A Report to the Joint Standing Committee
on Natural Resources

Mobile Source Strategy Report

February 2001

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Maine Department of Environmental Protection

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Acknowledgements

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Executive Summary

This report summarizes existing and alternative mobile source emissions reduction strategies. These mobile source strategies include strategies either implemented or being considered by the State of Maine, the United States Environmental Protection Agency or other states.

Motor vehicles are significant emitters of a number of pollutants including carbon monoxide, nitrogen oxides, volatile organic compounds, carbon dioxide, and hazardous air pollutants such as benzene. While motor vehicle emission control devices have dramatically reduced pollutant emissions per vehicle during the past 20 years, the number of cars and trucks on the road, and the number of miles they are driven, have doubled. This growth in vehicle travel is offsetting the progress achieved through improved vehicle emission controls.

Motor vehicle registration data indicates that the average age of a vehicle on Maine roads is 8.7 years. The 1993 Ford Escort is the most registered vehicle. In year 2000 the GMC Sierra pick-up truck is the commonly purchased new vehicle; the Ford F150 pick-up truck is the most commonly purchased used vehicle.

Reducing emissions from these so-called mobile sources diminishes the risk of health problems associated with poor air quality. Generally, mobile source control strategies fall into four categories: using cleaner fuels for the vehicles, driving cleaner new vehicles, properly maintaining existing vehicles and reducing either the number of vehicles on the road or the number of miles they are driven. Strategies chosen may be mandatory or voluntary, contain elements of public education, and/or include incentives to make the strategy more attractive. Maine's experience runs the gamut of these options.

Fuels. Gasoline is the predominant fuel for motor vehicles used in Maine. Nearly 700 million gallons of gasoline and 150 million gallons of diesel were sold in Maine in 1999. In order to reduce air pollutants that form ground-level ozone and hazardous air pollutants, in 1994 Maine voluntarily participated in the federal Reformulated Gasoline (RFG) program. Concerns about groundwater contamination due to elevated levels of the additive used in the RFG sold in Maine (MTBE) prompted the State to withdraw from this program in 1998. In

its place Maine now requires a low volatility (evaporates less readily) gasoline in the seven southern counties to reduce emissions. (The remaining counties are subject to minimal federal standards for volatility.) The Department is currently working with other northeast states to identify a regional fuel which will provide the same air quality benefits of reformulated gasoline without the increased risk of groundwater contamination.

The Department has also supported the development of vehicles that run on fuels other than gasoline or diesel. Alternative fuels include, but are not limited to, natural gas, electricity, alcohol fuels (such as ethanol and methanol), propane, and bio-diesel. Vehicles burning these fuels can use original equipment or be conversions. Increased use of alternative fuels provides for better energy security by reducing use of imported oil and for improved air quality. The largest hurdles to overcome in terms of encouraging the use of alternative fuels are the lack of existing infrastructure to deliver the fuel and the increased cost of the vehicles and/or fuel.

In-Use Vehicle Maintenance. In 1994, to identify vehicles in need of a tune-up or work on vehicle pollution control equipment, Maine implemented the nation's first state-of-the-art, centralized, vehicle emissions testing program (IM240) in the seven southern Maine counties. After great public outcry and debate, the program was repealed in 1995. In its place the U.S. Environmental Protection Agency allowed a less elaborate inspection program. It was piggybacked on the safety inspection program, not centralized, and required only in Cumberland County. This test, started in 1998, includes the existing visual check for a catalytic converter on 1983 and newer vehicles, a gas cap pressure test on 1974 and newer vehicles, and a check of the onboard diagnostic (OBD) system on 1996 and newer vehicles. The OBD scan began in 1999 but required no repairs if the vehicle failed. Starting in 2001, any 1996 or newer vehicle that fails the OBD scan must make repairs before it may receive its safety inspection sticker.

An additional effort to identify maintenance needs came in 1998 when the Department began a heavy-duty diesel truck testing pilot program. Heavy-duty diesel trucks over 26,000 pounds were voluntarily tested for opacity emissions. (Opacity is a measure of the density of the emissions from the vehicle and is usually associated with the amount of particulate or soot released into the air.) In 1999 a full testing program was implemented, but failing vehicles were not

required to make repairs. Starting in January 2000, vehicles that failed the test were required to make repairs within 30 days or pay a fine of $290.

Cleaner New Cars and Trucks. Starting with model year 2001, all new motor vehicles under 6000 pounds sold in Maine must be California-certified. This means that the cars must meet certain pollution control standards, originally drafted by California, that qualify them as Low Emission Vehicles (LEV). In December 2000, the Board of Environmental Protection (BEP) adopted the "second generation" of California's Low Emission Vehicle program, known as LEV2. This program establishes tougher standards, running from 2004 through 2010, that represent continuing progress in emission reductions. As the state's passenger vehicle fleet continues to grow and more sport utility vehicles and pickup trucks are used as passenger cars rather than work vehicles, the new, more stringent LEV2 standards are necessary for Maine to meet its clean air goals. During 2001 the BEP will consider additional changes to the LEV regulation, including emission standards for new heavy-duty trucks.

Also, in December 2000 the Board of Environmental Protection repealed the requirement for a Zero Emission Vehicle sales mandate. California's current Zero Emission Vehicle (ZEV) mandate requires that in 2003 10% of all new vehicles under 3750 pounds would have to be zero emission vehicles (or partial zero vehicle vehicles such as gasoline/electric hybrids or super clean gasoline powered vehicles). However, since the California Air Resources Board is expected to make changes to its ZEV mandate in late January 2001, the BEP directed the Department to report back in July 2001 on California's ZEV mandate model.

Transportation Control Measures. Efforts to reduce the number of vehicles on the road or the number of miles driven are often called Transportation Control Measures (TCMs). TCMs include a variety of measures to reduce motor vehicle emissions. A few examples of TCMs include increased mass transit, ridesharing, accelerated vehicle retirement, telecommuting and schedule changes, and increased pedestrian and bikeway programs. Methods to change the ways people travel are difficult to mandate and emission benefits from voluntary measures are difficult to quantify.

Overall, when it comes to mobile source reduction strategies, Maine has pursued the options most readily implemented for maximum effect. The strategies that

remain, or those that have already been rejected, are either unacceptable to the general public, controversial, or are not cost effective. The Department's limited resources for mobile source activities are therefore primarily directed towards implementation of existing mobile source programs including: the Low Emission Vehicle program, the Inspection and Maintenance program, the Low Volatility Fuel program, the High Pollution Vehicle Retirement Pilot program, the "Cleaner Cars for Maine" program, mobile source public education, working with the Maine Department of Transportation on conformity and Transportation control measures, the Heavy Duty Diesel Truck program, and continuing to work with the other Northeast States on a regional fuel.

The Department does not recommend any additional motor vehicle emission reduction strategies at this time. The Department will continue to work with the other Northeast and Ozone Transport Region states in the evaluation of future strategies. In addition, as the Department has not conferred with interested parties in the review of this report, the Department is committed to convene these interested parties to solicit input on both the existing mobile source strategies and possible alternative and additional strategies.

Chapter 1 Purpose

"The Commissioner of Environmental Protection, after consultation with the Joint Standing Committee on Natural Resources, representatives of low-income consumers, automobile dealers, public health agencies, environmental organizations, cleaner fuels organizations, the Department of Transportation, Bureau of Motor Vehicles and the Executive Department, State Planning office and other entities with interests or expertise relevant to the examination and development of mobile-source-emission-reduction strategies, shall issue a report providing the results of the examination undertaken pursuant to the Act. The report must include a recommended mobile-source-emission-reduction plan that includes the most effective and cost-efficient methods of ensuring compliance with federal Clean Air Act air quality standards and reducing in-state-generated vehicle pollution. The report must include draft legislation and funding mechanisms necessary to implement the recommendations."

"The Commissioner of the Department of Environmental Protection shall undertake an examination of methods and strategies for achieving reductions and maintaining levels of mobile-source emissions that will ensure compliance with federal Clean Air Act air quality standards. The commissioner shall evaluate each method and strategy in terms of its costs and the pollution-reduction benefits likely to be achieved. The commissioner shall evaluate at least the following:

Incentive rebates designed to encourage the purchase of cleaner vehicles;

Accelerated retirement programs designed to encourage the scrapping of older, high-emission vehicles;

Methods and strategies of ensuring that vehicle pollution prevention mechanisms are functioning properly;

Government procurement policies, including municipal procurement policies, that involve purchase of low-emission vehicles; and

Aggressive public education programs that inform the public about mobile-source emissions and the benefits of low-emission vehicles.

The commissioner shall also compile and evaluate data on cars and trucks registered in the State including, but not limited to, the following: average age,

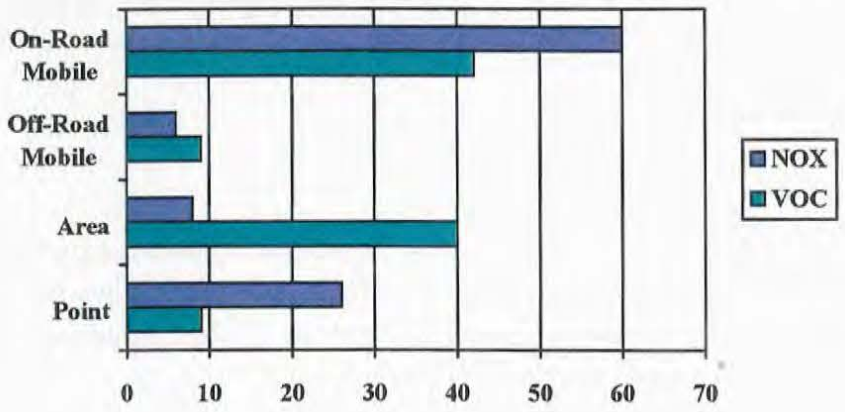
percentage bought new and percentage bought used in each of the last 5 years, average prices for the popular used cars and trucks sold in the State, and relevant available information about buyers in the State of used, post-model-year 1995 cars and trucks."

Chapter 2 Mobile Source Emissions

A. Air Emissions.

The 1996 mobile source inventory indicates that mobile sources make up 51% of the anthropogenic (man-made) Volatile Organic Compounds (VOC) and 66% of Nitrogen Oxides (NO_x) generated in Maine (See Figure 1). Sources of on-road mobile emissions are automobiles and trucks, locomotives, and planes. Off-road mobile sources include construction equipment and recreational and commercial vessels. Point sources are our larger industrial sources. Area sources include the smaller industrial or commercial sources, residential sources, and general emissions from individual consumer activity or other small emission sources.

Figure 1. 1996 VOC and NOx Emissions



Percent of Total Maine's VOC and NOx Emissions Inventory

Mobile sources are also significant contributors of several key air toxics that are considered to be hazardous air pollutants. These include 1,3-butadiene, acrolein, benzene, and formaldehyde. In addition, diesel exhaust is a source of fine particulates that are likely to cause lung cancer.

In December 2000, EPA finalized a rule to control emissions of hazardous air pollutants from mobile sources. In that rule, for the first time, EPA identified compounds that should be considered Mobile Source Air Toxics (MSATs). Unlike the provisions governing toxic emissions from stationary sources, the Clean Air Act does not provide a list of mobile source pollutants to be controlled. Table 1 lists the 21 MSATs identified by EPA:

Table 1. Mobile Source Air Toxics

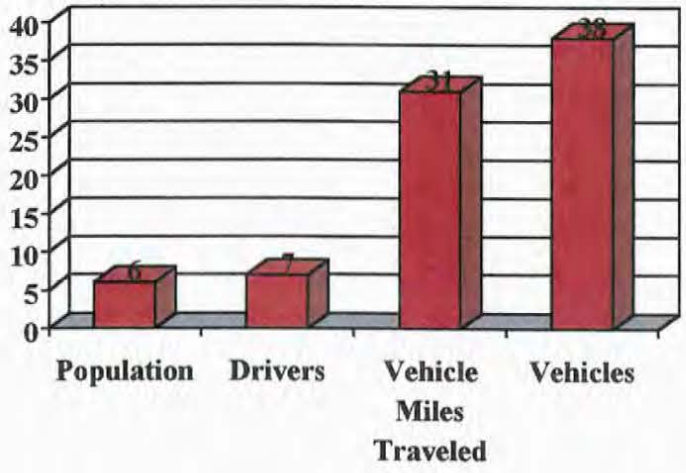
Acetaldehyde	Diesel Exhaust	MTBE
Acrolein	Ethylbenzene	Naphthalene
Arsenic compounds	Formaldehyde	Nickel compounds
Benzene	n-Hexane	POM
1,3-Butadiene	Lead compounds	Styrene
Chromium compounds	Manganese compounds	Toluene
Dioxin/Furans	Mercury compounds	Xylene

In addition, the *"Maine's Greenhouse Gas Emissions"* report dated June 1995 indicates that in 1990, Maine energy use (fossil and biomass fuel consumption) was the greatest source of greenhouse gas emissions, contributing 87% of the total emissions. Carbon dioxide made up 99% of the emissions in the energy use category. The transportation sector was the largest contributor making up 47% of the total fossil fuel CO_2 emissions. Of the fuel types within transportation, gasoline had the greatest emissions.

B. Transportation Trends

The number of vehicles registered in Maine increased significantly from 1985 to 1995 at a rate of nearly 40% per year. The Bureau of Air Quality projects on-road emissions will continue to make up a large segment of the emissions generated in Maine for the foreseeable future.

Figure 2. Percent Increase from 1985 to 1995

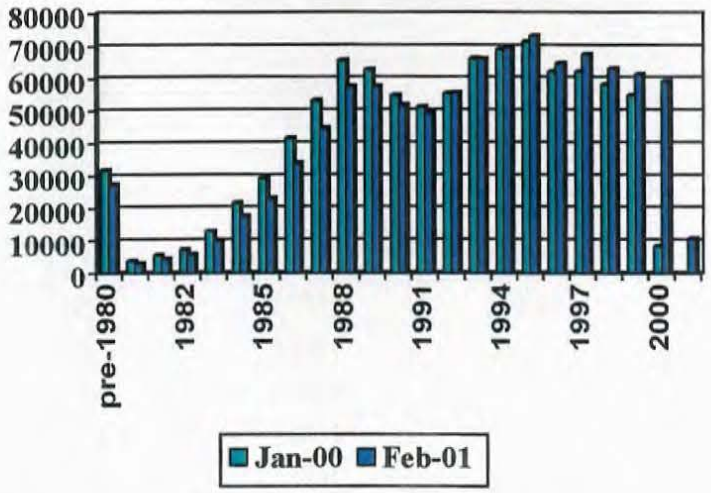


Chapter 3 Motor Vehicle Information

A. Vehicle Registrations

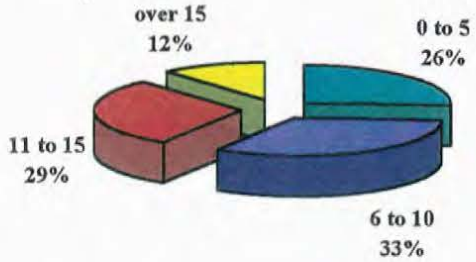
Figure 3 shows vehicle registration by model year as of January 2000 and February 2001. Based on this data, the average (weighted) age of vehicles in Maine is **8.7 years**.

Figure 3. Vehicle Registrations by Model Year



Another way of looking at this same registration data is to group the vehicles by their age. Figure 4 shows the percent vehicles that are 0 to 5 years old, 6 to 10 years old, 11 to 15 years old, and vehicles over 15 years old for the January 2000 data.

Figure 4. Vehicle Registrations by Age



A look at the actual make, model, and year of vehicles currently registered on Maine roads as of January 2001 indicates that the 1993 Ford Escort is the most common vehicle. From the Top 20 there are five model year Ford Escorts, eight model year Ford Taurus, and four model year Ford F150 pickups. Table 2 lists the TOP 20 vehicles registered in Maine. A list of vehicles that total 1000 or more can be found in Appendix A.

Table 2. Top 20 Vehicles Registered in Maine By Make, Model, and Year

Make	Model	Year	Total
Ford	Escort	1993	3065
Ford	Escort	1995	2705
Ford	Escort	1994	2335
Ford	Taurus	1993	2225
Ford	Taurus	1995	2204
Chev	Truck	1988	2189
Ford	Escort	1997	2076
Ford	F150	1997	2037
Ford	Taurus	1996	2025
Ford	Taurus	1994	1970
Ford	Taurus	1997	1902
Ford	Windstar	1998	1864
Ford	F150	1994	1848
Ford	Escort	1991	1829
Ford	Taurus	1999	1799
Ford	Taurus	1998	1781
Ford	F150	1995	1775
Ford	Taurus	1992	1699
Ford	F150	1988	1671
Ford	Truck	1988	1648

B. Vehicles Titled (Purchased)

A look at the make and model of all model year 2000 vehicles titled in Maine in year 2000 indicates that of the approximately 44,000 vehicles titled, the most popular vehicle is the GMC Sierra pick-up. Table 3 lists the TOP 20 new vehicles titled in Maine. A total list of all titled vehicles is contained in Appendix B. Note that 9 out of the top 20 , or 45 percent of the top 20 vehicles, are pickups, vans, or sport utility vehicles.

Table 3. Top 20 Model Year 2000 (NEW) Titled Vehicles

Make	Model	Total
GMC	Sierra	2484
Chevrolet	1500	2214
Dodge	Caravan	1407
Subaru	Legacy	1251
Ford	Focus	1159
Ford	Ranger	1069
Dodge	Neon	1036
Toyota	Camry	1008
Ford	F150	1007
Honda	Accord	829
Dodge	Dakota	764
Honda	Civic	740
Chevrolet	S10	692
KIA	Sephia	678
Buick	Lesabre	676
Hyundai	Elantra	631
Jeep	Grand Cherokee	630
Chevrolet	Cavalier	595
Toyota	Tacoma	547
Dodge	Intrepid	531

A look at the make and model of all used vehicles titled in Maine in year 2000 indicates that of the approximately 208,000 vehicles titled, the most popular vehicle is the Ford F150 pick-up. Table 4 lists the TOP 20 used vehicles titled in Maine. A total list of all vehicles titled in year 2000 is contained in Appendix C. Note that 10 out of the Top 20, or 50 percent, are pickups, vans, or sport utility vehicles.

Table 4. Top 20 Used Titled Vehicles

Make	Model	Total
Ford	F150	7324
Ford	Taurus	6039
Ford	Escort	5311
Chevrolet	Cavalier	5035
Ford	Ranger	4802
GMC	Sierra	4463
Dodge	Caravan	4408
Oldsmobile	Cutlass	4323
Pontiac	GrandAm	3858
Chevrolet	Blazer	3581
Chevrolet	S10	3342
Ford	Explorer	3177
Chevrolet	K1500	3152
Jeep	Cherokee	3020
Chevrolet	Lumina	2707
Plymouth	Voyager	2644
Buick	Century	2504
Subaru	Legacy	2464
Honda	Accord	2285
Ford	Tempo	2233

Figure 5 indicates that when buying used vehicles people either buy relatively new (about 3 years old) or buy older vehicles (about 12 years old).

Figure 5. Age Distribution of Used Vehicles Purchased in Year 2000

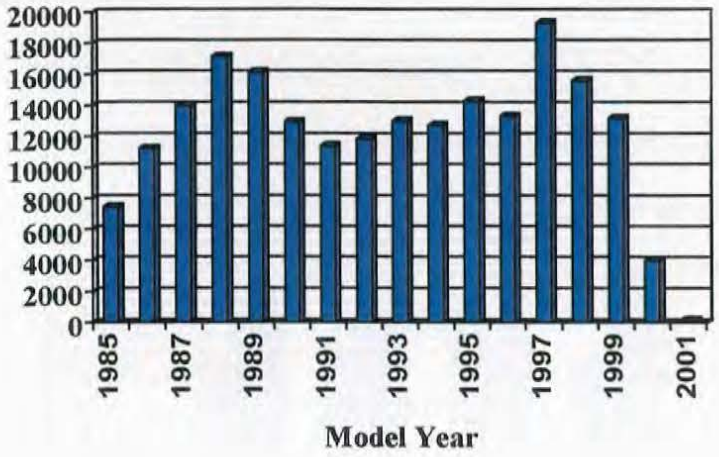


Table 5 shows the prices of the Top Ten purchased used vehicles for the most current 5 model years.

Table 5. Used Car Prices

					Model Years				
	Make	Model			1996	1997	1998	1999	2000
1	Ford	F150	Short Bed	2W	$10,165	$12,965	$14,350	$15,535	$16,515
			Short Bed	4W	$12,230	$15,265	$16,885	$18,300	$19,515
2	Ford	Taurus	LX Sedan		$8,450	$10,235	$10,305	$11,950	$14,220
3	Ford	Escort	LX 4D Sedan		$6,935	$7,300	$8,135	$9,190	$10,765
4	Chevrolet	Cavalier	4D Sedan		$6,360	$7,565	$9,050	$10,300	$11,750
5	Ford	Ranger	Short Bed	2W	$6,450	$7,290	$8,860	$9,625	$10,440
			Short Bed	4W	$8,585	$9,655	$11,460	$12,460	$13,505
6	GMC	Sierra	1500 Short Bed	2W	$12,330	$13,580	$14,965	$17,440	$18,545
			1501 Short Bed	4W	$14,395	$15,880	$17,500	$20,205	$21,545
7	Dodge	Caravan	Minivan		$8,830	$9,860	$11,550	$13,865	$14,535
8	Oldsmobile	Cutlass	GL Sedan		$9,500	$9,525	$11,480	$13,250	NA
9	Pontiac	Grand Am	SE 4D Sedan		$7,535	$8,875	$10,665	$11,890	$13,615
10	Chevrolet	Blazer	Sport Utility 2D	2W	$10,230	$11,505	$13,265	$15,445	$18,530
			Sport Utility 2D	4W	$11,165	$12,540	$14,400	$16,680	$19,865
	Source	Retail Prices from Kelley Blue Book (www.kbb.com)							
	Assumptions	Geographic location - Augusta, ME							
		12,500 miles per year							
		Automatic, if possible							
		default accessories							

C. Purchaser Information

Figure 6 shows that in year 2000 the purchaser profile of vehicles model year 1996 and newer is male dominated. However, in many joint vehicle purchases the male's name is often listed first, thus skewing the statistics in that direction.

Figure 6. Vehicle Purchaser by Gender

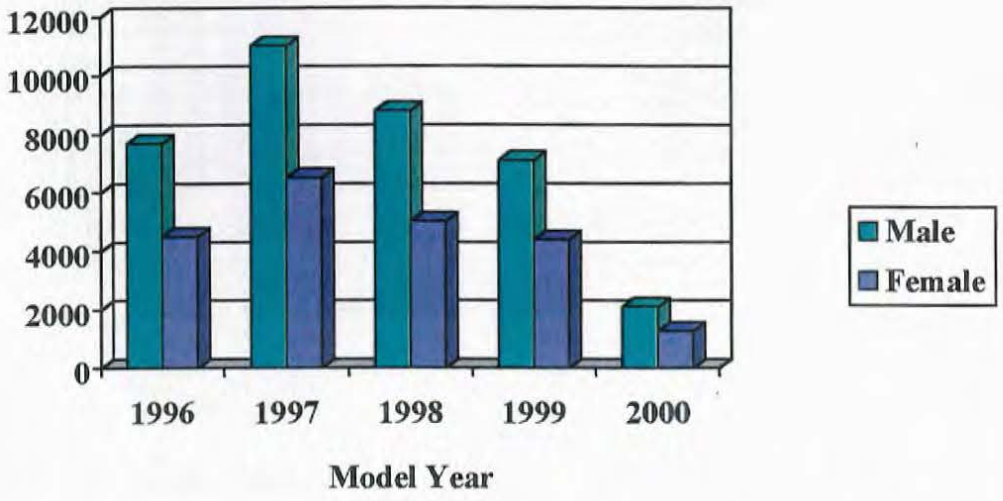


Figure 7 graphs the age of purchasers of model year 1996 and newer vehicles in 2000.

Figure 7. Year 2000 Vehicle Purchasers by Age

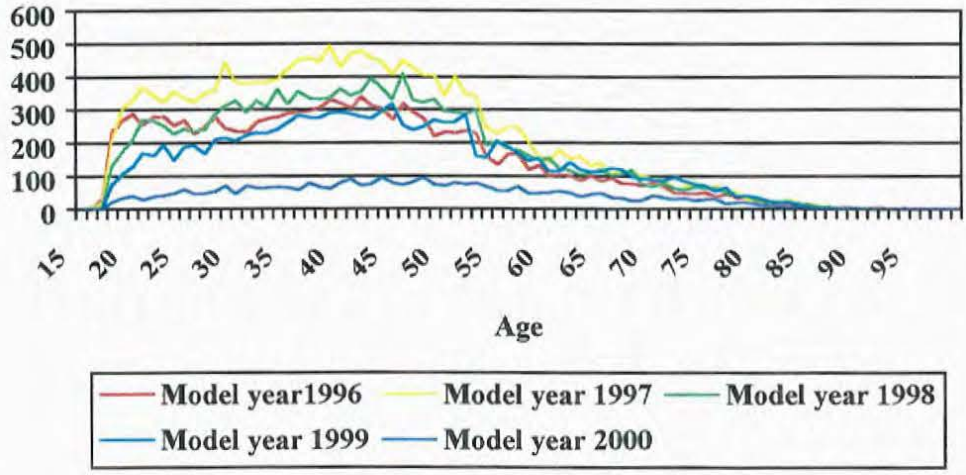


Table 6 shows a calculation of the weighted average age of vehicle purchaser by model year vehicle purchased.

Table 6. Year 2000 Vehicle Purchasers by Weighted Age

Model Year	Weighted Average Age of Purchaser
1996	41.2
1997	41.7
1998	42.7
1999	45.4
2000	46.9

The entire database for used vehicle purchasers for vehicles purchased in year 2000 is contained in Appendix D.

Chapter 4 Existing Strategies

A. Cleaner Fuels

Some toxic compounds are present in the fuel and are emitted when the fuel evaporates or is emitted from the tailpipe as unburned fuel. For example, benzene is a component of gasoline that may enter the air as unburned fuel or as vapor when the fuel evaporates. Other compounds such as formaldehyde, and 1,3-butadiene are not present in the fuel but are by-products of incomplete combustion.

The emissions from a vehicle greatly depend on the fuel that goes into it. Consequently, programs to control pollutant emissions center around changing the composition of the fuel. An example would be the removal of lead from gasoline. More recent fuel system changes include limits on volatility, reformulated gasoline, and limits on sulfur in the fuel. In addition, another strategy to reduce emissions is switching to alternative, non-petroleum fuels that are cleaner than today's gasoline and diesel fuels.

1. Maine's Current Fuels Program

Currently all gasoline that is distributed or marketed by bulk gasoline terminals or is delivered to gasoline service stations or bulk gasoline plants shall not have a Reid Vapor Pressure greater than 9.0 (pounds per square inch) psi during the period between May 1, 1989 and September 15, 1989 and continuing every year thereafter with the exception that York, Cumberland, Sagadahoc, Androscoggin, Kennebec, Knox and Lincoln counties shall not have a Reid Vapor Pressure greater than 7.8 psi during the period of May 1 through September 15 of each year.

Reid Vapor Pressure is a measure of the volatility of a liquid or how readily the liquid evaporates.

In addition, the Department terminals are required to record the composition (oxygenate, MTBE, oxygen, aromatics, sulfur, and benzene) of all gasoline sold in Maine. The Department will report the composition values for year 2000 to the legislature by February 2001.

2. Federal Low Sulfur Gasoline Standards.

On February 10, 2000 the U.S. Environmental Protection Agency adopted new motor vehicle emission standards and gasoline sulfur control requirements known as the Tier 2 standards. The program is a comprehensive regulatory initiative that treats vehicles and fuels as a system, combining requirements for much cleaner vehicles with requirements for much lower levels of sulfur in gasoline. (See Chapter 4(C)2 of this report for a description of the new Tier 2 motor vehicle emission standards).
The new control of gasoline sulfur content will have two important effects. The lower sulfur levels will enable the much improved emission control technology necessary to meet the new stringent vehicle standards to operate effectively over the useful life of the new vehicles. Also, as soon as the lower sulfur gasoline is available, all gasoline vehicles already on the road will have reduced emissions from less degradation of their catalytic converters and from fewer sulfur compounds in the exhaust.

The program will significantly reduce average sulfur levels nationwide as early as 2000, fully phased in by 2006. Refiners will generally add refining equipment to remove sulfur in their refining process. Importers of gasoline will be required to import and market only gasoline meeting the sulfur limits. The program includes provisions for trading of sulfur credits, increasing the flexibility available to refiners. The credit program will ease compliance uncertainties by providing refiners the flexibility to phase in early controls in 2000-2003 and use credits gained in these years to delay some control until as late as 2006.

The program requires that most refiners and importers meet a **corporate average gasoline standard of 120 ppm and a cap of 300 ppm beginning in 2004. By 2006, the cap will be reduced to 80 ppm and most refiners must produce gasoline averaging no more than 30 ppm sulfur.**

3. Federal Toxics Emission Standards for Gasoline

On December 21, 2000 EPA announced new toxic emission performance requirements for conventional gasoline and cleaner-burning reformulated gasoline. Under these new requirements, refiner must maintain their average 1998-2000 toxics performance levels

4. Federal Diesel Low Sulfur Fuel

On December 21, 2000 the U. S. Environmental Protection Agency established a comprehensive national control program that will regulate heavy-duty vehicles and fuels as a single system. New emission standards will begin in model year 2007 and will apply to heavy-duty highway engines and vehicles. These new standards are based on the use of high efficiency catalytic exhaust emission control devices and other comparable advanced technologies. Because sulfur damages these new control devices, EPA also reduced the level of sulfur in highway diesel fuel by 97 percent by mid 2006. (See Chapter 4 (C) 3 of this report for a description of the new heavy-duty engine and vehicle standards emission standards).

The rule specifies that, **beginning June 1, 2006, refiners must begin producing highway diesel fuel that meets a sulfur standard of 15 part per million (ppm).** All 2007 and later model year diesel-fueled vehicles must be refueled with this new low sulfur diesel fuel. The existing diesel fuel maximum sulfur standard is 500 ppm.

The program includes a combination of flexibilities available to refiners to ensure smooth transition to low sulfur highway diesel fuel. First, refiners can take advantage of a temporary compliance option, including an averaging, banking, and trading component, beginning in June 2006 and lasting through 2009, with credit given for early compliance before June 2006. EPA also provided additional hardship provisions for small refiners to minimize their economic burden.

B. Maintaining the Vehicles on our Roads

Automobile pollution control systems are becoming more sophisticated, and as a result cars are running cleaner than in years past. However, pollution controls wear out with time or malfunction and some car owners who mistakenly believe that emission controls hinder vehicle performance disable or remove their emission control devices. In addition, some cars owners do not maintain their vehicles due to real or perceived short-term costs and a lack of information about long-term cost savings associated with good vehicle maintenance. Without good maintenance, cars cannot run as cleanly as they were designed to.

1. Inspection and Maintenance Programs

The Clean Air Act required that any area in the Ozone Transport Region which has a Metropolitan Statistical Area (MSA) with a population of over 100,000 must implement an enhanced motor vehicle inspection and maintenance program to control the production of ground level ozone. The only MSA in Maine with a population over 100,000 is the greater Portland MSA which, at a minimum, represents Cumberland County.

In 1994, EPA defined an "enhanced motor vehicle program" as I/M240, the "treadmill" test. Maine implemented the I/M 240 test with its Cartest program on June of 1994 at centralized locations in Maine's most southerly seven counties. After implementation and eventual termination of the "treadmill" test, Governor Angus King urged EPA to provide Maine more flexibility in meeting the federal requirement.

In response to Governor King's request, EPA revised its rule in 1995 by redefining a "low enhanced" program for certain qualifying areas. This program allowed for testing of an idling vehicle's tailpipe exhaust at decentralized locations such as safety inspection stations.

Governor King again urged EPA in 1995 to consider Maine's unique geographic location and the impact on Maine from transported air pollution. EPA responded by allowing certain MSAs in a handful of states (Vermont, up state New York, Pennsylvania, New Hampshire, and Maine) located in the Ozone Transport Region (OTR) to implement an "OTR low enhanced program." This program provided these states with even more

flexibility, allowing visual inspection (tampering check) of a vehicle's air pollution control equipment, such as gas cap and catalytic converter, in lieu of exhaust testing.

In response to this federal mandate with additional flexibility, the legislature established the environmental portion of the safety inspection program. In January 1, 1999 a gas cap pressure test was added for 1974 and newer vehicles. Starting January 1, 2000 an On-board Diagnostics (OBD) inspection for 1996 and newer vehicles was added to the inspection. In January 2001, vehicles failing the OBD portion of the inspection are required to make repairs prior to receiving a safety inspection sticker. The OBD portion was mandated by the Federal Clean Air Act as part of any enhanced I/M program.

Status of the program

The enhanced motor vehicles inspection program under 29-A MRSA §1751 went into effect January 1, 1999. The program requires that all gasoline-powered motor vehicles registered in Cumberland County be subjected to an enhanced inspection. By rule, all inspection stations in Cumberland County licensed to perform Class A motor vehicle inspections had to become licensed for Class E (enhanced) inspections. Class D stations in Cumberland County which inspected gasoline powered trucks also had to become Class E stations. In addition, all Class A inspection mechanics had to become Class E mechanics to issue the new "E" inspection stickers. In January 2000 OBD inspections started in Cumberland County. All 1996 and newer vehicles are being inspected. Starting January 2001 any vehicle failing the OBD portion will have be repaired before a sticker can be applied.

2. Heavy-Duty Diesel Testing

Heavy-duty diesel engines used in trucks and buses are a significant source of nitrogen oxides and particulate matter which contribute to air pollution problems such as ground-level ozone, fine particulates, regional haze, air toxics and acid deposition. Since the early 1990's, Maine and a number of other Northeast states have been investigating the benefits of testing heavy

duty diesel vehicles' emissions, and requiring those vehicles with high emissions to be repaired. Several years ago the Maine Legislature authorized a pilot program to study diesel engine emissions. Heavy-duty diesel trucks over 26,000 pounds were voluntarily tested for opacity emissions. (Opacity is a measure of the density of the emissions from the vehicle and is usually associated with the amount of particulate or soot released into the air.) While this program could not enforce repairs, it did provide significant information on the number of grossly polluting vehicles and served as an important educational tool.

The Maine Legislature extended the program, and authorized the Board of Environmental Protection to adopt a rule incorporating opacity standards. The Legislature also established penalties for noncompliance with the opacity standards. The enforcement of smoke opacity standards is expected to result in the repair of poorly maintained or tampered heavy duty diesel vehicles, and to encourage proper long-term maintenance of these vehicles. In February 2000 the Board of Environmental Protection adopted opacity standards that are consistent with the other New England states. In 1999 a full testing program was implemented, but failing vehicles were not required to make repairs. Starting in January 2000, vehicles that failed the test were required to make repairs within 30 days or pay a fine of $290.

In addition, in an effort to reduce excess emissions from heavy-duty diesel engines, Maine has signed a Memorandum of Understanding with eight other Northeast states to adopt and coordinate smoke opacity testing programs.

Status of the Program

Maine's Heavy Duty Diesel testing program has had it first full summer of testing. Over 90 percent of trucks failing the opacity standards have certified repairs to the department within 30 days. A majority of repairs involve the adjustment of the fuel controls on the engine. The cooperation between the DEP and the Bureau of Public Safety has been exceptional. Testing has taken place throughout the state at roadside weigh stations and other safe areas.

C. Cleaner New Cars and Trucks

Since 1968 the federal government has set emission standards for conventional vehicles. Due to its unique atmospheric conditions and air quality problems, California was granted authority under the Clean Air Act to establish vehicle standards that surpass federal standards. California actually established the first motor vehicle standards in the nation in 1966. Both California and federal standards have become increasingly more stringent over the years.

1. Maine's Low Emission Vehicle (LEV) Program

As stated above, the Clean Air Act authorized California to establish new vehicle emission standards. However, the Clean Air Act amendments of 1990 allowed other states to adopt and enforce new motor vehicle emission standards if such standards are identical to the California standards and that each state adopt such standards at least two years before the commencement of affected model years.

On February 17, 1993, Maine adopted the Chapter 127, New Motor Vehicle Emission standards, which provide for cleaner new vehicles than those vehicles manufactured under federal emission standards. However, legislation was subsequently passed stipulating that the effective date of the regulation was dependent on whether states in the northeast and the Ozone Transport Region also adopted similar rules. The automobile manufacturers were notified in December 1997 that these conditions were met, and Maine's LEV program commenced with model year 2001 motor vehicles. The Legislature subsequently removed the triggers from legislation.

The California Air Resources Board first adopted LEV standards in 1990. These first LEV standards run from 1994 through 2003. California's LEV program contains three basic components. First manufacturers must certify vehicles to one of the five following categories (listed in order of increasing stringency): California Tier 1, Transitional Low Emission Vehicle, Low Emission Vehicle, Ultra Low Emission Vehicle, and Zero Emission Vehicle. Second, manufacturers must comply with an overall

fleet average NMOG (Non Methane Organic Gases are comparable to VOC) standard. This requirement began in model year 1994 and became more stringent over time. The third element is a Zero Emission Vehicle production mandate. Currently the California ZEV mandate requires 10 percent of the manufacturer's fleet to be ZEV in model year 2003.

In 1999 California adopted the "second generation" of LEV standards known as LEV II. These changes, running from 2004 through 2010, represent continuing progress in emission reductions. As the state's passenger vehicle fleet continues to grow and more sport utility vehicles and pickup trucks are used as passenger cars rather than work vehicles, the new, more stringent LEV II standards are necessary for Maine to meet federally-mandated clean air goals.

The LEV II amendments affect passenger cars, light-duty trucks, and medium-duty vehicles. The main elements are:

- Extension of passenger car emission standards to heavier sport utility vehicles and pickup trucks (with gross vehicle weight up to 8,500 pounds) which formerly had been regulated under less-stringent emission standards;

- Extension and tightening of the fleet average emission standards during 2004-2010 (a fleet includes all new vehicles from an automaker);

- Creation of a new super-ultra low emission vehicle (SULEV) category for light-duty vehicles (SULEVs will only emit a single pound of hydrocarbons during 100,000 miles of driving-about the same as spilling a pint of gasoline);

- Significantly lower oxides of nitrogen emission standards for the low and ultra-low emission vehicle categories, a reduction of 75% from the current LEV standards;

- Increased emission control durability standards from 100,000 miles to 120,000 miles for passenger cars and light trucks;

- Further reduction of evaporative emissions;

- Changes in how the smog index is calculated; and

- Amendments to the zero-emission and hybrid electric vehicle test procedures.

The Board of Environmental Protection adopted the LEV II standards on December 21, 2000. The decision to maintain Maine's Low Emission Vehicle Program over federal emission standards was based primarily on the heavy influence of the Massachusetts LEV program on Maine's new car sales market. Massachusetts has had an active LEV program since 1995. As a result Maine has seen California certified vehicles on new car dealership lots for years. In part this is because of a Cross Border Sales requirement that only allows sale of California certified vehicles in those states that have adopted the LEV program or in those states that are contingent to the LEV states. EPA has certified that Maine is "contingent" to Massachusetts, allowing California-certified vehicles to be sold in Maine. However, as only California certified vehicles could be sold in Massachusetts, if an automobile dealership in Maine wanted to make a car trade (for example the Maine buyer wanted a red Camaro which the Maine dealer did not have on his lot) with a Massachusetts dealer, only a California certified vehicle could be traded to a Massachusetts dealer.

Currently four states have adopted the California LEV II standards: Massachusetts, New York, Vermont, and Maine.

On December 21, 2000 the Board also repealed the Zero Emission Vehicle mandate. California is in the process of revising its Zero Emission Vehicle mandate in January 2001. The Board directed the Department to report back to them in July 2001 with an update of the California revisions.

2. Federal New Car Emission Standards

Over the past three decades the United States Environmental Protection Agency (EPA) has made significant progress in reducing emissions from passenger cars and light-duty trucks. Nevertheless, due to increasing vehicle population and vehicle miles traveled, passenger cars and trucks

will continue to be significant contributor to air pollution. Emission contributions of light trucks now matches that of passenger cars.

Based on the Clean Air Act Amendments of 1900, in 1991 EPA promulgated new motor vehicle emissions standards that took effect in 1994. These standards are known as "Tier 1" standards. By statute, EPA could not promulgate mandatory exhaust standards more stringent than Tier 1 standards before model year 2004.

In 1997 EPA adopted regulations for the National Low Emission Vehicle (NLEV) program. This regulation established a set of **voluntary** National LEV standards to control exhaust emissions from new motor vehicles. In general, the NLEV standards and related requirements are patterned after California's more stringent tailpipe emission standards and fleet average NMOG standards. Manufacturers must certify vehicles to either federal Tier I, or California vehicle certifications. From model year 1997 to model year 2001 manufacturers must meet an increasingly more stringent fleet average NMOG standard. Beginning with model year 2001, the fleet average NMOG standard is equivalent to the average NMOG emissions of a 100 percent LEV fleet.

EPA reported in March 1998 that nine northeastern states and 23 manufacturers opted into the NLEV program. Manufacturers that opted into the NLEV program will have to comply with applicable emission standards beginning in model year 1999 for those vehicles offered for sale in the Ozone Transport Region, and beginning in model year 2001 for those vehicles that are offered for sale in the rest of the nation, except California and other states that have adopted the California LEV program.

Most recently on February 10, 2000 EPA finalized a set of tailpipe emission standards that will apply to all passenger cars, light duty trucks, and larger passenger vehicles operated on any fuel. This new set of standards are known as the "Tier 2" standards and build on EPA's past Tier 1 standards and EPA's National Low Emission Vehicle program. These standards, starting in 2004, through a phase-in, apply the same set of standards covering passenger cars to light trucks, and large Sport Utility Vehicles. Additional components of the federal Tier 2 program are very similar to the California LEV II program (minus the ZEV mandate).

While there is considerable debate as to which program provides more environmental benefit, overall the programs are very close in emission reductions depending on the assumptions used to model the benefits.

3. Federal Heavy-Duty Engine and Vehicle Standards

On December 21, 2000 U.S.EPA adopted the second of two phases in a comprehensive nationwide program for controlling emissions from heavy-duty engines and vehicles. It builds upon the phase 1 program finalized in October 2000. That action affirmed a 50% reduction in emissions of NOx from 2004 model year diesel engines, set in 1997, and set new emission standards for heavy-duty engines and vehicles for 2005.

