bobit, *Automotive Fleet 2001* p. 34. Comparing sales and new vehicle registration data is generally inadvisable, but here it is not likely to affect the conclusion significantly.

The enormous weight of rental cars in the new fleet car market together with rental agencies' ties to U.S. manufacturers might also appear to be a major factor in the preponderance of American vehicles among fleets, but in fact foreign cars are an even smaller fraction of government and commercial fleets than of rental fleets. Ninety-eight percent of model year 2000 cars registered to government fleets were Big Three vehicles.[41]

The preference for U.S. manufacturers is potentially significant for fuel economy efforts because the Big Three are not leaders in producing fuel-efficient vehicles. Among model year 2001 vehicles, those sold by each of the Big Three had lower-than-average fuel economy for both cars and trucks. Furthermore, of the 32 car nameplates that were among the four most fuel-efficient in their classes in model year 2000, 22 were foreign.[42]

The most popular fleet vehicles are in fact about average in fuel economy for their respective classes. In the smaller size classes, cars with high fleet sales are almost never among the most efficient vehicles,[43] which consistently have fuel economies several miles per gallon higher than average. Popular fleet vehicles are typically more fuel-efficient than average among vehicles of their class from the same manufacturer, however. This could reflect either fleet preference for high fuel economy or manufacturer incentives set to ensure compliance with fuel economy (CAFE) standards.

State Procurement Policies

State procurement offices typically create a set of vehicle specifications for each class of vehicle, and retailers then bid on the state contract. This may result in the purchase of a single vehicle model in each class, which works against fuel economy in that selecting vehicles that must meet the needs of all users will impose requirements for power, transmission types, and other features that the most efficient vehicles may not be able to meet. Typically, agencies are allowed to purchase vehicles not listed on the contract or purchasing agreement, but only if the vehicles are cheaper or perform a duty that was unavailable from the vehicles originally on the list. The limited choice of vehicles on state lists can also influence the purchases of the far more numerous local fleets, which often are required to select from their states' lists.

The same issue arises for commercial fleets leasing vehicles. The leasing agency may compile a limited selector list from which clients can choose. While large fleets might be able to prevail upon lessors to add more efficient vehicles, limitations of the selector list is an obstacle to small fleets' purchase of vehicles with high fuel economy.

Procurement Timelines

The timing of vehicle purchase is important for most fleets, reflecting the fleet owner's budget cycle, the arrival of new models, timing of manufacturers' incentives, and, most importantly for some fleets, the need to maximize resale value, which varies seasonally.

[41] Based on data from Bobit, *Automotive Fleet 2001*, p. 34.
[42] Hellman and Heavenrich, *Light-Duty Automotive Technology and Fuel Economy Trends,* p. 25 and p. N-1.
[43] The Toyota Corolla is a notable exception.

Vehicle fleet bids typically go out between late spring and fall. Yet no comprehensive comparison can be made of new vehicles for the year until October, at the earliest. Some vehicle specifications are available before the model arrives in the show room, but EPA does not officially determine a vehicle's emissions certification and fuel economy until later. Therefore, it is therefore difficult to apply procurement criteria based on these specifications, especially for new model offerings or models that have undergone major redesign.

THE ALTERNATIVE FUEL FLEETS EXPERIENCE

The most extensive experience to date with fleets and green vehicles is associated with alternative fuel vehicles, and reviewing this experience is instructive. Energy Information Administration's estimates of alternative fuel vehicles in use today are shown in Table 2.

Table 2. Estimated Light-duty Alternative Fuel Vehicles (AFVs) in Use, 2001[44]

	Federal	State & Local	Private	Total
LPG	172	42,000	172,000	214,172
CNG	16,093	25,514	47,121	88,728
LNG*	44	60	117	221
M85	172	7,829	8,898	16,899
E85	16,844	12,471	18,697	48,012
Electricity	759	4,619	4,606	9,984
Total AFV	34,084	92,493	251,439	378,016
Total vehicles in fleet[45]	539,000	2,752,000	9,070,000	12,361,000
AFV % of fleet	6.3%	3.4%	2.8%	3.1%

* Liquified Natural Gas

These figures generally include all alternative fuel vehicles, regardless of ownership. An exception is flexible-fuel E85 vehicles, which can run on gasoline, E85, or a blend of the two. These are included only if they are "believed to be intended for use as alternative fuel vehicles."[46] As a result, flexible-fuel personal vehicles are not shown, because most are run exclusively on gasoline due to the scarcity of E85 refueling stations and the fact that many buyers are not even aware of the vehicles' ability to run on ethanol.

Were all flexible-fuel vehicles included, they would far outnumber all other alternative fuel vehicles combined. In fact, in 2000, flexible-fuel vehicles constituted nearly 8% of all light

[44] Energy Information Administration, 2002, *Estimated Number of Alternative-Fueled Vehicles in Use in the United States, by Fuel and Weight Category, 1997, 1999, and 2001*, www.eia.doe.gov/cneaf/alternate/page/datatables/table.html, Washington, D.C: Energy Information Administration. The General Services Administration gives somewhat higher figures for alternative fuel vehicles in use in Fiscal Year 2000 in federal fleets, and in particular lists 35,804 E85 vehicles in federal fleets (Rivers, *FY2000 Federal Fleet Report*, p. 49).