As mentioned in Section B.2, the second phase of the program is based on the use of high-efficiency exhaust emission control devices and the consideration of the vehicle and its fuel as a single system.

The federal regulation finalized a Particulate Matter emissions standard for new, heavy-duty engines of 0.01 grams per brake-horse-hour (g/bhp-hr), to take full effect for diesels in 2007 model year. It also finalized standards for NOx and non-methane hydrocarbons (NMOC) of 0.2 g/bhp-hr and 0.14 g/bhp-hr, respectively. These NOx and NMOC standards will be phased on a percent-of-sales basis: 50 percent from 2007 to 2009 and 100 percent in 2010.

Gasoline engines will be subject to these standards based on a phase-in requiring 50 percent compliance in the 2008 model year and 100 percent compliance in the 2009 model year.

The program includes flexibility provisions to facilitate the transition to the new standards and to encourage the early introduction of clean technologies, and adjustments to various testing and compliance requirements to address differences between the new technologies and existing engine-based technologies.

D. Transportation Control Measures (TCM)

The term "Transportation Control Measure" (TCM) is a broad term that encompasses virtually any action intended to decrease automobile travel or the number of vehicles being driven on roads. Methods include making infrastructure changes to reduce congestion and encouraging or mandating lifestyle changes to reduce dependence on vehicles.

In addition, the transportation conformity provision of the Clean Air Act requires that transportation officials and air pollution officials work together to avoid creating air pollution problems through transportation plans and programs.

1. TCMs

The 1990 Clean Air Act Amendments required EPA to publish and make available to environmental and transportation agencies information "regarding the formulation and emission reduction potential of transportation control measures related to criteria pollutants and their precursors." In May 1992, EPA finalized two documents outlining how states can implement TCMs. EPA reported on sixteen different types of TCMs (See Table 7). The Department will make these repots available to the Committee on request.

Table 7 Transportation Control Measures

Sixteen Transportation Control Measures Studied By EPA

- Programs for improved public transit.
- Lane or road restrictions or construction of new restricted lanes or roads for high-occupancy vehicles (HOV) or passenger busses.
- Employer-based transportation management plans, including incentives.
- Trip-reduction ordinances.
- Traffic flow improvement programs that achieve emission reductions.

- Fringe and transportation corridor parking facilities serving multiple-occupancy-vehicle programs or transit service.

- Programs to limit or restrict vehicle use in downtown areas or other areas of emission concentration, particularly during periods of peak use.

- Programs to limit portions of road surfaces or certain sections of metropolitan areas to the use of non-motorized vehicles or pedestrian use, with respect to both time and place.

- Programs for secure bicycle storage facilities and other facilities, including bicycle lanes, for the convenience and protection of bicyclists, in both public and private areas.

- Programs to control extended idling of vehicles.

- Programs to reduce motor vehicle emissions, consistent with Title II, which are caused by extreme cold-start conditions.

- Employer-sponsored programs to permit flexible work schedules.

- Programs and ordinances to facilitate non-automobile travel, to provide for the development and utilization of mass transit, and to generally reduce the need for single-occupant vehicle travel, as part of transportation planning and development efforts of a locality, including programs and ordinances applicable to new shopping centers, special events, and other centers of vehicle activity.

- Programs for new construction and major reconstruction of paths, tracks, or areas solely for use by pedestrian or other non-motorized means of transportation when economically feasible and in the public interest.

- Programs to encourage the voluntary removal from use and the marketplace of pre-1980 model year light-duty vehicles and trucks.

To summarize a few of the TCMs evaluated by EPA, the Department has included in Appendix E the following Environmental Fact Sheets:

Accelerated Vehicle Retirement Programs
Bicycle and Pedestrian Programs
Congestion Pricing
The Congestion Mitigation and Air Quality Program
Episodic Emission Control Programs
Intelligent Transportation Systems
Commuter Choice: Guidance Overview
Commuter Choice Program: A Way to save Money and Help the Environment

2. Conformity

Section 176 (c)(4) of the Clean Air Act mandates that transportation plans approved by state and local transportation officials cannot interfere with the goals of the Act. The mechanism is known as transportation conformity. It ensures that transportation plans do not lead to transportation-related emissions inconsistent with clean air goals in State Implementation Plans (SIP). To show that its transportation improvement plan (TIP) conforms to the applicable SIP in an area, the transportation agencies must show that new construction in TIPs and plans does not lead to an overall increase in emissions in the near-term and must conform to an attainment "budget" of emissions once it is established by a SIP revision. In order to comply with this requirement state Departments of Transportation have pursued TCMs. Most TIPs and plans, for instance, now contain added park-and-ride facilities as well as improved transit and traffic flow improvements.

Chapter 5 Alternative Strategies

A. Fuels

1. NESCAUM/ Mid Atlantic Regional Fuels Task Force

When MTBE was found in a public water supply well, a subsequent groundwater study caused Maine to opt-out of the RFG program. At that time Maine began working with the Northeast States for Coordinated Air Use Management (NESCAUM) and the other New England States, New York and New Jersey to develop a regional fuel strategy. The Northeast States/Mid Atlantic Regional Fuels Task Force which consists of state air and water officials including those that are part of the Ozone Transport Commission was formed to implement recommendations included in a RFG/MTBE study done by NESCAUM at the request of the Northeast Governors. This task force stated six principles for changes to the current reformulated gasoline program that included:

5. Repeal the 2% oxygen mandate for reformulated gasoline (RFG) in the Clean Air Act.

6. Phase-down and cap MTBE content in all gasoline.

7. Clarify state and federal authority to regulate, and/or eliminate, MTBE or other oxygenates if necessary to protect public health or the environment.

8. Maintain the toxic emission reduction benefits achieved to date by the federal RFG program.

9. Promote consistency in fuel specifications through the timely implementation of effective federal requirements.

10. Provide adequate lead-time for the petroleum infrastructure to adjust in order to ensure adequate fuel supply and price stability.

Under section 211(c)(4)(C), EPA may approve a non-identical state fuel control as a SIP provision, if the state demonstrates that the measure is

necessary to achieve the national primary or secondary ambient air quality standard that the plan implements. EPA can approve a state fuel requirement as necessary only if no other measure exists that would bring about timely attainment, or if other measures exist but are unreasonable or impracticable.

2. Alternative Clean Fuels [1]

What are Clean Fuels?

The most familiar transportation fuels in this country are gasoline and diesel fuel, but any number of energy sources are capable of powering motor vehicles. These include alcohols, electricity, natural gas, and propane.

Some vehicle fuels, because of physical or chemical properties, create less pollution than do today's gasolines. These are called "clean fuels."

Why Switch to Clean Fuels?

Cars operating on today's gasolines emit complex mixtures of compounds that lead to the formation of ground-level ozone Many of these compounds are also toxic. A lot has been done to reduce automobile pollution, from development of innovative emission control technologies to establishment of Inspection and Maintenance programs. But each year sees more cars on the road, traveling more miles, and the pollution control measures taken so far have not been sufficient to solve the ozone problem in many large cities.

Clean fuels have a number of inherent properties that make them cleaner than conventional gasoline. In general, these fuels emit fewer hydrocarbons, and the hydrocarbons they do emit are less reactive (slower to form ozone) and less toxic. Emissions from electricity, natural gas, or alcohol-powered vehicles can be as much as 90 percent lower in toxics and ozone-forming hydrocarbons than emissions from vehicles fueled with conventional gasoline. New gasoline formulations (reformulated gasoline) are expected to reduce these emissions up to 25 percent over today's gasoline.

[1] Taken from EPA Fact SheetOMS-6 August 1994

Use of clean fuels could also help slow atmospheric buildup of carbon dioxide, a greenhouse gas that contributes to the potential for global warming. Combustion of any carbon-based fuel produces carbon dioxide. But the overall impact of a given fuel on global warming depends on how the fuel is made. In general, fuels produced from biomass (crops, trees, etc.) and from natural gas result in less carbon dioxide accumulation than fuels made from petroleum or coal.

Clean fuels have benefits that reach beyond their air quality advantages. New fuels in the marketplace give consumers new choices and could decrease our dependence on imported oil.

Electricity

Battery-powered vehicles give off virtually no pollution directly and offer one of the best options for reducing motor vehicle emissions in polluted cities. Power plants that produce the electricity to run these vehicles do pollute. (But these plants are often in rural areas where the emissions do not drive pollution levels above health standards really?? Isn't' much of our transported pollution from these plants??). Also, efficient emission controls can be installed and maintained more easily on individual power plants than on millions of vehicles. The driving range of today's electric cars is limited by the amount of power the battery can provide. Current batteries take hours to recharge and the cost of electric vehicles is high. Recent developments in electric vehicle technology show much promise for the future.

Ethanol

Ethanol (grain alcohol) is the primary automotive fuel in Brazil, and ethanol/gasoline blends (known as "gasohol") have been used in the United States for many years. Pure ethanol fuel offers excellent performance, plus low hydrocarbon and toxic emissions. It can be produced domestically from corn or other crops, as well as from cellulose materials such as wood or paper wastes, potentially minimizing the accumulation of greenhouse gases (since these renewable feedstocks draw carbon dioxide out of the atmosphere as they grow). With current technology and price structures, ethanol is more expensive than gasoline. New technologies offer the hope of significantly reduced costs.

Methanol

Methanol (wood alcohol), like ethanol, is a high-performance liquid fuel that emits low levels of toxic and ozone-forming compounds. It can be produced at prices comparable to gasoline from natural gas and can also be produced from coal and wood. All major auto manufacturers have produced cars that run on M85, a blend of 85 percent methanol and 15 percent gasoline. Cars that burn pure methanol (M100) offer much greater air quality and efficiency advantages. Many auto manufacturers have developed advanced M100 prototypes. Methanol has long been the fuel of choice for race cars because of its superior performance and fire safety characteristics.

Natural Gas (Methane)

Natural gas is abundant and is widely used for home heating and industrial processes. It is easily transported through pipelines and costs about the same or slightly less than gasoline. Compressed natural gas (CNG) vehicles emit low levels of toxics and ozone-forming hydrocarbons. But CNG fuel must be stored under pressure in heavy tanks, and the cost of accommodating these tanks must be considered. There are significant tradeoffs for CNG vehicles among emissions, vehicle power, efficiency, and range; however, natural gas is already used in some fleet vehicles and appears to have a bright future as a motor vehicle fuel.

Propane

Propane, or liquefied petroleum gas (LPG), is a by-product of petroleum refining and natural gas production. It burns more cleanly than gasoline but is limited in supply. Propane-fueled vehicles are already common in many parts of the world.

Biodiesel (added to fact sheet)

Biodiesel is a biodegradable transportation fuel used in diesel engines and produced from organically derived oils or fats. Typically produced from soybean oil, it may be used either as a replacement for or a component of diesel fuel.

Are Clean Fuels Feasible?

Clean-fueled vehicles are here today and widespread use in the near future is feasible. To enable the transition, technologies must be refined so vehicles can achieve optimum performance and emissions characteristics. Consumers must accept the new vehicles and fuels, and government and industry must cooperate to ensure their availability. It will take a concerted effort by all sectors of society, but a switch to clean fuels may be the most viable way for many cities to attain clean and healthy air.

B. Inspection and Maintenance Programs

1. Alternative Methods of Testing Vehicles

Basic idle testing

Basic Idling testing has been used for many years. It tests emissions from the exhaust. A probe is inserted into the tailpipe while the vehicle is idling or while the engine is being revved to 2500 rpm. Emissions analyzers then measure pollution levels in the exhaust. Pollutants (carbon monoxide (CO), hydrocarbons (HC)) are measured in parts per million (ppm) and percent.

A variation of this test is the two speed idle test. It tests the vehicle at two different engine speeds with no driving simulation.

Acceleration Simulation Mode (ASM)

The ASM uses a probe in the exhaust and a dynamometer. The dynamometer is used to create a load on the vehicle. With a load on the engine this test can measure NOx , Hydrocarbons, and Carbon Monoxide.

I/M 240

The I/M 240 test is much more effective than older technologies for identifying polluting vehicles. It tests for carbon monoxide (CO), hydrocarbons (HC) and oxides of nitrogen (NOx) during a simulated driving cycle. The vehicle is placed on a treadmill-like device, or

dynamometer, and typical driving activities such as idling, cruising, acceleration and deceleration are performed while pollution is collected from the tailpipe.

The name of the I/M 240 test means "Inspection and Maintenance," with 240 representing the length of the treadmill test in seconds (240 seconds, or four minutes). Pollutants are measured in grams per mile (gpm), and limits are set by vehicle type and model year.

A variation of the I/M 240 is a RG240. The RG240 is a "Repair Grade 240." This equipment is less expensive for test and repair center. The equipment is not designed to do the large volumes of tests the I/M 240 equipment. Some states are changing the 240 section of the test. Some states have shortened the test to only the first 90 seconds of the whole 240 seconds.

Onboard Diagnostics (OBD)

By the early 1980's, numerous vehicles were using electronics and on-board computers to control many of the engine's control systems, such as fuel and ignition. Vehicle manufacturers had to develop ways to diagnose problems generated by the new electronic hardware found under the hood. Thus, the first OBD systems were developed by auto manufacturers in the early 1980's as electronic systems replaced mechanical systems.

The engines in today's vehicles are largely electronically controlled. Sensors and actuators sense the operation of specific components (e.g., the oxygen sensor) and actuate others (e.g., the fuel injectors) to maintain optimal engine control. An on-board computer, known sometimes as a "powertrain control module" or an "engine control unit," controls all of these systems. With proper software, the on-board computer is capable of monitoring all of the sensors and actuators to determine whether they are working as intended. It can detect a malfunction or deterioration of the various sensors and actuators, usually well before the driver becomes aware of the problem through a loss in vehicle performance or driveability. The sensors and actuators, along with the diagnostic software in the on-board computer, make up what is called "the OBD system."

The intent of OBD systems is to assure proper emission system operation of each and every vehicle and light truck for its lifetime by monitoring emission-related components and systems for malfunction and/or deterioration. An important aspect of OBD is its ability to notify the driver of a problem before the vehicle's emissions have increased significantly. If the vehicle is taken to a repair shop in a timely fashion, it can be properly repaired before any significant emission increase occurs.

There are circumstances under which the vehicle computer will detect a system problem before the driver notices a driveability problem. Furthermore, OBD can detect problems that may not be noticeable upon visual inspection because many component failures that impact emissions can be electrical or even chemical in nature. By detecting these emission-related failures and alerting the driver to the need for potential repair, EPA hopes that vehicles will be properly repaired before emissions become a problem.

When the OBD system determines that a problem exists, a corresponding "Diagnostic Trouble Code" is stored in the computer's memory. The computer also illuminates a dashboard light indicating "Service Engine Soon" or "Check Engine" or displays an engine symbol. This light, usually yellow in color, serves to inform the driver that a problem has been detected and vehicle service is needed. When the car is delivered to the repair shop, a service technician can quickly retrieve the stored diagnostic trouble codes from the computer memory of the vehicle using newly developed diagnostic tools. Since the diagnostic trouble codes will specifically identify the problem, the service technician can more quickly and accurately make the proper repair.

C. Transportation Control Measures

1. Accelerated Vehicle Retirement.

Old automobiles with no or few emissions controls are typically a source of high emissions. While normal attrition of the fleet alleviates a portion of these emissions, some high emitting vehicles remain in operation and contribute to emissions problems for long periods of time. An accelerated

vehicle retirement program or 'scrappage program' seeks to remove these high emitting vehicles by providing an incentive for owners to retire these vehicles sooner than they would have in the absence of a program.

Maine High Pollution Vehicle Retirement Pilot Project Program

In an effort to encourage the purchase of cleaner cars and the removal of high-pollution vehicles from the vehicle fleet, the Maine Legislature established a pilot program for the retirement of high pollution automobiles and trucks. Beginning on November 1, 2000, this 3-year voluntary program will provide owners of high pollution vehicles[2] with a cash incentive to retire (or "scrap") their vehicle and replace it with a 1996 or later model year vehicle that is certified as either a National Low Emission Vehicle, or as a Low Emission Vehicle, Ultra Low Emission Vehicle, Super Low Emission Vehicle, or Zero Emission Vehicle under the California Low Emission Vehicle Program.

Under the cash incentive in this program, an 8-cylinder Truck or SUV is eligible for a $2,000 voucher, a 6-cylinder Truck or SUV is eligible for a $1,500 voucher and all others are eligible for a $1,000 voucher.

The Department promulgated rules for the program and the Board of Environmental Protection adopted those rules on October 19, 2000. Those rules establish the following procedures:

The buyer contacts the DEP requesting to participate in the "Scrap and Buy" program. If the vehicle meets the requirements of the program and there is money available, applicants are chosen on a first come first serve basis to receive a Letter of Assurance from the DEP.

The buyer then has 90 days to drive the vehicle to an Automobile Recycler to be recycled, where he will receive a Certificate of Verification (COV).

The buyer then submits the COV to the DEP to receive a Cleaner Car Voucher, which is then mailed to the buyer.

[2] A high pollution vehicle is defined as being a 1987 model year or older that has been registered in the State for the last 24 months, is presently operational, and driven under its own power to the site where it is scrapped.

The buyer then has 90 days to purchase a cleaner car. Once the buyer has purchased the cleaner car either the seller or buyer may submit the completed voucher to the Finance Authority of Maine for reimbursement.

Program Start-up

The Program began on November 1, 2000. The public could request participation in the program via email, fax, telephone or in person. The initial interest in the program far exceeded our expectations. On the first day alone, there were over 500 requests to participate. As of the end of January 2001, there are over 1000 people on the waiting list with more continuing to call to sign up.

Program Problems

There are two major problems with this program. The first is a lack of continued funding for the program and the second is the lack of participation of the Automobile Recyclers.

Funding

The lack of funding for the program presents a major hurdle to overcome. The Legislature authorized the establishment of the High Pollution Vehicle Retirement Pilot Program (HPVRPP) without funding for the incentive vouchers. The statute uses the existing Clean Fuel Vehicle Fund, which was created in 1998 to offer direct loans through FAME to finance clean fuel vehicle projects such as fueling infrastructure and purchase of clean fuel vehicles. The fund is non-lapsing and revolving.

The statute authorized FAME to create a second account within the Fund to carry out the purposes of the HPVRPP, and the statute allows for money from a civil penalty to be deposited into the fund if the penalized party assents. Since the effective date of this statute, no additional money from penalties or other eligible sources of money such as grants has been deposited in the Fund. The Chairs of the Natural Resources Committee stated that the original intent of the committee was that the money from the original account be used to initially fund the program. The original Clean Fuel Vehicle Fund account contained $125,000. The legislature allocated

$10,000 to the Department for public education and transferred $110,000 into the HPVRPP account for vouchers.

This initial $110,000 will fund about 80 incentive vouchers leaving over 900 people on the waiting list without funding.

Recycler Concerns

The second major roadblock for this program has been lack of participation by automobile recyclers. Department regulation specifies that the vehicle to be scrapped must be taken to a permitted automobile recycler. Automobile Recyclers are defined by 30-A M.R.S.A. Section 3752 (1-A) and permitted by 30-A M.R.S.A. § 3753. The Board determined that the rule should require vehicles to be scrapped by automobile recyclers due to their higher level of regulation, as opposed to automobile graveyards and junkyards, which have less stringent environmental requirements.

After rule development, it became clear the Automobile Recyclers have no interest in participating in the program. The Maine Auto Recyclers Association testified that the auto recyclers would incur a cost of $350 to $500 to dismantle and process (scrap) the high polluting vehicle. The recyclers would not recoup this cost from the sale of parts off the vehicles, nor from the crushed metal which sells at $35 to $65 per ton. Therefore, as the regulation is drafted, without the auto recyclers participation, the program can not work. Even if a limited number of auto recyclers participate, the public is unlikely to scrap their high polluting vehicle without a sufficient number of convenient locations where the vehicle can be driven for scrapping.

The public has responded overwhelmingly to this program. The thought of having $1,000 to $2,000 dollars as a down payment on a newer, cleaner vehicle just by scrapping an older vehicle has shown to be an attractive incentive.

At this time the Program is "on hold" until issues can be resolved with the automobile

D. Education and Incentives

The Department has previously submitted two reports to the Joint Standing Committee on Natural Resources:

Clean Car Education and Incentives (March 1998); and
Clean Car Education and Incentives: Update (March 1999)

1. Incentives

Historically, strategies for reducing transportation-related emissions have focussed on technological changes in vehicles and fuels. As a result government regulators have traditionally relied on command–and-control methods to achieve emission reductions. However, in many cases, financial incentives are needed to either influence driver habits or performance. Many states have adopted such incentives. Appendix F contains a full list of existing state laws and regulations relating to financial incentives.

2. Mobile Sources Outreach Programs

The Maine Department of Environmental Protection, Bureau of Air Quality, engages in a number of education and outreach activities geared specifically toward mobile sources. These educational activities reach a variety of audiences, from school children to technicians, reaching the general public and the legislature in between. This chapter describes the most visible of these efforts.

Cleaner Cars for Maine

The Cleaner Cars for Maine program promotes the purchase of high-mileage, low-emissions vehicles. Launched in 1999 as a collaboration between Maine DEP, the Natural Resources Council of Maine and the Maine Automobile Dealers Association, this program serves to inform consumer choice through the use of window labels. These clear window stickers alert new car buyers to the fact that the vehicle they are viewing is certified as a Low Emissions Vehicle or better and gets at least 30 miles per gallon.

One year into the program, the Department and its partners are beginning the process of evaluating the efficacy of the program. As a first step, we will survey automotive dealers about their level of participation in the program. If survey results reveal that dealers need further assistance in order to participate, we will develop and provide training workshops or other means of increasing the use of the stickers throughout the state. Once it has been established that the clean car stickers are in fact being used universally, we will survey new car buyers to discover what impact the program has had on purchasing decisions.

Outreach and Partnerships

The US EPA Office of Transportation and Air Quality annually requests grant proposals from states developing transportation-related outreach and education programs. In 1998 EPA awarded the Department an Outreach and Partnerships grant for the Screen Seens education effort. The Screen Seens were advertisements geared toward educating the public about mobile source contributions to air pollution and how they can reduce their impact. The ads were shown to captive audiences in movie theaters prior to the preview and feature presentation. Maine DEP ran each Screen Seen for several weeks at eight different theaters around Maine throughout 1998.

Volunteers interviewed movie-goers to assess their reaction to the Screen Seens and the effectiveness of the program. In total, 296 viewers were interviewed. Of those, 44 recalled seeing the DEP message, 42 having gotten the message.

In 2001, Maine DEP is again applying for an Outreach and Partnerships grant from EPA. This year we are partnering with the Portland Council of Governments and the Northeast Sustainable Energy Association (NESEA). The project will be to developed a web-based game that teaches players about transportation choices.

Technical Assistance

The Maine DEP contracted training for On Board Diagnostics through the Aspire Train the Trainer program. This program trained technicians in the

Enhanced On Board Diagnostic Inspection of vehicle emission control systems.

School-based Education

The Maine DEP sponsors and participates in a number of school-based educational activities. DEP staff work closely with the Maine Energy Education Program (MEEP) which sponsors the Junior Solar Sprint and the Electrathon, both of which promote the development of alternatively-powered vehicles, i.e. solar power.

The DEP also sponsors annual Earth Day and Ozone Awareness Week school workshops which provide hands-on education for middle and high school students in energy, air quality, climate change and transportation. Last year the program taught students about vehicle efficiency and alternative fuels through the use of puzzles and the demonstration hybrid vehicle.

Alternative Vehicles

The Maine DEP, in partnership with EVermont, an electric vehicle promotion organization, as well as Central Maine Power, Natural Resources Council of Maine and other businesses and organizations, educates the public about electric vehicles. The goal of the project is to develop and demonstrate technologies that improve electric vehicles' performance in cold weather. Participating groups take turns using an electric car as a promotional curiosity to show that these vehicles are useful in Maine.

The Maine DEP has also used a number of alternative and efficient vehicles in its fleet. The hybrid-electric cars are stand-alone educational showpieces, with eye-catching labels that inform passers-by of the vehicles' environmental benefits. These cars are also used as showpieces at a number of educational events including The Common Ground Country Fair, Ozone Awareness Week open houses, school outreach programs, and press events.

E. Government Procurement

On November 29, 1999 when Governor Angus King kicked off the nation's first Cleaner Car Sticker Program. (See Chapter 4(E)) the Governor also announced that he had directed the Maine Department of Administration and Finance (DAFS) to develop a new procurement policy that will consider fuel economy and tailpipe emissions when evaluating the purchase of new state vehicles.

Governor King said: "The State of Maine is committed to continual environmental improvement within its own business activities and should set a good example in environmental performance. What better example than driving cleaner, more efficient vehicles whenever possible? We can protect the environment and save money at the same time."

The new procurement policy was not implemented for the model year 2000 purchase as bids had already been sent out. However, of the 86 model year 2000 vehicles purchased by Maine's Central Fleet Management 72, or 84%, met the Cleaner Cars for Maine standard (LEV / 30 miles per gallon). The vehicles that did not meet the standard were 11 Ford Tauras wagons and 3 Crown Victorias.

In 2000 DAFS implemented a procurement policy for the purchase of new State vehicles which considers fuel economy and emissions certification. Before awarding bids, DAFS will in addition to the price of the vehicle, add the estimate of life-cycle fuel costs based on the fuel economy of the vehicle as published in the U.S. Department of Energy Fuel Economy Guide. Second, the DAFS reserves the right to reject any vehicle that does not meet the Low Emission Vehicle certification standard or better.

Chapter 6 Process

The Department did not have the opportunity to meet and consult with the Joint Standing Committee on Natural Resources, representatives of low-income consumers, automobile dealers, public health agencies, environmental organizations, cleaner fuels organizations, the Department of Transportation, Bureau of Motor Vehicles and the Executive Department, State Planning office and other entities with interests or expertise relevant to the examination and development of mobile-source-emission-reduction strategies.

The Department is committed to consult with the above listed interested parties over the next several months to review the content of this report and amend this report based on that input.

APPENDIX A

Counts of Vehicles by Make, Model, and Year

as of January 1, 2001

Make	Model	Year	Total
FORD	ESCO	93	3065
FORD	ESCO	95	2705
FORD	ESCO	94	2335
FORD	TAUR	93	2225
FORD	TAUR	95	2204
CHEV	TK	88	2189
FORD	ESCO	97	2076
FORD	F160	97	2037
FORD	TAUR	96	2025
FORD	TAUR	94	1970
FORD	TAUR	97	1902
FORD	WIND	98	1864
FORD	F157	94	1848
FORD	ESCO	91	1829
FORD	TAUR	99	1799
FORD	TAUR	98	1781
FORD	F158	95	1775
FORD	TAUR	92	1699
FORD	F152	88	1671
FORD	TK	88	1648
FORD	ESCO	98	1632
DODG	CARA	94	1604
FORD	F153	89	1595
CHEV	CAVA	94	1576
FORD	F156	93	1564
DODG	CARA	93	1561
FORD	F155	92	1555
CHEV	TK	89	1537
CHEV	CAVA	93	1511
CHEV	LUMI	92	1511
PONT	GRAN	95	1498
CHEV	LUMI	93	1483
CHEV	LUMI	90	1460
CHEV	CAVA	91	1459
CHEV	TK	86	1453
FORD	RANG	99	1437
FORD	WIND	95	1431
PONT	GRAN	99	1415
DODG	CARA	92	1407
CHEV	CAVA	89	1383
FORD	F161	98	1363
FORD	RANG	94	1357
FORD	FOCU	2000	1350
JEEP	CHER	96	1340
OLDS	CUTL	88	1332
DODG	CARA	96	1314
CHEV	TK	87	1308
FORD	WIND	96	1305
OLDS	CUTL	89	1288
FORD	F154	90	1287
GMC	TK	88	1283
PONT	GRAN	93	1282
FORD	F151	87	1275
CHEV	CAVA	97	1257
FORD	ESCO	89	1257
FORD	RANG	2000	1257
FORD	TK	89	1257
DODG	CARA	99	1255
FORD	RANG	88	1255
PONT	GRAN	96	1254
CHEV	LUMI	95	1225
PONT	GRAN	94	1225
FORD	TEMP	93	1221
DODG	CARA	95	1218
FORD	TK	86	1210
JEEP	CHER	99	1198
FORD	TK	87	1191
CHEV	CAVA	90	1190
FORD	ESCO	99	1190
SUBA	LEGA	95	1189
PONT	GRAN	92	1182
FORD	F150	86	1179
FORD	F162	99	1172
FORD	RANG	98	1170
FORD	TEMP	92	1168
CHEV	CELE	87	1155
TOYO	CAMR	99	1155
DODG	CARA	97	1152
SUBA	LOYA	92	1147
CHEV	TK	85	1141
PONT	GRAN	97	1140
OLDS	CUTL	90	1139
OLDS	CUTL	87	1138
CHEV	CELE	88	1126
FORD	RANG	97	1126
CHEV	CAVA	96	1115
FORD	BRON	88	1106
DODG	CARA	2000	1105
SUBA	LEGA	97	1102
PONT	GRAN	90	1099
CHEV	LUMI	96	1097
FORD	ESCO	96	1096
CHEV	BLAZE	96	1095
DODG	CARA	98	1092
FORD	F163	2000	1091
DODG	CARA	90	1087
DODG	CARA	89	1079
FORD	CONT	96	1068
JEEP	CHER	2000	1059
FORD	TAUR	89	1057
FORD	CONT	98	1056
CHEV	CELE	89	1052
CHEV	SILV	2000	1039
FORD	TAUR	90	1037
FORD	F159	96	1027
JEEP	CHER	95	1019
GMC	TK	89	1018
HOND	ACCO	92	1016
DODG	NEON	95	1015
FORD	TAUR	2000	1010
JEEP	CHER	93	1010
CHEV	CAVA	92	1008
CHEV	CAVA	98	1007
SUBA	LEGA	90	1006
JEEP	CHER	94	1002

APPENDIX B

Model Year 2000 Titled Vehicles

February 8, 2001

Make	Model	Sum	Make	Model	Sum	Make	Model	Sum
GMC	SIERRA	2484	CHRY	TOWN&C	286	CHEV	PRIZM	93
CHEV	1500	2214	TOYT	COROLL	282	VOLV	S40	93
DODG	CARAVA	1407	TOYT	SIENNA	275	VOLK	GOLF	92
SUBA	LEGACY	1251	VOLK	PASSAT	272	VOLV	S80	91
FORD	FOCUS	1159	MERC	GRANDM	262	CHEV	ASTRO	89
FORD	RANGER	1069	DODG	DURANG	260	PONT	MONTAN	89
DODG	NEON	1036	NISS	XTERRA	259	OLDS	INTRIG	87
TOYT	CAMRY	1008	VOLV	V70	259	VOLV	S70	86
FORD	F150	1007	DODG	RAM250	253	GMC	SAVANA	83
HOND	ACCORD	829	MAZD	PROTEG	251	BUIC	PARKAV	82
DODG	DAKOTA	764	STRN	SL	247	OLDS	ALERO	82
HOND	CIVIC	740	MERC	SABLE	240	DODG	RAMVAN	81
CHEV	S10	692	CHRY	CONCOR	230	BUIC	REGAL	78
KIA	SEPHIA	678	CHEV	VENTUR	227	HYUN	SONATA	78
BUIC	LESABR	676	CHRY	CIRRUS	221	DAEW	LANOS	77
HYUN	ELANTR	631	GMC	JIMMY	221	MAZD	B3000	77
JEEP	GRANDC	630	TOYT	AVALON	217	TOYT	CELICA	76
CHEV	CAVALI	595	TOYT	ECHO	217	SUZI	VITARA	75
TOYT	TACOMA	547	SUBA	IMPREZ	212	MITS	ECLIPS	74
DODG	INTREP	531	GMC	YUKON	210	NISS	QUEST	74
DODG	RAM150	527	NISS	ALTIMA	201	MERC	MOUNTA	73
JEEP	CHEROK	527	PLYM	NEON	201	MERC	COUGAR	72
TOYT	TUNDRA	510	PONT	SUNFIR	185	STRN	LW	71
VOLK	JETTA	504	STRN	LS	183	SUZI	GRANDV	71
FORD	TAURUS	502	CHRY	VOYAGE	180	CHEV	K15/BL	69
CHEV	IMPALA	495	FORD	EXPEDI	172	ISU	RODEO	69
FORD	WINDST	455	TOYT	RAV4	167	CADI	DEVILL	66
FORD	EXPLOR	450	CHEV	3500	166	DAEW	NUBIRA	66
PONT	GRANDA	436	CHEV	TRACKE	164	GMC	SAFARI	66
DODG	STRATU	426	NISS	SENTRA	159	CHEV	EXPRES	64
FORD	F250	415	FORD	MUSTAN	155	CHRY	LHS	62
JEEP	WRANGL	415	SUZI	ESTEEM	155	CHRY	SEBRIN	62
CHEV	BLAZER	395	PONT	GRANDP	151	FORD	EXCURS	62
BUIC	CENTUR	383	TOYT	4RUNNE	149	STRN	SW	62
HYUN	ACCENT	377	CHEV	MONTEC	145	MERC	VILLAG	61
SUBA	FOREST	372	CHEV	TAHOE	141	AUDI	A6	59
KIA	SPORTA	357	PONT	BONNEV	141	SAA	9-3	59
HOND	CR-V	355	LEXS	300	139	OLDS	SILHOU	58
CHEV	2500	351	FORD	ESCORT	133	VOLV	V40	58
NISS	FRONTI	335	FORD	ECONOL	125	LINC	TOWNCA	56
HOND	ODYSSE	315	PLYM	VOYAGE	122	MITS	GALANT	56
VOLK	BEETLE	315	SAA	9-5	118	MITS	MONTER	53
CHEV	MALIBU	311	CHRY	300M	112	NISS	PATHFI	53
FORD	F350	310	MAZD	626	112	FORD	CROWNV	52
NISS	MAXIMA	303	MERZ	320	111	MAZD	B2500	52
GMC	SONOMA	290	MAZD	MPVWAG	108	LINC	LS	51

Model Year 2000 Titled Vehicles

February 8, 2001

Make	Model	Sum
BMW	323	50
AUDI	A4	47
PLYM	BREEZE	44
CHEV	METRO	41
FORD	CONTOU	41
MERZ	430	40
HYUN	TIBURO	39
DODG	RAM350	37
INFI	I30	36
DAEW	LEGANZ	35
ISU	TROOPE	35
MERC	MYSTIQ	35
OLDS	BRAVAD	35
DODG	GRANDC	32
LNDR	DISCOV	31
MERC	MARQUI	31
PONT	FIREBI	31
CHEV	CORVET	29
BMW	Z3	28
KIA	SPECTR	28
MAZD	MIATA	27
STRN	SC	26
HOND	INSIGH	25
FORD	F550SU	22
LINC	CONTIN	22
VOLK	CABRIO	22
WSTR	CONVEN	22
BMW	528	20
LINC	NAVIGA	20
MERZ	230	20
MITS	DIAMAN	20
MITS	MIRAGE	20
BMW	328	19
FORD	F450SU	19
KW	CONSTR	19
MERZ	500	19
CADI	SEVILL	18
CHEV	CAMARO	18
HOND	S2000	18
ACUR	3.2	17
CADI	ESCALA	17
LEXS	LX470	17
PORS	BOXSTE	16
ISU	HOMBRE	15
PTRB	CONVEN	15
CHEV	SILVER	14
CHEV	SUBURB	14
FRHT	CONVEN	13
MAZD	B4000	13
TOYT	LANDCR	13
HOND	PRELUD	12
HYUN	999	12
CHRY	GRANDV	11
INFI	G20	11
KW	CON	10
MAZD	MPV	10
AUDI	S4	9
LEXS	400	9
CHEV	LUMINA	8
VOLK	EUROVA	8
AUDI	999	7
BMW	X5	7
CADI	ELDORA	7
GMC	DENALI	7
VOLK	GTI	7
VOLV	VN	7
DODG	AVENGE	6
GMC	C-SERI	6
INFI	QX4	6
MACK	600	6
MAZD	MILLEN	6
PORS	911CAR	6
TOYT	MR2SPY	6
VOLV	C70	6
VOLV	CNV	6
ACUR	INTEGR	5
AUDI	TT	5
BMW	740IL	5
FORD	CUTAWA	5
FORD	F650SU	5
FORD	MHSTRI	5
HOND	PASSPO	5
ISU	AMIGO	5
JAGU	S-TYPE	5
LNDR	RANGER	5
CHEV	C-SERI	4
INTL	4000SE	4
ISU	VEHICR	4
MITS	639	4
NAVI	4000SE	4
PTRB	CON	4
STRG	LT8500	4
VOLV	VVN	4
AUDI	AUDITT	3
BMW	MROADS	3
BUIC	999	3
FORD	F750SU	3
KW	T2000	3
PLYM	PROWLE	3
SUZI	SWIFTG	3
VOLK	999	3
VOLV	ACL	3
VOLV	CONVEN	3
ACUR	999	2
AUDI	A84.2Q	2
AUDI	AVANT	2
BLUB	B-SERI	2
BMW	M5	2
CHEV	999	2
CHEV	CK1575	2
CHEV	CSR	2
CHEV	K25/SU	2
CHEV	W35042	2
DODG	RAM	2
DODG	RAMWAG	2
DUCA	750M	2
FRHT	CON	2
GMC	G1500	2
GMC	TK2590	2
GMC	W35042	2
INTL	990	2
JAGU	VANDEN	2
JAGU	XK8	2
MERZ	E55	2
MITS	FH211	2
NAVI	9200I	2
NISS	EXTERR	2
STRG	LT9500	2
STRG	ST9500	2
STRG	STE	2
VOLV	WCN	2

APPENDIX C

Used Cars Purchased in 2000

Make	Model	Sum
ACUR	2.2CL	4
ACUR	2.3CL	3
ACUR	2.5TL	6
ACUR	3.0CL	5
ACUR	3.2TL	10
ACUR	3.5RL	12
ACUR	INTEGR	208
ACUR	LEGEND	66
ACUR	SLX	2
ACUR	VIGORG	6
ALFA	SPIDER	7
AMC	EAGLE	3
AMER	ALLIAN	3
AMER	CHEROK	65
AMER	CJ7	11
AMER	COMANC	11
AMER	EAGLE	36
AMER	EAGLEL	5
AMER	GRANDW	9
AMER	JEEP	2
AMER	WAGONE	7
AMER	WRANGL	17
AMGN	HUMMER	5
AUDI	100	37
AUDI	100CS	3
AUDI	100CSQ	7
AUDI	100QUA	7
AUDI	100S	16
AUDI	200	4
AUDI	200QUA	10
AUDI	4000	3
AUDI	4000CS	8
AUDI	4000SC	28
AUDI	4000SQ	8
AUDI	5000	2
AUDI	5000CS	13
AUDI	5000S	2
AUDI	5000SC	52
AUDI	5000SD	8
AUDI	5000SQ	10
AUDI	5000ST	7
AUDI	80	31
AUDI	80QUAT	9
AUDI	90	13
AUDI	90CS	5
AUDI	90CSQU	3
AUDI	90QUAT	14
AUDI	90S	9
AUDI	90SPOR	4
AUDI	A4	12
AUDI	A41.8T	29
AUDI	A42.8	2
AUDI	A42.8A	4
AUDI	A42.8Q	25
AUDI	A4QUAT	10
AUDI	A6	5
AUDI	A64.2Q	2
AUDI	A6AVAN	8
AUDI	A6QUAT	84
AUDI	A84.2Q	6
AUDI	CABRIO	2
AUDI	CUSTOM	2
AUDI	GT	7
AUDI	QUATTR	3
AUDI	S4QUAT	7
AUDI	S6	2
AUDI	TTQUAT	3
AUDI	V8QUAT	7
BMW	318I	36
BMW	318IAU	5
BMW	318IC	4
BMW	318IS	14
BMW	318ISA	2
BMW	318TI	7
BMW	318TIA	3
BMW	323CI	2
BMW	323I	3
BMW	323IC	2
BMW	325	7
BMW	325/E	19
BMW	325/EA	4
BMW	325AUT	2
BMW	325E	42
BMW	325EAU	6
BMW	325I	25
BMW	325I/I	7
BMW	325IAU	31
BMW	325IC	5
BMW	325ICA	10
BMW	325IS	13
BMW	325ISA	5
BMW	325IX	17
BMW	325IXA	4
BMW	328I	10
BMW	328IAU	10
BMW	328IC	5
BMW	328ICA	3
BMW	328IS	4
BMW	328ISA	2
BMW	525I	13
BMW	525IAU	9
BMW	525ITA	6
BMW	528E	14
BMW	528EAU	12
BMW	528IAU	16
BMW	530IAU	2
BMW	535I	7
BMW	535I/I	8
BMW	535IAU	2
BMW	540I	3
BMW	540IAU	5
BMW	635CSI	9
BMW	735IAU	14
BMW	735IL	4
BMW	740IAU	9
BMW	740IL	10
BMW	740ILA	4
BMW	750IL	8
BMW	M3	11
BMW	M3AUTO	3
BMW	M5	3
BMW	Z3	41
BUIC	999	7
BUIC	CENTUR	2504
BUIC	ELECTR	355
BUIC	LASABR	2
BUIC	LESABR	2034
BUIC	PARKAV	529
BUIC	REATTA	3
BUIC	REGAL	232
BUIC	REGALC	535
BUIC	REGALG	46
BUIC	REGALL	288
BUIC	REGALT	2
BUIC	RIVIER	106

Used Cars Purchased in 2000

Make	Model	Sum
BUIC	ROADMA	97
BUIC	SKYHAW	138
BUIC	SKYLAR	719
BUIC	SOMERS	66
CADI	60SPEC	3
CADI	ALLANT	4
CADI	BROUGH	134
CADI	CATERA	47
CADI	CIMARR	27
CADI	COMMER	5
CADI	DEVILL	897
CADI	ELDORA	119
CADI	ESCALA	3
CADI	FLEETW	134
CADI	SEVILL	190
CHEV	4000W4	13
CHEV	5000W5	2
CHEV	999	11
CHEV	ASTRO	450
CHEV	ASTROV	253
CHEV	BERETT	1010
CHEV	BERRET	2
CHEV	BLAZER	3581
CHEV	C-SERI	6
CHEV	C10	477
CHEV	C10/BL	15
CHEV	C10SUB	3
CHEV	C15/SU	8
CHEV	C1500	1333
CHEV	C1500S	42
CHEV	C20	49
CHEV	C20/SU	8
CHEV	C2500	125
CHEV	C30	48
CHEV	C3500	77
CHEV	C5000C	2
CHEV	C6500C	29
CHEV	CAMARO	865
CHEV	CAMERO	2
CHEV	CAPRIC	824
CHEV	CAVALI	5035
CHEV	CELEBR	1535
CHEV	CHEVET	52
CHEV	CHEVYV	10
CHEV	CITATI	26
CHEV	CORSIC	1923
CHEV	CORVET	147
CHEV	D10MIL	4
CHEV	D30MIL	6
CHEV	ELCAMI	23
CHEV	EXPRES	50
CHEV	G/PSCH	3
CHEV	G10SPO	24
CHEV	G10VAN	84
CHEV	G1500E	2
CHEV	G20	7
CHEV	G20SPO	249
CHEV	G20VAN	244
CHEV	G30CUT	69
CHEV	G30SPO	6
CHEV	G30VAN	76
CHEV	G3500E	10
CHEV	GEO	2
CHEV	GEOMET	2
CHEV	GEOSTO	2
CHEV	HICUBE	3
CHEV	IMPALA	117
CHEV	K10	323
CHEV	K10/BL	74
CHEV	K10BLA	11
CHEV	K10SUB	4
CHEV	K15/BL	191
CHEV	K1500	2654
CHEV	K1500B	7
CHEV	K1500S	346
CHEV	K1500T	47
CHEV	K20	98
CHEV	K20/SU	7
CHEV	K25/SU	16
CHEV	K2500	525
CHEV	K2500S	32
CHEV	K30	16
CHEV	K3500-	20
CHEV	K3500	139
CHEV	KODIAK	33
CHEV	LUMINA	2707
CHEV	M6V	5
CHEV	MALIBU	629
CHEV	ME6500	3
CHEV	METRO	72
CHEV	METRO/	22
CHEV	METROL	35
CHEV	METROX	5
CHEV	MONTEC	697
CHEV	NOVA	288
CHEV	P30	86
CHEV	PRIZM	62
CHEV	PRIZM/	133
CHEV	PRIZMG	2
CHEV	PRIZML	2
CHEV	PS6500	2
CHEV	R10	140
CHEV	R10/SU	10
CHEV	R10SUB	2
CHEV	R15/SU	10
CHEV	R1500S	3
CHEV	R20	15
CHEV	R20/SU	3
CHEV	R2500/	2
CHEV	R30	41
CHEV	R3500	15
CHEV	S-10	8
CHEV	S10	3029
CHEV	S10BLA	306
CHEV	S6000B	9
CHEV	S6M	3
CHEV	SILVER	3
CHEV	SPECTR	203
CHEV	SPORTV	63
CHEV	SPRINT	67
CHEV	STORM	21
CHEV	STORM2	22
CHEV	STORMG	8
CHEV	SUBURB	66
CHEV	TAHOE	353
CHEV	TRACKE	98
CHEV	V10	193
CHEV	V10/BL	168
CHEV	V10BLA	25
CHEV	V10SUB	6
CHEV	V15/SU	31
CHEV	V1500S	4
CHEV	V20	47
CHEV	V20/SU	5
CHEV	V25/SU	11

Used Cars Purchased in 2000

Make	Model	Sum
CHEV	V30	38
CHEV	V3500	17
CHEV	VEGA	2
CHEV	VENTUR	280
CHRY	300M	19
CHRY	5THAVE	18
CHRY	CIRRUS	159
CHRY	CONCOR	341
CHRY	CONQUE	9
CHRY	FIFTHA	166
CHRY	GRANDV	10
CHRY	IMPERI	24
CHRY	INTREP	2
CHRY	LABARO	2
CHRY	LASER	15
CHRY	LASERX	9
CHRY	LEBARO	832
CHRY	LHS	135
CHRY	NEON	2
CHRY	NEWYOR	529
CHRY	PTCRUI	17
CHRY	SALON	11
CHRY	SEBRIN	208
CHRY	TOWN&C	235
CHRY	VOYAGE	12
DAEW	LANOSS	11
DAEW	LEGANZ	4
DAEW	NUBIRA	4
DAIH	CHARAD	4
DAIH	ROCKY	3
DODG	600	72
DODG	600SE	41
DODG	999	3
DODG	ARIES	83
DODG	ARIES4	2
DODG	ARIESL	272
DODG	ARIESS	89
DODG	ASPEN	3
DODG	AVENGE	94
DODG	CARAVA	4408
DODG	CHARGE	11
DODG	COLT	93
DODG	COLTDL	44
DODG	COLTE	22
DODG	COLTE/	14
DODG	COLTGL	23
DODG	COLTGT	9
DODG	COLTPR	4
DODG	COLTVI	103
DODG	D-100	161
DODG	D-100/	115
DODG	D-150	156
DODG	D-150S	15
DODG	D-250	69
DODG	D-350	26
DODG	D150	2
DODG	D50CUS	49
DODG	D50ROY	7
DODG	DAKOTA	1641
DODG	DART	2
DODG	DAYTON	361
DODG	DIPLOM	58
DODG	DURANG	173
DODG	DYNAST	644
DODG	GRANDC	241
DODG	INTREP	1094
DODG	LANCER	84
DODG	MINIRA	30
DODG	MONACO	17
DODG	NEON	265
DODG	NEON/E	170
DODG	NEON/H	265
DODG	NEONHI	383
DODG	NEONSP	36
DODG	OMNI	122
DODG	OMNI/E	114
DODG	OMNICH	21
DODG	OMNISE	10
DODG	RAIDER	70
DODG	RAM	10
DODG	RAM150	1588
DODG	RAM250	375
DODG	RAM350	84
DODG	RAM50	226
DODG	RAM50C	15
DODG	RAM50S	18
DODG	RAMCHA	150
DODG	RAMVAN	481
DODG	RAMWAG	318
DODG	SHADOW	875
DODG	SPIRIT	808
DODG	STEALT	23
DODG	STRATU	776
DODG	W-100	115
DODG	W-100/	47
DODG	W-150	149
DODG	W-150S	27
DODG	W-250	151
DODG	W-350	24
DODG	W250	2
DODG	W350	2
EGIL	EAGLE	4
EGIL	MEDALL	4
EGIL	PREMIE	98
EGIL	SUMMIT	193
EGIL	TALON	79
EGIL	TALOND	18
EGIL	TALONE	33
EGIL	TALONT	45
EGIL	VISION	87
FORD	F150	2
FORD	TEMPO	2
FORD	AEROST	799
FORD	ASPIRE	231
FORD	BRONCO	1440
FORD	BUSCHA	5
FORD	CARGOL	8
FORD	CLUBWA	196
FORD	COH	2
FORD	COL	41
FORD	CON	14
FORD	CONTOU	1249
FORD	CONVEN	183
FORD	CROWNV	745
FORD	CUTAWA	175
FORD	E350	2
FORD	E350CO	2
FORD	ECONOE	33
FORD	ECONOL	943
FORD	ECONOR	9
FORD	ESCORT	5311
FORD	ESUPER	10
FORD	EXCORT	3
FORD	EXCURS	6
FORD	EXPEDI	369

Used Cars Purchased in 2000

Make	Model	Sum
FORD	EXPLOR	3177
FORD	F-150	5
FORD	F150	7313
FORD	F150SU	6
FORD	F250	1213
FORD	F250SU	163
FORD	F350	537
FORD	F350SU	89
FORD	F450SU	8
FORD	F530FS	18
FORD	F550SU	14
FORD	F650SU	2
FORD	F700LP	3
FORD	F800	7
FORD	F8000	2
FORD	F800F	7
FORD	F800LP	3
FORD	FESTIV	359
FORD	FOCUS	8
FORD	FOCUSL	30
FORD	FOCUSS	48
FORD	FOCUSZ	10
FORD	FSUPER	80
FORD	HIGHTI	3
FORD	LTD	91
FORD	LTDCRO	134
FORD	MEDIUM	29
FORD	MHSTRI	3
FORD	MHV	10
FORD	MUSTAN	1077
FORD	PINTO	2
FORD	PROBE	137
FORD	PROBE/	161
FORD	PROBEG	338
FORD	PROBEL	93
FORD	RANGER	4802
FORD	TAURUS	6039
FORD	TEMPO	316
FORD	TEMPO4	88
FORD	TEMPOG	1627
FORD	TEMPOL	145
FORD	TEMPOS	67
FORD	THUNDE	678
FORD	WINDST	1987
FORD	WINSTA	2
FRHT	COE	2
FRHT	COEFLA	4
FRHT	COEFLT	3
FRHT	CON	31
FRHT	CONVEN	127
FRHT	MEDCON	12
FTWD	CUTAWA	2
FTWD	F530FS	2
GEO	GEOMET	3
GEO	METRO	201
GEO	METRO/	241
GEO	METROL	124
GEO	METROX	36
GEO	PRIZM	109
GEO	PRIZM/	419
GEO	PRIZMG	4
GEO	PRIZML	13
GEO	SPECTR	6
GEO	STORM	118
GEO	STORM2	182
GEO	STORMG	46
GEO	TRACKE	338
GMC	4000W4	23
GMC	B-SERI	2
GMC	C-SERI	11
GMC	C1500	357
GMC	C1500S	11
GMC	C2500	46
GMC	C2500S	4
GMC	C3500	45
GMC	C6000C	6
GMC	C6500C	40
GMC	C6V	12
GMC	CABALL	3
GMC	CUTAWA	29
GMC	DENALI	8
GMC	ENVOY	11
GMC	FORWAR	6
GMC	G/PSCH	3
GMC	GMCVAN	3
GMC	H7500J	10
GMC	H95	2
GMC	H9500J	2
GMC	J75	2
GMC	J9500J	5
GMC	JIMMY	888
GMC	JIMMY/	33
GMC	JIMMYS	595
GMC	K1500	408
GMC	K1500J	38
GMC	K1500S	172
GMC	K2500	156
GMC	K2500S	22
GMC	K3500	21
GMC	M95	4
GMC	M9500N	4
GMC	ME6500	2
GMC	MOTORH	2
GMC	N9500N	2
GMC	R1500	51
GMC	R1500S	4
GMC	R2500	18
GMC	R2500S	8
GMC	R3500	49
GMC	RALLY	15
GMC	RALLY/	46
GMC	RALLYW	45
GMC	S15	464
GMC	S6000B	16
GMC	SAFARI	305
GMC	SAVANA	105
GMC	SAVANN	2
GMC	SIERRA	4463
GMC	SONOMA	594
GMC	SUBURB	41
GMC	T-SERI	2
GMC	TOP	9
GMC	TOPKIC	58
GMC	V1500	85
GMC	V1500J	87
GMC	V1500S	44
GMC	V2500	29
GMC	V2500S	7
GMC	V3500	30
GMC	VANDUR	189
GMC	W55042	2
GMC	W5R042	7
GMC	YUKON	288
GMC	YUKONX	2
HINO	FAMODE	2

Used Cars Purchased in 2000

Make	Model	Sum
HOND	ACCORD	2285
HOND	ACURA	2
HOND	CIVIC	423
HOND	CIVIC/	10
HOND	CIVIC1	258
HOND	CIVIC4	39
HOND	CIVICC	116
HOND	CIVICD	547
HOND	CIVICE	200
HOND	CIVICH	19
HOND	CIVICL	294
HOND	CIVICS	35
HOND	CIVICV	8
HOND	CIVICW	5
HOND	CR-V	86
HOND	CR-VEX	5
HOND	CR-VLX	6
HOND	CRX	3
HOND	INSIGH	2
HOND	ODYSSE	56
HOND	PASSPO	62
HOND	PRELUD	273
HOND	S2000	2
HYUN	999	13
HYUN	ACCENT	430
HYUN	ELANTR	402
HYUN	EXCEL	280
HYUN	EXCELG	155
HYUN	EXCELL	35
HYUN	SCOUPE	75
HYUN	SONATA	153
HYUN	TIBURO	27
IMPE	IMPERI	9
INFI	G20	50
INFI	I30	55
INFI	J30	7
INFI	Q45	18
INFI	QX4	22
INTL	1000SE	2
INTL	2000SE	3
INTL	3000SE	7
INTL	4000SE	25
INTL	40S	13
INTL	8000SE	6
INTL	9000SE	28
INTL	90S	4
INTL	937	3
INTL	9370F9	11
INTL	F9300	12
INTL	PAYSTA	3
INTL	SS	15
INTL	SSERIE	83
INTL	XCN	2
ISU	AMIGO	41
ISU	FSR	3
ISU	HOMBRE	52
ISU	I-MARK	22
ISU	IMPULS	13
ISU	NPR	24
ISU	NRR	2
ISU	OASIS	2
ISU	PUP-LO	3
ISU	PUP-RE	37
ISU	PUP-SP	9
ISU	REGCAB	133
ISU	RODEO	363
ISU	RODEOS	41
ISU	SPACEC	11
ISU	STYLUS	15
ISU	TROOPE	440
ISUZ	4000W4	2
ISUZ	AMIGO	4
ISUZ	HOMBRE	2
ISUZ	I-MARK	2
ISUZ	REGCAB	10
ISUZ	RODEO	34
ISUZ	RODEOS	7
ISUZ	TROOPE	54
ITAS	P30	2
IVEC	EURO12	5
JAGU	VANDEN	9
JAGU	XJ12	2
JAGU	XJ6	39
JAGU	XJ6L	2
JAGU	XJ6SOV	8
JAGU	XJ6VAN	7
JAGU	XJ8	3
JAGU	XJR	3
JAGU	XJS	13
JAGU	XJSCLA	2
JAGU	XK8	2
JEEP	CHEROK	3020
JEEP	CJ7	67
JEEP	COMANC	191
JEEP	GRANDC	1982
JEEP	GRANDW	120
JEEP	WAGONE	112
JEEP	WRANGL	1243
KIA	SEPHIA	298
KIA	SPORTA	157
KW	COEK10	3
KW	CON	21
KW	CONSTR	65
LEXS	ES250	8
LEXS	ES300	54
LEXS	GS300	8
LEXS	LS400	27
LEXS	LX450	4
LEXS	LX470	5
LEXS	RX300	15
LEXS	SC300	2
LEXS	SC400	5
LINC	CONTIN	537
LINC	LS	14
LINC	MARK-7	3
LINC	MARK	2
LINC	MARK7	8
LINC	MARK8	2
LINC	MARKVI	87
LINC	NAVIGA	41
LINC	TCSIG/	15
LINC	TOWNCA	846
LNDR	DEFEND	5
LNDR	DISCOV	115
LNDR	RANGER	60
LNDR	RROVER	3
MACK	200MS2	2
MACK	300	2
MACK	600	18
MACK	600CH6	26
MACK	600DM6	10
MACK	600R60	10
MACK	600RD6	25
MACK	600RW6	4
MACK	700	3

Used Cars Purchased in 2000

Make	Model	Sum
MACK	700CL7	6
MACK	700RW7	9
MACK	800RD8	2
MALL	G30CUT	2
MAZD	323	221
MAZD	323/SE	71
MAZD	3234WD	2
MAZD	626	228
MAZD	626DX	78
MAZD	626DX/	365
MAZD	626ES	17
MAZD	626ES/	44
MAZD	626GT	5
MAZD	626LX	11
MAZD	929	16
MAZD	929S	4
MAZD	B2000	4
MAZD	B2000C	25
MAZD	B2000L	48
MAZD	B2000S	85
MAZD	B2200C	58
MAZD	B2200L	12
MAZD	B2200S	194
MAZD	B2300	3
MAZD	B2300C	21
MAZD	B2300R	77
MAZD	B2500C	7
MAZD	B2500R	21
MAZD	B2600C	46
MAZD	B2600L	3
MAZD	B2600S	66
MAZD	B3000C	57
MAZD	B3000R	30
MAZD	B4000C	62
MAZD	B4000R	17
MAZD	GLC	17
MAZD	MIATA	8
MAZD	MILLEN	37
MAZD	MPV	15
MAZD	MPVWAG	83
MAZD	MX-3	30
MAZD	MX-3/R	8
MAZD	MX-3GS	10
MAZD	MX-5MI	102
MAZD	MX-6	92
MAZD	MX-6/R	8
MAZD	MX-6GT	19
MAZD	MX-6LS	12
MAZD	MX3	3
MAZD	MX6	3
MAZD	NAVAJO	48
MAZD	PROTEG	643
MAZD	RX7	77
MAZD	RX712A	14
MAZD	RX7GTU	4
MERC	CAPRI	43
MERC	CAPRIX	6
MERC	COUGAR	682
MERC	GRANDA	3
MERC	GRANDM	1083
MERC	LYNX	14
MERC	LYNX/L	21
MERC	LYNXGS	33
MERC	LYNXL	27
MERC	MARQUI	214
MERC	MOUNTA	145
MERC	MYSTIC	2
MERC	MYSTIQ	484
MERC	SABLE	334
MERC	SABLEG	1444
MERC	SABLEL	349
MERC	TOPAZ	115
MERC	TOPAZG	725
MERC	TOPAZL	65
MERC	TOPAZX	10
MERC	TRACER	691
MERC	VILLAG	240
MERK	SCORPI	4
MERK	XR4TI	11
MERZ	190D2.	2
MERZ	190E	2
MERZ	1.90E+04	5
MERZ	190E2.	49
MERZ	260E	7
MERZ	300CDT	3
MERZ	300D	7
MERZ	300DT	12
MERZ	300E	42
MERZ	300E/4	6
MERZ	300E2.	3
MERZ	300SD	6
MERZ	300SDL	6
MERZ	300SE	12
MERZ	300SEL	4
MERZ	300TDT	5
MERZ	300TE	8
MERZ	300TE/	9
MERZ	380SL	3
MERZ	400E	4
MERZ	420SEL	12
MERZ	500SEL	5
MERZ	500SL	7
MERZ	560SEC	4
MERZ	560SEL	14
MERZ	560SL	17
MERZ	C220	12
MERZ	C230	10
MERZ	C280	9
MERZ	CLK320	5
MERZ	E300D	3
MERZ	E300TD	5
MERZ	E320	40
MERZ	E320/S	4
MERZ	E420	7
MERZ	E430	2
MERZ	ML320	28
MERZ	ML430	4
MERZ	S320LO	5
MERZ	S320SH	2
MERZ	S420	6
MERZ	S430	3
MERZ	S500	4
MERZ	SL500	5
MERZ	SLK230	6
MITS	3000GT	49
MITS	CORDIA	2
MITS	DIAMAN	135
MITS	ECLIPS	392
MITS	EXPO	6
MITS	EXPO4W	2
MITS	EXPOLR	12
MITS	EXPOSP	2
MITS	FE434	3
MITS	FE449	5
MITS	FE639	6

Used Cars Purchased in 2000

Make	Model	Sum
MITS	FG639	2
MITS	FH100	6
MITS	FH211	2
MITS	FK457	2
MITS	GALANT	326
MITS	MIGHTY	69
MITS	MIRAGE	261
MITS	MONTER	172
MITS	PRECIS	16
MITS	SIGMA	2
MITS	STARIO	2
MITS	WAGON	2
NAVI	1000SE	3
NAVI	2000SE	5
NAVI	3000SE	4
NAVI	4000SE	44
NAVI	40S	8
NAVI	8000SE	5
NAVI	80S	3
NAVI	9000SE	49
NAVI	90S	21
NAVI	930	3
NAVI	F9300	5
NAVI	PAYSTA	2
NAVI	SS	4
NAVI	SSERIE	7
NISS	200SX	61
NISS	200SX/	28
NISS	200SXS	11
NISS	240SX	16
NISS	240SX/	27
NISS	240SXS	28
NISS	240SXX	16
NISS	300ZX	45
NISS	300ZX2	16
NISS	720KIN	296
NISS	720LON	20
NISS	720SHO	389
NISS	720STA	59
NISS	999	3
NISS	ALTIMA	359
NISS	AXXESS	12
NISS	FRONTI	110
NISS	KINGCA	379
NISS	LONGBE	2
NISS	MAXIMA	631
NISS	NX	2
NISS	NXCOUP	20
NISS	PATHFI	698
NISS	PULSAR	154
NISS	QUEST	107
NISS	QUESTX	9
NISS	SENTRA	1506
NISS	SHORTB	162
NISS	STANDA	223
NISS	STANZA	321
NISS	TKNGCA	2
NISS	XTERRA	16
OLDS	CUTLA	2
OLDS	88	2
OLDS	88/LS	195
OLDS	88ROYA	315
OLDS	98	3
OLDS	98REGE	398
OLDS	999	6
OLDS	ACHIEV	395
OLDS	ALERO	23
OLDS	ALEROG	173
OLDS	AURORA	94
OLDS	BRAVAD	147
OLDS	CALAIS	219
OLDS	CIERA	27
OLDS	CIERAC	13
OLDS	CIERAS	226
OLDS	CUSTOM	58
OLDS	CUTLAS	4323
OLDS	DELT88	44
OLDS	DELTA	7
OLDS	DELTA8	635
OLDS	FIRENZ	58
OLDS	INTRIG	251
OLDS	LSS	19
OLDS	REGENC	16
OLDS	SILHOU	150
OLDS	TORONA	52
OSHK	CHASSI	2
OSHK	JOHNDE	2
PEUG	405DL	5
PEUG	405MI1	3
PEUG	405S	11
PEUG	505	4
PEUG	505DL	4
PEUG	505GL	7
PEUG	505LIB	3
PEUG	505S	7
PEUG	505STI	5
PEUG	505STX	4
PEUG	505SW8	5
PLYM	ACCLAI	744
PLYM	BREEZE	445
PLYM	CARAVE	67
PLYM	COLT	91
PLYM	COLTDL	36
PLYM	COLTE	20
PLYM	COLTE/	18
PLYM	COLTGL	27
PLYM	COLTGT	4
PLYM	COLTPR	3
PLYM	COLTVI	99
PLYM	FURY	7
PLYM	GRANDV	110
PLYM	GRANFU	38
PLYM	HORIZO	268
PLYM	LASER	77
PLYM	LASERR	44
PLYM	NEON	141
PLYM	NEON/E	44
PLYM	NEON/L	28
PLYM	NEONHI	309
PLYM	NEONSP	30
PLYM	RELIAN	481
PLYM	SUNDAN	677
PLYM	TURISM	2
PLYM	VOYAGE	2644
PONT	6000	281
PONT	6000LE	290
PONT	6000SE	46
PONT	6000ST	43
PONT	999	4
PONT	BONNEV	1174
PONT	FIERO	59
PONT	FIEROG	20
PONT	FIEROS	33
PONT	FIREBI	441
PONT	GRANDA	3858

Used Cars Purchased in 2000

Make	Model	Sum	Make	Model	Sum	Make	Model	Sum
PONT	GRANDP	1739	SAA	999	4	SUBA	XT6	11
PONT	LEMANS	191	SAAB	900	59	SUBA	XT64WD	25
PONT	MONTAN	65	SAAB	900/S	14	SUBA	XTDL	6
PONT	PARISI	68	SAAB	9000	18	SUBA	XTGL-1	7
PONT	SAFARI	18	SAAB	9000/S	5	SUBA	XTGL	36
PONT	SUNBIR	913	SAAB	9000CD	5	SUBA	XTGL4W	22
PONT	SUNFIR	508	SAAB	9000CS	20	SUZI	ESTEEM	71
PONT	T-1000	8	SAAB	9000S	4	SUZI	GRANDV	19
PONT	TRANSP	19	SAAB	900S	63	SUZI	SAMURA	116
PONT	TRANSS	240	SAAB	900SET	5	SUZI	SIDEKI	224
PORS	911	4	SAAB	900TUR	3	SUZI	SWIFT	7
PORS	911CAR	30	STRN	999	6	SUZI	SWIFT/	8
PORS	911TUR	2	STRN	LS1	7	SUZI	SWIFTG	26
PORS	924S	6	STRN	LS2	2	SUZI	VITARA	16
PORS	928S	4	STRN	SC	30	SUZI	X90	18
PORS	944	21	STRN	SC1	105	TL	WILSN	3
PORS	944S	3	STRN	SC2	160	TOYT	1/2TON	51
PORS	BOXSTE	16	STRN	SL	194	TOYT	4RUNNE	546
PORS	CARRER	2	STRN	SL1	512	TOYT	999	9
PTRB	COE362	4	STRN	SL2	718	TOYT	AVALON	147
PTRB	CON	26	STRN	SW1	54	TOYT	CABCHA	24
PTRB	CONVEN	68	STRN	SW2	148	TOYT	CAMRY	418
RENA	ALLIAN	20	SUBA	999	3	TOYT	CAMRY/	11
RENA	ENCORE	11	SUBA	BRAT	2	TOYT	CAMRYC	750
RENA	MEDALL	3	SUBA	BRATGL	24	TOYT	CAMRYD	643
SAA	03-Sep	4	SUBA	DL	188	TOYT	CAMRYL	475
SAA	9-3S	15	SUBA	DL4WD	74	TOYT	CAMRYS	11
SAA	9-3SE	29	SUBA	FOREST	188	TOYT	CAMRYX	26
SAA	05-Sep	24	SUBA	GL	445	TOYT	CELICA	348
SAA	9-5SE	60	SUBA	GL10	24	TOYT	COMMER	4
SAA	900	521	SUBA	GL104W	43	TOYT	COROLL	1805
SAA	900/S	160	SUBA	GL4WD	654	TOYT	CORROL	2
SAA	900/SE	6	SUBA	IMPREZ	471	TOYT	CRESSI	30
SAA	9000	139	SUBA	JUSTY	23	TOYT	ECHO	12
SAA	9000/S	55	SUBA	JUSTYD	55	TOYT	EXTRAL	230
SAA	9000AR	22	SUBA	JUSTYG	93	TOYT	LANDCR	74
SAA	9000CD	100	SUBA	LEGACY	2464	TOYT	LONGBE	75
SAA	9000CS	222	SUBA	LOYAL	2	TOYT	MR2	32
SAA	9000S	61	SUBA	LOYALE	945	TOYT	MR2T-B	12
SAA	900S	680	SUBA	LOYALL	2	TOYT	MR2W/S	5
SAA	900S/S	15	SUBA	RX44WD	8	TOYT	PASEO	63
SAA	900SE	16	SUBA	STANDA	4	TOYT	PICKUP	40
SAA	900SET	123	SUBA	SVXLS-	5	TOYT	PREVIA	41
SAA	900STU	6	SUBA	SVXLS	2	TOYT	PRIUS	2
SAA	900TUR	3	SUBA	SVXLSI	2	TOYT	RAV4	248

Used Cars Purchased in 2000

Make	Model	Sum
TOYT	SHORTB	497
TOYT	SHORTW	135
TOYT	SIENNA	57
TOYT	STANDA	185
TOYT	STDBED	7
TOYT	SUPRA	35
TOYT	SUPRAW	9
TOYT	T100	17
TOYT	T100/D	11
TOYT	T100DE	7
TOYT	T100RE	5
TOYT	T100SR	3
TOYT	T100XT	145
TOYT	TACOMA	1084
TOYT	TERCEL	985
TOYT	TUNDRA	22
TOYT	VANWAG	35
TOYT	XTRACA	190
UD	UD1000	3
UD	UD1400	2
UD	UD1800	2
UTIM	AEROMA	2
VOLK	BEETLE	156
VOLK	CABRIO	114
VOLK	CORRAD	26
VOLK	EUROVA	16
VOLK	FOX	159
VOLK	FOXGL	219
VOLK	GOLF	195
VOLK	GOLFCA	6
VOLK	GOLFCU	108
VOLK	GOLFGL	460
VOLK	GOLFGT	45
VOLK	GOLFII	73
VOLK	GOLFJA	5
VOLK	GOLFK2	10
VOLK	GOLFTR	7
VOLK	GTI	72
VOLK	GTI16V	20
VOLK	GTIVR6	10
VOLK	JETTA	459
VOLK	JETTAC	126
VOLK	JETTAD	285
VOLK	JETTAG	1186
VOLK	JETTAI	240
VOLK	JETTAJ	20
VOLK	JETTAK	14
VOLK	JETTAS	8
VOLK	JETTAT	104
VOLK	JETTAW	52
VOLK	PASSAT	286
VOLK	QUANTU	50
VOLK	SCIROC	54
VOLK	VANAGO	55
VOLV	240	482
VOLV	240/DL	53
VOLV	240/GL	18
VOLV	240/SE	21
VOLV	240DL	15
VOLV	244	2
VOLV	244DL	3
VOLV	245	3
VOLV	740	94
VOLV	740/76	8
VOLV	740/GL	49
VOLV	740/SE	8
VOLV	740GL	45
VOLV	740GLE	214
VOLV	760	28
VOLV	760GLE	49
VOLV	765GLE	2
VOLV	780	6
VOLV	850	244
VOLV	850/GL	131
VOLV	850GLT	53
VOLV	850R	6
VOLV	850T	2
VOLV	850T5	12
VOLV	940	75
VOLV	940/GL	11
VOLV	940SE	4
VOLV	960	69
VOLV	ACL	7
VOLV	AEROWI	6
VOLV	C70TUR	3
VOLV	CONVEN	3
VOLV	FE6	2
VOLV	S40	4
VOLV	S70	54
VOLV	S70GLT	47
VOLV	S70TUR	20
VOLV	S80	4
VOLV	S80T6	4
VOLV	S90	2
VOLV	V70	51
VOLV	V70/SE	3
VOLV	V70AWD	55
VOLV	V70GLT	56
VOLV	V70RAW	6
VOLV	V70TUR	8
VOLV	V70XCA	7
VOLV	V90	3
VOLV	VN	4
VOLV	VVN	2
VOLV	WCN	2
WHGM	ACL	6
WHGM	AEROWC	2
WHGM	AEROWI	20
WHGM	ARO	9
WHGM	BRIGAD	6
WHGM	CONVEN	25
WHGM	GBR	2
WHGM	WCN	6
WHIT	CONVEN	3
WHIT	WCN	2
WINN	CUTAWA	2
WINN	LESHAR	6
WINN	P30	7
WINN	S/P	2
WSTR	CNV	19
WSTR	CONVEN	63
YUGO	GV	9
YUGO	GVPLUS	2

APPENDIX D

Used Vehicle Purchaser Data - February 5, 2001

Vehicles Purchased in Year 2000

	Model Year 1996				Model Year 1997				Model Year 1998				Model Year 1999				Model Year 2000				
Age	M	F	Total	weight	M	F	Total	weight	M	F	Total	weight	M	F	Total	weight	M	F	Total	weight	TOTAL
15	1	0	1	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
16	1	2	3	48	0	3	3	48	2	2	4	64	0	0	0	0	0	0	0	0	10
17	11	19	30	510	10	9	19	323	4	1	5	85	1	2	3	51	0	0	0	0	57
18	102	131	233	4194	85	125	210	3780	54	76	130	2340	30	45	75	1350	11	10	21	378	658
19	137	131	268	5092	153	152	305	5795	82	94	176	3344	47	61	108	2052	16	18	34	646	875
20	150	136	286	5720	162	165	327	6540	119	94	213	4260	61	67	128	2560	19	20	39	780	974
21	131	123	254	5334	203	166	369	7749	150	120	270	5670	73	97	170	3570	16	11	27	567	1074
22	159	119	278	6116	176	168	344	7568	145	122	267	5874	83	79	162	3564	19	18	37	814	1069
23	156	124	280	6440	191	132	323	7429	124	127	251	5773	105	89	194	4462	23	19	42	966	1067
24	135	116	251	6024	199	155	354	8496	126	102	228	5472	74	75	149	3576	28	19	47	1128	1001
25	153	114	267	6675	178	158	336	8400	134	109	243	6075	107	79	186	4650	31	27	58	1450	1059
26	148	80	228	5928	189	132	321	8346	144	90	234	6084	117	76	193	5018	27	18	45	1170	994
27	146	103	249	6723	213	138	351	9477	159	82	241	6507	94	73	167	4509	33	14	47	1269	1022
28	186	91	277	7756	237	120	357	9996	163	124	287	8036	118	92	210	5880	27	25	52	1456	1156
29	144	99	243	7047	274	171	445	12905	195	118	313	9077	128	88	216	6264	41	29	70	2030	1246
30	160	76	236	7080	234	151	385	11550	198	129	327	9810	102	105	207	6210	29	17	46	1380	1172
31	144	88	232	7192	242	137	379	11749	190	102	292	9052	150	73	223	6913	43	27	70	2170	1153
32	175	86	261	8352	242	142	384	12288	220	108	328	10496	146	85	231	7392	33	30	63	2016	1234
33	174	97	271	8943	252	131	383	12639	185	123	308	10164	150	79	229	7557	34	30	64	2112	1221
34	179	99	278	9452	252	141	393	13362	239	121	360	12240	130	111	241	8194	39	27	66	2244	1299
35	186	103	289	10115	263	159	422	14770	200	118	318	11130	144	97	241	8435	33	31	64	2240	1301
36	190	100	290	10440	291	159	450	16200	219	136	355	12780	171	91	262	9432	32	24	56	2016	1381
37	195	102	297	10989	283	175	458	16946	231	104	335	12395	168	115	283	10471	54	24	78	2886	1397
38	189	116	305	11590	285	160	445	16910	208	124	332	12616	175	103	278	10564	38	29	67	2546	1389
39	207	122	329	12831	318	179	497	19383	205	131	336	13104	167	108	275	10725	37	23	60	2340	1460
40	187	131	318	12720	270	159	429	17160	225	137	362	14480	171	119	290	11600	46	34	80	3200	1433
41	188	117	305	12505	299	171	470	19270	233	110	343	14063	162	130	292	11972	60	29	89	3649	1439
42	221	116	337	14154	305	174	479	20118	233	122	355	14910	185	101	286	12012	41	29	70	2940	1486
43	185	125	310	13330	276	180	456	19608	244	151	395	16985	157	122	279	11997	50	27	77	3311	1467
44	202	99	301	13244	287	157	444	19536	234	130	364	16016	160	114	274	12056	60	35	95	4180	1418
45	164	105	269	12105	253	152	405	18225	209	123	332	14940	178	118	296	13320	45	34	79	3555	1336
46	204	113	317	14582	282	168	450	20700	265	145	410	18860	199	119	318	14628	49	23	72	3312	1518
47	185	106	291	13677	273	154	427	20069	209	121	330	15510	184	70	254	11938	57	25	82	3854	1327
48	175	99	274	13152	277	126	403	19344	204	118	322	15456	155	85	240	11520	69	27	96	4608	1266
49	147	73	220	10780	264	139	403	19747	216	115	331	16219	155	93	248	12152	40	34	74	3626	1236
50	155	78	233	11650	215	127	342	17100	209	88	297	14850	165	104	269	13450	43	27	70	3500	1168

Used Vehicle Purchaser Data - February 5, 2001

	Model Year 1996				Model Year 1997				Model Year 1998				Model Year 1999				Model Year 2000				
Age	M	F	Total	weight	M	F	Total	weight	M	F	Total	weight	M	F	Total	weight	M	F	Total	weight	TOTAL
51	155	74	229	11679	259	144	403	20553	186	106	292	14892	174	87	261	13311	50	31	81	4131	1216
52	153	84	237	12324	232	115	347	18044	183	104	287	14924	180	84	264	13728	45	29	74	3848	1164
53	162	65	227	12031	244	98	342	18126	206	95	301	15953	203	84	287	15211	50	28	78	4134	1185
54	115	43	158	8532	166	80	246	13284	116	76	192	10368	101	61	162	8748	52	16	68	3672	774
55	88	47	135	7425	160	67	227	12485	150	55	205	11275	101	55	156	8580	38	18	56	3080	741
56	107	58	165	9240	175	72	247	13832	117	68	185	10360	136	71	207	11592	37	18	55	3080	822
57	122	44	166	9462	176	70	246	14022	128	51	179	10203	123	67	190	10830	44	25	69	3933	806
58	78	41	119	6902	118	86	204	11832	104	57	161	9338	103	69	172	9976	31	16	47	2726	672
59	95	37	132	7788	107	52	159	9381	94	56	150	8850	93	53	146	8614	25	24	49	2891	611
60	71	28	99	5940	104	39	143	8580	115	41	156	9360	96	60	156	9360	27	24	51	3060	578
61	64	40	104	6344	118	61	179	10919	92	32	124	7564	69	46	115	7015	33	21	54	3294	543
62	66	33	99	6138	106	46	152	9424	82	35	117	7254	82	33	115	7130	31	18	49	3038	501
63	60	25	85	5355	111	49	160	10080	76	27	103	6489	104	38	142	8946	30	7	37	2331	497
64	72	29	101	6464	91	40	131	8384	85	24	109	6976	79	42	121	7744	32	13	45	2880	475
65	58	26	84	5460	95	45	140	9100	92	28	120	7800	77	37	114	7410	32	18	50	3250	476
66	67	26	93	6138	67	34	101	6666	69	33	102	6732	74	41	115	7590	26	10	36	2376	421
67	51	26	77	5159	89	31	120	8040	79	27	106	7102	86	39	125	8375	25	9	34	2278	437
68	51	25	76	5168	75	35	110	7480	89	30	119	8092	88	33	121	8228	16	10	26	1768	436
69	46	25	71	4899	66	36	102	7038	58	19	77	5313	63	37	100	6900	22	5	27	1863	355
70	59	21	80	5600	58	31	89	6230	40	28	68	4760	62	32	94	6580	24	17	41	2870	348
71	53	16	69	4899	66	23	89	6319	54	24	78	5538	64	25	89	6319	23	12	35	2485	337
72	36	14	50	3600	45	18	63	4536	41	24	65	4680	59	26	85	6120	21	9	30	2160	272
73	35	13	48	3504	48	17	65	4745	37	20	57	4161	66	32	98	7154	23	11	34	2482	279
74	31	15	46	3404	43	39	82	6068	43	24	67	4958	68	18	86	6364	23	2	25	1850	283
75	30	19	49	3675	34	27	61	4575	41	21	62	4650	51	26	77	5775	21	8	29	2175	257
76	25	10	35	2660	47	24	71	5396	47	18	65	4940	48	25	73	5548	22	9	31	2356	253
77	31	14	45	3465	37	20	57	4389	43	7	50	3850	38	16	54	4158	11	5	16	1232	211
78	22	12	34	2652	41	10	51	3978	26	15	41	3198	43	23	66	5148	10	9	19	1482	201
79	26	6	32	2528	17	13	30	2370	26	15	41	3239	19	18	37	2923	8	11	19	1501	151
80	19	11	30	2400	11	11	22	1760	17	10	27	2160	32	10	42	3360	7	7	14	1120	128
81	10	5	15	1215	19	9	28	2268	9	8	17	1377	26	10	36	2916	6	4	10	810	100
82	10	4	14	1148	11	7	18	1476	17	7	24	1968	15	11	26	2132	8	2	10	820	84
83	4	11	15	1245	15	12	27	2241	11	12	23	1909	14	5	19	1577	3	4	7	581	88
84	10	8	18	1512	6	4	10	840	11	6	17	1428	12	10	22	1848	4	4	8	672	71
85	4	1	5	425	8	6	14	1190	11	3	14	1190	17	4	21	1785	2	3	5	425	57
86	3	5	8	688	7	2	9	774	3	3	6	516	9	3	12	1032	1	0	1	86	35
87	2	1	3	261	5	0	5	435	5	1	6	522	5	1	6	522	2	1	3	261	21
88	4	1	5	440	1	2	3	264	2	1	3	264	4	1	5	440	3	0	3	264	16

Used Vehicle Purchaser Data - February 5, 2001

	Model Year 1996				Model Year 1997				Model Year 1998				Model Year 1999				Model Year 2000				
Age	M	F	Total	weight	M	F	Total	weight	M	F	Total	weight	M	F	Total	weight	M	F	Total	weight	TOTAL
89	2	2	4	356	1	3	4	356	3	0	3	267	0	1	1	89	0	0	0	0	12
90	0	1	1	90	0	1	1	90	2	1	3	270	2	1	3	270	1	0	1	90	8
91	1	1	2	182	0	0	0	0	2	1	3	273	3	1	4	364	2	0	2	182	9
92	2	1	3	276	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
93	1	0	1	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
94	1	1	2	188	1	0	1	94	1	0	1	94	1	0	1	94	0	0	0	0	5
95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
98	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
99	1	0	1	99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	7675	4508	12183	501558	11013	6514	17527	731190	8790	5030	13820	589794	7102	4401	11503	521850	2094	1272	3366	157876	
			41.169				41.718				42.677				45.366				46.9		

TOTAL PURCHASERS 2457824

APPENDIX E

United States Environmental Protection Agency | Air and Radiation | EPA420-F-97-031 December 1997

Office of Mobile Sources

EPA

Environmental Fact Sheet

Accelerated Vehicle Retirement Programs

Accelerated vehicle retirement programs offer incentives for voluntary retirement of high-emitting vehicles, leading to the earlier reductions in air pollution than would otherwise occur.

What is Accelerated Vehicle Retirement or Scrappage?

In many cities across the country, the personal automobile is the single greatest polluter, as emissions from all the vehicles on the road add up. Old automobiles with no or few emission controls are typically a source of high emissions. Newer vehicles possessing emission controls which have been tampered with, maintained improperly, or have otherwise been rendered ineffective are also significant contributors of emissions. While normal attrition of the vehicle fleet helps, some high emitting vehicles remain in operation and contribute to the problem for long periods of time.

Accelerated vehicle retirement (scrappage) programs, through rebates and other incentives, encourage vehicle owners to voluntarily retire their vehicle sooner than they would have otherwise. These programs are entirely voluntary, and vehicle owners decide whether or not the compensation is sufficient to induce them to turn in their vehicles.

EPA's Role

Scrappage programs are not mandatory, and are not run by the EPA. These programs are part of an overall U.S, Environmental Protection Agency initiative to give state and local governments and industry flexibility in meeting Clean Air Act emission reduction requirements in the most efficient and effective manner possible. A program can be run by a state or local government as part of their overall strategy to reduce emissions in its air quality plan (state implementation plan or SIP) or by a private company, with approval from the state to satisfy existing or new stationary source-specific requirements for industry.