[45] This data from Bobit, *Automotive Fleet 2001*, pp.12-13. Because the alternative fuel vehicle data and fleet vehicle data are from two different sources, they may not be precisely comparable. These figures nonetheless serve to show the small fraction of fleet vehicles that are alternative fuel vehicles.

[46] EIA, *Estimated Number of Alternative-Fueled Vehicles.*

truck sales.[47] Manufacturers are making entire production runs of certain popular vehicles, such as the Taurus, as flexible-fuel vehicles, because they carry credits towards meeting CAFE standards and involve minimal extra manufacturing cost. Only a small percentage of these vehicles is sold to fleets.

As Table 2 shows, propane (LPG) vehicles are the second most common alternative fuel vehicles. LPG vehicles are primarily conversions, rather than OEM (original equipment manufacturer) vehicles, and often are purchased for location-specific reasons unrelated to environmental concerns. As with other alternative fuel vehicles (besides flexible fuel, as noted above), fleets are the main users,[48] largely due to constraints on refueling.

Federal Programs

In an effort to reduce U.S. reliance on imported fuels and address tailpipe pollution, lawmakers included in EPAct a series of mandates and incentive programs to promote the increased use of alternative fuels in federal, state, local, and private fleets, including those of alternative fuel providers. Requirements for local and private fleets were made contingent upon regulation that has never occurred.[49] Over the past decade, EPAct has required federal, state, and alternative fuel provider fleets to increase the percentage of their new vehicles that can use alternative fuels. Federal fleets were to achieve 75% alternative fuel vehicle purchase rates for fiscal year 1999 and thereafter. State fleets were required to reach rates of 75% by 2000, and alternative fuel providers, 90% by 1999,[50] though these deadlines were later delayed by one year. EPAct only affects fleets of 50 or more vehicles of which at least 20 are operating in metropolitan areas and are centrally fueled or capable of being centrally fueled.

Fleets can purchase dedicated or dual-fuel vehicles[51] in order to meet purchasing requirements, and EPAct does not require that dual-fuel vehicles use an alternative fuel. Executive Order 13149, discussed below, mandates alternative fuel use by alternative fuel vehicles used to meet EPAct requirements for federal fleets, but contains broad provisions for exemption from this provision.

The DOE's Clean Cities Program was created for the purpose of promoting voluntary alternative fuel vehicle programs, especially among local governments and businesses. There are currently 82 Clean Cities Coalitions in over 40 states, and over 20 military bases have joined with the program.

The 1990 Clean Air Act amendments established a Clean Fuel Fleets Program requiring certain public and private fleet operators to include "clean fuel vehicles" as a certain percentage of new vehicle purchases. Both alternative fuel vehicles and gasoline low-emission vehicles (LEVs), as defined by the federal NLEV tailpipe emissions program,

[47] DOT, *Report to Congress*, p. viii.
[48] Alternative Fuels Data Center, 2002, *Propane (LPG) General Information*, http://www.afdc.doe.gov/altfuel/lpg_general.html, Washington, D.C.: U.S. Department of Energy.
[49] An August 2002 federal court ruling directs the U.S. Department of Energy to complete its review of the need for such a regulation.
[50] *Energy Policy Act of 1992*, Public Law 102-486, Sections 303, 501 and 507, October 24, Washington, D.C.
[51] "Dual-fuel" is a broader designation than flex-fuel and includes vehicles with separate tanks for two fuels.

qualify. Most areas to which the program applied elected not to participate, however. Furthermore, the vast majority of new vehicles sold today meet LEV standards.[52] So Clean Fuel Fleets Program requirements have a limited impact on light-duty fleets. Nonetheless, the program is significant historically for having included private fleets and performance-based requirements.

State and Local Programs

In addition to EPAct requirements, many states have their own alternative fuel vehicle purchase mandates for fleets. These may exceed EPAct requirements with regard to the timeline for phase-in, final alternative fuel vehicle purchase percentages, or scope of fleet coverage. New York State, for example, must purchase 100% clean fuel vehicles by 2010. San Francisco requires that all cars and light trucks purchased by city departments be ultra-low-emissions vehicles (ULEVs) or zero-emissions vehicles (ZEVs), which includes alternative fuel as well as clean gasoline vehicles.[53] Requirements that are not specific to fleets exist as well, most notably the California mandate that 10% of all new vehicles must be ZEVs starting in 2003. While not specifically requiring alternative fuel vehicles, the mandate in effect will require purchase of many electric and other alternative fuel vehicles.[54] Maine, Massachusetts, New York, and Vermont have adopted much of California's motor vehicle emissions program and will require sales of electric vehicles by 2003.[55]

Far more common than mandates at the state level are incentive programs for alternative fuel vehicles.[56] California currently offers grants of up to $11,000 per vehicle for purchase or lease of electric vehicles by fleets in areas where environmental equity is a concern. Most states' incentive programs are not specific to fleets, but are open to the public as well. State programs include tax incentives for vehicle purchase (California, D.C., and Nevada), access to high-occupancy vehicle lanes (Georgia, Utah, and Virginia), parking fee exemptions for electric vehicles (Hawaii), emissions inspection exemption (Washington), and exemption from time-based transportation control measures (Wisconsin).[57]

[52] Eighty-seven percent of all light-duty model year 2002 listings (905 of 1039) are LEV or better. J. Kliesch, 2002, *ACEEE's Green Book®* database, Washington, D.C.: American Council for an Energy-Efficient Economy.

[53] International Council for Local Environmental Initiatives, *San Francisco 'Healthy Air and Smog Prevention' Ordinance,* 10/15/99*,* http://www.greenfleets.org/San_Francisco.html, Berkeley, Calif: International Council for Local Environmental Initiatives.

[54] The mandate was revised to allow "partial" ZEVs to fulfill part of the 10% requirement. The revisions have been successfully challenged in court, and as a result, the final form of the mandate is uncertain.

[55] Burke, A.F., K. Kurani, and E. Kenney, 2000, *Study of the Secondary Benefits of the ZEV Mandate*, p. 50, http://www.arb.ca.gov/msprog/zevprog/2000review/zevben.pdf, Davis, Calif.: California Air Resources Board.

[56] Thirty-five states have such incentives, according to DOT, *Report to Congress,* p. 18.

[57] State-by-state reviews of alternative fuel incentive programs can be found, for example, in M. Brown, *State Alternative Fuel Vehicle Incentives: A Decade and More of Lessons Learned*, National Conference of State Legislatures, 2001.

Discussion

Despite a concerted effort over the past decade to bring alternative fuel vehicles into the vehicle stock, they remain a minuscule fraction of U.S. vehicles and a tiny percentage even of fleet vehicles. The DOE reported 91% compliance with EPAct mandates among covered state and fuel provider fleets in Fiscal Year 2001.[58] Federal agencies' record has been less satisfactory: in August 2002, a federal court ruled that fifteen federal agencies, including the EPA and the U.S. Department of Transportation (DOT), have failed to meet the targets and have failed to report to the public on their compliance, as required under the act.

Full compliance with EPAct purchase requirements would not in itself have led to a much more significant presence of alternative fuel vehicles, however, and would not have come close to reaching the petroleum fuel replacement goals set out in EPAct of 10% by 2000 and 30% by 2010.[59] To achieve the 2010 targets, alternative fuel vehicles would have to make their way, in large numbers, beyond the fleet market. Alternative fuel vehicles still have the clear potential to fill niche markets and may yet play a role in the general-purpose market, but fundamental changes will be required for this to happen.

FLEET FUEL ECONOMY EFFORTS TODAY

Given the prominent role fleets have played in efforts to build the alternative fuel vehicle stock, it is natural to ask whether fleets might be a good starting point for promoting high fuel economy vehicles as well. Fuel-efficient vehicles do not require properties specific to fleets, such as centralized refueling, to gain a foothold in the market, so a fleet strategy is not nearly so fundamental to promoting high fuel economy as it has been to promoting alternative fuel vehicles. On the other hand, advances in vehicle fuel economy in the fleet market are more readily transferable to the retail market, precisely because fuel-efficient vehicles are not dependent upon features only fleets possess. Concerted efforts to orient fleet purchasing toward fuel-efficient vehicles have been limited, but important initiatives do exist.

Federal Programs

Federal fleets are required to select vehicles "to achieve maximum fuel efficiency."[61] The practical effect of this requirement is unclear, however. A more result-oriented approach was taken in Executive Order 13149, “Greening the Government through Federal Fleet and Transportation Efficiency," signed in April 2000. Executive Order 13149 was intended to establish a leadership role for the federal government in reducing petroleum consumption

[58] Office of Transportation Technologies, 2001, *Program Activity & Accomplishments in FY 2001*, EPAct Fleet Information & Regulations, U.S. Department of Energy, Office of Transportation Technologies, State & Alternative Fuel Provider Program.
[59] Replacement of petroleum fuels with alternative fuels can also be achieved to a degree through fuel blending. For example, the quantity of ethanol used as an oxygenate in E10 dwarfs the quantity used in alternative fuel (E85) vehicles.
[60] For an extensive discussion of this topic, see Brown, *State Alternative Fuel Vehicle Incentives*.
[61] 41 CFR §102-34.45.

through increases in fleet fuel efficiency and use of alternative fuels.[62] Under the order, each federal agency with an operating fleet of twenty or more vehicles is to reduce its consumption of petroleum by at least 20% from 1999 levels by the end of Fiscal Year 2005. The extent of compliance with the order has yet to be determined, but meeting these goals would require a significant departure from current trends: federal vehicles' gasoline consumption went from 340 million gallons in Fiscal Year 1999 to 355 million gallons in Fiscal Year 2000, a 4.4% increase.[63]

Executive Order 13149 gives agencies several options to meet the petroleum reduction goals, including the use of alternative fuel vehicles, fuel-efficient vehicles, and hybrid vehicles; the substitution of cars for light trucks; reductions in fleet size; and reduction in the number of vehicle miles traveled. Each agency is to develop a strategy that fits its fleet configuration and specific requirements, but is specifically required to buy vehicles with higher fuel efficiency. The average fuel economy of passenger cars and light trucks purchased must rise by at least 1 mile per gallon by the end of Fiscal Year 2002 and by at least 3 miles per gallon by the end of Fiscal Year 2005, relative to Fiscal Year 1999 levels.