In February, 1993, EPA released a guidance document entitled *Guidance for the Implementation of Accelerated Retirement of Vehicles Programs.* The guidance document is intended to assist state, municipal or industry program sponsors in the design and implementation of scrappage programs.

How Do Scrappage Programs Impact the Supply of Older, Antique Vehicles, and the Availability of Parts for These Vehicles?

EPA encourages the maintenance and upkeep of older vehicles. Scrappage programs are aimed at highly polluting cars, rather than indiscriminately targeting old cars in general. In addition, since vehicle owners are always compensated for scrapping their vehicles, they would turn in their vehicles only if the level of the compensation is greater than the value of vehicle.

EPA has also taken several steps to ensure that scrappage programs do not diminish the supply of parts for older vehicles. Programs are allowed to strip vehicles for parts prior to scrappage, thus providing a source of parts to keep other old clean cars running and used parts suppliers and repair shops in business. Non-emission producing parts can be recycled directly while emission producing parts must be dismantled and rebuilt.

How Extensively Has Scrappage Been Used?

Several areas have implemented scrappage programs which range in size and contain various design features. In addition, a few areas have devel-

oped legislation setting up rules for the implementation of scrappage programs.

For Further Information

For more information on accelerated vehicle retirement programs, please contact John Hall at:

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The 1993 EPA guidance on accelerated vehicle retirement programs can be found on EPA's Internet World Wide Web (WWW) site at:

http://www.epa.gov/OMSWWW/market.htm.

EPA's Directory of Air Quality Economic Incentive Programs, also located at this site, has additional information on state and local scrappage programs and legislation. The directory includes descriptions of a number of programs, as well as contact names and phone numbers for more information.

United States Environmental Protection Agency | Air and Radiation | EPA420-F-97-032 December 1997

Office of Mobile Sources

EPA

Environmental Fact Sheet

Bicycle and Pedestrian Programs As a Transportation Control Measure

The U.S. Environmental Protection Agency (EPA) is working with governmental and non-governmental groups that share the objective of promoting bicycling and pedestrian programs as environmentally sound, viable transportation options.

Significance

"When I see an adult on a bicycle I do not despair for the future of the Human Race."
- H.G. Wells

Bicycling and walking are underutilized modes of transportation that offer the potential for significant reductions in transportation emissions while also reducing traffic congestion and demand on petroleum. Additional benefits of using these options include making neighborhoods safer and more friendly as well as reducing other environmental impacts of motorized transportation, such as solid and hazardous waste production, water pollution, greenhouse gases, noise, and the destruction of open space, wetlands, and other habitats.

Since the Federal Highway Administration estimates that 60 percent of all automobile trips are under five miles in length (Transportation Air Quality Selected Facts and Figures; USDOT FHWA, 1996), it appears that the public misses a great many opportunities in which bicycling and walking could be substituted for driving. Several governmental and

public interest groups are now participating in an initiative to encourage the public to choose bicycling and walking more often.

Initiative Design

EPA is working as part of the Interagency Task Force on Bicycling and Walking to support the goals of the National Bicycling and Walking Study. The study's goals are to double the current percentages of total trips made by bicycling and walking while reducing by ten percent the number of bicyclists and pedestrians killed or injured in traffic crashes. The task force includes representatives from government agencies and advocacy groups.

Partners

- U.S. Environmental Protection Agency - Office of Mobile Sources
- U.S. Department of Transportation - Federal Highway Administration
- Bicycle Federation of America
- League of American Bicyclists

Implementation Plan

- Provide technical guidance in the interpretation of national transportation legislation
- Include consideration for integration of bicycling and pedestrian needs in EPA programs and policies
- Provide outreach to the general public and other government agencies concerning safely increasing bicycling and walking usage levels
- Serve as a positive national presence and role model

For Further Information

For more information on this program, please contact Pat Childers at:

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United States Environmental Protection Agency | Air and Radiation | EPA420-F-97-030 December 1997

Office of Mobile Sources

EPA

Consumer Information

Congestion Pricing

Congestion pricing provides a disincentive to driving by imposing fees in congested areas which vary depending on location, time or vehicle occupancy. These fees are intended to reduce congestion and improve air quality by encouraging people to change their travel patterns: shifting to off-peak periods, less congested travel routes, higher occupancy vehicles, or a different mode of transport (e.g., public transit, walking, bicycling).

What is congestion pricing?

Congestion pricing refers to fees charged for driving on specific roadways during times of dense traffic. It serves to encourage drivers to consider alternatives to driving alone (ride sharing), alternatives to driving (e.g., public transit, walking, bicycling), different routes, or different travel times. A congestion fee may be more or less expensive depending on location, time of day, or the number of passengers in a vehicle. Congestion pricing strategies fall under the jurisdiction of and are implemented by municipal, regional or state governments.

Significance

Air pollution remains a problem for many areas across the country, even though vehicles have become cleaner through technological innovation. As regional, state, and local officials work to reduce mobile source air pollution, the federal government, industry, and public interest organizations continue to identify alternative methods that have the potential to reduce air pollution from mobile sources. Congestion pricing measures are some of those options that use the market, rather than regulatory

directives, to encourage the reduction of polluting activities or the increase of less-polluting alternatives.

The goal of congestion pricing policies is to mitigate traffic congestion and improve air quality. Congestion pricing strategies are designed to shift travel to alternative modes, routes, destinations and/or time of day. Some of these transportation modes and temporal travel shifts lead to reduced vehicle trips and miles traveled, as well as improved traffic flow or speeds.

Theoretically, emissions will be reduced somewhat from congestion pricing measures because the imposed fees will result in some current drivers switching from driving alone to car pooling or utilizing mass transit. Thus, there will be fewer overall miles driven, which directly eliminates the emission of harmful pollutants. The fewer miles that are driven during peak hours (rush hour), the more traffic congestion is reduced, which results in less idling. Idling is known to contribute significantly to air pollution (e.g., carbon monoxide emissions and smog).

In addition to goals of alleviating congestion problems and improving air quality, other factors have led transportation authorities and air quality regulators to consider congestion pricing measures. These include continuing trends in metropolitan travel demand growth, the recognition that construction of new road capacity may not always be feasible or desirable, the development of new electronic tolling technologies with potential to greatly reduce implementation costs, and the need for new infrastructure investment revenue sources.

Additional Benefits

Besides improving air quality and reducing congestion, other environmental and financial benefits may result from congestion pricing policies. In terms of environmental benefits, both oil and fuel consumption are reduced. Potentially, drivers have the opportunity to save time and money. Drivers that choose to pay higher congestion fees in order to access less congested roadways such as high occupancy vehicle lanes (HOV) will save time due to more free flowing traffic. People who decide to forgo driving altogether and opt to use mass transit will save money due to reduced or eliminated vehicle operation and maintenance costs. Additionally, as more people switch to mass transit, more revenue

will be generated that may be used for transportation improvements. Congestion pricing also has the virtue of charging more of the costs of building new road capacity to those who create the demand, rather than charging drivers in general or charging all taxpayers, regardless of whether they drive at all or use the congested facilities.

Some Concerns

Although congestion pricing has the potential to be a way of apportioning the use of limited metropolitan road space and to be a cost-effective strategy to reduce mobile source air emissions and energy consumption, many local and regional government officials have been reluctant to implement congestion pricing measures because of institutional barriers and the lack of political acceptance. Critical political and institutional issues include public opposition to any new taxes or fees, geographic and economic equity concerns, lack of regional transportation coordination, and the lack of alternatives to driving alone during peak traffic periods.

For Further Information

For more information on congestion pricing, please contact Joann Jackson-Stephens at:

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This fact sheet and additional information on transportation and air quality are available electronically from the EPA Internet World Wide Web (WWW) site at:

http://www.epa.gov/OMSWWW/transp.htm

United States Environmental Protection Agency | Air and Radiation | EPA420-F-99-003 February 1999

Office of Mobile Sources

EPA

Environmental Fact Sheet

The Congestion Mitigation and Air Quality Improvement Program (CMAQ)

The Congestion Mitigation and Air Quality (CMAQ) Improvement Program provides federal transportation funds to support state and local projects that reduce transportation related air pollution. It was reauthorized by the Transportation Equity Act for the 21st Century (TEA-21) to fund projects that initiate or expand transportation related infrastructure and services with air quality benefits. The U.S. Department of Transportation (DOT) administers the program, in consultation with the U.S. Environmental Protection Agency (EPA), under flexible guidelines. These projects include both traditional and non-traditional highway and transit projects. Examples of non-traditional projects include marketing and outreach to reduce driving, reduced fare programs to encourage transit use, transportation demand management programs, and programs to increase the use of clean alternatively-fueled vehicles. The highest priority for CMAQ funds are transportation control measures (TCMs) identified in approved State Implementation Plans (SIPs).

CMAQ projects compliment many of the more traditional strategies for reducing air pollution from transportation sources. Traditionally, states and local governments have relied on technological control measures to reduce air pollution and attain the air quality standards. Industrial processes with significantly lower emission levels, cleaner exhaust emissions from vehicles, and lower evaporative emissions from fuels have resulted in cleaner air in many cities. Yet the increase in the number of

vehicle miles traveled (VMT) in recent years counteracts these gains and may slow progress toward achieving healthy air. Strategies to reduce VMT and reduce congestion in order to make travel less polluting are increasingly viewed as integral components of sustainable air quality plans.

How Does the Program Work?

TEA-21 provides for as much as $8.1 billion for the CMAQ program from 1998 through 2003. The funds are apportioned to the states annually, based upon a legislated formula, with each state guaranteed 0.5% and the rest apportioned on the basis of population and the severity of the air pollution in ozone and carbon monoxide nonattainment and maintenance areas. As with most of the federal transportation programs, a state or local match of funds is required.

Two project eligibility requirements apply to the CMAQ program. First, the money must be spent on projects which reduce ozone, carbon monoxide, or PM-10 from transportation sources. Second, the money must be used in nonattainment or maintenance areas, if one exists within the state. It is important to note that nonattainment and maintenance areas for PM-10 are eligible to receive CMAQ funds, even though these areas are not included in the CMAQ apportionment formula. The state is responsible for distribution of funds among multiple nonattainment areas. If the state does not have an ozone or carbon monoxide nonattainment or maintenance area, the funds may be used anywhere in the state for any activity eligible under the CMAQ or Surface Transportation Programs. However, in these cases, if a PM-10 area exists, funding projects that address transportation-related particulate matter is encouraged.

What Kinds of Projects are Eligible for CMAQ Funds?

Because of the program's high degree of flexibility, CMAQ projects can vary greatly from area to area. However, there are some common characteristics, due to the program's focus on air quality. Generally, CMAQ projects are developed through a coordinated planning process and target the pollutants for which the area is in nonattainment or maintenance. CMAQ projects can usually be classified in one of the following categories:

- Travel Demand Management Strategies
- Transit Improvements
- Shared Ride Services
- Traffic Flow Improvements
- Pedestrian and Bicycle Programs

These broad categories provide wide-ranging flexibility and can support specific projects that vary greatly in design, scope, and implementation. The categories are not intended to be exclusive; other activities, such as public education and outreach programs and the conversion of vehicle fleets to clean alternative fuels, are also eligible.

How to Get CMAQ Funding for a Project

CMAQ programs are coordinated through an urban area's lead transportation planning organization. Usually this is an area's regional council or association of governments, known as a Metropolitan Planning Organization (MPO). MPOs have broad responsibility in developing an area's long-range Transportation Plan and Transportation Improvement Program (TIP). MPOs typically work with the state air quality agency to develop the State Implementation Plan (SIP) for air quality.

Any individual or organization can develop a formal proposal and submit it to the MPO for consideration. Examples include transportation management associations, transit operators, local or state government transportation or environmental departments, or simply a neighborhood group. The MPO, and in some cases the state, evaluates the proposal in consultation with state and local air quality agencies to determine if the proposal supports the area's air quality needs and should be included in the long range transportation plan and TIP. A list of projects from the transportation plan, including specific CMAQ projects based on priorities and available CMAQ funds, are subsequently included in the next TIP. The inclusion of any specific CMAQ project in the TIP is more likely if the project has support from other interested parties (transit operators, air quality agencies, local government representatives, etc.).

The new amended TIP is approved by the MPO and sent to the governor for state approval. CMAQ projects are then selected for implementation from the approved TIP and are submitted to the Federal Highway Administration or the Federal Transit Administration, as appropriate, for final approval and authorization to proceed. CMAQ funds are obligated for each submitted project when it receives this final approval. When CMAQ funds are obligated to a project, the state can then draw on the funds for reimbursement of expenses incurred for that specific project.

For Further Information

For more information about the CMAQ program, you may contact:

- Your local Metropolitan Planning Organization
- Your State Department of Transportation
- The U.S. Department of Transportation
  - Federal Highway Administration, State Division Offices
  - Federal Transit Administration, Regional Offices
- The U.S. EPA Regional Offices

or:

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Office of Mobile Sources

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Environmental Fact Sheet

Episodic Emission Control Programs

The dramatic increase in the number of miles being driven in recent years threatens to overwhelm the technological advances made with respect to vehicle emissions reductions and has contributed to urban gridlock and highway congestion. The Environmental Protection Agency (EPA) is committed to providing states and local areas with support in their efforts to meet air quality standards. The implementation of episodic emission control programs is becoming increasingly popular across the country as an innovative approach to reduce emissions of ozone precursors, carbon monoxide, and particulate matter.

Episodic Emission Control Programs

The dramatic increase in the number of miles being driven in recent years threatens to overwhelm the technological advances made with respect to vehicle emissions reductions and has contributed to urban gridlock and highway congestion. EPA is committed to providing states and local areas with support in their efforts to meet air quality standards. The implementation of episodic emission control programs is becoming increasingly popular across the country as an innovative approach to reduce emissions of ozone precursors, carbon monoxide, and particulate matter.

What Are These Programs?

The episodic emission programs being implemented in many U.S. cities provide steps that the public and industry can take to reduce emissions when weather conditions that contribute to high ozone (smog) levels are forecast. The programs are usually voluntary. They emphasize educating

the public about the impact that individual activities can have on local air quality and about the basics of air pollution (e.g., "good" stratospheric ozone vs. "bad" ground-level ozone). The education programs inform the public of activities that can reduce pollution on both an intermittent "episodic" basis (e.g., reduction of trips, postponement of certain activities) and on a longer term basis (maintenance of cars).

Motivation for implementation of this type of program often stems from local government and business concerns about the attainment status of the area (a designation indicating the severity of the ozone problem) and the restrictions that might apply to that status, additional controls to reduce ozone, and costs associated with reclassification into a different attainment status. Many areas are also motivated by public health concerns and believe that increasing the amount of air quality information available to sensitive populations raises awareness and results in significant health benefits. Specific goals usually associated with episodic control programs include:

- Educate the public
- Attain air quality standards (NAAQS)
- Meet specific emission reduction targets
- Manage/reduce congestion
- Maintain economic benefits associated with attainment status
- Protect public health
- Maintain air quality standards

Episodic programs are appealing to areas that have significant emissions from sources such as onroad vehicles, which are traditionally difficult to reduce due to driver behavior. The programs may also offer additional emission reductions, that historically are not easily obtained on an ongoing basis, during a time when the impacts of emission reductions are the most critical. Public education efforts may also reduce emissions over the long term, due to increased public awareness of the air quality impacts of changed behavior. These public education efforts serve the general public and help them to understand their role in air quality planning. The education component of these programs also helps to create a strong link between environmental goals (attainment) and associated public health benefits.

What Are the Air Quality Benefits?

Most episodic control programs are designed to limit the number of times the ozone (or other pollutant) standard is exceeded, and therefore should have a positive impact on air quality. When episodic control days are forecast, notification through various means (e.g., TV, radio, etc.) is undertaken to raise awareness of the general public and encourage individuals to make behavioral changes. Emission reductions associated with changes in individual behavior can be significant if a large number of individuals limit activities that are associated with production of emissions, such as driving, use of small engines, and refueling.

Long-term emission reduction measures currently in place are expected to lower long-term average (annual average) concentrations of pollutants in urban areas, but may not be enough to completely avoid violations of short-term standards (one-hour or eight-hour average) during severe ozone episodes. Because episodic controls have been designed to cut emissions by larger amounts for shorter periods, they have the potential of being more effective in reducing short-term air quality violations.

To stay in attainment of air quality standards, areas must reduce and eventually eliminate the number of air quality violations. Activities that cannot be eliminated on a long-term basis, such as lawn maintenance or tank refilling, can be restricted on ozone alert days and result in reductions of emissions and improvement of air quality.

What Are the Health Benefits?

In addition to reduced pollutant exposure of the general population due to improved air quality on days having a high potential for ozone formation , there are other health benefits directly associated with episodic control programs. Several population groups are more susceptible to the harmful health effects of ground-level ozone: the elderly, children, and asthmatics. Public education or programs directly targeting these groups may provide the most significant benefits of an episodic control program. Early awareness of a potential high ozone day may help these groups limit their outdoor activities and therefore limit their potential for overexposure to ozone.

The American Lung Association (ALA) has measured the effects of ozone on emergency room visits. Its report finds that ground level ozone is linked with 10,000 to 15,000 hospital admissions for respiratory

conditions (including asthma, pneumonia, influenza, bronchitis, and chronic obstructive pulmonary disease) in 13 cities during the 1993 and 1994 high ozone seasons. The report links 30,000 to 50,000 emergency room visits with high ozone levels, and cites increasing evidence that these effects occur at levels at or below the current ozone standards. Many cities, such as Los Angeles and Houston, continue to exceed the 0.12 ppm summertime standard.

The ALA study highlights the specific link between ground-level ozone concentrations and health effects on susceptible populations. While the principal investigators note that their methodology does not account for all factors (e.g., demographics and other factors associated with the use of emergency rooms), the results do indicate that high concentrations of ground-level ozone can be statistically associated with emergency room visits and hospital admissions.

Implementation of effective episodic control programs can mitigate these effects in three direct ways. First, communication and outreach programs can inform the public—and specific susceptible populations—about the potential public health risks due to increases in ground-level ozone. Second, accurate forecasting and subsequent notification of alert days can allow people in these susceptible populations to change their behavior to limit their exposure. Third the long-term impact of the episodic control program may reduce concentrations of ground-level ozone and further cut the exposure to susceptible populations and all other residents.

For Further Information

For more information on Episodic Emisson Control Programs, please contact Michael Ball at:

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Information on episodic control programs is available electronically at the Survey Of Episodic Control Programs page on EPA's Internet World Wide Web (WWW) site:

http://www.epa.gov/OMSWWW/reports/episodic/study.htm.

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Intelligent Transportation Systems

ITS applies new communication, monitoring, and computer technologies to improve our national transportation systems and to lessen the need to build new roads.

What is ITS?

ITS stands for Intelligent Transportation Systems. ITS can help people and goods move more safely and efficiently by providing information links between travelers, vehicles, and infrastructure. The goal of ITS is to apply modern computer and communications technologies in transportation systems, resulting in improved mobility, safety, air quality, and productivity. ITS products and services:

- collect and transmit information on traffic conditions and transit schedules to aid travelers before and during their trips
- relieve congestion by reducing the number of traffic incidents, clearing them more quickly when they occur, rerouting traffic flow around them, and automatically collecting tolls
- raise the productivity of commercial, transit, and public safety fleets by using automated tracking, dispatch, and weigh-in-motion systems
- help drivers in reaching a desired destination with in-vehicle navigation systems

- benefit public and government agencies at all levels through lower costs, enhanced services, and a healthier environment for all

Why Do We Need ITS?

Congestion. Inefficiency. Crashes. Pollution. These are all too often associated with today's transportation infrastructure—and everyone knows it. Traffic congestion costs the American people billions each year in lost productivity. Crashes claim thousands of lives and injure millions. Vehicle emissions are a major cause of air pollution. Trucks, buses, and cars idling in traffic emit millions of tons of pollutants each year and waste billions of gallons of fuel.

For years, we have sought to solve many of these problems by merely building more highways. Pouring additional asphalt and concrete added capacity but did not address the underlying problems of our transportation system. Fulfilling the need for a national system that is both economically sound and environmentally efficient requires a new way of solving our transportation problems.

What Can ITS Do For the Environment?

An area's transportation system has a big impact on its air quality. The way an area chooses to use ITS technologies in meeting transportation needs can influence that impact.

In the short run, using ITS technologies to increase speeds and capacity on severely congested highways can reduce emissions of some pollutants. However, there is a point at which higher speeds cause pollutant emissions to increase again. Moreover, as less congestion encourages more driving, the impact of increased traffic volumes on air quality is clearly negative.

ITS technologies can reduce congestion without encouraging more traffic by improving public transit and other alternatives to driving alone. The U.S. Environmental Protection Agency is working closely with the U.S. Department of Transportation (DOT) to evaluate the environmental impacts of the different ITS technologies in several areas of the country. This will give areas considering ITS the information they need to choose technologies that will improve air quality. These evaluations are scheduled for completion in 1999.

Where Did This Program Come From?

In 1991, Congress passed the Intermodal Surface Transportation Efficiency Act (ISTEA). ISTEA provided funding to DOT for ITS research, development, testing, and implementation. The program has received about $200 million/year since then.

Who Will Carry Out ITS?

The various elements of ITS are being used by a broad range of state and local government agencies, transportation service providers, private entities, and through the consumer markets for electronics, automobiles, and information services. No part of ITS will be owned or operated by the federal government; however, federal funding will play a large role in ITS development by funding state and local transportation improvements. A few of the areas already using ITS include:

- for personal travel improvements: Atlanta, Seattle, Phoenix, San Antonio, and the metropolitan area of New York, New Jersey and Connecticut

- for commercial vehicle improvements: Connecticut, Kentucky, Michigan, Minnesota, Colorado, California, Oregon and Washington

For Further Information

For more information on intelligent transportation systems, please contact the DOT Intelligent Transportation Systems Joint Program Office (ITS JPO):

Phone: (202) 366-9536
Fax: (202) 366-3302

Information regarding Intelligent Transportation Systems is available electronically on the Internet World Wide Web (WWW) at:

http:\\www.its.dot.gov.

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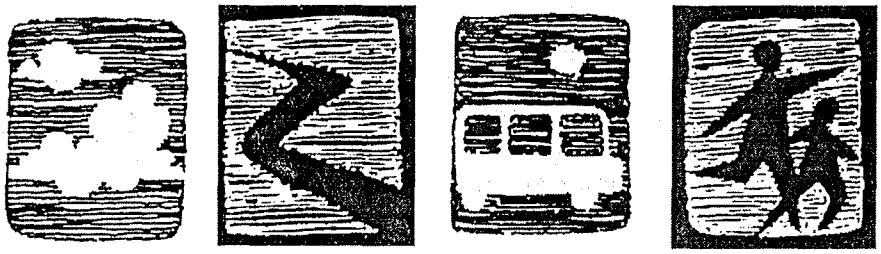
TRAQ Technical Brief

Transportation Air Quality Center

Commuter Choice: Guidance Overview



Commuter Choice is an important strategy to reduce emissions from passenger vehicles and improve air quality. Through Commuter Choice programs, employers offer one or more options from a diverse menu of commute benefits encouraging employees to commute by modes that are less polluting than driving alone. In addition, Commuter Choice programs can improve public transit systems and potentially reduce congestion. This technical brief is an introduction to the document "State Implementation Plan (SIP) Development Guidance: Using Emission Reductions from Commuter Choice Programs to Meet Clean Air Act Requirements". SIPs enumerate plans for implementation, maintenance, and enforcement of the National Ambient Air Quality Standards (NAAQS) in each air quality control region of a state. The Guidance directs State and local governments to the available tools and necessary requirements for including Commuter Choice programs in State Implementation Plans.

Getting There with Clean Air

Significance

Since 1970, the amount people drive annually has more than doubled, and more people are driving. Employee commute trips to work make up approximately 28% of the vehicle miles traveled (VMT) on our roads today. The problem is that emissions from growing VMT and congestion threaten to offset and, in some areas, overwhelm the air quality benefits of today's cleaner cars and/or fuels. Auto emissions contribute heavily to air pollution and to increased greenhouse gases in the atmosphere. Both pose recognized risks to the environment and to people.

Since Commuter Choice programs can reduce VMT, auto emissions and greenhouse gases, they can improve public health and contribute to climate change prevention efforts. Commuter Choice can be an essential tool used by State and local air quality planning authorities to address transportation issues and air pollution concerns. The programs can be developed by an individual company or as part of a wider regional strategy.

Commuter Choice programs can help regions meet Clean Air Act goals. Emissions reductions generated through Commuter Choice programs may be included in SIPs for any criteria pollutant (e.g., ozone, particulate matter) in both nonattainment and maintenance areas. EPA is prepared to approve emission reductions in SIPs that may be used to meet Reasonable Further Progress (RFP) requirements, baseline determinations, redesignation, and maintenance demonstrations. EPA's Office of Mobile Sources (OMS) has issued a guidance document to assist State and local governments and agencies in calculating the emissions benefits of Commuter Choice programs in SIPs. OMS will provide technical guidance and assistance on SIP submittals, quantification expertise, outreach workshops, and location of funding information.

How Commuter Choice Programs Work

Reducing the frequency that commuters drive alone generates air quality benefits. Commuter Choice programs may be run by States, local agencies, or individual employers. However, economies of scale and the synergistic effects of large programs make community and regional efforts, including public-private partnerships, most effective. Such projects may include one, all, or a combination of the following individual benefits:

- Free or reduced cost passes for public transportation (such as subway cards, bus tokens, or train tickets).
- Transit or vanpool vouchers and subsidies.
- Services to facilitate vanpools and carpools (such as providing vans, ridematching, and guaranteed ride home services).

- Park and Ride subsidies.
- Telecommuting options (so employees can work at home more often).
- Proximate Commuting: a program that matches employees of multi-site employers (such as banks or chain stores) to the branch office nearest their home.
- Incentives to bike or walk.
- Parking Cash Out: employees can trade an employer-paid parking space for cash or other benefits.
- Guaranteed Ride Home programs.

With more options, commuters can be expected to use single-occupant vehicles less often.

Benefits of Tax Code Changes

Federal tax benefits and cost savings can motivate employers to offer more commute benefits for working people. Recognizing the air quality benefits of VMT reduction, Congress has established tax incentives giving employers and employees new ways to get tax savings in association with specified work commute benefits. These provisions, amended by the Transportation Equity Act for the 21st Century (title 9 section 910, PL 105-178), are contained in the Internal Revenue Code Section 132(f). The new tax law provides direct benefits for transit, vanpooling, and parking.

Under current law, qualified parking, transit and vanpool benefits offered by employers are not subject to certain Federal taxes (up to specified limits). Employers may also offer Parking Cash Out, a program in which employees can trade employer-paid parking spaces for cash or other qualified benefits.

How Commute Benefits Are Offered

Tax savings from Commuter Choice vary, depending on which commute benefits are offered by the employer and how they are provided to the employee. Below are three qualified methods:

1. "In-Addition-to" Compensation / Additional Benefit
Employees may receive the benefit in addition to their current wages. Specifically, they can receive transit, vanpool, and parking benefits completely free of all U.S. payroll and Federal income taxes up to specified limits. The employer pays for the benefit and receives a deduction from its Federal business income taxes for the value of the benefit. Neither the employer nor employee pays payroll-related taxes or costs on the benefit.

2. "In-Lieu-of" Compensation / Pre-Tax Benefit
An employer may permit employees to set aside some of their income, before taxes, to pay for qualified commutes. Employees may use this pre-tax income to pay for transit, vanpools, or parking. Employees would not pay Federal income taxes or payroll taxes on the amount they elect to set aside for the commute option, and employers would not pay U.S. payroll taxes or other payroll related costs since the amount is treated as a benefit rather than as taxable salary.

3. Cost-Sharing
An employer may share the cost of commuting to and from work with their employees. They could do this through a combination of the two benefits above.

Under the new tax law, employers can offer the specified benefits for their work commutes in addition to or in lieu of compensation, Federal-tax-free, up to these Federal limits: *

Up to $175 for parking at or near work site and transit facilities
Up to $65 for public transit
Up to $65 for vanpool services

(For transit and vanpooling, this amount will increase to $100/month for taxable years beginning after December 31, 2001.)

Note: Tax breaks on benefits only apply directly to transit, vanpool and parking benefits. The cash option from Parking Cash Out and any other cash incentives are taxable for the individual employee. In addition, the employer must pay payroll taxes related to the cashed out parking spot. Subsidized parking and other transportation benefits do not become taxable if an employer offers them along with the Parking Cash Out option. Although the tax laws do not specifically relate to benefits like telecommuting, carpooling, biking, walking, and other commute options, employers may still offer or encourage these choices. One way to provide an incentive for these options is through Parking Cash Out, where employees can choose the cash benefit and commute by these alternative modes.

* Any amount of benefit in excess of the federal limits will be subject to Federal income and payroll taxes. In addition, States may apply taxes even when the Federal government does not.

Additional Economic Benefits to Communities

Enhancing Downtown Parking

Commuter Choice can free up parking now used by downtown employees for other uses, making downtowns more attractive business locations. In addition, Commuter Choice can aid urban transit agencies whose services now compete with free parking to commuters. Cities using the program effectively can experience increased demand for alternative modes of transportation and increased efficiency, both aiding urban revitalization and efforts to prevent climate change. Commuter Choice can help revive downtowns as areas of transportation alternatives and multiple uses, rather than areas of gridlock.

Raising Tax Revenue

In a study of eight California employers who implemented Parking Cash Out, it was found that the tax base was increased. State and federal tax revenues from the employers increased by $48 annually for each employee electing the taxable cash option.

The Guidance Document

The document, "SIP Development Guidance: Using Emission Reductions from Commuter Choice Programs to Meet Clean Air Act Requirements," includes information that:

Describes the range of measures that are included under the Commuter Choice umbrella.

Summarizes the analytical details for quantifying the emissions reductions from Commuter Choice programs, including a basic four-step methodology.

Reviews legal and administrative requirements for using the emissions reductions in SIPs.

Estimating Emissions Reductions

The guidance provides a four-step methodology for developing protocols used to project emission reductions from Commuter Choice programs.

Four-Step Methodology	
Step 1	*Population of Commute Vehicles* Estimate the relevant population of vehicles driven to work
Step 2	*Potentially Affected Population* Estimate the proportion of these vehicles driven to employer worksites where Commuter Choice options are or will be available
Step 3a	*Participation Rates* Forecast the typical effectiveness of a commute benefit options program
Step 3b	*Uncertainty* Incorporate compliance and programmatic uncertainty factors
Step 4	*Emission Reductions* Estimate the total change in VMT and associated emission changes

For More Information

This document and additional information on transportation and air quality are available electronically at the TRAQ Center on the EPA Internet server at:

http://www.epa.gov/oms/traq

For a hard copy of this technical brief or the full document SIP Development Guidance: Using Emission Reductions from Commuter Choice Programs to Meet Clean Air Act Requirements, please call the National Service Center for Environmental Publications (NSCEP) at (800) 490-9198.

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Office of Mobile Sources

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Environmental Fact Sheet

The Commuter Choice Program: A Way to Save Money and Help the Environment

Commuter Choice Programs encourage employers to offer flexible commute options to their employees. These strategies help employers and employees save money and help reduce pollution.

What is the Commuter Choice Program?

Under Commuter Choice programs, employers offer commuting options that encourage employees to get to work in ways that pollute less than driving alone. A Commuter Choice program can be developed by an individual company or as part of a wider regional strategy. In addition, Federal tax laws relating to transit, vanpool, and parking benefits now provide tax savings for employers and employees who want to "Get There with Clean Air!"

Commute Options

Commuter Choice programs encourage employers to provide their employees transportation options in commuting to and from work. These programs may include one, all, or a combination of the following individual benefits:

- Free or reduced cost passes for public transportation, such as subway cards, bus tokens, or train tickets.
- Transit or vanpool vouchers which can be used to pay for those services.

- Services to facilitate carpooling and vanpooling such as providing vans, ridematching, and a guaranteed ride home.
- Telecommuting options (so employees can work at home more often).
- Proximate Commuting: a program that matches employees of multi-site employers (such as banks or chain stores) to the branch office nearest their home.
- Incentives to bike or walk
- Parking Cash Out: Employees can trade employer paid parking space for cash or other benefits.

Tax Savings

Tax Savings from Commuter Choice vary depending on which commute benefits are offered by the employer and how they are provided to the employee. Below are three qualified methods:

1. In Addition to Compensation/Additional Benefit
Employees may receive the benefit in addition to their current wages. Specifically, they can receive transit, vanpool, and parking benefits completely free of all U.S. payroll and Federal income taxes. The employer pays for the benefit and receives a deduction from his Federal business income taxes for the value of the benefit. The employer also does not pay payroll related taxes or costs on the benefit.

2. In Lieu of Compensation/Pre-tax Benefit
An employer may permit employees to set aside some of their income, before taxes, to pay for their commutes. Employees may use this pre-tax income to pay for transit, vanpools, or parking. Employees would not pay Federal income taxes or payroll taxes on the amount they elect to set aside for the commute option, and employers would not pay U.S. payroll taxes or other payroll related costs since the amount is treated as a benefit rather than as taxable salary.

3. Cost-Sharing
Employers may share the cost of commuting to and from work with their employees. They could do this through a combination of the two benefits above.

Under the new tax law, employers can offer the specified benefits for their employees' work commutes in addition to or in lieu of compensation, Federal-tax-free, up to these Federal limits:

- Up to $175 per month for parking at or near work site and transit facilities
- Up to $65 per month for public transit
- Up to $65 per month for vanpool services

(For transit and vanpooling, this amount will increase to $100/month for taxable years beginning after December 31, 2001.)

Note: Tax breaks on benefits only apply directly to transit, vanpool and parking benefits. The cash option from Parking Cash Out and any other monetary incentives are taxable for that employee. Subsidized parking and other transportation benefits do not become taxable if an employer offers them along with the Parking Cash Out option. Although the tax laws do not specifically relate to benefits like telecommuting, carpooling, biking, walking, and other commute options, employers may still offer them. One way to provide incentive for these other options is through Parking Cash Out, where employees can choose the cash benefit and commute by these alternative modes.

Commuter Choice Benefits Everyone

Employees:

Reduced Commuting Costs and Reduced Congestion - As a result of participation in this program, employees have more choice in how to get to work and how it is paid for. The tax savings or additional benefits lessen the cost of commuting for the employee, no matter how the benefit is offered, making it a win-win situation for that employee. The opportunities provided depend on the employer and the available alternatives in an area. As more and more people exercise Commuter Choice, congestion on America's busy highways will decrease.

Environmental Protection - When commuters drive alone in large numbers, they can contribute significantly to smog and air pollution. By using carpools, vanpools, public transportation, or biking/walking they are helping to make the environment cleaner for all Americans. Like recycling, Commuter Choice programs can contribute to ensure a clean and safe environment for ourselves and our children.

Parking Cash Out - Parking Cash Out gives an employee the option to trade an employer-provided parking space for its cash value (up to $175) or other benefits. If the cash is chosen, the employee can keep the money and carpool, telecommute, bike or walk. The money itself is taxable as income for that employee. Employees retain the option of keeping the tax-free parking space.

Employers:

Tax Savings - The Commuter Choice benefits that the employer pays for can be deducted from Federal business income taxes. In addition, no U.S. payroll taxes or other payroll related costs are required on the benefits either, whether the employer pays for them or offers them in lieu of compensation.

Enhanced Recruitment and Retention - With additional benefits, employers stand out in the competitive market for qualified employees. By offering a choice of commute option benefits, an employer can respond to the differing needs of these employees. Commuter Choice programs are attractive because they can help alleviate some of the problems associated with commuting.

Parking and the Business - Reducing employee demand for parking can free up parking spaces for customers, or the space can be converted for other revenue producing purposes. It also has the potential to remove the need for expensive new parking construction.

States and Cities:

State and local areas can apply emission reductions achieved through Commuter Choice programs toward meeting national air quality standards. Specifically, States and local areas can include Commuter Choice programs in State Implementation Plans (SIPs), which outline how air quality in the region will be improved.

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United States Environmental Protection Agency | Air and Radiation | EPA420-F-98-031 December 1998

Office of Mobile Sources

EPA

Environmental Fact Sheet

Commuter Choice: Information for Employers

Commuter Choice Programs allow businesses to give employees a better benefits package, save tax money, and save on parking costs. The programs also help employers improve local air quality and decrease traffic congestion.

What is Commuter Choice?

Commuter Choice programs provide a framework for employers to offer commute benefit options which will encourage employees to get to work in ways that are less polluting than driving alone. A Commuter Choice program can be developed by an individual company or as part of a wider regional strategy. Such programs serve as attractive employee benefits which help in the recruitment and retention of quality employees. In addition, because of recent changes in the Federal tax code, employers can save on taxes by offering these benefits.

Commute Options

Commuter Choice programs may include one, all, or a combination of the following individual benefits:

- Free or reduced cost passes for public transportation, such as subway cards, bus tokens, or train tickets.

- Services to facilitate vanpooling and carpooling such as providing vans, ridematching, and a guaranteed ride home.
- Telecommuting options (so employees can work at home more often).
- Proximate Commuting: a program that matches employees of multi-site employers (such as banks or chain stores) to the branch office nearest their home.
- Incentives to bike or walk.
- Parking Cash Out: employees can trade employer-paid parking space for cash or transit/vanpool benefits. (Employers can deduct the cashed out space from income taxes as a parking benefit.)

Commuter Benefits in Federal Tax Law

Federal law offers these tax advantages to employers who provide employees with qualified transit, vanpool, and parking benefits:

- Employers do not pay payroll taxes (e.g., FICA, unemployment insurance, and other payroll related costs) on the value of these benefits.
- When employers pay for the benefit, they can *deduct* the value of these benefits from their Federal business income taxes.
- Employers save compared to conventional raise or bonus.

Under the new tax law, employers can offer the specified benefits for their employees' work commutes in addition to or in lieu of compensation *Federal-tax-free* up to these Federal limits:

- Up to $175 per month for parking at or near work site and transit facilities
- Up to $65 per month for public transit
- Up to $65 per month for vanpool services

(For transit and vanpooling, this amount will increase to $100/month for taxable years beginning after December 31, 2001.)

Note: Tax Breaks on benefits only apply directly to transit, vanpool and parking benefits. The cash option from Parking Cash Out and any other monetary incentives are taxable for that employee. Subsidized parking and other transportation benefits do not become taxable if an employer offers them along with the Parking Cash Out option. Although the tax laws do not specifically relate to benefits like telecommuting, carpooling, biking, walking, and other commute options, employers may still offer

them. One way to provide incentive for these other options is through Parking Cash Out, where employees can choose the cash benefit and commute by these alternative modes.

How Benefits are Offered

1. In Addition to Compensation/Additional Benefit

An employee may receive the benefit *in addition to* their current wages. Specifically, they can receive transit, vanpool, and parking benefits *completely free of all U.S. payroll and Federal income taxes*. The employer pays for the benefit and receives a deduction from his Federal business income taxes for the value of the benefit. The employer also does not pay payroll related taxes or costs on the benefit.

Examples:

- Employer purchases a $65 subway or bus pass and gives it to the employee. Employee pays no payroll or income taxes on benefit. Employer pays no payroll taxes and deducts the $65/month ($780/year) expense.
- Employer provides a free vanpooling service worth $65 per month. Employer and employee experience same tax savings as above.
- Employer offers the $80 instead of the parking space (Parking Cash Out). Employee can take $80 as taxable income or keep parking space tax-free. Employer deducts the $960 per year benefit from Federal business income taxes, but pays payroll taxes on the cash for that employee.

2. In Lieu of Compensation/Pre-tax Benefit

An employer may permit employees to *set aside some of their income, before taxes*, to pay for their commutes. Employees may use this pre-tax income to pay for transit, vanpools, or parking. Employees would not pay Federal income taxes or payroll taxes on the amount they elect to set aside for the commute option, and employers would not pay U.S. payroll taxes or other payroll related costs since the amount is treated as a benefit rather than as taxable salary.

Example: Employee asks employer to set aside $65 per month of existing (pre-tax) salary for a subway or bus pass. Employee saves payroll and income taxes on $65 per month. Employer saves payroll taxes on $65 per month.

3.Cost-Sharing
Employers may *share the cost of commuting* to and from work with their employees. They could do this through a combination of the two benefits above.

Example: Employer provides a $35 transit pass. Employee asks employer to set aside $30 from existing (pre-tax) salary. Employer saves payroll taxes on $65 and deducts the additional $35 expense. Employee saves on payroll and income taxes for the $65 benefit.

Commuter Choice Can Save Employers Money

Clearly, employers do save money on taxes for providing the Federally specified benefits. In fact, because of these payroll and income tax savings, providing commute benefits can sometimes be cheaper than providing a salary increase (depending on fringe factors). However, there are also other ways costs can be cut, revenue produced, and money saved. Reducing employee demand for parking can free up parking spaces for customers, or the space can be converted for other revenue producing purposes. Commuter Choice programs also have the potential to remove need for expensive new parking construction.

Commuter Choice Enhances Recruitment and Retention

With additional benefits, employers stand out in the competitive market for qualified employees. By offering a choice of commute option benefits, an employer can respond to the differing needs of these employees. Under the current tax code, employers can realize Federal payroll and income tax savings while providing their employees with benefits that are appreciated by current employees and sought by potential employees.

Commuter Choice is Flexible For Employers

A Commuter Choice program can take different forms for employers in different areas. This is not a "one size fits all program" because transportation alternatives and parking situations vary from region to region. Employers have the flexibility to address commute benefit issues within the context of site specific circumstances.

Commuter Choice Improves Air Quality and Relieves Congestion

Commuter Choice programs can help reduce air pollution and other negative environmental effects from commuting by reducing vehicle miles traveled. Expanding travel choices is a way to improve air quality and decrease congestion. Commuters with choices other than free parking are less likely to drive alone to work.

Employers and Employees like Commuter Choice

The experience of many participating employers in Commuter Choice programs has been uniformly positive. Programs have achieved high satisfaction rates from employers and are well appreciated by employees. Parking Cash Out in California, for example, has been characterized as "a really good experience," "fairer," "very little administrative burden," and "loved" by employees.[1]

Getting Recognized for Commuter Choice

Employers can gain recognition for their programs. In early 1998, Tacoma, Washington held its first "Governor's Commute Smart Awards". Eighteen out of 900 work sites involved in the Washington Department of Transportation's (DOT) Commute Trip Reduction Program were honored at a luncheon in Olympia.

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[1] Shoup, Donald, "Evaluating the Effects of Parking Cash Out: Eight Case Studies," final report to the California Air Resources Board. Draft, May 22, 1997.

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Office of Mobile Sources

EPA

Environmental Fact Sheet

Commuter Choice: Information for Employees

Increase your income and your transportation options to and from work while doing your share to reduce congestion and air pollution. Ask your employer about Commuter Choice!

What is Commuter Choice?

Commuter Choice programs can provide employees with more ways to get to work and more help in paying for it. Commuters also save money on gas, oil, and tolls. Less time is wasted in traffic, and less wear and tear extends the life of a car. Commuter Choice does not limit employees that desire or need to continue driving.

Commuter Choice provides a framework for employers to offer their employees transportation options in commuting to and from work, such as:

- The ability to pay for commuting expenses with pre-tax income (thus reducing your taxes!).
- Free or reduced cost passes for public transportation, such as subway cards, bus tokens, or train tickets.
- Transit and vanpool vouchers for independent services.
- Services to facilitate carpooling and vanpooling such as providing vans, ridematching, and a guaranteed ride home.
- Telecommuting options (so you can work at home more often).
- Proximate Commuting: a program that matches employees of multi-site employers (such as banks or chain stores) to the branch office nearest their home.

- Incentives to bike or walk.
- Parking Cash Out: you can trade parking space for cash or other benefits.

Saving Money

Employees can save money with Commuter Choice Programs in one of three ways:

1. In Addition to Compensation/Additional Benefit
You may receive the benefit *in addition to* current wages. Specifically, you can receive transit, vanpool, and parking benefits *completely free of all U.S. payroll and Federal income taxes*. Your employer pays for the benefit and receives a deduction from his Federal business income taxes for the value of that benefit. The employer also does not pay payroll related taxes or costs on the benefit.

2. In Lieu of Compensation/Pre-tax Benefit
Your employer may permit you to *set aside some of your income, before taxes*, to pay for your commutes. You may use this pre-tax income to pay for transit, vanpools, or parking. You would not pay Federal income taxes or payroll taxes on the amount they elect to set aside for the commute option, and your employer would not pay U.S. payroll taxes or other payroll related costs since the amount is treated as a benefit rather than as taxable salary.

3. Cost-Sharing
Your employer may *share the cost of commuting* to and from work with you. They could do this through a combination of the two benefits.

Under the new tax law, employers can offer the specified benefits for their employees' work commutes in addition to or in lieu of compensation *Federal-tax-free* up to these limits:

- Up to $175 per month for parking at or near work site and transit facilities
- Up to $65 per month for public transit
- Up to $65 per month for vanpool services

(For transit and vanpooling, this amount will increase to $100/month for taxable years beginning after December 31, 2001.)

Parking Cash Out

Parking Cash Out allows employers who provide parking to offer you the option of receiving cash, or other qualified benefits, instead of a parking space. You can keep the money and carpool or use it to pay for other transportation. Or, you can choose to keep the Federal-tax-free parking space. Only if an employee accepts the cash option is the benefit taxable as income for that employee.

Proximate Commuting

For multi-site work locations, such as banks and fast food chains, this can be a very effective strategy. Many employees of multi-site businesses do not work in the branch closest to where they live. Proximate commuting matches new and existing employees to work sites closer to their homes and allows them to trade places.

Air Quality and Congestion

Free parking at work leads to more driving at times of the day when most of us are already on the road. In addition to creating congestion, emissions from tailpipes are a big contributor to urban smog. Additionally, emissions from automobiles are a major source of greenhouse gases that warm the atmosphere and contribute to the threat of climate change. Commuter Choice programs help reduce air pollution and other negative environmental effects from solo-driving.

Satisfaction

The experience of many participating employers in Commuter Choice programs has been uniformly positive. Programs have achieved high satisfaction rates from employers and are well appreciated by employees.

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APPENDIX F

As of November, 2000

STATE LAWS AND REGULATIONS IMPACTING ELECTRIC VEHICLES

Note: A 10% federal tax credit ($4,000 max.) is available for the purchase of, or conversion to, electric vehicles. A federal tax exemption ($100,000 max.) is available for refueling infrastructure.

ARIZONA

SB 1001
Law as of 10/20/00

Suspends for one year (from October 20, 2000 to October 19, 2001), all grants provided by the Arizona Clean Air Fund (SB 1504) relating to alternative fuel vehicles (AFVs), alternative fuel delivery systems and vehicle refueling apparatus, as well as all individual and corporate income tax credits relating to the above-mentioned vehicles and supporting equipment.

SB 2256
Law as of 4/00

Exempts neighborhood electric vehicles (NEVs) and golf carts, which were manufactured or modified before June 17, 1998, from registration requirements placed on foreign vehicles imported into Arizona.

SB 1504
Law as of 4/00

Creates the following new EV incentives

- Provides a rebate or tax credit from 30% to 50% of the cost of an AFV based on emission levels;
- Provides a tax credit for the incremental cost or conversion cost of an AFV;
- Provides an exemption from both state (5%) and local (1-2%) sales taxes for AFVs and AFV conversion equipment;
- Provides an exemption from emssions inspection for tests for AFVs with a gvw of less than 12,000 lbs.;
- Premits single occupant AFVs to use high occupancy vehicle (HOV) lanes, regardless of the number of occupants;
- Provides grants to non-profit organizations to purchase fueling equipment; and,
- Provides a tax credit for neighborhood electric vehicles (NEVs) with a gvw over 12,000 lbs.

Tax credits applicable to all vehicles purchased after January 1, 2000.

HB 2405
Law as of 6/99

Modifies existing EV incentives and creates several new ones:

$ Provides an individual and corporate income tax credit to a taxpayer who purchases or leases a new alternative fuel vehicle, converts a conventionally fueled vehicle to an alternative fuel vehicle, or purchases a used alternative fuel vehicle. The amount of the credit can be based on a graduated percentage based on the full cost of the vehicle and/or the vehicle emission levels. The percentage will range from 25 to 90% of the vehicle cost. Or, the credit amount can also be based on a $2,000 flat dollar amount, whichever credit would be greater.

$ Enables the Arizona Clean Air Fund (CAF) to provide grants available for individuals or small businesses that own or lease alternative fuel vehicles, of

S.B. 1002
Law as of 7/96

- $ Requires special AFV license plates; exempts EVs from the special license plate fee;
- $ Authorizes AFVs to use HOV lanes after 4/1/97;
- $ Requires signage for HOV lane access by AFVs regardless of occupant numbers;
- $ Requires AFV fueling stations to be identified on state highway maps.

Chapter 353
H.B. 2575
Law as of 4/94

$2 million for the alternative fuel delivery system and filling station development fund.

Chapter 206
H.R. 2095
Law as of 4/93

Alternative Use Fuel Tax Exemption

Chapter 1
S.B. 2001

$2.9 million was allocated to school districts for the conversion of buses and vehicles to alternative fuels or for the incremental costs of alternative fuel buses, as of May 6, 1999, all funds have been utilized.

ARKANSAS

Act 976
Law as of 3/99

Provides a tax credit equal to 50% of the amount spent during the taxable year for any Arkansas taxpayer who constructs a facility in Arkansas that would produce electric vehicles, fuel cells and/or photovoltaic devices.

Act 659

Creates a nine-member alternative fuels commission to coordinate and direct the development of alternative fuel vehicle markets.

CALIFORNIA

Chapter 1072
Law as of 9/00

Provides grants to individuals, local governments, state agencies, nonprofit organizations, and private businesses in an amount equal to 90% of the incremental cost above $1,000 of an eligible new ZEV light-duty car or truck. [*ZEVs shall include previously leased vehicles that have been substantially upgraded with new technologies (e.g. advanced batteries or power electronics).*]
Grants would be (1) available for ZEVs purchased after October 1, 2000 and before December 31, 2002, and (2) distributed over the first three years of the purchase lease and would not exceed $3,000 per year.

Chapter 929
S.B. 501
Law as of 10/95

Requires CARB to establish a program to create emission reduction credits through the retirement of light-duty vehicles from service. This program is to be applied *law* state-wide and operated by a private entity.

Chapter 862
S.B. 1302
Law as of 10/95

Authorizes a bus emissions reduction fund for school districts. School districts may access this fund for the replacement of diesel buses with low or zero-emission buses. Funds also may be utilized to retrofit buses to achieve emissions reductions.

A.B. 2766
SCAQD approved 7/95

$7 million appropriated for the "EV Charge" (formerly "Quick Charge" Zero Emission Vehicle Program. This two-year program (FY 1996-1997) provides matching funds to assist communities in testing the consumer market for EVs and demonstrating the infrastructure, permitting process, and coordination necessary for the introduction of large quantities of EVs. The "Quick Charge" Program also provides a includes a $5,000 per EV subsidy to the purchasers of 1,200 EVs.

$ *Expires:* 6/30/2000

Chapter 1000
A.B. 3239
Law as of 9/94

Prior law requires the Public Utilities Commission to authorize electric utilities to undertake activities of interest to the rate payer, including the development of electric vehicles. This law supplements the prior Act by further defining "interests" to mean direct benefits for ratepayers in the form of safer, more reliable, non discriminatory, or less costly, gas and electrical services.

Chapter 1218
S.B. 1952
Law as of 9/94

Renamed California Alternative Energy Source Financing Authority Act to the California Alternative Energy *and Advanced Transportation* Financing Authority Act and authorizes financial assistance for projects that relate to the development and commercialization of advanced transportation technologies, including electric vehicles.

Chapter 916
S.B. 1327
Law as of 9/94

Designates 20% of the state's Employment Training Fund for special training projects including the development of an electric/clean fuel industry.

E.O. W-100-94
signed 8/94

Governor Wilson issued an Executive Order to accelerate the purchase of alternative fuel vehicles for the State fleet. The Order authorizes the purchase of 900 AFVs by the year 2000. 25% of vehicle purchases in 1996 must be AFVs annually. Percentage is increased annually to 75% of purchases in 1999 and beyond. Beginning in 1996, at least 10% of purchases must be ultra low emission vehicles (ULEVs) and *zero emission vehicles (ZEVs)*.

Chapter 48
S.B. 678
Law as of 4/94

Technical changes regarding tax credits for low-emission vehicle purchases or conversion costs.

$ *Value of Tax Credit*:
55% of the cost incurred for the purchase of, or conversion to, a low-emission vehicle.

$ *Expired*: 1996

Chapter 875

Amends existing $1,000 tax credit for LEVs.

All references to alternative fuel vehicles (AFVs) include electric vehicles – All references to alternative fuels include electricity

S.B. 2103
S.B. 1123

Requires a utility commission investigation into the proper role of utilities in EV development.

COLORADO

HB 1067
Law as of 5/00

Provides individuals or businesses a tax credit of 85%of the incremental cost of ZEVs between 2000-2006; 75% of the incremental cost between 2006-2009, and between 2009-2011. (Credits also provided for other clean transportation technologies based on emission characteristics.) Provides a tax credit to individuals businesses based on the incremental/conversion cost of constructing, converting acquiring recharging/refueling infrastructure. Value is 50% between 2000-2006; 35% between 2006-2009; and 20% between 2009-2011. Provides a rebate for governmental and nonprofit organizations that purchase EVs at the same value as the vehicle credit noted above. Hybrids are included in the definition of a motor vehicle.

Executive Branch Initiative
approved in 1994

Provides rebates for purchase of, or conversion to, an AFV for public or private fleets as well as for individual use. Fleets operated by the federal government and fuel suppliers are ineligible for rebates. Rebates are provided on a first-come, first-served basis from 1995 through 1997.

$ *Value of Rebate:*
$ $1,500 (max.) for light-duty vehicles
$ $2,500 (max.) for light-duty trucks
$ $3,500 (max.) for medium-duty trucks
$ $6,000 (max.) for heavy-duty trucks

H.B. 1191
Law as of 6/92

Tax credit for purchases of EVs.

$ *Value of Tax Credit:*
5% of purchase price (Not to exceed 50% of the cost of the electric fuel system option)
$ *Expires:* 7/1/98

CONNECTICUT

Public Act 95-15
Law as of 4/95

Allows tax credits to encourage use of clean alternative fuels.

$ *Value of Tax Credit*:
10% for the incremental purchase cost of a new vehicle
50% for refueling stations and conversions
Applicable to utility gross receipts tax
Unused credits may be carried forward 3 years
$ *Expires*: 1/1/99

Public Act 94-170
S.B. 333
Law as of 6/94

Business tax credit to convert motor vehicles to use alternative fuels.

$ *Value of tax credit*:
50% of total conversion cost
$ *Expires*: 1/1/99

All references to alternative fuel vehicles (AFVs) include electric vehicles -- All references to alternative fuels include electricity

S.B. 116
Law as of 5/97

Designates use of High Occupancy Vehicle (HOV) lanes by alternatively-fueled vehicles with only one occupant. EV owners to apply for a special $50 license plate that will allow access to HOV lanes at all times. Funds raised by the license plate fee will help enforce new HOV travel lane use and be used for general highway maintenance.

HAWAII

Chapter 290

Requires the state Department of Transportation to adopt rules for registration of EV's in the State and to establish and issue special license plates for these vehicles.

S.B. 1160
Law as of 6/21/97

The bill exempts EVs from parking fees, high occupancy vehicle restrictions and waives registration and other fees. The law takes effect July 1, 1997 until July 1, 2002. The DOT is to review the incentive program every two years to determine the proper level of incentives for continuation of the program.

INDIANA

Chapter 123
Law as of 3/94

Establishes a task force to study renewable transportation fuels.

IOWA

Chapter 253

Requires a percentage of new state vehicles to be equipped to use alternative fuels: 5% beginning in 1/92; 10% beginning 1/94; AFVs may be financed under the Iowa Energy Bank Program which provides energy financing for public entities.

KANSAS

HB 2641
Law as of 5/00

-Prohibits the operation of low-speed vehicles on streets or highways with a posted speed limit greater than 40 miles per hour (mph).
-Defines a "low-speed vehicle" as any four-wheeled vehicle whose top-speed is greater than 20 mph (but not greater than 25 mph) and is manufactured in compliance with the National Highway and Traffic Safety Administration standards for low speed vehicles.
-Defines an "electric-assisted bicycle" as a bicycle with two or three wheels, a saddle, fully operative pedals for human propulsion, and an electric motor. The electric motor must have an output of no more than 1,000 watts, be incapable of independently reaching a speed greater than 20 mph on level ground, and be incapable of further increasing the speed of the electric bicycle when human power alone is used to propel the device beyond 20 mph.

S.B. 45
Law as of 5/99

Provides residents an income tax credit on expeditures made to purchase AFV's (including EVs) and/or refueling infrastructure. The tax credit, which is based on

Chapter 500
Law as of 6/97

Exempts AFVs from some taxes and parking and registration fees. Directs establishment of programs entitling utilities to recover costs if they provide AFV programs to their customers. Prohibits insurers from assessing an unsupported surcharge on a motor vehicle insurance policy. Establishes a program to guarantee loans made to operators of vehicle fleets and businesses in order to establish AFV support and maintenance facilities.

Chapter 127
Adopted 2/93

Adopts California LEV program.

MARYLAND

HB 20
Law as of 5/00

Provides a tax credit, equal to 100% of the imposed excise tax, for qualified EVs that are registered in the State of Maryland and titled before July 1, 2004. Tax credit may not exceed $2,000. Also provides tax credit from $250 to $1,000 for qualified hybrid electric vehicles, based on their energy efficiency; and, provides an additional tax credit from $125 to $500 depending on the amount of regenerative braking employed by the vehicle.

Chapter 705
H.B. 705
Law as of 5/98

Amends Chapter 124 to extend the tax credit against the public service corporate franchise tax and the state income tax for the costs of electric vehicles and related property from June 30, 1998 to June 30, 2001. The bill will sunset on July 1, 2001.

Chapter 124
S.B. 648
Law as of 5/95

Tax credit against the public service corporate franchise tax and the state income tax for the costs of electric vehicles and related property.
Credit may be applied for one year.
$ *Expires:* 1998

Chapter 201
Law as of 5/93

Adopts California LEV program, if surrounding States also enact the program.

Chapter 270
Law as of 5/93

Lowers the motor fuel tax rate for alternative fuels from $24.25 cents per gallon to $23.50 cents per gallon-equivalent.

Chapter 269
Law as of 5/93

Exempts certain refueling equipment and related machinery from state property tax.

$ *Value of Exemption*:
20% of assessed value in 1998
40% in 1999; 60% in 2000; 80% in 2001; and
100% in 2002 and each following taxable year.

Chapter 603
Law as of 5/93

Exempts conversion machinery and equipment from sales and use taxes.

MINNESOTA

S.B. 371

Provides $250,000 for the Commissioner of Transportation to test and install an *law as of 6/95* electric-powered road demonstration system with high occupancy vehicles, shuttles or buses under the "Saints Road Project" in St. Cloud, MN

Chapter 640
H.R. 3230
Law as of 5/94

An omnibus transportation bill that:

- $ Requires a study of electric vehicle transportation technology;
- $ Appropriates funds to study road-powered electric vehicle technology and high-speed rail under the Saints Road Project;
- $ Requires the Commissioner to study specific airport electrification issues and the cost of electric light rail transportation.

Chapter 587
H.R. 3029
Law as of 5/94

Requires annual permits for AFVs.

- $ *Cost of Permit*:
  $141-$420 per vehicle (according to vehicle weight)

Excludes the sale of compressed natural gas or propane for certain vehicles from the motor fuel tax.

Chapter 254
Law as of 5/93

Requires the Public Utilities Commission to develop alternative fuels infrastructure.

MISSOURI

Chapter 414
Law as of 7/91

Establishes a timetable for the conversion of government fleets consisting of 15 or more vehicles: 10% by 7/96; 30% by 7/98; and 50% by 2000.

MONTANA

S.B. 251
Law as of 3/95

Establishes a transportation energy policy and an alternative fuels policy as well as implementation guidelines.

NEBRASKA

L.B. 1160
Law as of 4/94

Requires AFV operators to purchase an alternative fuel user permit annually to pay for the estimated fuel use tax liability.

S.B. 102
Law as of 6/93

NEW JERSEY

SB 16/HB 2586 Directs the Department of Transportation and the New Jersey Transit Corporation to prepare a five-year Capital Investment Strategy that outlines a preliminary timetable for the replacement of the current diesel bus fleet with a fleet of buses that have reduced emissions. (New Jersey Transit may consider cooperative efforts to develop "clean buses" as part of its strategy.)
Law as of 5/00

Beginning July 1, 2007, and each fiscal year thereafter, all buses purchased by the New Jersey Transit Corporation shall be buses with improved pollution controls or buses powered by a fuel other than conventional diesel (e.g., compressed natural gas vehicles; hybrid vehicles; fuel cell vehicles; biodiesel vehicles; vehicles operated on ultra low sulfur fuel, as well as vehicles operated on any other fuel approved by the U.S. Environmental Protection Agency.)

C69-1993 Adopts California LEV program, if surrounding states also enact the program.
S. 1346
Law as of 3/93

NEW MEXICO

H.B. 66 Establishes an incentive for using vehicles converted to alternative fuels and provides for the imposition and collection of the Alternative Fuel Excise Tax.
Law as of 3/95

SJM10 Urges New Mexico state energy policy and any energy-policy related agencies to promote the use of all alternative transportation fuels.
signed on 2/95

Chapter 130 $750,000 provided to the State's alternative fuel conversion loan fund to provide loans for the conversion of vehicles to alternative fuels.
H.B. 940
Law as of 3/94

Sets a timetable for conversion of state government vehicles to alternative fuels.

13-1B-1 NMSA The Alternative Fuel Conversion Act mandates the conversion of at least 30% of new State-owned vehicles beginning in mid-year 1993. This percentage increases to 60% in 1994 and 100% in 1995.

Post-secondary institution fleets also are required to convert to alternative fuels.Provides $5 million to a loan fund to finance conversions.

NEW YORK

All references to alternative fuel vehicles (AFVs) include electric vehicles – All references to alternative fuels include electricity

10% ($200 maximum for vehicles under 10,000 lbs. and $500 maximum for vehicles over 10,000 lbs.)

$ *Expires:* 12/97

OKLAHOMA

H.B. 2655
Law as of 4/98

Amends the Oklahoma Alternative Fuels Conversion Fund to allow electric vehicles purchased/converted by schools and the government, and EV recharging property installed by the schools and/or the state, county or municipal governments, to receive funds.

$ *Value*:
$5,000 for EV purchases or conversions (government and school vehicles only)
$100,000 for charging stations

Amends the Committee of Alternative Fuels Technician Examiners to include an EV technician and an individual involved in manufacturing, EV conversions, or EV research. Sets criteria for certifying EV technicians.

Chapter 224
S.B. 679
Law as of 5/96

Provides an income tax credit for individuals who invest in EVs.

$ *Value of Credit:*
12/90-1/97: 50% of cost of converting a vehicle to alternative fuels;
1/97-1/2002: 20% of cost of converting a vehicle to alternative fuels;
10% up to $1,500 for the purchase of an AFV, including EVs

Ineligible for credit: golf carts; go-carts; other "off-road" vehicles

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Chapter 379
H.B. 1886
Law as of 6/94

Develops a training curriculum for technicians who install alternative fuel dispensing stations.

One-time income tax credit for investments in AFV property placed in service after 12/31/90.

$ *Value of Credit*:
50% of the cost of the property if placed in service before 1997
20% after 1/1/97

Requires conversion of school and government vehicles when such fuels are reasonably available.

Chapter 224
H.B. 1063
Law as of 1993

Establishes Alternative Fuels Conversion Fund to make loans for AFV conversions

$ *Value of Loans*:
$5,000 for AFV purchases or conversions
$100,000 for refueling stations

Chapter 235

10% discount, based on the total cost of the AFV, up to $1,500 maximum.

RHODE ISLAND

HR 7879
Law as of 5/00

Requests that the Rhode Island Airport Corporation provide incentives to rental car companies and motor carriers for the use of alternative fuel vehicles. (Legislation does not define an AFV).

Chapter 168
H.B. 6745
Law as of 7/3/97

The Alternative Fueled Vehicle Incentive Act of 1997 provides tax incentives to individuals, groups, associations, corporations and other organizations that utilize domestically produced alternative fuels as set forth in the Energy Policy Act of 1992.

- $ 50% tax credit to businesses for the construction of EV recharging stations (available from January 1, 1998 - January 1, 2003);
- $ tax credit equal to 50% of the incremental cost of purchasing an EV or converting a vehicle to an alternative fuel. Tax credit is available to all taxpaying entities (available from January 1, 1998 - January 1, 2003); and,
- $ Gross earnings from the sale of alternative fuels may be deducted by a corporation from its gross earnings tax returns (available from January 1, 1998 - December 31, 2002).

Chapter 361
H.B. 8161
Law as of 7/92

Grants the Department of Environmental Management the authority to regulate tailpipe emissions and promulgate regulations in 1994 for the LEV program.

SOUTH CAROLINA

Chapter 52

Creates the Alternative Transportation Fuels Study Committee to study clean alternative transportation fuels.

TENNESSEE

HJR 210
signed on 6/95

Establishes a committee to study alternative fuel use.

Joint Resolution
approved in 1992

Urges the development and use of alternative fuels.

TEXAS

H.B. 1441
Law as of 6/95

Affects the manner in which the Public Finance Authority funds the state's alternative fuels infrastructure.

All references to alternative fuel vehicles (AFVs) include electric vehicles – All references to alternative fuels include electricity

Law as of 3/95

$ *Value of Credit*:
$700 per year/per job

Chapter 664
H.B. 1892
Law as of 3/95

Eliminates the special fuels (diesel) category for the calculation of tax rates and credits, but maintains the clean special fuels exemptions. Electricity is considered a "clean special fuel."

S.B. 656
Law as of 3/95

Extends the clean fuel tax credit to allow individuals and corporations to claim a tax credit against income and gross receipts taxes for purchases of clean-fuel vehicles.

S.B. 772
Law as of 3/95

Eliminates the annual $10 surcharge for issuance of "clean special fuel" vehicle license plates.

$ *Charge Waver Expires*: 7/1/98

HJR 410
approved 2/95

Resolution continues the Clean Fuels Study Subcommittee for a sixth year.

S.B. 883
Law as of 2/95

Makes Federally owned motor vehicle fleets subject to the Virginia Clean Fuel Fleets Program.

Chapter 875
H.B. 97
Law as of 4/94

Includes electric vehicles as a clean fuel vehicle eligible for corporate income tax credits. Any individual or public service corporation may receive the tax credit.

$ *Value of Tax Credit:*
10% of the deduction allowed under the Internal Revenue Code.
If the credit exceeds the tax liability in one year, it may be carried forward for up to five years.

Chapter 527
H.B. 67
Law as of 4/94

The 3% motor vehicle sales and use tax rates will be replaced with a 1 1/2% rate for motor vehicles converted or retrofitted to use clean fuels.

$ *Effective:* 1/1/96

Chapter 528
H.B. 71
Law as of 4/94

Authorizes the issuance of local motor vehicle licenses free of charge for AFVs.

Chapter 164
H.B. 949
Law as of 4/94

Extends a tax credit to income or gross receipt taxes allowed to individuals and businesses for the purchase of clean fuel vehicles or refueling property.

$ *Value of Tax Credit*:
10% of the Federal tax credit
The credit may be extended for up to five succeeding years

All references to alternative fuel vehicles (AFVs) include electric vehicles – All references to alternative fuels include electricity

S.B. 720
approved in 1999

Extends the date that single-occupant drivers of vehicles displaying "clean special fuel" licence plates can use HOV lanes until July 1, 2004.
$ *Effective July 1, 1999*

WASHINGTON

King County
Ordnance 9891
approved in 1991

Required 50% of vehicles purchased in 1992 to be AFVs.

King County
Ordinance 9892
approved in 1991

Waives licensing fee for taxicabs and for-hire vehicles that use alternative fuels.

$ *Expires*: 1996

King County
Ordinance 9893
approved in 1991

Provided $132,500 to implement the Alternative Fuels Pilot Program.

Chapter 199
Law as of 1991

Requires 30% of vehicles purchased through State contracts to use clean fuels after 7/92. This percentage increases by 5% each subsequent year.

WEST VIRGINIA

Chapter 94
S.B. 508
Law as of 5/93

Provides for the purchase and use of AFVs in fleets owned by *political subdivisions* and specifies the minimum AFV purchase requirements for 1995-1997.

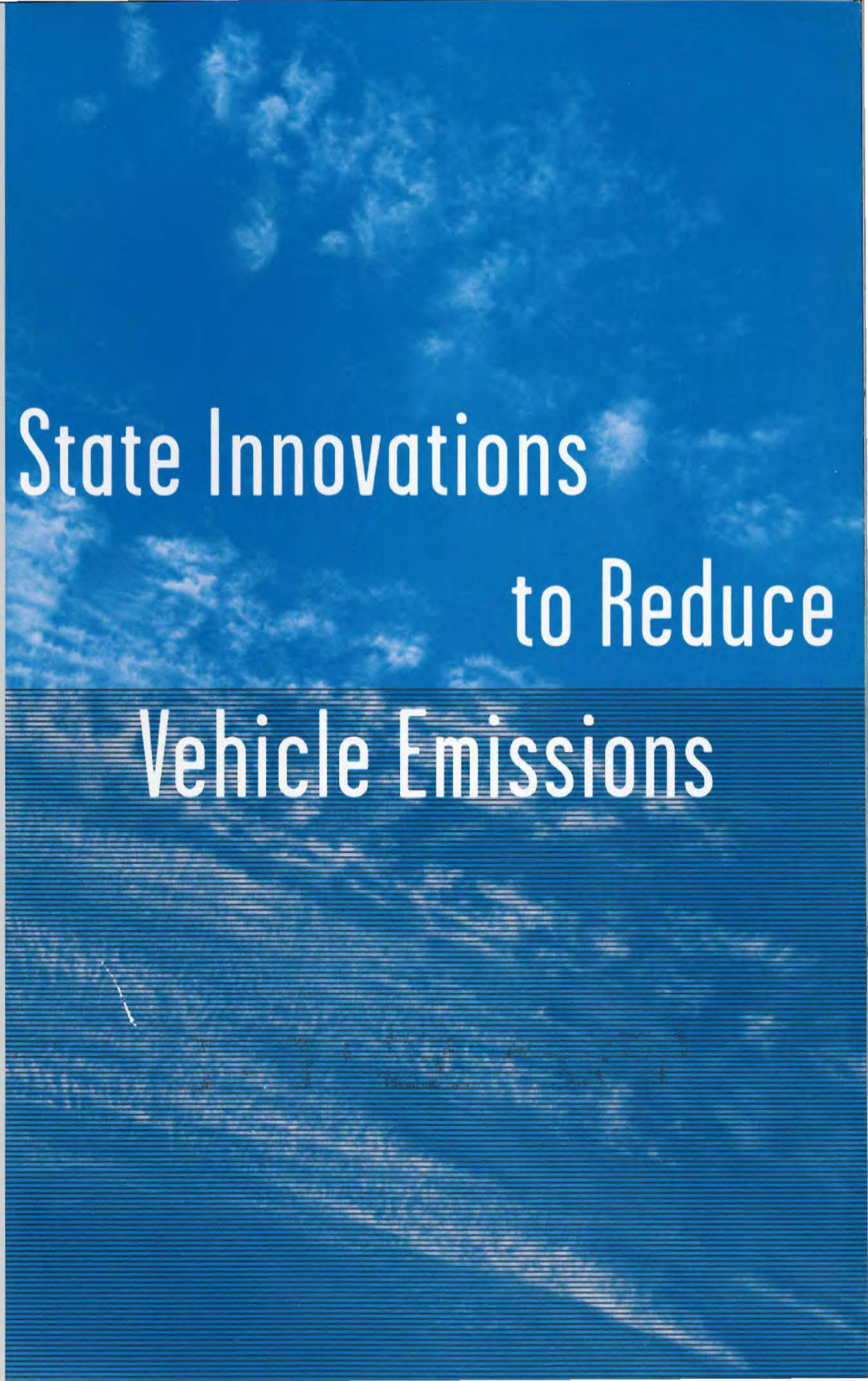
Chapter 92
S.B. 509
Law as of 4/93

Provides for the purchase and use of AFVs in state-owned fleets owned by government entities and specifies the minimum government AFV purchase requirements for 1995-1997.

WISCONSIN

Task Force

The State developed a task force in 1989 to monitor a State fleet alternative fuels pilot program and to develop State policy on the use of alternative fuels.



State Innovations to Reduce Vehicle Emissions

NATIONAL GOVERNORS' ASSOCIATION

NGA CENTER FOR BEST PRACTICES

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NGA Center for
Best Practices

Natural Resources
Policy Studies Division

State Innovations To Reduce Vehicle Emissions

Since their initial meeting in 1908 to discuss interstate water problems, the Governors have worked through the National Governors' Association to deal collectively with issues of public policy and governance. The association's ongoing mission is to support the work of the Governors by providing a bipartisan forum to help shape and implement national policy and to solve state problems.

The members of the National Governors' Association are the Governors of the fifty states, the territories of American Samoa, Guam, and the Virgin Islands, and the commonwealths of the Northern Mariana Islands and Puerto Rico. The association has a nine-member Executive Committee and three standing committees—on Economic Development and Commerce, Human Resources, and Natural Resources. Through NGA's committees, the Governors examine and develop policy and address key state and national issues. Special task forces often are created to focus gubernatorial attention on federal legislation or on state-level issues.

The association works closely with the administration and Congress on state-federal policy issues through its offices in the Hall of the States in Washington, D.C. The association serves as a vehicle for sharing knowledge of innovative programs among the states and provides technical assistance and consultant services to Governors on a wide range of management and policy issues.

The Center for Best Practices is a vehicle for sharing knowledge about innovative state activities, exploring the impact of federal initiatives on state government, and providing technical assistance to states. The center works in a number of policy fields, including agriculture and rural development, economic development, education, energy and environment, health, social services, technology, trade, transportation, and workforce development.

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Contents

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Martha C. Bohm, a policy associate in the NGA Center's Natural Resources Policy Studies Division authored this report.

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Executive Summary

Vehicles and fuels have become much cleaner since the 1970 passage of the Clean Air Act, but the trends of increased driving and ever-worsening congestion could threaten continued air quality improvements. States are responsible for designing strategies that achieve and maintain national air quality standards, as established by the U.S. Environmental Protection Agency (EPA) for the mobile-source pollutants: carbon monoxide, nitrogen oxides, volatile organic carbons, and particulate matter.

Federal regulations largely control fuel formulas and vehicle emissions standards, but states have a wide range of other options for controlling mobile source pollution. State programs to curb pollution from motor vehicles can be grouped into the following four general categories:

- ensuring tailpipe emissions standards are met through inspection and maintenance;
- slowing the increase in vehicle miles traveled;
- mitigating congestion; and
- encouraging the purchase of alternative fuel vehicles.

This report examines a selection of innovative strategies in each of these four categories and discusses how these strategies might be applied to maximize the potential for emissions reduction.

Inspection and Maintenance

The most cost-effective approach to lowering motor vehicle emissions in some metropolitan areas is to ensure that the national tailpipe emissions standard for each vehicle is met over the life of the vehicle. One effective way to achieve this is through inspection and maintenance (I&M) programs, which ensure that vehicles continue to operate efficiently and emit air pollutants only at their certified level. These programs involve periodic testing or remote sensing of vehicles for malfunctioning emissions equipment and require repairs of vehicles not making the grade.

To be most effective, I&M programs should be implemented in ways that minimize expense and inconvenience to motorists. Because the majority of pollution comes from older vehicles, the most effective programs target these vehicles for inspection and repair. Vehicles with newer technology gradually penetrate the market, resulting in the turnover of the total fleet, but vehicles with less-advanced technology or malfunctioning systems are a significant pollution source.

One example of an innovative I&M program is Missouri's clean-screening program, which uses remote sensing technology to detect vehicle emissions on the road. The technology enables the state to exempt the cleanest vehicles from the inconvenience of station testing, while still requiring inspection and repair of dirtier cars. The state decreases the burden on the public while maintaining the air quality benefit of the program.

Slowing the Growth of Vehicle Miles Traveled

States also help reduce air pollution by slowing the growth in the number of miles driven. Many states encourage less driving on days or

in seasons of high pollution rather than seeking reductions in driving every day. States actively emphasize the use of alternative travel modes on these days and may provide financial incentives to people who use them. States publicize vehicle miles traveled (VMT) reduction strategies either through mass advertising or by engaging business and governmental entities in a VMT reduction program. Some conduct outreach efforts only on specifically selected "ozone action days," and some attempt to lower VMT and ozone production during the entire summer. Methods to reduce vehicle miles traveled are often similar to the methods to reduce congestion.

An example of a state VMT reduction strategy is the Partnership for a Smog-free Georgia, a program that enlists public agencies and private-sector companies to encourage driving reductions. The goal of the program is to decrease single-occupant vehicles during the ozone season, and a noticeable decrease in peak traffic volume has been observed since the start of the program.

Mitigating Congestion

States attempt to minimize congestion because stop-and-go traffic contributes more of some pollutants than does free-flowing traffic. Common techniques include carpooling and vanpooling, transit use, bike and pedestrian programs, high-occupancy vehicle (HOV) lanes, land-use planning, and signal timing. Congestion mitigation tends to focus on high travel times of the day, whereas VMT reduction strategies are geared toward changing overall driving habits on certain days or during certain seasons. Though the tools are the same, the way they are implemented determines whether they have the desired effect.

An innovative congestion mitigation strategy is employed in California, where a congestion-sensitive toll pricing system has been put in place on a heavily traveled highway in Los Angeles. This system charges commuters more during peak commute hours, and therefore encourages ridesharing and non-peak hour travel. The length of rush hour has decreased on this highway since the dynamic pricing system was instituted.

Encouraging Alternative Fuel Vehicles

The use of alternative fuels, such as compressed natural gas, liquefied petroleum gas, electricity, methanol, or ethanol may reduce emissions of air pollutants. Reductions vary in degree and type depending on the kind of alternative fuel used. Alternative fuel vehicles (AFVs) help to reduce emissions even in the absence of VMT or congestion reduction from the fleet. Drawbacks to using AFVs include their generally higher costs and the inconvenience and expense of maintenance and fueling. New conventional-fuel vehicles are generally achieving lower emissions criteria, and national strategies are expected to continue this trend. Therefore the use of AFVs tends to be confined to operators of fleets of vehicles. Many states have begun to offer financial incentives for the purchase of vehicles or building of the necessary infrastructure to support AFVs.

An example of an AFV incentive program is the Oklahoma Alternative Fuel Program, which provides a revolving fund for no-interest loans to governmental entities for vehicle conversion or the installation of refueling infrastructure. The program has funded the purchase of 370 vehicles and the building of 9 fueling stations since its inception.

Introduction

Background

Progress has been made to reduce tailpipe emissions even as the rate of vehicle miles traveled (VMT) has increased. However, there are limits to future technological progress. Moreover, two trends are working to negate progress: increasing VMT and congestion. Innovative strategies may be needed to reduce the air pollution contributions from rising VMT and worsening congestion and to ensure that vehicle emissions systems function on the road according to their design standards.

Air quality over the past 30 years has improved significantly in terms of decreases in carbon monoxide (CO), nitrogen oxides (NO_x), volatile organic compounds (VOC), lead (Pb), and sulfur dioxide (SO_2). Mobile source emission reductions have contributed most to these improvements, particularly reductions from technological conrrols. According to the U.S. Environmental Protection Agency (EPA), today's new cars are up to 90 percent cleaner than their 1970 counterparts. Many provisions in the Clean Air Act (CAA) will further reduce harmful emissions from all sources. However, continued increases in automobile travel could, in 20 years to 30 years, begin to erode the progress made in lowering vehicle emissions if technology does not keep pace. Srates can help address this problem through a number of innovative programs to reduce total emissions from mobile sources.

Progress Made in Reducing Mobile-source Air Pollution

Significanr reductions in air pollutants from automobiles have been made since the CAA's passage in 1970. Specifically, cleaner fuel formulations; use of new engine designs and tailpipe treatments, on-board diagnostics, and vehicle tailpipe emissions standards; and the associated inspection and maintenance programs to ensure the achievement of these standards have brought substantial air quality gains over the last three decades. These approaches have been largely federal in scope; under the CAA, states are generally prevented from individually establishing tailpipe emissions or fuel standards. (Two important exceptions to this prohibition are the opt-in to the federal reformulated gasoline program and state adoption of a Reid vapor pressure (RVP) requirement that is more stringent than the federal requirement.) Since the implementation of these programs, on-road vehicle emissions of NO_x are down 60 percent, CO by 40 percent, and coarse particulate matter (PM_{10}) by 25 percent. These substantial reductions reflect the success of the federal vehicle and fuel regulations.

Future Challenges to Continued Air Quality Improvements

Despite the progress made in reducing tailpipe emissions from cars, two trends present challenges to future reductions: VMT has grown rapidly and continues to increase, and congestion levels are continually increasing in metropolitan areas across the country. In the last 30 years, the total VMT in the country grew by 125 percent, roughly 4 times the rate of population growth. VMT growth also outpaced inflation-adjusted gross domestic product and the number of vehicles on the road by 25 percent each. Americans simply continue to drive more miles per person and have more cars per household. This trend is projected to

The Dirty Half-dozen: Criteria Pollutants Regulated by the U.S. Environmental Protection Agency

Ozone: Also known as "smog," ozone is a powerful lung irritant and inhibitor of plant growth. Because its formation is sunlight dependent, it is a greater problem on summer days. It is formed from a reaction between nitrogen oxides and organic gases.

CO: Carbon monoxide is a poisonous gas formed from incomplete fuel combustion. Mobile sources account for about three-quarters of CO emissions.

NO_2: Nitrogen dioxide and nitrogen oxide are collectively referred to as "NO_x," a class of pollutants from fuel combustion that contributes to acid rain and to ozone formation. Mobile sources account for one-third of NO_x emissions.

PM_{10}: Particulate matter includes tiny particles of soot, smoke, and dust, and small droplets of other pollutants. Mobile and industrial sources combined make up 10 percent of particulate matter emissions.

Pb: Lead has been removed from gasoline so mobile sources are no longer a major contributor.

SO_2: Mobile sources are not a major contributor of sulfur dioxide.

continue, with VMT growth possibly outpacing emissions reductions in 2020. This projected date is area-specific, with faster-growing metropolitan areas facing the problem sooner than slower-growing metropolitan areas.

In recent years, the number of light-duty trucks sold has grown; they now represent half of new vehicle sales. Because light-duty trucks, including pick-up trucks, minivans, and sport utility vehicles, currently have less-stringent tailpipe emissions standards than passenger cars, the growth of this vehicle market has increasingly contributed to mobile-source air pollution. Under EPA's Tier 2 standards, this contribution should begin to decline after model year 2004, when light-duty trucks will be required to meet the same standards as passenger cars.

In the time that VMT more than doubled, the number of new route miles added to the highway system grew by only 5 percent. The explosion in VMT, coupled with only a modest growth in road miles, has resulted in increased traffic congestion. This increase has been a larger problem in urban areas with more concentrated driver populations. At least 20 of the nation's large cities have seen increases of 30 percent or more in congestion over the last 25 years. Increased congestion brings increased emissions, as cars release more of certain pollutants under stop-and-go or slow conditions.

Traffic congestion is the top quality-of-life concern in numerous public surveys. Several governors have taken action to influence growth and land-use planning to alleviate what is seen as a threat to citizens' desired quality of place. Governors cite the undesirable outcomes of higher governmental costs and threatened economic growth from this decreasing quality of life as reasons for implementing smart growth strategies. These strategies were explored in the recent NGA report, *Growing Pains: Quality of Life in the New Economy.*

The emissions from continued growth in VMT and congestion offset some of the gains from the original federal regulations for tailpipe standards and fuels, despite the enormous air quality benefits of the federal strategies. Many areas have been unable to comply with the national air standards in the time prescribed under the CAA.[1]

Road Building May Not Be the Only Solution to Congestion

In some areas, the solution to the growing congestion problem may be simply to build more roads. This can be a challenge for some states that may not have the space to build these roads or the funds for construction. In addition to building new roads, states should maximize the usefulness of existing roads through construction improvements and through technologies to facilitate smoother flow of traffic.