The most significant federal fuel economy requirements are the Corporate Average Fuel Economy (CAFE) standards, which apply to all light-duty vehicles (both retail and fleet). CAFE standards arose from concerns in the 1970s about dependence on imported oil, which led to provisions in the Energy Policy and Conservation Act of 1975 requiring passenger cars and light trucks from each manufacturer to meet average fuel economy standards. Average fuel economy of new vehicles increased by 69% between 1975 and 1987, but has since fallen to its lowest level in more than 20 years,[64] due in part to an enormous increase in the percentage of light trucks sold. The DOT is currently preparing a rule to change the light truck standard, to be adopted in April 2003.

With regard to federal incentives for fuel-efficient vehicles, there are none specifically for fleets. Hybrid vehicles qualify for a federal tax deduction of up to $2000 as "Clean-Fuel Vehicles,"[65] but many fleets would be unable to take advantage of this deduction due to their limited tax liability. A bill has been introduced in Congress that provides federal tax credits for efficient, advanced technology vehicles, including up to $4000 for hybrids and $8000 for fuel cell vehicles. Fleet vehicles would be eligible for these tax incentives. In the case of a non-taxpaying entity, the proposed tax credit would accrue to the dealer, who would be required to disclose the existence of the credit to the buyer. This approach is somewhat problematic, in that dealers may not have sufficient tax liability to take full advantage of the credits, and those credits that are received will not automatically be passed on to the buyers.

[62] Clinton, William J., 2000, *Executive Order 13149: Greening the Government Through Federal Fleet and Transportation Efficiency*, April 21, http://ceq.eh.doe.gov/nepa/regs/eos/eo13149.html, Washington, D.C.
[63] Rivers, W., 2001, *FY2000 Federal Fleet Report,* p. 17, www.gsa.gov/vehiclepolicy, Washington, D.C.: U.S. General Service Administration, Federal Vehicle Policy Division.
[64] Hellman and Heavenrich, *Light-Duty Automotive Technology and Fuel Economy Trends,* p 8.
[65] Internal Revenue Service, 2002, "IRS Moves to Clarify Taxpayer Deduction for Hybrid Vehicles," May 21st News Release, http://www.irs.gov/pub/irs-news/ir-02-64.pdf, Washington, D.C.: Internal Revenue Service.

EPAct-Eligibility for Hybrids

There have been legislative proposals to allow fleet purchases of hybrids meeting a fuel economy threshold to qualify for EPAct credit. Many fleets are interested in hybrid vehicles, and a broadening of EPAct eligibility could greatly increase purchases of hybrids. Incremental costs of hybrids are comparable to those for dedicated alternative fuel vehicles, but hybrids involve no infrastructure costs. Flexible fuel vehicles also require no new infrastructure and have no incremental cost, but upcoming federal requirements to increase the percentage of alternative fuel used by vehicles satisfying EPAct requirements could mean that fueling will become an issue in the future. In any case, it is reasonable to ask whether hybrids could displace a significant percentage of alternative fuel vehicle purchases.

The answer depends in part on the number of hybrids available relative to the EPAct-driven demand for alternative fuel vehicles. EPAct requirements apply only to a subset of federal, state, and fuel provider fleets, and within these covered fleets, only a certain percentage of vehicles must be alternative fuel vehicles. An upper bound for the number of alternative fuel vehicles required to be purchased by EPAct in 2002 is 52,000 vehicles: 15,000 federal; 25,000 state; and 12,000 fuel provider fleets.[66] Alternative fuel providers would presumably continue to purchase alternative fuel vehicles, leaving a maximum of 40,000 required EPAct purchases susceptible to replacement by hybrids. Of these, some 10,000 will be cars, given that three-quarters of state and federal vehicles are trucks. For 2002, projected sales of 25,000 Honda Civic Hybrids and 10,000 Toyota Priuses yield a new hybrid compact car population of 35,000, which would be more than sufficient to fulfill the EPAct requirement for government fleets.

Demand for hybrids has already outstripped the supply. The substitution of alternative fuel vehicles by hybrids in government fleets would not increase hybrid sales in the short run and would in fact make a significant dent in the number of hybrids available to the general public.[67] In the longer term, manufacturers may look to fleet mandates and buying practices to determine how many hybrids to produce. On the other hand, an EPAct fleet demand of 40,000 is not sufficient to create economies of scale and consequently will not have a large effect on the speed with which hybrids reach a mass market.