Though there are many issues surrounding road building beyond just air quality concerns, this report does not address programs and policies concerning road construction.

Technology Will Not Provide Immediate Answers to the Air Quality Threat

Further technological advances in emissions control will not solve this problem right away. The National Low-Emission Vehicles Program (NLEV) first makes lower-emission vehicles available in nine northeastern states, and later (in model year 2001) in the rest of the country. Completely new technology, such as fuel-cell-powered vehicles or hybrid electric-gasoline vehicles, will eventually provide air quality benefits with greenhouse gas reductions, but significant nationwide use of these technologies cannot be expected in the near future. The first privately developed vehicles with extraordinarily high fuel efficiency will be coming on the market in some areas in the next few years, and these will provide greenhouse gas emissions reductions. However, it is unknown whether these vehicles will be cost-effective enough for large-scale industry production, and whether they will be priced competitively enough for a large enough market to produce large air quality gains. A federal research and development program called the Partnership for a New Generation of Vehicles exists to create a new class of vehicles with gas mileage of at least 80 miles per gallon. However, these cars are not expected to be sold until at least 2004. Affordability remains a major challenge.

States may have to consider programs to supplement federally enacted control strategies because of the timing of the newest standards. The most advanced vehicle emissions technology improvements will not have a pronounced impact upon regional air quality until placed into production and made available for purchase. The full impact will not be realized until the existing regional fleet of vehicles is retired and replaced.

Changes in fuel formulation are also unlikely to yield large emissions reductions. Like the removal of lead additives from gasoline, which in the mid 1970s virtually eliminated lead emissions, dramatically reduced gasoline sulfur levels under new fuels standards (Tier 2) will achieve significant reductions in hydrocarbons (HC), CO, and NO_x emission components. The reduction of sulfur in fuels is likely to increase the effectiveness of tailpipe controls remarkably. In addition, Phase II of the reformulated gasoline program recently went into effect in the nation's smoggiest cities to help reduce ozone precursor emissions. However, after these two new clean fuels strategies, improvements in gasoline formulation may be politically more difficult.

Cleaner Diesel Vehicles Will Provide Future Emission Reductions

EPA is currently gathering information on the best strategy for requiring cleaner diesel fuel. Although new car emission rates have decreased 85 percent to 99 percent with Tier 2, depending on the pollutant, diesel truck emission rates have only declined by 10 percent to 60 percent. Diesel vehicles contribute about one-third of on-road NO_x emissions and about three-quarters of on-road particulate emissions, so these future federal regulations, EPA's Heavy-duty Engine Rulemaking, will provide another piece of the solution to the mobile source air pollution problem. A Notice of Proposed Rulemaking (NPRM) was published October 6, 1999, for the first phase of the standards that take effect in the 2004 model year. The second phase—more stringent standards along with sulfur controls that will result in a reduction of more than 90 percent in NO_x and PM—could take effect as early as 2007 under a separate NPRM published May 17, 2000.

Innovative Strategies Will Reduce Mobile Source Emissions

The CAA brought a number of additional strategies that states can use to reach required air quality goals. The provisions include planning strategies, VMT reduction and traffic congestion mitigation (programs collectively called transportation control measures or TCMs), regional fuel reformulations, alternative fuel programs, and new inspection and

National Fuel and Tailpipe Regulations to Achieve and Maintain Air Quality

Federal requirements for gasoline and automobile tailpipe emissions have had significant impacts on air quality since they were first implemented. EPA has the authority to regulate fuel composition, vehicle fleets, and emissions from on- and off-road vehicles.

Federal standards currently regulate standard or "baseline" gasoline to meet certain limits on sulfur, vapor pressure, and toxics, and require a minimum octane concentration. EPA is tightening these requirements under new regulations that will substantially limit the amount of sulfur in everyday gasoline.

Federal law also limits emissions from new-vehicle tailpipes. These standards have reduced tailpipe emissions from new cars by 95 percent. Emission standards are required over the entire useful life of the vehicle. Under the Tier 2 regulations, "useful life" is defined as 120,000 miles. Changes to federal regulations will further reduce NO_x levels by 70 percent to 90 percent and bring cars and light-duty trucks (i.e., pickups, sport utility vehicles, and minivans) under the same emission control requirements.

California is the only state allowed under the CAA to pass its own regulations on fuels or vehicle emissions. Under these provisions California adopted the Low Emission Vehicle/ Clean Fleet program, which requires lowered tailpipe emissions, use of clean fuels, and the sale of Zero Emission Vehicles (ZEV). Other states can adopt some of California's stricter legal requirements if they choose. In particular, several East Coast members of the Ozone Transport Commission petitioned EPA to require the LEV/ZEV portion of California's program in the northeast ozone transport region. This program, known as the National Low Emission Vehicle (NLEV) program, represents a voluntary agreement among the northeast states and automobile companies to put cleaner vehicles on the road in the northeast states several years before they will be available to consumers in the rest of the country.

maintenance (I&M) procedures. State program efforts are critical to reducing pollution to meet the national ambient air quality standards (NAAQS). States have some flexibility in the implementation of required programs, and they have the freedom to select additional programs that suit their needs.

These CAA provisions do not, however, reduce emissions by a large amount relative to ongoing reductions from cleaner fuels and new, more strict vehicle emissions standards. Most emission reductions in the past have come from cleaner cars and cleaner fuel. Although on-road mobile source emissions are declining as a percentage of total emissions and total emissions are declining for most pollutants, mobile sources still account for about 30 percent of volatile organic compounds and NO_x pollution and about 60 percent of CO emissions. There is clearly room for additional reductions.

However, the states, not the federal government, have the responsibility for air quality control, and the CAA gives them specific requirements and defines the flexibility they have to create plans to meet air quality goals. The variety of options available also presents states with the challenge of building the most effective strategy from the many available tactics.

Implementation Options for Air Quality Control Programs

Through a combination of national standards and state-implemented programs, the nation's air has become significantly cleaner. However, the air pollution problem cannot be declared "solved," as VMT and congestion may continue to be issues. States need flexibility to implement innovative or pilot programs to determine which are the most successful at alleviating their pollution problems.

This report presents a selection of state programs for ensuring national tailpipe standards, slowing the growth in VMT, reducing congestion, and encouraging the purchase of alternative fuel vehicles. It highlights strategies that push the boundaries of integrated transportation and clean air planning and explains how and why such measures work.

Ensuring National Emissions Standards Through Inspection and Maintenance

EPA points out that today's cars are up to 90 percent cleaner than their 1970 counterparts. However, older, poorly kept vehicles emit far more air pollution than do newer and properly maintained vehicles. Malfunctioning and poorly maintained vehicles produce excess emissions, sometimes as high as 17 times the pollution they were designed and certified to emit. To help control emissions from mobile sources in areas of high ozone pollution, the Clean Air Act Amendments of 1990 (CAAA) require inspection and maintenance (I&M) programs that involve periodic checks of a vehicle's emission control system and mandatory repairs of any malfunctioning system. EPA has established a model program rule to enable states to meet the minimum emission reduction requirements and performance standards required of I&M programs.

Of all the programs presented in this report, I&M has produced the greatest emissions reductions. I&M can reduce vehicle-related hydrocarbon and carbon monoxide emissions by up to 30 percent and nitrous oxide emissions by up to 10 percent. The total cost of this pollution reduction has been estimated at $500 to $1,000 per ton, making it also one of the most cost-effective pollution reduction methods presented here. Other approaches can cost 10 times as much.

On-board diagnostic (OBD) systems in newer cars help supplement the states' I&M programs. The OBD system assures proper emission control system operation for the vehicle's lifetime by monitoring emission-related components and systems for deterioration and malfunction. OBD can detect a system problem before the driver notices a driveability problem. Furthermore, OBD can detect problems that may not be noticeable upon visual inspection because many component failures that impact emissions can be electrical or even chemical in nature. By detecting these emission-related failures and alerting drivers to the potential need for repair, OBD systems make it possible for vehicles to be repaired before emissions become a problem. EPA requires OBD systems on light-duty vehicles and light-duty trucks beginning with the 1994 model year.

EPA allows a state to vary the design elements of a given model I&M program, as long as the program meets the minimum performance standard for CO, HC, and NO_x. States have the flexibility to vary the testing network (test-only or test-and-repair), the frequency of inspections, the types of vehicles tested, the type of testing equipment, the stringency of the test, and the use of repair waivers.[2]

Despite its cost effectiveness, I&M is not necessarily the first choice for air pollution control in all regions. Several areas, including the Detroit metropolitan area and Minnesota, used I&M for several years to attain air compliance and then discontinued the program without detriment to their air quality. Though I&M has advantages, it is not a panacea for a region's air quality concerns.

Table 1: I&M in the States

Types of I&M Programs Used by States		
Network Type	**Number of States/Areas**	**States**
Test-and-Repair Network	19	Alaska, California (basic I/M), Colorado, Idaho, Louisiana, Maine, Massachusetts, Nevada, New Hampshire, New Mexico, New York, North Carolina, Oklahoma, Pennsylvania, Rhode Island, Texas, Utah, Vermont, Virginia
Test-Only Network	17	Arizona, Colorado, Connecticut, Delaware, District of Columbia, Florida, Illinois, Indiana, Kentucky, Maryland, Missouri, Ohio, Oregon, Tennessee, Utah, Washington, Wisconsin
Hybrid Network	3	California (enhanced I/M), Georgia, New Jersey
Test Type		
IM240 Test	10	Arizona, Colorado, District of Columbia, Illinois, Indiana, Maryland, Missouri, Ohio, Utah, Wisconsin
Idle Test	15	Arizona, Colorado, Delaware, District of Columbia, Florida, Idaho, Indiana, Kentucky, Maryland, Missouri, New Jersey, New York, Ohio, Tennessee, Washington
2-Speed Idle Test	12	Alaska, California (basic I/M), Colorado, Georgia, Nevada, New Mexico, North Carolina, Oregon, Pennsylvania, Texas, Utah, Virginia
Accelerated Simulation Mode Test	9	California (enhanced I/M), Connecticut, Georgia, New Jersey, Ohio, Pennsylvania, Utah, Virginia, Washington
On-board Diagnostic Test	4	Colorado, Utah, Vermont, Wisconsin
Other Testing Procedures	8	Louisiana, Maine, Massachusetts, New Hampshire, New York, Oklahoma, Oregon, Rhode Island

**Data from EPA's Office of Transportation Air Quality, as of December 1999.*

I&M Implementation Problems

Two challenges are inherent in maintaining successful I&M testing programs. First, some vehicle owners fail to achieve the expected emissions reductions because they do not submit to testing or neglect to perform the required repairs. Tests cost between $10 and $50, and repairs average between $90 and $210. Second, some vehicle owners may tamper with emissions control systems after testing, therefore emitting at higher levels than they would from normal wear and tear.

States have responded to these difficulties with some innovative modifications to the federally mandated I&M program. Two states conduct on-road remote sensing to complement and verify the accuracy of station testing and to improve the convenience of I&M. Remote sensing can either detect high-emitting vehicles and single them out for repair or it can "clean screen" vehicles to exempt the cleanest cars from the inconvenience of station testing. Two states supplement their I&M programs by providing additional assistance to vehicle owners to obtain repairs for vehicles with excessive emissions.

Table 1 lists the various I&M programs in use in the states. Many states make use of this cost-effective pollution reduction tool but use a variety of implementation strategies. The

flexibility of this program provides states with a wide range of options in the comprehensiveness of testing procedures, the organization of testing and repair facilities, and the use of new technologies such as remote sensing.

Improving Detection of High-emitting Vehicles

The Arizona Department of Environmental Quality (ADEQ) started an I&M program in 1976, and switched to an enhanced test in 1995. In recent years, focus has increased on catching high-emitting vehicles, with the chief concern being vehicles developing emissions problems between their required periodic inspections. Because of the continued high growth rate and consequent elevated VMT growth rate in Arizona's urban areas, ADEQ needed additional measures to keep emissions in check. In 1995 ADEQ began supplementing the station-testing program by conducting random remote sensing to identify potentially high-emitting vehicles. ADEQ assumed this new approach would capture about 60 percent of the total vehicle population for only a small percent of the cost of the station-testing program. Remote sensing is predicted to reduce carbon monoxide by 6.1 tons per day and VOC by 0.22 tons per day in metropolitan Phoenix alone.

Arizona's vehicle emissions testing program requires a biennial, high-technology test for the newest cars (model years 1981 and newer), and a simpler test annually for older vehicles (model years 1967–1980). Cars from the newest five model years are exempt because these vehicles were manufactured at a standard that usually gives them a very low failure rate. Arizona uses mobile units to conduct random on-road remote sensing. Vehicles identified as high emitters are required to undergo a station test and, if found to be malfunctioning, must be repaired. Thus, the remote testing serves as a check of the traditional inspection program. In addition to catching vehicles that become high emitters between their required station inspections, remote sensing eliminates some of the concern about the reproducibility of results from even the most modern station tests.

One shortcoming of remote screening is that it cannot test for evaporative hydrocarbon (HC) emissions, the unburned gasoline vapors that vent into the air along with combustion products. (Enhanced station I&M does test for these using a pressure test of a vehicle's gas cap.) Evaporative HC emissions can contribute as much as tailpipe HC emissions from some vehicles. Weather conditions, such as wind speed and precipitation, also greatly affect the accuracy of test results. Therefore, it is unlikely that remote sensing will ever completely replace station testing. However, it will continue to serve as a method to identify vehicles that have fallen into disrepair between required station tests. This includes vehicles with malfunctioning or tampered-with emissions controls systems and vehicles registered outside the areas where they do most driving.

Increasing the Convenience of I&M Programs in Missouri and Colorado

Regular inspection of vehicles can be a burden to motorists. Bringing a vehicle to a designated testing station is often inconvenient and time consuming, and more so when testing is centralized in a small number of facilities. Testing can also be frustratingly inconsistent; a vehicle may fail, submit to retesting, and pass the second time, despite the fact that no repairs were performed. Finding a suitable mechanic to perform necessary repairs is also an inconvenience, exacerbated in states with separate inspection and repair facilities.

The inconveniences make states reluctant to expand I&M programs. Some states have discontinued I&M upon achievement of their air quality goals. The Minnesota legislature voted in April 1999 to discontinue the state's I&M program after achieving compliance with national CO standards, citing the cost and inconvenience to motorists. According to the Minnesota Pollution Control Agency, public perception was that I&M was ineffective because 80 percent to 90 percent of the cars tested passed without needing repair. (However, the bulk of the emissions reduction comes from the other 10 percent to 20 percent of vehicles.) This decision is noteworthy since

I&M is one of the most cost-effective and significant methods for reducing mobile source pollution in a state. Negative public perception of I&M is a significant detriment to its effectiveness.

Missouri Screens to Exempt the Cleanest Cars From Station Tests

Missouri began a new I&M program in April 2000 in the St. Louis nonattainment area that will avoid some of the inconveniences by exempting motorists from station tests. Missouri will exempt about 20 percent of its fleet, using remote sensing clean screening. Another 20 percent of the fleet will be excused from testing due to exemptions for the two most recent model years and exemptions based on low-emitter profiling. Mandatory testing did not start until May 2000, so the results from this state's experiences are inconclusive.

The mobile sensor measures emissions and records the vehicle's license plate number as it drives by the sensor's location. Car owners receive a postcard in the mail once they pass two clean screens in a row. Motorists still have to pay the $24 inspection fee, but they can do so by mail and their car is exempted from that biennium's cycle of station testing.

Missouri will be the first state to combine a remote sensing-based clean-screening program with an enhanced vehicle emissions inspection program. Unlike Arizona's high-emitter remote sensing program, Missouri's program will exempt the cleanest cars from periodic station tests. Using a roadside detector to measure HC, CO, and NO_x, the state will excuse cars from the next scheduled station test if the car's emissions are below certain cutpoints. This clean-screening program eliminates the inconvenience of station tests. It will result in more cost-effective air quality improvements by testing only the vehicles that are not identified as clean by either remote sensing or low-emitter profiling.

Despite the improvements in motorist convenience, the use of remote sensing programs typically reduces the credit assigned to the program in the state's air quality plan, as some higher-emitting cars may be mistakenly identified as clean and exempted from a station test. In part, this is because of the inability to screen for evaporative HC emissions. It is difficult to estimate the amount of state implementation plan (SIP) credit reductions lost through clean screening because the loss of credits depends upon the age mix of vehicles on the road. EPA estimates that up to one-third of cars can be excused from emissions testing with remote sensing, with only a 5-percent to 10-percent loss in HC emission reduction credits. Therefore, clean screening is best used as a complement to a station-testing program, not as a testing program in itself.

Colorado Aims to Raise Customer Satisfaction Through an Emissions Repair Guide

Like Missouri, Colorado soon will be running a remote clean screening in an effort to make the Air Care Colorado program as customer friendly as possible. It is estimated that this program will exempt 35 percent of the cleanest cars from the next inspection cycle. The cost for the individual car owner is the same as the station test, but the clean screen is quicker and easier.

Clean screening is just one of several techniques used to make the I&M process more efficient. Another approach is to make the repair part of the process easier, and hence, more readily acceptable to car owners. Colorado hopes to achieve a more customer-friendly repair program to attain the most cost-effective repair standards. The state's Customer Assistance for Repair and Services program features the *Emissions Repair Guide*, a handbook listing repair technicians and repair effectiveness grades for each facility. This idea was initially received with some skepticism by the auto repair industry but has come to be seen as an important resource for consumers.

Colorado's customer service facilities also provide free evaluations and repair guidance to owners of 1982 and newer vehicles that have failed the test and been repaired more than once. The state estimates that in 1997, vehicles that failed an I&M test and were repaired averaged a 62-percent reduction in carbon monoxide emissions.

To complement the improved customer service aspects of Colorado's I&M program, the department of public health and environment reaches out to car repair technicians to achieve the best repair standards. For example, the department runs a "Dirty Dozen" program, wherein 12 particularly dirty vehicles are taken out of service and used to train mechanics in emissions systems. Diagnostics and repair procedures are then formulated using these vehicles.

Financial Guarantees for On-time Service in Colorado and Missouri

To improve customer convenience even further, both Colorado and Missouri use financial incentives to motivate their contractors to perform vehicle inspections efficiently. Colorado has implemented a policy of fining the I&M contractor for excessive customer wait time at the inspection facilities. In the first year of this rule, the contractor was fined $1.5 million, which was then used for the

Retrofit Success In Massachusetts

In the densely populated and frequently reconstructed Northeast, emissions of the approximately 200,000 construction vehicles account for 25 percent of mobile source PM and 8 percent of all NO_x pollution. Although heavy-duty diesel vehicles, such as buses and trucks, have been retrofitted with modern pollution control technology for years and with much success, this is only starting to be applied to the non-road construction sector. The Northeast States for Coordinated Air Use Management (NESCAUM) initiated a diesel vehicle retrofit program on 25 percent of off-road equipment used in the long-term, large-scale Central Artery/Tunnel (CA/T) project in Boston. This program will reduce CO emissions by 25 tons per year, HC emissions by 5 tons per year, and PM emissions by 3 tons per year. This is the equivalent of taking 1,300 diesel buses off the streets of Boston each year.

The considerable number of non-road construction vehicles represents an opportunity to achieve significant emissions reductions quickly and cost effectively. Because regulations for this emissions sector passed only in 1996, the vast majority of non-road construction equipment is not currently federally regulated or limited. A NESCAUM study found that non-road diesel vehicles emit as much air pollution in the Northeast as the entire fleet of on-road trucks and buses. Heavy-duty diesel construction equipment contributes about a quarter of mobile source particulate matter (PM) emissions and, absent new federal standards, would emit about 35 percent of all diesel PM by 2010.

To demonstrate the pollution control effectiveness of diesel engine retrofit technology, NESCAUM formed a partnership with the Massachusetts Turnpike Authority (which oversees the CA/T project), the Massachusetts Department of Environmental Protection, the Massachusetts Executive Office of Environmental Affairs, EPA Region 1, and the Manufacturers of Emissions Control Association. This partnership implemented the Clean Air Construction Initiative, which began in 1998 to retrofit 25 percent of the permanent heavy-duty construction equipment of the CA/T project with advanced pollution control devices. These are roughly the same technologies used to retrofit over 10,000 buses under the mandatory federal Urban Bus Retrofit/Rebuild Program and used by engine manufacturers in over 1 million trucks to comply with emissions standards. This program represents the first time these control technologies have been used on a major construction project. The retrofitting involved purchasing and installing:

- oxidation catalysts, which cost about $2,000 apiece and reduce PM by 25 percent and CO and HC by up to 90 percent; and
- particulate filters, which cost about $9,000 apiece and reduce PM by up to 90 percent and, if combined with an oxidative coating, can further reduce HC and CO up to 90 percent.

An additional benefit is that these devices can reduce diesel air toxics emissions up to 70 percent.

This project will reduce total emissions by 198 tons over the six remaining years of the CA/T project. Although this public works project is of a larger scale than typical road construction projects (it has been likened to putting the Panama Canal underneath an urban area), the emissions benefits of this innovation are easily transferable to other locations. Although equipment may not be used in one specific location for as long as the CA/T project, retrofitting provides an air quality benefit that lasts for the lifetime of the vehicle, no matter where it is used. The participating agencies are continuing to work to expand this program, on a voluntary basis, to other large construction projects within Massachusetts.

Clean Fuel Fleets program. In the second year, efficiency at the inspection stations was improved to the extent that no fines were assessed.

Missouri is taking a slightly different approach. If motorists wait more than 30 minutes before their emissions test begins, the cost of the inspection is discounted by $10, so motorists are immediately compensated if there are long wait times. The fee reduction applies only to the contractor's portion of the $24 inspection fee, and does not reduce the state's share.

Slowing the Increase in Vehicle Miles Traveled

Reducing the number of miles driven will reduce mobile source pollution contributions. However, in this highly mobile and largely vehicle-dependent era, mandatory driving restrictions are not feasible. To slow VMT growth, citizens must be presented with alternatives to driving and an incentive to exercise these alternatives.

One approach many states take is to encourage less driving on days or times of high pollution, rather than seeking reductions in driving every day. States actively emphasize use of alternative travel modes on these days and may provide financial incentives to those who exercise them. States promote vehicle miles traveled (VMT) reduction either through mass advertising or to specific entities participating in a VMT reduction program. Some conduct outreach efforts on specifically selected "ozone action days," others attempt to lower VMT and ozone production during the entire summer. Methods to reduce vehicle miles traveled are often similar to the methods to reduce congestion, which are discussed in the next chapter.

This chapter looks at the various ways states control VMT through episodic emissions reduction programs, land-use and transportation planning strategies, and mass transit.

- In Georgia, public and private-sector organizations voluntarily participate in a program to reduce vehicle trips throughout the ozone season.
- In the Baltimore-Washington, D.C., area, a group called ENDZONE Partners encourages the general public to change pollution-causing behaviors on ozone risk days.
- In Maine, a passenger transportation plan provides integration of transportation modes to allow for car-free vacations.
- In Oregon, transportation and land-use planning are integrated, and transit is expanded to account for rising demand because of denser development.

Enlisting Public Agencies and the Private Sector to Reduce Seasonal Pollution in Georgia

In 1997, after failing for nearly two decades to meet ozone limits in the Atlanta metropolitan area, Governor Zell Miller started the Partnership for a Smog-Free Georgia (PSG)[3] by executive order. In an effort to reduce ozone levels and decrease the number of annual "smog alert days," the order requires state agencies to reduce the number of single-occupant vehicle commute trips by 20 percent. Private-sector employers also committed to making similar reductions. In the first year of the program, the Georgia Department of Transportation reported a 1.67-percent reduction in peak regional traffic volume on smog alert days. In the summer ozone season of 1999, the department found a 2-percent to 3-percent reduction in metropolitan area traffic volume, compared with the non-ozone season—a reduction of almost 500,000 highway miles per day.

A significant opportunity for voluntary emissions reductions exists in Atlanta because three-quarters of area air emissions are not covered by federal regulations. A large portion of these air emissions come from weekday peak-hour traffic; Atlanta motorists drive on average 35 miles each per day, more than the residents of any other metropolitan area in the

Episodic Programs and the Eight-hour Standard

In 1999 the Partnership for a Smog-free Georgia (PSG) began forecasting its smog alert days using EPA's new eight-hour ozone standard. The stringency of the new standard will bring more exceedances, and hence a need for more smog alert days. In 1999 PSG called 68 smog alert days and exceeded the eight-hour standard on 68 occasions (though not the same 68 days as forecasted).

It is unclear if and when this new proposed standard will be adopted nationally (see box *U.S. Court Rejects Ozone and PM Standards* in Appendix B), but it is evident from PSG's experience that a new strategy for episodic programs will be needed under the new standard. Many episodic programs rely on public reaction on a few ozone high-risk days of the year. Dramatically increasing high-risk days would probably decrease the amount of public response to any one of them. Although citizens may be willing to carpool for 5 days or 10 days of the summer, it is doubtful they would be as responsive to 50 or 60 such requests. For this reason, many states may see the benefit in choosing seasonal ozone response programs under an eight-hour ozone standard.

country. This significant mobile source pollution contribution, combined with the fact that approximately 400,000 Atlanta area residents fall into high-risk categories for respiratory problems on high-ozone days, makes clear the need for a program to reduce pollution on high-ozone days.

All state agencies, departments, and universities, whose combined employees account for a third of downtown Atlanta's workforce, have been members of PSG since 1998. They were required to develop and implement plans to reduce their single-occupancy vehicle (SOV) trips by 20 percent on smog alert days in 1998 and for the entire ozone season beginning in 1999. In addition, Governor Miller wrote to the top 100 businesses in the Atlanta area to specifically request their participation in the program. His letter stressed the restrictions and regulations that would be placed on highway construction and industry in Atlanta if pollution levels were not reduced. He emphasized the negative impact on the quality of life in the region because of these penalties.

The Georgia Environmental Protection Division (EPD) has found that employers prefer a seasonal approach. It is more fruitful to encourage behavior-changing activities (such as teleworking, carpooling, or riding transit) over a period of several months than on only a few specific days. Attempting to change behavior for a certain day and on very short notice was often difficult, as employees are not always able to respond quickly enough to make the necessary arrangements. The seasonal approach to VMT reduction has resulted in a 2-percent to 3-percent reduction in metropolitan area traffic volume and a 33-percent reduction in single-occupancy vehicles over the entire ozone season. An unexpected benefit of the seasonal approach is that employers found several of the ride-reducing practices were so popular with employees that these were continued even into the non-ozone season.

The Georgia EPD suggests activities and provides information for the formation of the emission reduction plans for all program participants. VMT reduction techniques include transit incentives, vanpool subsidies, ridematching, telecommuting, alternative or flexible work schedules, and bicycling. Other suggested personal activities are refueling vehicles after sundown and decreasing use of non-road vehicles, such as small-engine or heavy-duty equipment. Georgia's program is funded through the Congestion Mitigation and Air Quality Improvement Program (CMAQ), state general funds, and in-kind contributions from EPD and participating agencies in the PSG program.

The Georgia EPD considers the first complete season of the program a success. Employers are asked to monitor the success of their plans and report results to PSG. After the first year of public education, awareness of air quality as a priority environmental problem increased 18 percent. The most positive result of the program was that drivers changed their behavior during the 1998 ozone season, as corroborated by Georgia DOT traffic counts. Moreover, although 35 smog alert

days were forecast, the one-hour ozone standard was exceeded only 22 times. This implies that, at best, PSG helped avert 13 ozone standard exceedances. The decrease in peak-hour and total summer traffic levels contributed to the reduction in ozone formation. Appeals to the public for general air quality improvements, as well as specific smog alert day action, were received and acted upon.

Predicting and Publicizing High Ozone Days: Baltimore-Washington's ENDZONE

ENDZONE Partners began in 1994 as a volunteer, nonprofit, public-private organization in response to respiratory health concerns related to ground-level ozone pollution. In 1997 the Metropolitan Washington Council of Governments and the Baltimore Metropolitan Council chartered ENDZONE as a formal organization. ENDZONE Partners is a group of 51 government agencies, businesses, and health and environmental interest groups from across the Baltimore-Washington, D.C., region. ENDZONE forecasts high ozone days, encourages its 260 ozone action day (OAD) participating organizations to take voluntary action to reduce ozone levels, and coordinates media coverage and outreach to the public. Through this combined forecasting and public education campaign, ENDZONE can reduce as much as 20 tons of ozone precursor emissions per action day, according to projections in an EPA-sponsored study. There are usually between 8 and 12 action days per summer.

Forecasting Ozone Alert Days

Days of high ozone risk must be forecast in advance and communicated to the public for them to change their driving behavior. Virginia and Maryland meteorologists forecast the next day's ozone levels during the ozone season (May through September). Based on these predictions, the Maryland Department of the Environment (MDE) and the Metropolitan Washington Council of Governments assign an ozone alert level.[4] If ozone levels are high enough, they designate an OAD.[5] ENDZONE Partners' spending on forecasting OADs is about $480,000, or more than 45 percent of the total budget.

Communicating the Alert

ENDZONE communicates an OAD through evening newscasts, weather reports, and television advertisements. In the summer of 1998, a local weather forecaster was featured in a series of television spots urging viewers to take voluntary actions to reduce pollution. Weather and news commentators announced code-red alerts and made suggestions for voluntary behavior changes, based on information from ENDZONE Partners. In 1999 ENDZONE tapped into the radio market to announce OADs. A weekly radio program during the ozone season provided a forum for discussion of ozone health effects and ozone prevention.

The 260 participants of ENDZONE Partners' OAD program agreed to inform their employees of OADs and to suggest appropriate measures, such as ridesharing, transit use, and refueling after dark. Some members provide unique services to reduce emissions on OADs, such as free bus rides on code-red days. Four counties in Maryland and Northern Virginia report ridership increases of 1 percent to 3 percent on these days.

According to ENDZONE surveys, about 90 percent of the public sees air quality as a top environmental problem. In a 1998 survey on OADs, 70 percent of the population had heard about the ozone alert from television, and 20 percent from the radio. This combination of media was the most cost-effective way to raise public awareness about OADs in the region.

To educate the public about ozone, ENDZONE Partners produced and aired a number of television and radio public service announcements during the peak weeks of the ozone season. Total spending on public education accounted for about 20 percent of ENDZONE's 1998 budget, or about $200,000.

Taking Action

Once the public is informed about high ozone days, they need information about what they can do to help solve the problem. The potential for behavior changes to reduce ozone formation is significant, if the information about preventative actions is communicated effectively. Surveys indicate that 90 percent of individuals would be

willing to take action, and about 70 percent of people named driving as a source of air pollution. However, at least 15 percent of individuals thought that they did nothing to contribute to air pollution, indicating a large audience for public education. A survey conducted immediately following an OAD found that a large number of people heard about the alert, about half of whom heard of what actions they could take, and about 20 percent voluntarily took some action.

The largest reductions from voluntary actions are expected in vehicle driving and refueling, since these are the source of 60 percent of the total NO_x and VOC in the area.[6] ENDZONE suggests modifying behavior by carpooling, taking transit, refueling after dark, combining errands into one trip, and cutting down on excess idling. These choices reflect areas where the potential to modify behavior and reduce emissions is largest and the desired behavior change is clear.

Portland Integrates Transportation and Land-Use Planning

Portland has adopted a smart growth plan to slow uncontrolled urban growth and reduce congestion and the resultant emissions from vehicles. The Metro 2040 Growth Concept was adopted in 1994, and it clearly establishes the long-term planning goals for the region. Its philosophy is to preserve access to nature while building better communities. A multimodal transportation system that assures the mobility of people and goods throughout the region is an important part of the idea. The concept's realization in policy, the Urban Growth Management Functional Plan, seeks to coordinate this transportation system with local land use to create a compact urban design and reduce sprawl.

As cities grow outward, new suburban communities quickly build new roads to meet the area's transportation needs, but transit systems are often slow to follow. Thus, the movement of people within and among the outlying areas is primarily via single- or low-occupancy vehicles. Encouraging development in preexisting urban areas helps reduce roadway congestion as transit becomes an increasingly viable means of transportation. A general rule of thumb is that per capita vehicle miles traveled are reduced by 25 percent to 30 percent when density is doubled. This is due to increased alternative transportation means and decreased automobile use. Additionally, concentrated, mixed-use development makes longer car trips less necessary.

Portland's metropolitan planning organization (MPO), the Portland Metro Council, has the authority to shape development in this way because, unlike other MPOs, it has legal authority over local government land-use planning. Several concept mechanisms guide development within the region. The first of these is the urban growth boundary (UGB), which is a limit on development that forces creation of higher density areas. Within the UGB, three mechanisms steer development in the urban area.

- There are required densities for each of several land-use categories. For example, the station community is a node of dense development focused near a significant transit hub.
- Regional parking policy restricts the construction of new parking spaces. This encourages more efficient use of land, promotes non-auto trips, and protects air quality.
- Development of retail areas in industrial and high-employment areas. Again, this type of mixed-use development diminishes the need for automobile travel.

Oregon has included these strategic measures in the ozone maintenance plan, but has not yet quantified emissions reductions from them. Portland is in the maintenance level of attainment, and no further reductions are necessary at this time.

EPA has issued draft guidance that identifies the specific ways land-use policies and projects could be accounted for in the air quality and transportation planning processes. The guidance, when finalized, will give states and communities methods to quantify air quality benefits and account for these benefits in the state implementation plan (SIP) or in the conformity process.

Portland Expands Transit Service to Meet Demand

Improvement of the transit system helps reduce congestion by providing alternatives to automobiles. This can involve the expansion and improvement of the underlying transit system infrastructure as well as upgrading the range of services. Transit agencies have responded to increased demand using higher technology and other creative, but low-technology approaches. Transit planners seeking to increase ridership must overcome two hurdles: the slower speed of mass transit relative to personal automobiles and the impaired flexibility in fixed-route transit. Transit authorities have responded to this with restructured service and advanced technology.

Portland's Growth Concept directs the area's regional transportation plan to expand transit service to meet the anticipated non-automobile transportation needs of the growing population. Oregon's population is expected to grow 30 percent by 2020; VMT is expected to increase by 38 percent in the same time period. The regional transportation plan calls for additional infrastructure, increased service, and an increasingly multimodal transportation system. The plan will accommodate 500,000 riders every weekday by 2020, as compared to 186,000 riders served at present.

Transit service will be expanded in a number of ways.

- Transit service hours will increase by an average of 1.5 percent annually.
- Light rail will be expanded to provide high-speed, high-capacity transit between the central city and the regional centers.
- Bus service will be designed so heavily traveled routes are served by frequent buses with minimum stops. Passenger amenities will be improved to add to passenger comfort.
- All newly constructed or redeveloped corridors will provide a broader range of travel options, such as bicycle and pedestrian networks.

These transit improvements will help encourage ridership and provide viable alternative modes of travel as the roads grow more congested in coming years. Making the improvements now helps provide a solution to a situation before it becomes a major problem.

Maine's Strategic Passenger Transportation Plan Links Urban Areas to Rural Tourist Destinations

In a slightly different approach to transportation planning, Maine developed a transportation plan that, among other goals, aims to improve air quality by expanding transit systems and facilitating interconnectedness among various transit modes. These steps are taken to enable car-free vacations in Maine—a state where tourism is a cornerstone of the economy. The Maine DOT is using CMAQ funds to accomplish these goals, and it must furnish emission reduction estimates at the end of each fiscal year. In fiscal 1997 (the most recent for which data are available) the plan reduced VOC emissions by 198 tpy and NO_x by 170 tpy.

Facilitating use of transit and encouraging more efficient transportation are not unique to urban centers. Rural states face their own challenges to moving people and goods in a way that will reduce auto emissions. Maine's plan is to create an integrated, multimodal passenger transportation capacity that supports tourism. Through this plan, Maine hopes to strengthen its already well-developed alternative transportation system. The plan will:

- develop hubs in urban areas supporting air, rail, marine, and highway interconnections;
- extend AMTRAK and private rail service throughout the state;
- expand existing high-speed ferry service and develop a water taxi service; and
- expand the network of bike/pedestrian trails spanning all areas of the state.

Funding for this plan has come from private and public sources. Annual CMAQ funds of $4.5 million and transportation enhancement funds of $2.9 million have stimulated capital investment in various projects.

Mitigating Congestion

State transportation officials and metropolitan planning organizations can prevent some mobile source pollution by reducing congestion-related emissions. Large-scale planning decisions improve traffic flow and hence reduce the amount of time motorists idle in traffic. This will alleviate some emissions, as it will cut down on total releases, especially VOC. Vehicle emissions of VOC and CO are as much as 250 percent higher under congested conditions than in free-flowing traffic. However, as vehicle speeds exceed about 50 mph, CO levels and NO_x emissions begin to increase. Thus, there is an upper limit to traffic flow improving air quality. Still, congestion mitigation is an important component of the emissions reduction toolbox.

As mentioned earlier, congestion mitigation and VMT reduction strategies often employ the same tools to achieve different goals. Common techniques include carpooling and vanpooling, transit use, bike/pedestrian programs, and land-use planning. Congestion mitigation tends to focus on high travel times of the day, whereas VMT reduction strategies aim to change overall driving habits on certain days or during certain seasons. Though the tools are the same, the way they are implemented determines whether they have the desired effect.

States have employed a variety of approaches to reduce chronic regional congestion.

- In California, a congestion-sensitive toll pricing system that charges commuters more during peak commuting hours was established on a heavily traveled highway in Los Angeles.
- In Arizona, an integrated intelligent transportation system was built to alleviate congestion in the Phoenix area using mainly existing transportation technology infrastructure.
- In Illinois, transit-oriented intelligent transportation technologies were employed to move people more efficiently on existing transit systems.
- In Utah, citizens are encouraged to decrease driving to prevent congestion during a four-year construction project.
- In Baltimore, new homebuyers are offered incentives to live near their work, and transit hubs are refurbished to reduce the need to commute.
- In Chicago, a vanpool program meets the needs of the underserved suburban commuter market and reduces use of single-occupancy vehicles.

In California, Time is Money: Using the Market To Alleviate Highway Traffic Congestion

The Los Angeles metropolitan area has a serious traffic congestion problem. L.A. commuters experience 2.4 million hours of delay every business day (about 65 hours per driver annually) and waste almost 660 million gallons of fuel stuck in traffic each year. In 1995 two-thirds of L.A.'s rush hour traffic was congested. The Los Angeles area has very high levels of ozone pollution. Although this air pollution problem is partly due to other factors (such as topography, climate, and stationary sources), mobile sources contribute

significantly to the inferior air quality in this car-dependent, congested, and rapidly growing urban area.

As a partial solution to this problem, four new lanes were added to California State Route 91 (SR-91), a major commuter route within one of the most heavily congested corridors in California. The new lanes use a dynamic pricing mechanism that charges commuters more during peak hours of congestion and offers incentives to drivers of high-occupancy vehicles. A year after the express lanes opened, the afternoon rush hour delay had decreased from 30-40 minutes to about 13 minutes. This could bring at most a 2-percent decrease in NO_x, a 7-percent decrease in VOC, and a 3-percent decrease in PM_{10}, for a total emissions reduction of at most 12 percent. However, this project is too new to conclusively demonstrate positive results. It should be noted that this type of project could add capacity and demand, therefore increasing pollution.

The California Department of Transportation (Caltrans) worked in partnership with the California Private Transportation Company (CPTC) to add the capacity to SR-91. CPTC designed, constructed and operates the facility. Caltrans helped fund a monitoring and evaluation study of the project to determine its applicability to other roadways in the state and throughout the U.S.

Construction of the highway was funded by CPTC. Costs are being recouped with the tolls, which range from 60 cents to $3.75, depending on the traffic level. High-occupancy vehicles pay a reduced fee. By the third month of operation, the company could completely cover its operating costs using the toll income, and it expects to cover operating costs and debt service by the end of the third year of operation. The lanes generated $12.7 million in revenue in 1997, offsetting that year's $9.1 million operating costs and chipping away at the $133 million in capital costs.

An obvious benefit of the added capacity is reduced commuting time. The average commute delay has decreased by more than half. Moreover, the number of people in vehicles has increased: Caltrans reports a 40-percent increase in rush hour HOV use since the toll lanes opened. The reduction in congestion and decrease in single-occupancy vehicles will produce benefits for air quality—as long as the reduction in congestion does not draw

What does the public think?

Los Angeles commuters have gradually warmed to the concept of for-profit congestion-based pricing. The High Occupancy Toll (HOT) lane project is seen positively by:

- 65 percent of express lane customers,
- 62 percent of HOV users who do not pay tolls, and
- 53 percent of drivers in the adjacent, non-tolled lanes.

Initial controversy . . . .
Although 80 percent of commuters favored toll-financed lane capacity additions, the idea of varying tolls based on congestion severity took longer to catch on. Another somewhat contentious issue is the for-profit nature of the road. There remain two strong schools of thought on the issue: those in favor cite the private sector's efficiency at providing services; those opposed believe the government should provide for infrastructure and that for-profit highways are unfair to lower income travelers.

Response . . . .
In response to initial negative reactions, CPTC undertook a public education and marketing strategy. Part of the strategy offered a discounted toll rate to frequent users. Surveys found that commuters in higher income groups were twice as likely to be regular toll lane users as lower income groups, reflecting the general demographics of the highway users. Commuters in lower income groups were no more likely to switch to higher occupancy vehicles to cut their toll costs. This implied that the toll did not present a significant economic barrier to HOT lane use.

more drivers to the now more efficient highway. This behavior is known as "induced VMT." This oft-debated effect of added capacity on driver behavior may offset gains from adding lane miles.

Since the HOT lane opened, total miles driven on the highway has increased, due in part to the increase in lane capacity. Not enough data exist on the long-term VMT increase on the highway to determine how much of this growth is from population growth and how much is from induced demand. The faster road has not induced significant demand because bus/rail ridership on routes competitive with the highway were unaffected and the vehicle traffic on alternative street routes did not increase.

Arizona's Road-based Intelligent Transportation Systems Smooth Traffic Flow

Intelligent transportation systems (ITS) alleviate congestion by using technology to move the maximum number of travelers in the shortest time possible. Road-based ITS use various technologies to minimize unnecessary slowing or stopping of vehicles. It decreases roadway congestion and eliminates unnecessary vehicle stops. This reduces some emissions, as engines run more efficiently at steady, moderately high speeds than at variable or low speeds. Transit-based ITS make the transit system more user-friendly and efficient. Increasing mass transit convenience and efficiency will encourage more travelers to use non-automobile travel, which will reduce emissions.