State Programs

Few states have adopted policies specifically to raise fleet fuel economy. In Connecticut, the "environmentally preferable purchases" policy for state agencies requires that light-duty vehicles purchased by the state after September 2001 must achieve on average 35 miles per gallon and, after December 2002, 40 miles per gallon.[68] These are ambitious targets given the current limited availability of efficient vehicles, and Connecticut will not achieve them.

[66] US General Accounting Office, *Energy Policy Act of 1992: Limited Progress in Acquiring Alternative Fuel Vehicles and Reaching Fuel Goals*, p.28. GAO RCED-00-59. Washington, DC: US General Accounting Office.
[67] Of even greater relevance to hybrid availability would be local fleet purchases, which are considerably more numerous than federal and state purchases. But local fleet purchases would be unaffected by the proposed change in EPAct eligibility.
[68] Connecticut State Legislature, 2001, *Public Act No. 01-168,* http://www.cga.state.ct.us/2001/act/Pa/2001PA-00168-R00SB-01068-PA.htm, Hartford, Conn.: Connecticut State Legislature.

Several states have altered alternative fuel vehicle purchase requirements to allow hybrids to qualify. In New York, for example, Executive Order 111 mandates a higher percentage of alternative fuel purchases for fleets than is required under EPAct, but permits hybrids. Similarly, New Mexico expanded EPAct requirements to all educational institutions while allowing hybrids to qualify for credit.[69]

The Tellus Institute and Northeast States for Coordinated Air Use Management (NESCAUM) are exploring prospects for coordinating green vehicle procurement among eight Northeastern states. In addition to leveraging buying power, this would allow states to coordinate procurement, maintenance, and repair of vehicles. The effort would concentrate on advanced technology vehicles meeting both air pollution and fuel economy criteria.[70]

At the state level, incentives for efficient vehicles are more common than mandates. As at the federal level, however, these incentives are typically not specific to fleets. Maryland offers a sales tax reduction of up to $1500 for the purchase of hybrids.[71] Several states count hybrids as alternative fuel vehicles for purposes of the tax credit programs they have established, for which purchaser eligibility varies widely. These states include Oregon, Colorado, New Jersey (local government entities), and Pennsylvania (schools, municipal entities, nonprofit organizations, and residents). In New York, hybrids are eligible for an electric vehicle tax credit up to $5000. California also has an Efficient Vehicles Incentive Program to provide financial incentives to the public to purchase high fuel economy vehicles; to date the program has identified only alternative fuel and hybrid vehicles as eligible for the funds. Non-financial incentives for hybrids are appearing as well, as in Arizona and Virginia, where the vehicles are permitted in high occupancy vehicle lanes, and in Washington, which exempts them from emissions testing.[72]

Local Government Programs

The most extensive activity on fleet fuel efficiency to date has occurred at the local level. In 1993, Denver adopted a green fleets policy for the municipal fleet to address energy and air

[69] New Mexico State Legislature, 1992, *Statutes: Statutory Chapters in New Mexico Statutes Annotated 1978: Chapter 13 Public Purchases and Property: Article 1B Alternative Fuel Acquisition,* New Mexico State Legislature. http://legis.state.nm.us, Santa Fe, N.M.: New Mexico State Legislature, Alternative Fuel Conversion Act of 1992.

[70] S. Bernow, R. Cleetus, A. Cotter, B. Dougherty, and V. Thalheimer, 2002, *Coordinated Procurement of High Efficiency, Low-Emitting Vehicles in State Fleets in the Northeast: A Discussion Paper*, Draft, Prepared for the April 25 Meeting on Coordinated Green Fleet Procurement in the Northeast: Opportunities and Challenges, Boston, Mass.: Tellus Institute.

[71] Maryland Clean Energy Incentive Act, 2000, http://mlis.state.md.us/2000rs/bills/hb/hb0020e.rtf, Annapolis, Md.: Maryland State Legislature.

[72] EPA, 2001, *State Incentives for Cleaner Transportation Technologies*, www.epa.gov/OMS/market/rpt914.htm, Washington, D.C.: U.S. Environmental Protection Agency, Office of Policy Analysis and Review. U.S. Department of Energy, 2002, *Alternative Fuel Vehicle Fleet Buyer's Guide,* www.fleets.doe.gov/cgi-bin/fleet/main.cgi?19787.state_ins_rep.2.491299, Washington, D.C.: U.S. Department of Energy. Electric Vehicle Association of the Americas, 2002, *State Laws and Regulations Impacting Electric Vehicles,* http://www.evaa.org/evaa/pages/Enacted_State_Legislation.PDF, Washington, D.C.: Electric Vehicle Association of the Americas and Virginia Department of Transportation, *High Occupancy Vehicle (HOV) Systems: Frequently Asked Questions*, http://virginiadot.org/comtravel/hov-rulesfaq.asp, Richmond, Va.: Virginia Department of Transportation.

pollution concerns, having had some success in improving the energy efficiency of buildings. The policy required reductions in fuel expenditures of 1% per year and in CO_2 emissions of 1.5% per year.[73]

Taking Denver as its model, the International Council for Local Environmental Initiatives (ICLEI) created a Green Fleets Program as part of its Cities for Climate Protection Campaign. Several local governments have participated productively in the effort.