However, ITS technologies have mixed effects on air quality, depending on the technology employed. The additional roadway carrying capacity from VMT reduction, congestion mitigation and higher roadway speeds would induce an amount of highway traffic to the less crowded roadways, which may again offset air quality gains. Traffic moves more smoothly because of ITS, but because cars emit more pollution at their highest speeds (above 55 mph), gains from congestion reduction may be offset. ITS is not a technological cure for mobile source pollution. The emissions benefits of ITS programs can vary considerably depending on the system's components.

Individual components of ITS can have either positive or negative emissions impacts. Technological components must be combined to create the best system for a region's specific air quality and transportation needs. The key to the development of successful ITS is the linking of existing and new technological infrastructure into a coherent transportation support system. Studies of integrated ITS program areas find that a comprehensive program involving transit- and road-based components will not only reduce emissions, but also save money by reducing traffic delay and increase highway safety.

Arizona currently has 10 nonattainment areas, and the state will have to deal with future air quality impacts from continued growth. From 1995–2025, Arizona's total population is expected to increase by 2.2 million people, a 50-percent increase in total population. Mobile sources already account for 60 percent of ozone precursor pollutants, so this population increase will doubtless bring a significant number of new vehicles and the consequent air pollution.

To relieve current congestion levels and to plan for further VMT growth, the Arizona Department of Transportation (ADOT) developed an integrated ITS called AZTech for the Phoenix metropolitan area, the nation's fastest growing city of its size. The emissions benefits of this initiative are difficult to quantify, especially as regional VMT is constantly increasing because of the area's rapid population growth.

AZTech's objective is to integrate existing ITS infrastructure into a regional transportation management system. When completed, AZTech will serve a little over half the state's total population. The cost of this system was rather small. About $250 million in infrastructure was already in place, so an additional $7.5 million in federal funds, $3.5 million in private funds, and $4.6 million in state funds were all that was needed. The project will take seven years (two years of implementation and five years of operation). It will include:

- traveler information services through roadway message signs and kiosks;

- coordinated traffic signals across traditional jurisdictional boundaries to facilitate traffic flow along the length of an arterial;
- quick response to freeway accidents through detection of incidents, information dissemination to motorists, and routing of emergency vehicles to the scene;
- transit information systems; and
- commercial vehicle operations.

AZTech was created under a federal program to encourage state-of-the-art transportation systems across the nation. A significant portion of the freeway management system infrastructure (such as message signs, in-road sensors, and closed-circuit cameras) was already in place, so ADOT constructed an integrated ITS with relatively little capital investment. The program was developed and implemented by a wide-reaching public-private partnership among ADOT, city government, and the private sector. Private industries operate under contract with ADOT for the duration of the project.

The major tasks of the initiative were to link existing infrastructure to a cohesive network and then expand the network. The main benefit of ITS comes from information exchange. In this instance the traffic data gathering equipment was largely in place so it took only modest investment to integrate this equipment and data into a cohesive system. Costs stemmed largely from the planning and coordination involved with linking the infrastructure, not from the infrastructure itself. When completed, the system will serve more than half of the state's population. This widespread benefit will come with relatively little draw on state funds. However, the specific air quality gains of this system are difficult to discern.

Costs of ITS versus Costs of Building Roads

- To keep pace with VMT growth over the next 10 years, the U.S. Department of Transportation estimates that 34 percent more highway capacity is needed, at a cost of about $150 billion. Building an ITS infrastructure from scratch would cost $10 billion and provide 67 percent of this required new capacity.
- For the same cost as about eight miles of urban freeway construction, a metropolitan area the size of Washington, D.C., could design and completely build an ITS infrastructure.

Chicago's Transit-based ITS Increases Efficiency and Passenger Satisfaction

Traffic congestion in the Chicago region is the third worst in the nation. If it could build itself out of this congestion, the Chicago area would have to add 271 lane miles to the roadway system each year. Congestion is particularly problematic in the suburbs, where transit coverage is not as extensive as in denser urban centers. In some parts of the northwest suburban region, roadway capacity is exceeded by demand partially because transit accounts for less than 10 percent of commuter trips. Rush hour congestion is so severe that bus service is slowed significantly. Subsequently, few commuters have been willing to make the switch from automobiles and transit ridership has stayed low. In response to this, suburban Chicago's Pace has implemented several features of transit-based ITS to its bus fleet.

In developing ITS for its bus fleet, Pace wanted to increase bus ridership by decreasing passenger travel time and improving passenger convenience. It determined that reduced travel time was more important to customers than extending the range of transit service. As a result of ITS strategies, Pace increased its passengers for the third straight year in 1998. There are three main components to Pace's transit-based ITS strategy.

- **Transit vehicle signal priority.** Some Pace buses are equipped with devices to alert traffic signals to turn green as they approach. Preliminary studies show a 33-percent decrease in travel times without congesting cross streets. Other transit systems have found this technology reduces bus travel times by 5 percent to 10 percent, depending on the number intersections and the amount of traffic load. This public-private venture

is being closely watched by local officials to determine its applicability to dense urban areas.

- **Advanced bus communications and automatic vehicle locators (AVLs).** A number of Pace buses allow drivers to communicate with the garage and with other drivers on the road using both data and voice transmissions. The AVL allows a driver to look at an on-board screen and see if his or her vehicle is on time and following the right route. This helps drivers adhere to schedules and routes, greatly improving dependability and system interconnectedness. Subsequently, increased customer satisfaction results in increased ridership.
- **Advanced traveler information.** These systems communicate information about schedules using overhead signs and interactive kiosks at transit centers. This information improves customer satisfaction because it allows riders to plan their travel with greater precision. Data are not available yet for Pace's system, but similar services in Baltimore and Milwaukee report 25-percent improvements in on-time service.

Utah Encourages Citizens to "Skip a Trip" and Prevent Congestion During Construction

Voluntary driving reductions represent a proactive approach to reducing congestion. Similar strategies to those discussed in the previous chapter can be used to alleviate congestion. The programs are often targeted for a specific time period, such as during a significant highway construction project. This approach has high public acceptance because actions are voluntary. However, emissions benefits of voluntary programs are very difficult to quantify as there is often no way to accurately count participants.

The 4-year reconstruction of 17 miles of Interstate 15, a main highway through the Salt Lake City urban area, presented increased congestion and emissions. In response to this temporary elevated congestion level, Governor Michael O. Leavitt initiated a voluntary VMT reduction program called Skip a Trip. This program encourages citizens and businesses to reduce trips in any of a number of suggested ways. It was kicked off by a month of encouraging focused trip reduction. The month-long intensive program will be repeated yearly during the construction project to remind citizens to reduce congestion and the related emissions. In October 1998, commuters made approximately 10,000 fewer round trips than during a normal commuting month.

The Skip a Trip campaign advocates a variety of trip reduction strategies. Through the Utah Transit Authority (UTA), a variety of incentives and means of technical assistance is provided for the campaign.

- The Skip a Trip campaign places much emphasis on pooled commuting.
  - — UTA offers no-interest loans for van purchases—a savings of $3,500 to $5,000 in interest—plus yearly savings on gas, insurance, maintenance, and parking costs. This program increased the number of van loans by 80 percent in its first year.
  - — UTA leases vans for those not interested in purchase. UTA provides the insurance, back-up vehicles in the event of breakdown, and it allows for personal use of the vehicle. In 1998 this program increased the number of leased vans by 100 percent.
  - — UTA offers an online match list service for vanpools. Interested commuters submit an online form and UTA provides a list of commuters with similar travel requirements.
- UTA offers technical assistance to employers to set up programs for compressed work weeks, flexible work hours, and telecommuting.
- UTA helps facilitate biking/walking to work by providing bike racks on buses.
- Employers can sponsor the purchase of Eco-Passes for their employees, which provide unlimited public transportation. This program comes with a guaranteed ride-home program so commuters can get home in emergency or unexpected situations.

The Skip a Trip campaign is part of Utah's broader trip reduction program. Utah also has a mandatory statewide VMT reduction program for some employers. Unlike trip reduction regulations in other states that are based on company size, Utah's regulation applies to companies only in counties with elevated congestion levels. This program works with the voluntary VMT reduction program to maximize public involvement.

Maryland Refurbishes Transit Stations to Encourage Ridership

Encouraging a dense, mixed-use development means more destinations can be reached by traveling shorter distances. Trip chaining, the combination of several trips into one, is much easier when the destinations are close together. When mixed-use development is located near a transit center, the need for automobile travel is reduced. Thus it follows that encouraging transit-oriented development decreases vehicles on the road.

Maryland's Transit Station Smart Growth program—part of the state's overarching Smart Growth plan, encourages economic development near transit hubs and increases ridership by providing safer, more attractive stations. The current program provides grants to cities or municipalities for redevelopment in areas near transit stations. Typical grants range from $50,000 to $300,000, and they are used for improvements such as better sidewalks, lighting, signage, parking and furniture. The program has been well received and oversubscribed—with $16 million in requests for about $5 million in state funding. The Maryland Department of Transportation offers some technical assistance to those areas denied funding. Governor Parris N. Glendening hopes to double daily transit trips by 2020, and Maryland DOT already reports some modest ridership gains due to this program.

Chicago's Vanpools Bring Transit to the Suburbs

As discussed above, Chicago's suburban area lacks a transit system sufficient for its needs. The Pace vanpool program was started in order to meet the needs of the underserved suburban commuter market in a way that decreased air emissions. It also helps stave off further transit ridership losses and the resultant detrimental effect on air quality. Creating a flexible transit option helped fit the unique transportation needs of the suburban rider and prevented further VMT growth.

Pace's Vanpool Incentive Program's (VIP) primary niche is longer duration (over 30 minutes) inter-suburb travel in the low-density area surrounding Chicago. This does not compete with other transit providers in the region that offer service from the suburbs to the city or shorter distances within the suburban area. The program's flexibility allows it to continue to meet the needs of the suburban area as it grows. When it started in 1991, the program had only two vans; it now has over 300. There is little fiscal constraint on the continued growth of the program because Pace recovers nearly all of the costs of the program from fares.

The promising growth of the VIP has encouraged officials to expand the program in hopes of achieving further air quality improvements. Though transit only accounts for a small percentage of total daily trips, if there was no transit system VMT would be 12.7 million miles per day higher and daily NO_x emissions would be 40 tons greater. Preventing VMT growth is a primary objective of regional air quality plans, so the VIP program has been included as a transportation control measure (TCM) in the SIP. Vanpools take riders through many congested corridors not served by other transit. They do not compete with other transit, but open a new market of passengers—82 percent of whom report they would otherwise drive single-occupancy vehicles.

VIP is a public transit program with several unique features.

- Routes are designed using geographic information systems, and any changes must be officially approved by Pace. This ensures optimal routing of vehicles, which helps control costs and keeps fares low.
- The driver does not collect fares from passengers. Individuals are billed monthly.

This reinforces that VIP is a transit program and not a private arrangement or employee benefit.

- Drivers use fleet gas cards to eliminate out-of-pocket expenses. This makes it easier to monitor expenses and eliminates some responsibilities and inconveniences facing drivers in conventional vanpools.
- Vanpool fares are zonal, calculated based on the total distance traveled for each individual passenger compared to the flat fee in conventional vanpools.
- The VIP program makes travel easier on other modes of transit in the region. Riders can obtain a card allowing them to use all suburban buses at no extra charge. For an additional charge, commuters can purchase a pass for all suburban and city routes.

Pace has found the most successful vanpools are those in which vanpool planning agencies take an active interest in forming pools and integrating them into existing transit routes and fare systems.

Emissions reductions from the program constituted 26 tpy in 1996, according to an analysis by Michael Baker Jr., Inc., a transportation and engineering consulting firm. Since then, vanpools have increased by about 50 per year. The approximate cost-effectiveness of this reduction is $7,000 per ton and is dependent only on the cost of the vehicles, since operating costs are covered by fares.

Encouraging Purchase of Alternative Fuel Vehicles

Alternative fuel vehicles (AFVs) may emit fewer of the six federally regulated criteria pollutants and may cost less to operate per mile than do conventional fuel vehicles. Incorporating AFVs into a state's vehicle population will immediately lower emissions upon purchase.[7] Alternative fuels include compressed natural gas, liquified petroleum gas (propane), electricity, methanol, and ethanol. AFVs are a natural choice for public and private fleet owners who are required to reduce emissions but constrained by an inability to significantly reduce vehicle miles traveled (VMT) or change travel times to avoid congestion.

However, one problem for AFV fleet owners is that the vehicle purchase cost tends to be higher. The refueling infrastructure also is often inadequate. As a General Accounting Office report states, "The economic disadvantages of alterative fuel vehicles relative to conventional fuel are substantial." Thus many states have begun to offer grants, buydowns (incentives offered to vehicle distributors instead of consumers), tax incentives, and low-interest loans to fleet owners and individuals for the purchase of vehicles or the necessary infrastructure.

States offer several types of incentives for the purchase of original equipment manufacturer (OEM) AFVs or for the after-market conversion of vehicles to run on alternative fuels. These incentive strategies include:

- grants and rebates—the state offers a cash incentive directly to the vehicle purchaser and offers grants to municipalities for regionwide programs to promote alternative fuel use;
- loans—the state offers low- or no-interest loans to the vehicle purchaser; and
- buydowns—the state offers cash incentives to the vehicle seller.

Each of these incentives helps offset the higher sticker price of AFVs, and they are targeted mainly toward fleet owners, including municipalities, state agencies, and private businesses.

States can combine these three strategies to create a program suited to an area's needs and opportunities.

- Oklahoma offers low- or no-interest loans to fund vehicle purchase/conversion and infrastructure development.
- New York City offers incentives to taxi drivers to buy alternative fuel vehicles.
- Arizona offers grants and tax credits to build refueling stations.

Oklahoma Finances Autos and Infrastructure with Low- or No- Interest Loans

It is likely that Tulsa and Oklahoma City will go out of ozone attainment by 2000; both areas exceeded the NAAQS four times in 1998. If these urban areas move into serious ozone nonattainment and are required by the CAA to institute the Clean Fueled Fleet Program (CFFP), the state anticipates a significant economic burden. (See Appendix B for details on the Clean Air Act.) This would

Grants and Rebates for Fleet AFV Purchase

AFVs can cost several thousand dollars more than conventional vehicles, so states offer incentives for vehicle purchase and alternative fuel use. Vehicle grants are often geared towards fleet owners who purchase many vehicles and thus have a greater cumulative emissions impact. AFVs make good fleet vehicles because the vehicles can refuel at one central fleet-owned station—an important consideration given the scarcity of alternative refueling sites. Grants can often be used for either new AFV purchase or for gasoline vehicle conversion. The grants range from $400 to $1,000, and may include matching funds by various public-private partnerships.

Table 2 compares the cost, fuel economy and emissions class for variously fueled light-duty pickup trucks, which represent about a quarter of total AFV sales. This comparison shows that LPG, ethanol, and compressed natural gas (CNG) pickups cost approximately $8,000 more than a conventionally fueled truck, and electric vehicles cost almost $16,000 more. These figures demonstrate why comprehensive state AFV incentive programs can be helpful to initiate widespread AFV use.

Table 2: Comparison of Available AFV Types

Fuel Type	Model	Sticker Price	City/Highway Fuel Economy	Emissions Class
Gasoline	Ford Ranger FFV '99	$12,500	17/22 mpg	
Electric	Ford Ranger EV '98 (Lead acid battery)	$27,995	.38/.44 kilowatt-hr/mile	ZEV
LPG (bifuel)	Ford F-150 '99	$20,130	14/18 mpgge*	LEV
Ethanol (flexible fuel)	Ford Ranger FFV '99	$20,490	12/16 mpgge	TBD
CNG	Ford F-250 '99	$20,230	11/15 mpgge	ULEV and ILEV (CA-SULEV)
CNG (bifuel)	Ford F-150 '98	$20,490	11/15 mpgge	TBD

** mpgge = miles per gasoline gallon equivalent*

require fleets to purchase additional AFVs, and the need to develop infrastructure to support these fleets would cause a financial burden the state hopes to spread over more years than the CFFP schedule allows. Oklahoma's legislature hopes early introduction of fleets and supporting infrastructure will ease the transition to the requirements of the CFFP. This program helps support the state's alternative fuel production industry; Oklahoma is the second largest producer of compressed natural gas and propane in the nation.

The Oklahoma Alternative Fuel Program, offered through the state department of central services, provides a revolving fund for no-interest loans to governmental entities for vehicle conversion or infrastructure installation. From its inception in 1993 until 1999, the program loaned $1.6 million to 12 entities, facilitating the purchase/conversion of 370 vehicles and the construction of 9 fueling stations. Assuming these are light-duty vehicles consuming the national average of 500 gge of liquefied petroleum gas (LPG) per year, this would save 185,000 gallons of gasoline per year, or roughly 0.6 tons/year in NMOC emissions, 5.61 tons/year in CO emissions, and 1.1 tons/year in NO_x emissions.[8] In addition, natural gas vehicles have almost no evaporative emissions, which make up half of a conventional vehicle's HC emissions. This means 370 LPG vehicles would save an additional 1,100 kg of HC emissions per year from evaporative emissions.[9]

Loans can be up to $5,000 for vehicle purchase/conversion and up to $100,000 for fueling station construction. Loan payments are made from the price difference between gasoline and the alternative fuel, which may cost up to 70 percent less than gasoline. So far the program has received over $1.1 million in payments back to the fund. In addition to the no-interest loans to governmental agencies, Oklahoma's Department of Commerce offers

Emissions from AFVs

Total emissions from alternative fuel vehicles are lower than those from gasoline or diesel fuel vehicles. Their emissions are dependent on the type of fuel selected and the make and emissions class of the vehicle. Emissions from various alternative fuels as compared to gasoline are depicted in Table 3 below. In nearly every category these are lower than gasoline. Notable exceptions are volatile organic carbons from LPG and CNG vehicles due to fuel evaporation and SO_x and PM from emissions of electric power plants that supply the vehicles.

Table 3: Total Emissions from Alternative Fuels, Relative to Gasoline

Pollutant	E-85 (85% Ethanol in Gasoline)	Liquefied Petroleum Gas (Propane)	Compressed Natural Gas	M-85 (85% Methanol in Gasoline)	Electricity
Oxides of Nitrogen (NO_x)	Varies*	Equal	Equal	Equal	Less
Volatile Organic Compounds (VOC)	Equal	More	More	Equal	Less
Total O_3 precursors (NO_x and VOC)	Varies**	Less	Less	Less	Less
Carbon Monoxide (CO)	Equal or less	Less	Less	Equal	Less
Oxides of Sulfur (SO_x)	Less	None	None	Less	More***
Particulate Matter (PM)	Less	Less	None	None	More***

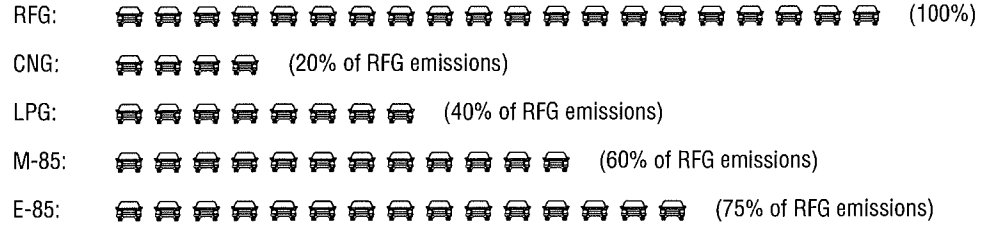
** More for splash-blended gasohol with higher Reid vapor pressure, equal for gasohol with controlled Reid vapor pressure and for ethanol fuels.*

*** More for splash-blended gasohol, less for specially reformulated gasoline and for ethanol fuels.*

**** Assumes roughly half of the power plant feedstock is coal.*

Total ozone precursor emissions (HC and NO_x) from various alternative fuels are compared to reformulated gasoline (RFG) emissions in Figure 1. RFG is gasoline specially blended to reduce VOC and air toxics such as benzene. Compressed natural gas offers the greatest ozone precursor reduction per gasoline gallon equivalent. The emissions of ozone precursors from electric vehicles vary greatly based on the feedstock of the supplying power plant. (About half of the electricity in the country is produced by coal-fired plants that emit NO_x, HC, SO_x and PM. Natural gas-fired power plants will contribute significant HC emissions.) Despite the variation, electric vehicles in general emit less HC and NO_x than other alternative fuel vehicles.

Figure 1: Total Ozone Precursor Emissions From Fuels, Relative to RFG



similar revolving low-interest loans to private organizations as well.

New York Offers Incentives to AFV Dealers

New York City has some of the poorest air quality in the country and is currently in severe ozone nonattainment. According to a study by the Texas Transportation Institute, more fuel is wasted in traffic in New York City than in any other city in the nation except Los Angeles. The majority of air emissions in the city come from mobile sources, including a

fleet of 12,000 taxis, many of which travel 100,000 miles or more per year within the city. In 1996, the New York State Energy Research and Development Authority (NYSERDA) and the City of New York developed an incentive program to encourage the purchase of alternative fuel taxis. The program has resulted in the purchase/conversion of about 300 CNG vehicles. This reduces roughly 85 tons/year of CO, roughly 8 tons/year of NO_x, and roughly 17 tons/year of evaporative HC.[10] CNG vehicles emit virtually no PM, so this would reduce PM by 6 tons/year over the baseline from gasoline vehicles. This case study represents a small percentage of New York's taxis, but demonstrates that significant reductions can come from a technology that is feasible and practical.

This program reimburses vendors of OEM AFV for the "incremental cost" of the vehicles—the difference in sticker price between alternative and conventional fuel vehicles. Thus the cost to the purchaser is almost the same as for a conventional fuel vehicle, and the purchaser does not need to apply for a loan, grant, or tax credit. Through the New York City Clean-Fuel Taxi Program, NYSERDA pays 80 percent of the incremental cost of voluntarily purchasing a CNG taxi or 80 percent of the conversion cost, with a maximum payment of $6,000. For a 1998 Ford Crown Victoria, a common taxi model, the incremental cost of a CNG model is about $8,000. Incentive payments are made directly to the dealerships or conversion shops.

Because this is a voluntary program, NYSERDA works in partnership with the New York Taxi and Limousine Commission, the New York Department of Transportation and the Brooklyn Union Gas Company to stir up interest and disseminate information. The commission instituted several policy incentives to encourage individual drivers and fleets to participate. NYSERDA also provides marketing materials to vehicle dealers to encourage sales.

The program is funded using federal CMAQ money, so the air quality benefits come at very little cost to the state. In 1997 this program was funded by a federal grant of about $2 million.

Arizona Gives Grants and Tax Credits for Building AFV Refueling Stations

Although AFVs are readily available for purchase and are a straightforward way to achieve immediate emissions reductions, the refueling infrastructure is not yet in place to support widespread alternative fuel use. Officials from federal agencies and state governments who administer vehicle fleets cited the lack of refueling infrastructure as the main impediment to using alternative fuels. Table 4 describes the various factors that encourage or inhibit the development of infrastructure for the different types of alternative fuel.

Arizona's AFV incentive program is one of the most comprehensive in the country. Like the incentives for vehicle purchase or conversion discussed above, Arizona offers grants to individuals, small businesses, and public agencies for infrastructure installation to overcome another barrier to AFV use. In 1994 the state legislature created the Clean Air Fund from state general funds, fees collected from car

As this report was going to print, a special session of the Arizona legislature passed a one-year moratorium on this tax incentive program. In the five months since it was created, the wildly popular program had received applications for $400 million in tax credits for AFV purchases, or roughly 7 percent of the state's budget. In order for the legislature to reach consensus on the program, a requirement to run bifuel vehicles full time on an alternative fuel was struck out, and bifuel vehicles could use gasoline the majority of the time. Bifuel vehicles made up 88 percent of the participating vehicles. Because the program represented such a large financial investment for the state without guarantee that the vehicles would run on alternative fuels and provide emissions reductions, the legislature passed the moratorium to provide time to reevaluate the program. The legislature appears to be in consensus that an alternative fuel vehicle incentive program is an important mechanism to improve air quality, but should be redesigned in order to provide maximum air quality benefits for the money invested.

Table 4: Factors in Alternative Fuel Infrastructure Development

Fuel Type	Number of Fuel Stations	Factors Inhibiting Infrastructure Development	Factors Facilitating Infrastructure Development	Price of Gasoline Gallon Equivalent (gge)
Compressed Natural Gas (CNG)	1,267[11]	Piped CNG is at a lower pressure than that needed for vehicles. Special CNG is needed to meet standards for powering vehicles.	Development of a CNG refueling network will require the least investment, as an extensive pipeline from wellhead to consumer already exists in every state.	$0.70- $1.00
Liquified Petroleum Gas (LPG or Propane)	4,181	Pipeline does not adequately serve western and southwestern states. Special shipping and refueling equipment needed.	A limited LPG pipeline system exists, serving areas near major refineries in the Midwest, Northeast, Southeast, and Texas.	About $1.00
Ethanol	45	Ethanol cannot be piped, must be distributed by barge or truck, and cannot be stored in existing gasoline facilities. Use is largely confined to the Midwest.	Ethanol use is already near areas of production, which is the cornbelt of the Midwest.	$1.03-1.30[12] for GGE pure or "neat" alcohol (E-100)
Electricity	489	Overnight recharging is usually required at residential sites.	Infrastructure complete; the only requirement is purchase of recharging units.	$0.2613

owners exempt from I&M testing, and the state lottery. The Clean Air Fund provides various air quality grants, including monies for the installation of AFV refueling stations.

The energy office in the Arizona Department of Commerce implements a program that offers grants for up to $100,000 to entities that build alternative fuel stations accessible to the general public. Since the program's inception in 1994, grants ranging from $4,200 to $100,000 have established 39 refueling stations. Spending between 1994 and 1999 totaled $1.6 million. Tax credits are also available for construction costs not covered by grants. For public access stations, this can be taken for 100 percent of non-grant costs, up to $400,000; for restricted access stations, this can be taken for 50 percent of non-grant costs, up to $200,000. Commercial alternative fuel station tax credits may be carried forward for 15 years against taxes owed.

The same office offers a grant of up to $2,000 for each AFV that will use home or small business refueling equipment. This grant is to be applied to the purchase and installation of alternative fuel refueling systems on the individual's property. Arizona also offers tax credits for the purchase or lease of new and used AFVs, as well as for AFV conversions. The highest credits (50 percent of cost, or $10,000) are for zero-emission vehicles (ZEVs). The lowest credits (15 percent of cost, or $2,500) are for purchase of LEVs or of used, converted AFVs.

State Tax Incentives to Offset Alternative Fuel Vehicle Operating Costs and Inconvenience

Alternative fuels vary in price regionally and, except for ethanol, tend to be cheaper than

conventional fuels. At least one preliminary study has found that operating, refueling and repairing CNG vehicles, a popular type of AFV, may be cheaper than for gasoline vehicles. However, savings at the pump may not be a sufficient incentive for a fleet operator or an individual to purchase an AFV, especially when considering the relative inconvenience of refueling. In fact, some AFVs, known as dual-fuel or flexible-fuel vehicles, can also be run on traditional fuels. Thus a fleet may continue to use gasoline or diesel, even though it has met requirements for AFV purchases, simply because it is easier. There are currently about 7,500 refueling stations for all types of alternative fuels combined, compared to roughly 200,000 gasoline stations. As a means to offset the inconvenience of a sparse refueling infrastructure, many states encourage alternative fuel use through tax incentives. This brings the price per gallon well below that of even the lowest grade of conventional gasoline.

A common method among states is a slight exemption in the excise tax on alternative fuels. For example, Massachusetts provides an 11-cent per gallon gasoline-equivalent tax reduction on CNG and LPG. Another approach is to provide a direct incentive for fuel production. In Kansas, producers receive 20 cents per gallon for ethanol fuel produced in the state. California offers a unique incentive. Its Sacramento Air Quality Management District offers $500 worth of free M-85 fuel for both public and private owners of flexible-fuel vehicles that operate 75 percent of the time in the air district.

In addition to reductions in fuel costs, states offer other tax incentives to facilitate the use of alternative fuels. One such tax incentive is the reduction in AFV license taxes. Arizona reduces the annual license tax on the vehicle by $4 for every $1,000 of vehicle value for AFV. Washington exempts CNG and LPG-powered vehicles from motor fuel excise taxes and instead requires an $85 annual fee. In Arizona, AFV owners receive special license plates allowing them to travel at all times in HOV lanes, regardless of the number of passengers in the vehicle. The increased convenience of reduced travel time may encourage prospective vehicle owners to consider AFVs they otherwise may not have.

Appendix A: Challenges to Quantifying Mobile Source Emission Reduction Strategies

This report highlights a selection of innovative and emerging ideas for reducing mobile source emissions. Because these programs are on the cutting edge of air quality control, they often do not have the years of data and quantifiable results of more tried-and-true methods. A number of challenges exist to not only the quantification of individual programs, but also to the side-by-side comparisons of different strategies. This appendix highlights some of these challenges to the analysis of results of these newer strategies. Several problems underlie the ability to quantify and compare certain mobile source air quality control strategies. These can be broken down into two shortcomings. First of all, there is a lack of measured emissions data. Second, the computer modeling used to extrapolate emissions reductions from these air quality measurements has its limitations, posing problems for accurate results and comparability of results among strategies.

Lack of Consistently Measurable Outcomes Prevents Quantification

A fundamental stumbling block to the quantification of mobile source air programs is a lack of numerical data. Some air quality strategies just do not lend themselves to rigorous analysis producing hard numbers for pollution reduction. In these cases, a qualitative assessment based on a logical examination of how the project or program will decrease emissions is the most appropriate option for discussion of results. For example, an educational program that informs citizens about behavioral changes to decrease air pollution has results that may be hard to quantify. In this example, an interview or survey is the best method for determining what effect the program had. These types of data, however, have an inherently large margin of error because they are self-reported.

These difficult-to-measure programs can be referred to as "directionally sound." That is, they contribute to the reduction of air pollution, but the programs have yet to be measured and their impact has yet to be determined. Some states may undertake programs of this nature because they can be very visible and popular with the general public. States either do not expect quantifiable results rigorous enough to be used for federal reporting purposes, or they may be waiting for standardized federal guidance and submission requirements before attempting to produce numerical results. EPA has tried to assist states and localities in quantifying emission reductions from voluntary programs through their Voluntary Measures Policy.

It is difficult to quantify programs because of the challenge in separating the effects of various air quality programs. Programs adopted

as part of a comprehensive air quality plan may be hard to evaluate individually. This becomes more difficult when programs work synergistically—when the whole sometimes *is* greater than the sum of its parts. For example, transportation control measures are often mutually reinforcing. Charging higher tolls during peak travel hours and simultaneously making transit service more efficient and extensive will decrease driving miles more than the sum of the effects of each strategy operating individually.

There are only a few measurements air quality officials can make: the numbers of cars on a stretch of road, the emissions from individual vehicles, and the amount of pollutants in the air at certain monitored locations. All other numbers are projections based on these measurements. Therefore, it becomes necessary to use elaborate computer models to paint the most accurate picture of the pollution situation on a statewide or regionwide scale and to predict the emissions reductions from a particular strategy.

Inherent Shortcomings in Computer Modeling Can Hinder the Calculation of Air Benefits

The available models for calculating the effectiveness of air quality programs are not always well suited to measuring results from the newer strategies outlined in this report. The newest models for air agencies to calculate emissions estimates for federally required state air quality plans are quite complex and take into account several factors, including varied roadway speeds and conditions, differences in gasoline compositions, use of prescribed alternative fuels, variations in vehicle emissions standards, and different types of I&M programs (excluding remote sensing).[14] Though this model is much improved, it is still not accurate in determining emissions in localized areas, and it does not help metropolitan areas determine whether new transportation projects will achieve air quality attainment goals. Newer models are being developed to more accurately portray transportation emissions in smaller areas and over much larger regions, but they are unlikely to completely replace EPA-approved versions. This competition among the various computer models will likely necessitate future guidance from EPA as to which model's projections are acceptable for federally required calculations.

Data Input Categories

These models cannot consistently input the variables involved in more innovative programs. Groundbreaking programs may use different fuels or new I&M technology, for example. There is no consistent method to perform calculations for these programs. States would be required to provide extensive justification and demonstration of emissions reductions if using alternative modeling programs. This would require significant time and resource investment with no guarantee of EPA approval. For this reason, most innovative mobile source emission reduction programs are not yet included or credited in state air quality plans.

If programs use CMAQ monies, states must perform some demonstration of emissions reductions, but there is no single reporting standard required of the programs receiving this funding. FHWA guidance on the matter reads,

> "Across the country, state and local transportation/air quality agencies have different approaches, analytical capabilities and technical expertise with respect to such analysis. At the national level, it is not feasible to specify a single method of analysis applicable in all cases. While no single method is specified, every effort must be taken to ensure that determinations of air quality benefits are credible and based on a reproducible and logical analytical procedure that will yield quantitative results of emission reductions. Of course, if an air quality analysis has been done for other reasons, it may also be used for this purpose."

A growing problem with using modeling to estimate emissions reductions is that periodic modeling software updates will produce an apparent change in air quality benefits, though

no actual emissions change took place. The different variables of air quality programs are weighed differently over time under the constantly evolving modeling software. As the models become more complex, new project features are added to the calculations. Therefore modeling cannot provide an accurate picture of an air quality program's emissions reductions over a long span of time.

Inconsistency in Data Evaluation and Among Air Quality Program Targets

Because there does not exist any one standard for calculating the emissions reductions of more innovative programs, states are often left to devise their own logic for estimating emissions reductions. This helps to demonstrate that a program may be more effective than the baseline scenario (i.e., it's directionally sound and better than doing nothing), but it becomes more challenging to say *how* effective the program may be, and nearly impossible to compare it to a program using a different strategy. It should be noted that state's improvised methods for determining emissions reductions may be useful for drawing comparisons among similar programs, but because there is no standardization of the measurements and calculations, it is not certain that numbers from different air agencies will be suitable for such evaluation.

Often, the programs present the proverbial "apples and oranges" problem: the programs are too dissimilar for side-by-side comparison. Several variables may prevent the comparability of programs, including the timetable of programs, the pollutant(s) targeted, the geographic scope, and the synergistic effect of several programs working together toward one air quality goal.

Differing Control Periods

Different control periods are associated with various air regulatory programs. Some may be in effect only certain days of the year (episodic), some for one season of the year (seasonal), some year-round (annual), and some may demonstrate results gradually over a number of years. While it is common to report emissions reductions in tons per year, this may overlook the important benefit of targeted emissions reductions on specific days or seasons. This reduction may appear slight in the context of the entire year's emissions but may be crucial to averting NAAQS exceedances on high-pollution days.

Duration of Programs

Time spans of different programs also may be vastly different. A program may contribute air quality benefits continuously over decades, whereas another may provide reductions for only a few months. The total number of tons reduced may be similar, but the impact of the reductions accomplishes different goals. The former provides for long-term air quality improvement or maintenance of current air quality, and the latter provides immediate short-term air benefits. Calculation of the per-ton cost-effectiveness of a strategy is difficult to calculate because a program may have an indefinite end point and will continue to provide emissions benefits for many years to come for a one-time capital investment.

Change in Effectiveness Over Time

A program's effectiveness may change through its duration. This "growth curve" must be evaluated before attempting to draw conclusions about a program's success. One long-term program could offer the same benefits every year. Another could offer decreasing benefits, as when equipment ages and deteriorates. Still another could show consistently increasing benefits, as with growing public participation in a program.

Different Target Pollutants

The total tonnage of pollution reduced includes many different pollutants. However, an area may be concerned with only one pollutant. An area solely in ozone nonattainment probably will not be concerned with particulate matter reduction. In this case, particulate matter reduction would be a waste of resources and a smaller-scale ozone reduction strategy would be a "better" idea. The total reduction must be viewed in the framework of the pollution problem of the area.

Geographic Scope

The geographic scope of programs can differ widely. Strategies may bring about small air quality improvements over an entire region or may provide reductions in a small, targeted area. As with temporal differences in scope, the relative importance of these emissions reduction strategies cannot be determined outside the context of the situation. These also must be weighed against the extent of the pollution problem as well, since a program that provides ozone reduction to an attainment area would be less desirable than one that concentrates results on the area with the pollution problem.

Inability to Compare Proxy Measurements

Proxy measurements that states use to demonstrate air quality improvement present a fundamental stumbling block to comparison among different innovative air pollution control strategies. The success of a given program may be expressed by a decrease in traffic volume, an increase in roadway speeds or in transit ridership, a survey of individuals showing percentages of participation in voluntary actions, or an amount of money given away through a grant program. By their nature, these results do not facilitate side-by-side comparisons, although they qualitatively demonstrate the success of a given approach.

No Single Number Can Easily Compare Innovative Emissions Reductions Strategies

Trying to compare a series of innovative air quality programs using one number, or trying to rank a list of programs from best to worst based on one characteristic, is difficult at best. The newness of approaches, complexity of programs, and number of contributing variables in each strategy make it challenging to come up with a single number for comparison. In established programs, it is common to use dollars/ton to compare pollution reduction efficiency, but in groundbreaking programs these figures are harder to come by.

There is merit to evaluating the pros and cons of various strategies and attempting to see how they fit into the overall picture of mobile source emissions reductions. One must be aware of the limitations of quantifying emissions reductions and the problems in comparing various strategies but still see the qualities that contribute to more successful programs in a specific area. There are many useful lessons and ideas to be gleaned from successful air quality programs.

Appendix B: Primer on the Provisions in the 1990 Clean Air Act Amendments Affecting Mobile Source Air Emissions

The Clean Air Act (CAA) seeks to protect people and the environment from dangerous air pollution. It delegates to EPA the authority to set appropriate pollution standards and to develop programs to achieve these standards. States have the responsibility to carry out these programs. The CAA deals with air quality standards, mobile source air pollution, toxic pollutants, acid rain-forming pollutants, stationary sources permitting, stratospheric ozone protection, and enforcement of the various CAA programs. This appendix discusses the first two sections of the act.

National Ambient Air Quality Standards (NAAQS)

The CAA requires EPA to set standards for common air pollutants. EPA has promulgated air quality standards for six criteria pollutants: ozone, nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter ($PM_{2.5}$ and PM_{10}), sulfur dioxide (SO_2), and lead. EPA has established for each a maximum concentration above which public health and welfare is threatened. EPA is required to review the scientific data on which the standards are based every five years and revise the standards if necessary. (See box "U.S. Court Remands Ozone and PM Standards.")

Ozone

Naturally formed ozone is beneficial when found in the upper atmosphere because it shields the earth's surface from ultraviolet radiation. On the other hand, surface ozone (commonly called smog) causes respiratory health problems. Ozone damages lung tissue in at-risk populations, and sustained exposure to low levels can harm healthy individuals.

Ozone is not emitted directly; it is formed from nitrogen oxides (NO_x), volatile organic compounds (VOC), and sunlight. Ozone levels are higher in summer, and an area may have an "ozone season" (typically May through October) during which control efforts are intensified.

The current ozone standard value is 0.12 parts per million (ppm) measured over a one-hour period. An area meets the ozone NAAQS if no more than one day per year is above this value. For attainment, an area must meet the ozone NAAQS for three consecutive years. An area is allowed one NAAQS exceedance per year, and the next highest value (the design value) is used to characterize an area's nonattainment status.

Nitrogen Dioxide

Nitrogen dioxide (NO_2) is a highly reactive air pollutant formed from fuel combustion in vehicles and other high temperature processes occurring in the presence of air. The two pollutants NO and NO_2, known as NO_x, play a significant pollution role as ozone precursors.

U.S. Court Remands Ozone and PM Standards

On May 14, 1999, a three-judge panel of the U.S. Circuit Court of Appeals in Washington, D.C., remanded EPA's most recent revisions to national ambient air quality standards for ozone and fine particulate matter and sent them back to EPA for reassessment. The court found that EPA lacked any determinate criterion for setting the specific standards and contended that EPA had thus unconstitutionally usurped Congressional authority (the "nondelegation doctrine" that prevents Congress from giving its legislative power to agencies). As a result, EPA must give further consideration to the standards for ozone and particulates.

The U.S. Department of Justice sought a rehearing before the full U.S. Circuit Court of Appeals, but it was denied. EPA has appealed to the Supreme Court, which is expected to hear arguments in the fall of 2001; a decision is likely in 2001.

EPA believes this rule will have no effect on its ability to proceed with Tier II regulations on gasoline formation and automobile emissions. EPA will proceed with the development of the small particulate matter monitoring system. EPA will continue to designate attainment status based on the new eight-hour standard, but these designations cannot be enforced. EPA proposes to reinstate the one-hour standard in areas where it had been revoked.

Table 5: Ozone Nonattainment Area Facts, As of August, 1999

Ozone Nonattainment Classifications				
Classification	Deadline for Attainment	Number of Areas	Population of Areas	Design Value (ppm)
Marginal	1993	5	1,260,000	0.121-0.138
Moderate	1996	8	8,438,000	0.138-0.160
Serious	1999	14	28,962,000	0.160-0.180
Severe-15	2005	4	10,666,000	0.180-0.190
Severe-17	2007	5	31,387,000	0.190-0.280
Extreme	2010	1	13,000,000	0.280 and above

Source: EPA's Greenbook: Nonattainment Areas for Criteria Pollutants

They pose a health risk due to the respiratory effects they cause, and they are a major contributor to acid rain formation.

The NAAQS for NO_2 is 0.053 ppm average concentration over the entire year. Unlike the ozone nonattainment classifications, there is no tiered ranking for NO_2 nonattainment. There are currently no nonattainment areas for NO_2. Mobile source NO_x emissions, which account for about a third of total NO_x emissions, are reduced in part by catalytic converter technology that converts NO_x into harmless nitrogen gas (N_2).

Carbon Monoxide

Carbon monoxide (CO) is a colorless and poisonous air pollutant formed from the incomplete burning of carbon. CO is harmful because it impairs the body's ability to supply oxygen to organs and tissues. This can impair visual perception, manual dexterity, thought and reflexes, and may threaten cardiovascular function in those with cardiovascular disease and angina.

The nonattainment classifications for CO are based on CO concentrations measured over eight hours. An area is in attainment for CO if it does not exceed 9 ppm CO more than once per year for two consecutive years. Mobile

Table 6: CO Nonattainment Area Facts, as of August, 1999

Carbon Monoxide Nonattainment Designations			
Classification	**Number of Areas**	**Population of Areas**	**Design Value (ppm)**
Moderate	13	16,521,000	9.1-16.4
Serious	7	17,595,000	16.5 and above

Source: EPA's Greenbook: Nonattainment Areas for Criteria Pollutants

Table 7: PM Nonattainment Area Facts, as of August, 1999

Particulate Matter Nonattainment Designations			
Classification	**Number of Areas**	**Population of Areas**	**Design Value ($\mu g/m^3$)**
Moderate	72	11,005,000	Over 150 microgram/m^3 24-hour average, or over 50 microgram/m^3 annual average
Serious	6	18,744,000	N/A

Source: EPA's Greenbook: Nonattainment Areas for Criteria Pollutants

sources account for 77 percent of CO emissions nationwide, so the focus of CO reduction strategies is on this contribution.

Particulate Matter

Particulate matter (PM) includes soot, smoke, dust, and dirt emitted directly or produced by windblown and reintrained dust. PM can be formed by condensation in the atmosphere of gases, such as SO_2 and VOC, into larger droplets called aerosols. PM irritates lung tissue, can aggravate respiratory and cardiovascular disease, and has been found to cause cancer, premature death, and increased infant mortality. PM is a major contributor to impaired visibility, or haze.

EPA currently regulates PM with a diameter of 10 microns or smaller (PM_{10}). A region must have a PM_{10} concentration below 150 microgram/m^3 averaged over a 24-hour period and must have PM_{10} concentrations below 50 microgramg/m^3 averaged over the entire year. As of August 1999, there are 6 areas in serious nonattainment and 72 areas in moderate nonattainment.

Sulfur Dioxide

Sulfur dioxide (SO_2) is a noxious gas largely produced by stationary sources. It affects breathing and aggravates respiratory conditions, and it is the most significant precursor to acid rain. For attainment of SO_2 NAAQS, an area must have a maximum annual mean concentration of 0.03 ppm, and not exceed the 24-hour level of 0.14 ppm and the 3-hour level of 0.50 ppm more than once per year. As of August 1999, there are 33 areas in nonattainment for SO_2.

Lead

The mobile source contribution to atmospheric lead pollution has decreased by 99 percent since lead was removed from gasoline in 1986; most lead emissions today come from stationary sources involving metals processing. The health effects of lead exposure can be quite severe, including central nervous system damage, such as seizures, mental retardation, and behavioral disorders. Young children and infants are particularly susceptible to the effects of lead exposure. The NAAQS for lead is 1.5 micrograms per cubic meter averaged over three months. There are currently 10 areas in nonattainment for lead.

State Implementation Plans

States are required under Section 110 of the CAA to develop plans to come into compliance with the NAAQS described above. These plans, known as state implementation plans (SIPs) are submitted to EPA to ensure they adequately meet statutory requirements. A SIP first defines the extent of the pollution problem using computer model predictions of future NAAQS exceedances based on actual emission inventories from mobile, stationary, and area sources. If the model predicts that exceedances will occur, states must impose additional controls on transportation, industry, and individuals to reduce current sources of pollutants.

Sanctions

If a state neglects to submit a SIP, fails to submit an adequate SIP, or fails to implement a SIP, EPA must impose sanctions unless the state corrects the error within 18 months. The first of these is a "2-to-1 emissions offset" on new or modified pollution sources. This means any newly permitted source of pollution must be offset by a double reduction of the new pollutant amount elsewhere in the sanctioned region. This type of sanction has been imposed 14 times since passage of the CAAA in 1990. The second type of sanction EPA can impose is the withholding of certain federal highway funds in the event the deficiency is not corrected within another six months. This sanction has been enforced twice since the 1990 amendments. Despite the imposition of sanctions, projects improving air quality or safety are allowed to proceed.

Transportation Conformity

Transportation conformity ensures transportation investments match a state's plan for meeting the NAAQS. It ensures that transportation activities do not worsen air quality by creating new NAAQS violations, increase the frequency or severity of existing NAAQS violations, or delay attainment of the NAAQS.

Transportation plans, programs, and projects in nonattainment or maintenance areas funded or approved by FHWA or FTA must conform with the SIP. Conformity determinations for transportation plans and programs are made by the metropolitan planning organization (MPO) before they are submitted to U.S. DOT for review and approval. Conformity determinations for individual projects are the responsibility of U.S. DOT and the project sponsor, which is usually the state DOT.

Conformity determinations must be made at least every three years, or as changes are made to plans, programs, or projects. Certain events, such as SIP revisions that establish or revise a transportation-related emissions budget or add or delete transportation control measures (TCM), may also trigger new conformity determinations.

The key components of the conformity determinations include regional emissions analyses, project-level analysis, and, if TCMs are part of the attainment demonstration, evidence of timely TCM implementation.

During a conformity lapse, only limited types of projects can proceed. If an area is in a lapse, FHWA and FTA can only make approvals or grants for projects that are exempt from the conformity process, TCMs that are included in approved SIPs, and projects that have received funding commitments for construction before the lapse. In addition, federal aid cannot continue to fund active design projects or right-of-way acquisition projects (with minor exceptions) during a lapse. Detailed discussion of what projects can advance during a lapse can be found in EPA guidance (May 14, 1999) and FHWA/FTA guidance (June 18, 1999).

Specific CAA Strategies to Reduce Mobile Source Emissions Contributions

The CAA delegates to states the responsibility of achieving NAAQS. In areas that exceed the standards, EPA requires states to adopt air quality control programs. The programs that apply to mobile sources fall into three general categories: cleaner vehicles, cleaner fuels, and lower VMT through transportation control measures. The most stringent requirements are placed on areas with the worst air quality.

Cleaner Vehicles

Cars and Light-duty Trucks

Title II of the CAA has prescribed automobile tailpipe emissions standards since 1968. In 1990 these standards were tightened considerably; Tier 1 standards reduced allowable tailpipe HC levels by 40 percent and tailpipe NO_x levels by 50 percent. In 1999 EPA finalized more stringent Tier 2 tailpipe emissions standards, affecting model year 2004. Tier 2 requires the same tailpipe emissions from cars and light-duty trucks—the first time these vehicles types are subject to the same national pollution control requirements. Tier 2 will mean a 77-percent NO_x emissions reduction for cars, and 65 percent to 95 percent NO_x reduction for light-duty trucks. Tier 2 also requires gasoline sulfur reductions.

Heavy-Duty Vehicles

In 1997 EPA adopted emissions standards for heavy-duty diesel engines in trucks and buses. The new standards regulate both HC and NO_x emissions, and bring a 50-percent reduction in NO_x from older standards. The new standard affects engines manufactured starting in 2004. Buses in cities of at least 750,000 people had to meet 60-percent stricter PM emission standards starting in 1993. EPA can determine that buses are not meeting the standards and require use of low-polluting fuels, such as ethanol, propane, or CNG. Buses built before 1993 are also required to meet PM emissions standards or be retrofitted with emissions-reducing technologies. A proposed second phase to this strategy includes more stringent emission standards and fuel sulfur reduction by 2007.

California Standards

California is given the authority under Section 209 (b) to develop its own stringent vehicle emissions standards. The state has created a program requiring the availability of low-emission vehicles (LEVs), ultra-low-emission vehicles (ULEVs), and zero-emission vehicles (ZEVs). Other states can choose to adopt these standards, as several states in the Northeast have done.

Inspection and Maintenance (I&M)

I&M is used to ensure vehicle emissions control systems are functioning correctly. Periodic inspections and required repairs ensure that vehicles continue to operate at the same emissions standards as when they were originally manufactured. I&M targets vehicles that have fallen into disrepair and emit more pollution than their design standard allows.

Basic I&M is required in areas with moderate or above ozone nonattainment status and in some marginal areas. It requires an idle test of tailpipe emissions and a visual inspection of critical control components. Enhanced I&M is required in areas with serious or worse ozone status. This is a more comprehensive and sophisticated test addressing evaporative emissions, a significant portion of hydrocarbon emissions. Enhanced I&M prohibits stations that conduct I&M tests from performing the vehicle repairs, but gives states other programmatic flexibility.

Fuels

Reformulated and Oxygenated Gasoline

Reformulated gasoline (RFG) burns cleaner than regular gas, and it must be sold in the worst ozone nonattainment areas to prevent smog formation. RFG is blended to reduce exhaust and evaporative emissions and toxic compounds such as benzene. As of 1999, 10 areas were required to sell RFG; 19 additional nonattainment areas have voluntarily opted to sell RFG. The CAA amendments also require that oxygenated gasoline, which has a higher oxygenate concentration, be sold in the worst CO nonattainment areas. The oxygenates methyl tertiary butyl ether (MTBE) and ethanol are most commonly used to meet the required oxygen content of oxygenated and reformulated gasoline.

Alternative Fuels

The CAA amendments encourage use of alternative fuels through the Clean Fuel Fleet Program (CFFP) in the worst ozone and CO nonattainment areas. (Alternative fuels here include methanol, ethanol, RFG, reformulated diesel, natural gas, liquefied petroleum

The MTBE Controversy

The gasoline additive methyl tertiary butyl ether (MTBE) used to reduce motor vehicle tailpipe emissions is contaminating drinking water supplies across the country. Much uncertainty and controversy about the health and environmental risks of this contamination exists, but consumers reject—and are increasingly alarmed about—the foul taste and smell of even slightly contaminated water.

To address public concerns about drinking water and curb expensive cleanup costs, some states have banned or restricted MTBE use. More such actions are likely. However, stopping MTBE use is not simple. It is one of very few chemicals that can satisfy the oxygen requirement for reformulated gasoline under the federal Clean Air Act (CAA), and it is widely used to increase octane in standard gasoline.

The federal government and the private sector do not favor a patchwork of MTBE regulations and fuel formulation requirements in different states. The threat of gasoline supply problems and higher prices encourage national resolution of the issue.

Repealing the oxygenate mandate requires congressional action, but EPA can regulate MTBE use under the Toxic Substances Control Act. EPA has given advance notice that it will propose elimination of MTBE as a fuel additive, but is also encouraging a legislative solution.

gas, hydrogen and electricity.) This program affects public and private fleet owners with 10 or more centrally fueled vehicles. The CFFP requires that an increasing proportion (30 percent at first and 70 percent after three years) of vehicle purchases to fleets be clean-fueled vehicles. As of 1999, this affected 22 metropolitan areas.

California is required to sell certain numbers of clean fuel vehicles; by 1999, it was required to sell 300,000 clean fuel vehicles per year.

Fuel Vapor Recovery

Areas with moderate or worse ozone nonattainment status must require gasoline dispensing systems above a certain size to install and operate gasoline vapor recovery systems to capture emissions from the refueling of vehicles. This might be waived once "on-board" vapor recovery systems are in widespread use throughout the motor vehicle fleet.

Requirements for Ozone, Carbon Monoxide, And Particulate Matter Nonattainment Areas

The CAA requires pollution control strategies in nonattainment areas. The requirements vary based on the type and severity of the pollution problem. These mobile source requirements, which are included in the SIP, become stricter with increasing nonattainment severity.

Reducing Ozone

Marginal (0.121-0.138 ppm): Submit an emissions inventory of all hydrocarbon sources and revise every three years thereafter until attainment. Implement current SIP and correct any SIP deficiencies. If a basic inspection and maintenance (I&M) was in place before designation, it must now meet EPA standards or the requirements of the SIP, whichever is more stringent.

Moderate (0.138-0.160 ppm): SIP must reduce baseline HC emissions by 15 percent over the first 6 years of enactment. Utilize basic I&M program and Stage II vapor recovery program. Contingency transportation control measures (TCMs) must be developed so they may be implemented if the state fails to achieve its required emissions reductions on time.

Serious (0.160-0.180 ppm): Demonstrate a 3-percent reduction on average for years 7 to 9 after the 15-percent reduction already required by year 6. Adopt contingency TCMs if VMT or vehicle HC emissions are higher than expected. Improve monitoring. Utilize enhanced I&M programs and clean fuel fleet programs.

Severe (0.180-0.280 ppm): Requires VMT limitation strategies and use of reformulated gasoline.

Extreme (0.280 ppm and above): Requires heavy-duty emissions control programs.

Reducing Carbon Monoxide

Moderate (9.1-16.4 ppm): Submit an emissions inventory and control plan and revise every three years until attainment. Forecast total VMT for the area. Demonstrate annual improvements sufficient to attain the standard. Plan contingency TCMs in the event VMT exceeds predicted levels or the area fails to attain the NAAQS. Adopt enhanced I&M program.

Serious (16.5 ppm and above): Adopt specified transportation control measures. Implement oxygenated fuels program.

Reducing Particulate Matter

Moderate: Submit a SIP and meet quantitative milestones every three years.

Serious: Submit a SIP and demonstrate attainment within 10 years of submission.

Appendix C: Primer on the Provisions in the Transportation Equity Act for the 21st Century Affecting Mobile Sources

Funding for most projects under the Transportation Equity Act for the 21st Century (TEA-21) comes from federal taxes on fuels paid into the Federal Highway Trust Fund. Each state receives an annual apportionment of these funds according to TEA-21 formulas, and U.S. DOT obligates funds, limited by TEA-21 authorizations. Unobligated funds may be available for future projects.

Out of a total of $218 billion authorized, TEA-21 sets aside roughly $12.4 billion from fiscal 1998–2003 for programs to reduce environmental impacts of transportation. Each of these programs is discussed in this primer in more detail.

- The Congestion Mitigation and Air Quality Improvement program ($8.1 billion: fiscal 1998–2003) helps states achieve the NAAQS by reducing traffic and pollution.
- The Transportation Enhancements program ($3.3 billion: fiscal 1998–2003) strengthens cultural, aesthetic, and environmental aspects of the transportation system.
- The Intelligent Transportation System program ($1.28 billion: fiscal 1998–2003) funds technology to reduce congestion and pollution and to improve highway and transit efficiency.
- The Clean Fuels Formula Grant program ($750 million: fiscal 1999–2003) helps transit systems acquire cleaner buses.
- The Advanced Vehicle Technologies program ($250 million: fiscal 1999–2003) funds research to improve the efficiency, safety and cost effectiveness of the transportation system.

Congestion Mitigation and Air Quality Improvement Program (CMAQ)

TEA-21 provides a six-year, $8.1-billion flexible funding source to state and local governments for transportation programs and projects that reduce transportation-related emissions. Generally, only programs in nonattainment or maintenance areas for O_3, CO, and PM_{10} are funded. Eligible activities include transit improvements, demand management, traffic-flow improvements, and cleaner fueled fleets.

Funding Priority and Apportionment

The highest priority for CMAQ funding is the implementation of transportation control measures (TCMs) in a state's improvement plan. Each state is apportioned at least 0.5 percent of each year's total CMAQ funding for this purpose. Beyond this minimum level, funds are apportioned according to weighted factors based on pollution severity. States with nonattainment areas are required to spend their CMAQ dollars largely in those areas.

Project Eligibility Requirements

CMAQ funds have a 20-percent state match requirement and must follow four general guidelines.

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Table 8: Programs and Projects Eligible for CMAQ Funds

Type of Program	Eligibility Criteria and Examples of Programs	Restrictions and Ineligible Activities	Notes
Transportation Control Measures (TCM)	• Improved public transit • HOV lane construction, provision of pooled ride services • Employer-based transportation incentives and flextime • Trip reduction ordinances, programs to reduce SOV travel • Emissions-reducing traffic flow improvements • Fringe and corridor parking lots for HOV and transit • Bike lanes and storage facilities; bike/ped path construction • Limiting vehicle idling • Extreme low-temperature cold start programs	• Scrappage programs for pre-1980 vehicles	SIP programs have highest priority for CMAQ funding. Air quality benefits will have already been documented. Scrappage of pre-1980 vehicles is included as a TCM in the CAA. Low-temperature cold start programs previously ineligible.
Public-Private Partnerships	• Before project starts, partnerships must specify use of funds, roles of the participants, and cost-sharing arrangements. • Programs must demonstrate strong emission reductions	Not for required private-sector obligations unless they exceed obligations.	The public agency must apply through the metropolitan planning process and oversee the funds.
Alternative Fuels	• Purchase of publicly-owned AFVs. • Establishment of publicly-owned refueling facilities in the absence of adequate privately owned facilities.	AFV must address the pollutant of the NAAQS exceedance.	Fleet conversions no longer are specifically identified in the SIP.
Traffic Flow Improvements	• Traffic signal control • Freeway, incident, and transit management • Electronic fare payment, electronic toll collection • Regional multimodal traveler information	Operating funds available only for three years unless a project is needed for NAAQS achievement.	Large urban areas must have a congestion management system. State ITS must be consistent with national ITS architecture.

Table 8: Programs and Projects Eligible for CMAQ Funds (CONTINUED)

Type of Program	Eligibility Criteria and Examples of Programs	Restrictions and Ineligible Activities	Notes
Transit Projects	• Purchase of new facilities and replacement vehicles • Three years of operating costs of a new facility • Fare subsidies in a program to avoid NAAQS exceedances	Rebuilding or maintaining existing transit. Operating costs after three years.	Included as a TCM in the CAA. These are CMAQ-eligible only if increase in ridership is expected.
Travel Demand Management (TDM)	• Market research and capital costs for TDM implementation • Emissions-reducing traffic calming measures • Up to three years of TDM operating costs • Public education/marketing of TDMs		TDMs are most successful with complementary measures to discourage SOV use, such as parking restrictions.
Outreach and Rideshare Activities	• Public education on transportation and air quality • Marketing of alternatives to SOV travel • Technical assistance to employers promoting HOV travel • Vanpool operating expenses for up to three years • Up to three years of start-up costs for Transportation Management Associations (TMA)	Purchase of publicly owned vehicle for a vanpool in competition with private-sector initiatives	
Telecommuting	• Planning and training • Technical and feasibility studies • Coordination, marketing and promotion	Construction of telecommuting centers; equipment purchases.	
Fare/Fee Subsidy Programs	• Transit subsidies, as part of a program to reduce SOV use • Subsidies for other demand-management strategies • Incentives for carpooling, bicycling and walking	Three-year limit on fare/fee subsidies.	

Table 8: Programs and Projects Eligible for CMAQ Funds (CONTINUED)

Type of Program	Eligibility Criteria and Examples of Programs	Restrictions and Ineligible Activities	Notes
Planning and Project Development	• Preliminary engineering or project planning studies • National Environmental Policy Act (NEPA) documentation and other transportation/air quality project planning • TCM project development • Monitoring to determine air quality impacts of projects	General planning or monitoring; NEPA or other environmental documentation unrelated to an air quality project.	
I&M	• Construction of I&M facilities • Purchase of I&M equipment • One-time start-up activities such as software development • Up to three years of operating expenses	Any expenses for privately owned facilities, except as part of a public-private partnership	
MagLev Technology	Planning, engineering and construction project costs of the Magnetic Levitation Transportation Technology Program		
Experimental Pilot Projects	Transportation projects that can reasonably be expected to reduce emissions by reducing VMT or fuel use. VMT, trip, or emissions reductions will need to be documented using before-and-after studies.		MPO, state DOT, FHWA/FTA, EPA and state/local air agencies must approve. Projects may not exceed 25 percent of a state's yearly CMAQ apportionment.

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1. Capital Investment—Funds should be used for new or expanded transportation projects and programs to reduce emissions, often in the form of capital investment in infrastructure or program establishment.
2. Operating Assistance—Funds *may* be used for three years of new transportation services, but other funding should eventually supplant the CMAQ portion of operating costs.
3. Emissions reductions—Projects must show reductions in CO, O_3 precursors, or PM_{10}.
4. Public Good—Funds must be used for emissions reductions. Public-private partnerships *may* be eligible if they demonstrate an emissions reduction that would benefit the community (see Table 8).

Eligible Programs and Projects

For a project to be considered for CMAQ funding it must be a transportation project, be in a nonattainment or maintenance area, and reduce emissions.

Project Selection Process

Estimates of emission reductions in CMAQ project proposals provide an objective cost-benefit comparison of funding requests. The type of analysis required is at the discretion of the Federal Highways Administration (FHWA), the Federal Transit Administration (FTA) and EPA. In the absence of a quantifiable emissions projection, a qualitative assessment based on reasoned and logical examination of how the project will decrease emissions and contribute to attainment of a NAAQS is acceptable.

State Program Oversight Responsibilities

Decisions on CMAQ program funding must be made through the appropriate metropolitan or statewide planning process. States, metropolitan planning organizations (MPOs), and transit agencies are encouraged to consult with air quality agencies to develop criteria to select CMAQ projects.

All projects funded under Title 23 of the United States Code, including CMAQ, must be included in plans and transportation improvement programs (TIPs). The TIP must contain a list of priority projects to be funded over a three-year period. Close coordination is required between states (that oversee the statewide program) and MPOs (that approve projects sponsored by local entities) to ensure funds are used appropriately and effectively. States must submit annual reports to FHWA listing the amounts of CMAQ funds that have been obligated and what emissions reductions have been achieved.

Transportation Enhancements

Transportation enhancements (TE) are transportation-related activities that strengthen the environmental, cultural or aesthetic aspects of the national transportation system.

To be eligible for TE funds, a project must fall under one or more of twelve activities specified in TEA-21. Traffic control measures included on this list are:

- provision of facilities for pedestrians and bicycles; and
- preservation of abandoned railway corridors, including the conversion and use thereof for pedestrian or bicycle trails.

Vehicle Technology

Intelligent Transportation Systems

The Intelligent Transportation Systems (ITS) program provides $1.28 billion over six years for research, development, and operational testing of ITS strategies that solve congestion and safety problems, improve efficiency of transit and commercial vehicles, and reduce the environmental impact of growing VMT. The most technically feasible and cost-effective technologies will be deployed in an integrated nationwide system. The U.S. Department of Transportation is responsible for developing and maintaining the national ITS architecture, supporting standards to promote consistent widespread use of ITS technology, and ensuring interoperability and efficiency of the integrated system to the maximum extent possible.

ITS research and development is funded at $603.2 million from fiscal 1998 to fiscal 2003. Research and development must follow priorities outlined in TEA-21. ITS deployment is funded at $679 million from fiscal 1998 to fiscal 2003. Small grants are available to state and local governments to integrate ITS infrastructure and to fund commercial vehicle ITS infrastructure deployment.

Advanced Vehicle Technology Program

Projects in this program must seek to alleviate transportation-related problems and must be undertaken by a statewide or multistate organization that is more than three years old. The organization must solicit participation from the private sector and projects must be at least 50-percent non-federally funded.

Alternative Fuels

Clean Fuels Formula Grant Program

This program accelerates the deployment of cleaner bus technologies. It provides grants to transit systems to purchase or lease clean fuel buses, construct alternative fuel facilities, rebuild older engines with clean fuel technology, and utilize alternative fuels. The funds are for vehicles fueled by compressed natural gas, liquefied natural gas, biodiesel, batteries, alcohol fuels, hybrid electric power, fuel cells, clean diesel, or other low- or zero-emissions technologies.

Grants are awarded based on the size of the vehicle fleet, the number of passenger miles traveled, and the severity of the area's air quality violation. No more than $15 million can be used in areas with a population under 1 million, and no more than $25 million can be used in areas with populations of 1 million or more. The federal match is 80 percent of the project cost.

Bicycle and Pedestrian (Bike/Ped) Projects

TEA-21 seeks to integrate bicycling and walking into the transportation mainstream. A number of funding sources are available for bike/ped projects, including funds from CMAQ, TE, the National Highway System, Surface Transportation Program, Recreational Trails, Federal Lands Highway Program, National Scenic Byways Program, and Transit Enhancement Activity Program. The federal share of a bike/ped project is usually 80 percent; state and local match funds for federal-aid projects may include in-kind contributions.

Transportation and Community and System Preservation Pilot Program

TEA-21 provides planning and implementation grants ($120 million from fiscal 1999–2003) to improve transportation system efficiency; reduce environmental impacts of transportation and the need for costly future public infrastructure investments; ensure efficient access to jobs, services, and centers of trade; and encourage private-sector development patterns that serve these purposes. This can be accomplished by concentrating spending in high-growth areas, establishing growth boundaries to guide urban expansion, creating green corridors that provide access to major highway corridors for efficient and compact development, and similar programs.

Unfunded Environmental Provisions in TEA-21

- States can permit single-occupancy, low-emission vehicles to use HOV lanes.
- DOT is required to develop and implement a coordinated concurrent environmental review process for federal agencies, ensuring that transportation projects move through the process in a timely manner.
- EPA must designate nonattainment areas for the new air quality standards issued in 1997. EPA must provide funding to states to establish a $PM_{2.5}$ monitoring system and designate $PM_{2.5}$ areas before implementing new controls on regional haze.
- TEA-21 changes the tax code to help bring employer benefits for parking and commuting into approximately the same range. These changes make it easier for an employer to offer transit and vanpool benefits or cash to an employee in lieu of parking. Under the Taxpayer Relief Act of 1997, transit and vanpool benefits are given the same tax treatment.

Appendix D: Acronyms Used In This Report

Acronym	Definition
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
AFV	Alternative fuel vehicle
ASM	Acceleration simulation mode test
AVL	Automatic vehicle locator
BMC	Baltimore Metropolitan Council
CA/T	Central Artery/Tunnel Project (Boston, Massachusetts)
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
Caltrans	California Department of Transportation
CARS	Customer Assistance for Repair and Services (Colorado)
CFFP	Clean Fuel Fleet Program
CMAQ	Congestion Mitigation and Air Quality Improvement Program
CNG	Compressed natural gas
CO	Carbon monoxide
CPTC	California Private Transportation Company
CTA	Chicago Transit Authority
DOT	U.S. Department of Transportation
E-100	Pure or "neat" ethanol
E-85	85 percent ethanol, 15 percent gasoline
EPA	U.S. Environmental Protection Agency
EPACT	Energy Policy Act
EV	Electric vehicle
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GA EPD	Georgia Environmental Protection Department
GADOT	Georgia Department of Transportation
GGE	Gasoline gallon equivalent
GIS	Geographic information systems
HOT	High-occupancy toll
HOV	High-occupancy vehicle
I&M	Inspection and maintenance
IDOT	Illinois Department of Transportation
ILEV	Inherently low-emission vehicle
ITS	Intelligent transportation system
LNG	Liquified natural gas
LPG	Liquified petroleum gas (propane)
M-85	85 percent methanol, 15 percent gasoline
MDE	Maryland Department of the Environment
MPGGE	Miles per gasoline gallon equivalent
MPO	Metropolitan planning organization
MTBE	Methyl tertiary butyl ether
NAAQS	National ambient air quality standards
NESCAUM	Northeast States for Coordinated Air Use Management
NLEV	National low-emission vehicle program
NMHC	Non-methane hydrocarbon

Acronym	Definition
NMOC	Non-methane organic compounds
NO_x	Oxides of nitrogen
NYSERDA	New York State Energy Research and Development Authority
O_3	Ozone
OAD	Ozone Action Day
OEM	Original equipment manufacturer
OMS	EPA's Office of Mobile Sources
PM	Particulate matter
PM_{10}	Particulate matter 10 microns or smaller in diameter
$PM_{2.5}$	"Small" particulate matter, 2.5 microns or smaller in diameter
PPM	Parts per million
PSG	Partnership for a Smog-Free Georgia
RFG	Reformulated gasoline
RSD	Remote sensing device
RTA	Regional Transportation Authority (Chicago area)
RVP	Reid vapor pressure
SIP	State implementation plan
SOV	Single-occupancy vehicle
SO_x	Oxides of sulfur
SR-91	California State Route 91
STP	Surface Transportation Program
SULEV	Super ultra low-emission vehicle
TCM	Transportation control measure
TEA-21	Transportation Equity Act for the 21st Century
THC	Total hydrocarbon
TIP	Transportation improvement program
TLEV	Transitional low-emission vehicle
UGB	Urban Growth Boundary (Portland, Oregon)
ULEV	Ultra low-emission vehicle
UTA	Utah Transit Authority
VIP	Vanpool incentive program
VMT	Vehicle miles traveled
VOC	Volatile organic compound
WashCOG	Metropolitan Washington D.C. Council of Governments
ZEV	Zero-emission vehicle

Appendix E: Glossary

Alternative Fuels: Non-gasoline fuels used to operate motor vehicles. Includes methanol, ethanol, or other alcohols and blends; natural gas; liquefied petroleum gas; hydrogen; and electricity.

Area Source: Small stationary and non-transportation pollution sources that are too small and/or numerous to be included as point sources, but may collectively contribute significantly to air pollution.

Attainment area: An area with air quality that meets or exceeds EPA health standards. An area may be an attainment area for one pollutant and a nonattainment area for others.

California Low-Emission Vehicles: California will require four new, tailpipe standards for cars sold in the state beginning in 1994. The standards are more stringent than federal standards. California will introduce four additional vehicle categories having even more stringent emission standards: TLEVs, LEVs, ULEVs and ZEVs. This program allows manufacturers to use any combination of control technology, conventional and clean-fueled cars, and alternative fuels to meet the standards. This approach treats vehicles and fuels as a system, providing flexibility and encouraging cooperation among fuel and automobile industries.

CAAA: Clean Air Act Amendments of 1990.

Carbon Monoxide (CO): A colorless, odorless gas produced through incomplete combustion of organic fuels. Automobiles are primary sources of CO.

Clean-Fueled Vehicles: Vehicles that must meet or exceed strict emission standards. They could include those powered by natural gas, alcohol fuels, or electricity.

Cold-Start Emissions: Emissions resulting during the first few minutes of vehicle operation before the catalyst heats up and becomes effective.

Catalytic Converter: A device containing a catalyst for converting automobile exhaust into modestly harmless products.

Conformity: The Clean Air Act Amendments of 1990 (CAAA) require that the transportation plans, programs, and projects conform to the purpose of the state implementation plan (SIP) and forbid federal approval or funding of any project that would cause or contribute to a violation of a national ambient air quality standard (NAAQS). Under the amendments, a conforming transportation plan, program, or project is one that "does not result in or contribute to a new violation in the NAAQS in any area; does not increase the severity or frequency of a NAAQS violation; and does not cause the delay in attainment of the NAAQS or other interim emissions reduction goals or other milestones in any area."

Congestion Pricing: A road fee levied based on the peak periods of travel.

Congestion Mitigation and Air Quality Improvement Program (CMAQ): A funding program created with the Intermodal Surface Transportation Equity Act of 1991 (ISTEA) that directs funding to projects that help meet national air quality standards. CMAQ funds generally may not be used for projects that result in the construction of new capacity available to single-occupancy vehicles.

Emission Budgets: The part of the state implementation plan (SIP) that identifies the allowable emissions levels, mandated by the NAAQS, for certain pollutants emitted from mobile, stationary, and area sources. The emissions levels are used to meet emission reduction milestones, attainment, or maintenance demonstrations.

Emissions Inventory: A complete list of sources and amounts of pollutant emissions within a specific area and time interval.

Emission Fees: Charges based on an estimate of a vehicle's emissions. Fees may be levied at the time of registration based on a reading of the vehicle odometer and a measurement of the tailpipe emissions.

Employer Commute Options (ECO): Employer-based transportation management plans. Employers with more than 100 employees in some nonattainment areas were originally required to adopt plans under the CAAA to increase occupancy-for-work commutes by 25 percent. Such programs are now optional and used only in a few states.

Employee Paid Parking: Charging employees for previously free parking. Revenues may be used to subsidize transit and ridesharing incentives.

Episodic Measures: Activity-based mobile source programs that are implemented during identified periods of high pollutant concentrations, varying by meteorological conditions. These measures may or may not be continuous in nature, depending on program design.

Gasoline Taxes: Highway user fees mandated by Congress to fund transportation improvements.

High-Occupancy Toll Lanes (HOT lanes): Special highway lanes that charge a higher fee to single- or low-occupancy vehicles, usually during peak travel periods.

High-Occupancy Vehicle (HOV) Lanes: Special highway lanes that prohibit single-occupancy vehicles, usually during peak travel periods.

Hot-Soak Emissions: Emissions that primarily come from the engine area where fuel is vaporized for combustion and from overload of the carbon canisters that are designed to control evaporation from the tank and engine. A good pressure cap will prevent most vapors from leaving the tank.

Hot Spot: An area where high concentrations of carbon monoxide and particulate matter occur. One criterion for conformity that individual projects must meet is to demonstrate that the project will not cause a hot spot.

Hydrocarbon (HC): HCs are compounds of carbon and hydrogen and include volatile organic compounds such as aldehydes and alcohols. Transportation-related HCs are produced primarily through unburned fuel that enters the atmosphere in vehicle exhaust.

Inspection and Maintenance (I&M): An emissions testing and inspection program to ensure that the catalytic converter or other emissions control devices on in-use vehicles are properly maintained.

Intermodal: The ability to connect modes of transportation.

ISTEA: Intermodal Surface Transportation Efficiency Act of 1991. This was a legislative initiative that restructured funding for transportation programs. ISTEA authorized increased levels of highway and transportation funding and an increased role for regional planning commissions/MPOs in funding decisions. ISTEA required comprehensive regional and statewide long-term transportation plans and increased emphasis on public participation and transportation alternatives.

Land-Use Planning: Community-based planning for future development. Fostering land-use patterns that minimize vehicle travel may achieve more efficient use of the transportation infrastructure.

Lead: A poisonous heavy metal that damages the nervous system and kidneys and impairs mental function. It entered the atmosphere as a result of the combustion of gasoline that contained lead antiknock compounds. Phase-out of leaded gasoline was mandated under the CAAA.

Low-Emission Vehicle (LEV): A vehicle meeting emission standards stricter than Tier 1 and less strict than TLEV, ULEV, and ZEV.

Metropolitan Planning Organization (MPO): The organizational entity designated by law with lead responsibility for developing transportation plans and programs for urbanized areas of 50,000 or more. MPOs are established by agreement of the governor.

Mobile Source: These include motor vehicles, aircraft, seagoing vessels, and other transportation modes. The mobile source-related pollutants are CO, VOCs, NO_x, and PM_{10}.

Mode Shifting: Incentives or mandates to alter travel behavior, such as telecommuting, compressed work weeks and flexible work schedules.

National Ambient Air Quality Standards (NAAQS): Health-based standards for airborne particulates, lead, nitrogen dioxide, ozone, carbon monoxide, and sulfur dioxide.

Nitrogen Oxide (NO_x): Oxides of nitrogen. This includes a number of compounds resulting from the burning of fossil fuels.

Nonattainment area: An area that exceeds NAAQS and has been formally designated as nonattainment by EPA. The CAAA divides CO and ozone nonattainment areas into categories based on severity of pollution. It requires certain programs in all areas and additional control measures in areas that have more severe pollution. An area remains in nonattainment until EPA redesignates it to attainment.

Non-Road Vehicle and Engine Controls: Emission controls for construction equipment, lawn and garden equipment, and recreational marine engines. Program can be developed to encourage turnover of older, uncontrolled equipment.

Onboard Diagnostics: Computerized systems that detect emission control failures and notify the driver of malfunctions so the vehicle can be repaired.

Onboard Vapor Recovery: Canisters on vehicles that capture gasoline fumes released during refueling.

Oxygenated gasoline: Gasoline enriched with oxygen-bearing liquids to reduce CO production by permitting more complete combustion.

Ozone: Also known as smog, ozone is produced through a reaction of NO_x and VOC emissions in sunlight.

Particulates/Particulate matter: A category of air pollutant that includes all solid particles and liquid droplets in the air, except water. Particulate matter may be in the form of fly ash, soot, dust, fog, fumes, etc.

Pricing Strategies: Market-based policies or economic incentives to change travel behavior.

Reformulated Gasoline (RFG): Gasoline reformulated to meet federal requirements to reduce VOCs, NO_x, and toxics. RFG is required in many ozone nonattainment areas.

Road fees: Similar to tolls and other charges for road use; may employ automatic vehicle identification (AVI) technology.

Scrappage: Program to accelerate retirement of older, more polluting vehicles, often through buy-back programs.

Seasonal Measures: Emissions reduction programs that are in effect only during the season when the area experiences high pollutant concentrations.

Single-Occupancy Vehicle (SOV): Vehicles driven by one person with no passengers.

State Implementation Plan (SIP): These are detailed plans states must develop and implement under federal clean air laws to bring areas that exceed the NAAQS into compliance. State and local air quality agencies have the primary responsibility for preparing the SIP. The SIP development process must allow for public review of plans and public hearings, and it must be supported by adequate legislation before the governor submits it to EPA for approval.

Stage II Vapor Recovery: A system to capture and recover evaporative emissions from refueling vehicles.

Stationary Source: Relatively large, fixed sources of emissions (e.g., chemical process industries, petroleum refineries, etc.).

Tailpipe Standards: Federally mandated standards established for CO, hydrocarbons (or VOCs), and NO_x. The CAAA of 1990 strengthened existing standards. In 1994, Tier 1 Tailpipe Standards were phased in for

vehicles sold nationwide. Tier 2 Tailpipe Standards are twice as stringent as Tier 1 and will be required beginning in 2004.

Tier 1: New tailpipe standards for VOCs (from 0.41 grams per mile (gpm) to 0.25 gpm) and NO_x (from 1 gpm to 0.4 gpm) established under the CAAA; CO remains at 3.4 gpm. Phased in beginning in 1994 for vehicles sold nationwide.

Tier 2: Tailpipe standards twice as stringent as Tier 1; required beginning in 2004.

Traffic Flow Improvement Programs: Signalization or other strategies to reduce congestion.

Transit: Passenger service provided to the general public along established routes with fixed or variable schedules at published fares.

Transportation Control Measure (TCM): Any action intended to adjust traffic patterns or decrease vehicle use to reduce air pollutant emissions. Examples include transit, HOV and HOT lanes, traffic-flow improvements, car- and vanpooling, flextime, telecommuting, and bike/pedestrian programs.

Transportation Plan and Transportation Improvement Program (TIP): The metropolitan transportation planning process requires each urbanized area to develop a transportation plan and a TIP. The MPO must approve the transportation plan, and the MPO and the state's governor must approve the TIP to receive federal funds for the transportation projects. The transportation plan is a 20-year plan describing policies, strategies, and facilities to accommodate current and future travel demands and to make more efficient use of the existing transportation system. The TIP is a three-year program of transportation projects consistent with the transportation plan. The TIP includes a priority list of projects and project segments to be carried out within each three-year period after the adoption of the TIP. The TIP is developed by the MPO, in cooperation with the state and affected transit operators, and it must be updated at least once every two years. These are then submitted to FHWA for approval.

Trip-Reduction Ordinances: Prohibitions against driving during certain periods or on certain days.

Transitional Low-Emission Vehicle (TLEV): A vehicle in the emissions class more stringent than Tier 1, and less stringent than LEV, ULEV, and ZEV.

Ultra-Low-Emission Vehicles (ULEV): A vehicle in the emissions class more stringent than Tier 1, TLEV, and LEV, and less stringent than ZEV.

Vehicle Miles Traveled (VMT): This refers to the total number of miles traveled by vehicles in a given area.

Volatile Organic Compounds (VOCs): Also referred to as non-methane hydrocarbons (NMHCs) or reactive organic gases (ROGs). VOCs are compounds containing carbon and hydrogen (in combination with any other element) that have a high volatility. They are reactive in sunlight, forming ozone or smog when mixed with nitrogen oxides in the atmosphere.

Voluntary Measures: Emission reduction programs that rely on voluntary actions of individuals or other parties for achieving emission reductions.

Zero-Emission Vehicle (ZEV): A vehicle that does not contribute directly to air pollution. The only current technology that fulfills this definition is an electrically powered vehicle.

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Endnotes

1. Although mobile sources are a significant piece of the puzzle, stationary, natural, and area sources also contribute to the air quality problem. However, non-mobile sources are beyond the scope of this document.
2. The Clean Air Act requires that vehicle owners spend at least $450 towards emissions-related repairs before a waiver is granted, but states may increase this amount to obtain extra credits or use vehicle scrappage programs, where old, dirty vehicles are destroyed to lower the minimum required expenditures.
3. The program was known as The Voluntary Ozone Action Program at the time.
4. This alert level is based on EPA's air quality index: 125 ppb and above is a red alert, 105ppb-125 ppb is an orange alert, and 61ppb-105 ppb is a yellow alert. An OAD designation is usually reserved for the red alert days but may also be used for consecutive days at orange alert.
5. An ozone action day (OAD) in the ENDZONE program is comparable to a Smog Alert Day in the Partnership for a Smog-Free Georgia program.
6. Non-transportation categories of voluntary reductions come from non-commercial painting, lawn and garden equipment, and consumer aerosol use.
7. This assumes the vehicles are dedicated AFVs, running solely on the alternative fuel. Some AFVs can run on conventional fuel as well, but these do not provide emissions benefits.
8. Vehicles are assumed to burn 500 gasoline gallon equivalent (gge) of LPG per year, with a fuel efficiency of 11 mpgge, based on data from DOE's Alternative Fuels Data Center. These vehicles are categorized as CNG Light-Duty Truck 4. The Ford F-250 pickup truck is an example and it meets federal ULEV standards.
9. Calculations use estimates of evaporative emissions based on Mobile 5a modeling. This calculation assumes summer temperatures of 65 degrees-72 degrees, 32 miles per hour average speed. This results in about 0.56 g evaporative HC per mile. The vehicles are assumed to burn 500 gge of LPG per year and achieve a fuel efficiency of 11 mpgge.
10. Calculations assume vehicles drive 100,000 miles per year, and emit the Federal Tier I emissions of 3.4g/mi for CO, and 0.4g/mi for NO_x for the a baseline emissions profile for 270 gasoline taxis. Emissions for the CNG taxis were assumed to be 0.476g/mi for CO, and 0.132g/mi for NO_x, based on data from the Natural Gas Vehicle Coalition. These emissions reductions assume the same parameters as above for evaporative emissions.
11. As of July 1999.
12. This is the at-pump price, which includes a $0.54/gal. federal tax credit. Without the credit, GGE prices would be $1.57-1.84/gal. It may be possible to produce biomass ethanol for $1.22/gal.
13. This is for a vehicle with a 17 mpg - 25 mpg rating, and an EV efficiency of 4.0 mi/kW-hr with a $.05/ kW-hr. electricity price.
14. This refers to the MOBILE6 model. Although this is not currently in use in the states, the shortcomings of this most sophisticated model further highlight the inability of older models to account for results of innovative programs.

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