Portland, Oregon set a goal to reduce CO_2 emissions for the city as a whole to 20% below 1988 levels, which was subsequently lowered to 10% in a 2001 report. Among a host of other strategies, the city plans to purchase 15,000 highly efficient vehicles and 15,000 alternative fuel vehicles with low CO_2 emissions. Portland maintains that its goals cannot be met through local legislation and initiative alone, and therefore advocates an increase in federal car and light truck fuel efficiency standards to 45 miles per gallon and 35 miles per gallon, respectively.[74]

Los Angeles, California has adopted a goal of increasing fuel economy of fleet vehicles by 25% between 2001 and 2010. The significance of this undertaking is perhaps enhanced by the fact that Los Angeles's fleet is larger than those of all but three states.[75] The city now requires bid specifications for new vehicles to choose the vehicle that can accomplish the job and is most fuel efficient, rather than the vehicle that can accomplish the job at the lowest bid.[76] *Arlington, Massachusetts* has a similar policy.

Dade County, Florida, as part of a program to reduce CO_2 emissions by 20% below 1988 levels by 2005, is committed to higher utilization of fuel-efficient cars in its fleet, as well as to promoting an increase in national gas mileage standards to 45 miles per gallon.

Madison, Wisconsin has adopted a Green Fleet Plan resolution. Its goals include the acquisition of the most energy-efficient vehicles possible; management and operation of the fleet in a manner that is energy efficient and minimizes emissions; reduction of energy expenditures for the fleet by a total of 1% by the year 2010; reduction in the emission of CO_2 from its fleet by a total of 2% by the year 2010; and implementation of cost-effective and common sense programs to reduce the city's transportation costs.

[73] City of Denver, 1993, "Executive Order 107," April 22, Denver, Colo: City of Denver. The policy was revised in 2000, however, eliminating the reduction targets.
[74] International Council for Local Environmental Initiatives, 1993, *The City of Portland, Oregon's Carbon Dioxide Reduction Strategy,* http://www.iclei.org/aplans/portlap.htm, Berkeley, Calif.: International Council for Local Environmental Initiatives.
[75] Bobit, *Automotive Fleet 2001*, p.28.
[76] Conversation with Chris Patton, Environmental Affairs Department, June 25, 2002 and City of Los Angeles, Environmental Affairs Department.

Ann Arbor, Michigan passed a resolution in 2000 calling for the establishment of "clear goals for reduction in energy use and emissions" of city vehicles and endorsing the goals of the Clean Car Campaign.[77]

Private Fleet Programs

Initiatives that will boost the fuel economy of some private fleets exist as well.

Environmental Vehicle Rental (a California-based company renting out natural gas, electric, and hybrid vehicles) has been in operation since 1998. Environmental Vehicle Rental now has 350 cars at 14 airport locations in California, Arizona, Pennsylvania, and Washington D.C. An affiliate of Budget Rental Car, Environmental Vehicle Rental offers prices comparable to those of other rental companies. The concept is a promising approach to increased green vehicle penetration, not only because of the rapid rate at which cars are turned over by the rental market, but also because of the opportunity it provides to interested clients to try out vehicles they may be reluctant to purchase without an extended trial. Furthermore, even people who would not be inclined to buy a fuel-efficient vehicle for their personal use may be interested in using one for business travel.

Federal Express, working with the Alliance for Environmental Innovation, has made a commitment to large-scale purchase of green delivery trucks.[78] Three businesses responded to a request for proposals from Federal Express and the Alliance that set vehicle specifications including a fuel economy increase of 50% and an emissions reduction of 90% relative to current delivery trucks.

ZipCar and *Flexcar* are car-sharing companies that provide vehicles on an hourly basis, on demand, to members. Each has 150–200 vehicles at present, serves 4–5 cities, and is growing rapidly. The environmental mission of these companies and the clientele they attract make green vehicles a priority for them. Flexcar plans to increase hybrid vehicles to 50% of its fleet.[79] Both companies lease their vehicles.

CONCLUSIONS AND RECOMMENDATIONS

The number of fleet vehicles in the United States is substantial, and many fleets have an interest in fuel economy. They do not present an easy opening for high fuel economy vehicles, however, and progress on this front to date has been limited. Major obstacles to raising fuel economy in the retail market, such as limited public and manufacturer interest, are also factors in the fleet market, if only indirectly. Nonetheless, special characteristics of fleets suggest that various fleet-oriented strategies are worth pursuing.

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[77] *Ann Arbor Resolution in Support of Clean Car Campaign and Establishment of a City Green Fleets Policy, http://www.iclei.org/grfleets/annarbor.html,* Ann Arbor, Mich.: International Council for Local Environmental Initiatives.

[78] The Alliance for Environmental Innovation, 2002*, FedExpress—Alliance for Environmental Innovation Project*, http://www.environmentaldefense.org/alliance/fedex_index.htm, Boston, Mass.: The Alliance for Environmental Innovation.

[79] Carr, D., 2002, "Car-Sharing Programs Come to U.S.," *NAFA Fleet Executive,* March, Volume 1, Number 3, p. 8.

Cost Issues

Prioritization of fuel economy in fleet vehicle selection would yield a significant efficiency increase and need not raise purchase prices. Fuel savings would result from purchase of conventional, fuel-efficient vehicles that are functionally equivalent to the current choices; bigger savings still could be achieved through a comprehensive effort to tailor vehicle specifications to performance requirements for individual vehicles.

Fuel costs are a concern to any commercial or government fleet manager, but do not necessarily play a major role in the purchasing process. Use of life-cycle costs is a step towards proper valuation of fuel efficiency in vehicle selection and is increasingly common among both commercial and government fleets. Obstacles to this practice remain, however, including separation of purchasing and operations functions within a fleet, and existence of other mandates.

Even if proper consideration of life-cycle costs in purchasing decisions were the norm, the results might not be particularly favorable to high fuel economy vehicles. Differences in manufacturers' incentives are likely to outweigh fuel cost differences among conventional vehicles. Furthermore, fleets typically own vehicles for less than half of their useful life, so high fuel economy reduces costs only through a few years of fuel savings and the increment in resale value attributable to high efficiency, which may be negligible.

Recommendations:

- (Advocates) Promote use of life-cycle costs, rather than purchase price, as a criterion in selecting vehicles.
- (Government) Support high resale values for fuel-efficient vehicles by extending any reductions in sales tax or other incentives to resale.

Fleet Properties

Fleets' interest in fuel economy and their ability to pursue it varies considerably by fleet type. Local governments represent some of the most advanced efforts toward fleet efficiency, and control the largest share of fleet vehicles of any level of government. Their efforts, which date from the early 1990s, would benefit from new support. For both state and local fleets, aggregating vehicle purchases could be very useful, in particular in helping transfer the initiative from the manufacturer to fleets to determine which vehicles are designated as fleet vehicles and are consequently discounted.

Commercial fleets have perhaps the greatest untapped fuel economy potential. Companies will increasingly look for opportunities to improve their environmental performance and image. In particular, they may be tracking CO_2 emissions and trying to reduce them. Commercial fleets have not (for the most part) been subject to government mandates, and are presumably more flexible in their purchasing procedures than are government entities. Their purchases constitute a very high percentage of sales of certain models, which gives commercial fleets a potentially large influence over manufacturers' decisions about those models. A large percentage of commercial fleet vehicles are leased, however, and many are

managed by fleet management companies, and this may weaken the role of companies in vehicle choice.

Despite their tantalizingly high share in the new vehicle market, rental companies have limited ability and motivation to bring about change in the vehicle market, given their ties to auto manufacturers and the fact that they do not pay for fuel used by their vehicles. Rental companies' interest in fuel economy will typically follow from, but not lead, the interest of the public and/or the manufacturers. Nonetheless, there are opportunities to engage rental fleets in limited ways. A segment of the population values fuel economy and other environmental features, so a company such as Electric Vehicle Rental fills an important niche and can increase sales of advanced technology vehicles. Also, corporate clients can influence rental fleets to the extent that they request efficient vehicles.

Recommendations:

- (Government) Aggregate vehicle purchases among jurisdictions, while ensuring that this does not lead to a "lowest common denominator" approach.
- (Advocates) Provide businesses with information allowing them to calculate the reduction in CO_2 emissions that would follow from purchase of fuel-efficient vehicles.
- (Advocates) Engage fleet managers in efforts to raise manufacturers' prioritization of fuel economy. Fleet managers' focus on fuel economy of particular models with high fleet sales could be helpful.

Benefiting from other Environmental Fleet Programs

Existing programs to promote purchase of low-emissions or alternative fuel vehicles offer some of the best opportunities to encourage fleet purchases of fuel-efficient vehicles. The Clean Cities Program, in particular, has created a large knowledge base and network of government and private interests across the nation. Several issues that arise in connection with alternative fuel vehicles (such as consolidation of fleet buying power, consistency of mandates across jurisdictions, and public awareness of benefits) are also issues for fuel-efficient and advanced technology vehicles, and the cooperative agreements and structures created in alternative fuel-oriented programs may be invaluable for fuel economy efforts.

Rivalries and conflicts among environmental priorities in transportation must be avoided. Numerous policies have been proposed, and in some cases adopted, that do create such conflicts. These include attempts to relax emissions standards to take advantage of efficient but dirtier technologies; the granting of CAFE credits to vehicles that can run on alternative fuels but do not in fact reduce gasoline consumption; and access to high occupancy vehicle lanes or preferential parking for hybrid or alternative fuel vehicles.[80] Promotion of fuel-efficient vehicles need not and should not come at the expense of reductions in air pollution, growth in the use of alternative fuels, or reductions in vehicle miles traveled.

[80] Energy and air pollution impacts are only part of the environmental toll taken by automobiles, and special use lanes are meant to address congestion and land use problems that green vehicles do not mitigate.

The extensive experience of fleets with alternative fuels provides many lessons for fuel efficiency efforts, including that incentives must be sensibly sized and predictable; that any program needs to include performance-based criteria; that periodic updating of strategy is essential; that fleet programs will not catalyze changes in the non-fleet market if they rely heavily on properties specific to fleets; and that the retail market will not be open to green vehicles with fundamental economic disadvantages.[81] The EPAct experience suggests that mandates are unlikely, in themselves, to produce results beyond the minimum required. Limited vehicle availability and high cost are features that advanced technology, efficient vehicles share with alternative fuel vehicles, but fleet fuel economy strategies to promote purchase of commonplace, economical vehicles will not face those problems. Furthermore, other major obstacles to significant market penetration of alternative fuel vehicles, such as fuel infrastructure needs and vehicle range limitations, do not apply to fuel-efficient vehicles.

Expansion of alternative fuel vehicle programs to include efficient gasoline-powered vehicles such as hybrids must be executed carefully to ensure that the net effect is an increase in environmentally superior vehicles. In the case of EPAct, this could be accomplished by allowing hybrids that are sufficiently clean and efficient to qualify for credit while expanding EPAct to fleets not currently covered. Municipal and private fleets or smaller federal and state fleets may be better able to accommodate a more flexible mandate of this kind, given that hybrid vehicles impose no infrastructure constraints.

Recommendations:

- (All) Take advantage of existing green fleet programs, including alternative vehicle programs, but avoid gaining ground on fuel economy at the expense of alternative fuel vehicles, which offer complementary benefits.
- (All) More generally, do not create conflicts between fuel economy and other environmental transportation priorities. In particular, avoid incentives to promote high fuel economy vehicles that result in more driving, use of vehicles during peak hours, greater tailpipe emissions, etc.
- (Federal government) Consider allowing hybrids that are sufficiently clean and efficient to qualify for EPAct credit while expanding requirements to fleets not currently covered.

Structure of Fleet Programs

Given that including fuel costs in vehicle purchase criteria will not in itself bring about a significant change in fleet fuel economy, more direct mechanisms will be needed as well. Two possible approaches to promoting purchase of higher fuel economy fleet vehicles are to set fuel economy performance targets in choosing vehicles and to prioritize purchase of advanced technology, efficient vehicles. Since these are not directly cost-based approaches to fuel economy, only those fleets interested in fuel economy as a matter of policy could be expected to adopt them. Incentives or mandates could be applied to other fleets, however, to increase their participation.

[81] For an extensive discussion of this topic, see Brown, *State Alternative Fuel Vehicle Incentives*.

Fuel economy incentives should be provided for both technology and performance. Performance needs incentives to correct for factors such as low fuel prices and consumer caution, which prevent reductions in oil consumption from being properly valued in the market. Advanced technologies need them also, because in some cases they have the potential to yield greater oil savings in the long term than conventional technologies, and may eventually be more cost-effective as well, but initially will be expensive on a dollars-per-gallon-saved basis. Also, advanced technology vehicles have high visibility, which helps meet policy and public image needs of governmental and certain private fleets.

While mandates are easier to impose on fleets than on the entire vehicle population, incentives for efficiency are generally no better suited to fleets than any other part of the vehicle market. At the same time, efficiency incentives offered for all vehicles can have major implications for fleets, so it is important to ensure that such programs are designed to allow fleets to take advantage of them. Tax credits for advanced technology vehicles, for example, need to be made available to commercial enterprises and to non-tax-paying entities, including government offices.

Recommendations:

- (Advocates) Promote high fuel economy through both advanced technology vehicles and conventional, affordable vehicles.
- (Government) Provide incentives for both technology and fuel economy performance.
- (Government) Ensure that incentives to promote purchase of efficient vehicles are structured to encourage participation by fleets, including those with limited or no tax liability.

Education

In considering the environmental performance of their vehicles, many fleet managers have focused exclusively on tailpipe emissions. It is important to clarify the relationship between clean air and other environmental goals that enter into procurement decisions. The EPA's pollution prevention program could help to accomplish this. Vehicle criteria for "environmentally preferable products" under this program are currently designed to promote low-emissions and alternative fuel vehicles. Establishing a preference for high fuel economy as well as low tailpipe emissions would be helpful to the many states that look to the EPA for environmental purchasing guidance.

Fleets can raise public awareness of the availability and importance of high fuel economy vehicles. Some fleets have prominently identified their alternative fuel vehicles; similar identification of high fuel economy conventional vehicles is difficult at present. A widely recognized ENERGY STAR®-type designation for vehicles could help address this problem. Another useful labeling program would be one that designated as green those fleets that met a set of environmental criteria including average or maximum fuel economy.

Recommendations:

- (Advocates) Clarify the relationship between clean air and other green vehicle goals for fleet managers, who have focused primarily on the former.
- (Government, manufacturers, advocates) Consider ENERGY STAR®-type designations for vehicles and for fleet practices to attract fleets and raise public awareness of fuel economy issues.
- (Federal government) Expand vehicle criteria for "environmentally preferable products" under the EPA's pollution prevention program to include fuel economy.