

# State Alternative Fuel Vehicle Incentives

A Decade and More of Lessons Learned

By  
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NATIONAL CONFERENCE *of* STATE LEGISLATURES

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## ABOUT THE AUTHORS

Matthew Brown is the director of the NCSL Energy Project. He has worked for more than a dozen years on state energy policy issues, ranging from electricity issues to energy and transportation issues. He has testified before legislatures in more than 30 states on a wide variety of issues, including alternative fuel vehicles, and has written numerous publications on the topic. Before joining the National Conference of State Legislatures, he led the alternative fuel vehicle efforts of the New York City Department of Telecommunications and Energy. He holds a bachelor's degree from Brown University and an MBA from New York University.

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# METHODOLOGY

NCSL gathered information for this study from numerous sources including personal and telephone interviews with Clean Cities coordinators, and utility, government, manufacturer and fleet representatives. NCSL also surveyed state tax and grant incentive managers to determine the exact usage of each state incentive. These were conducted using telephone and e-mail interviews and data gathering (See appendices A and B). NCSL also conducted several case studies on individual states. In these case studies, NCSL identified the incentives available in the state and examined the incentives and their performance in detail.

Finally, NCSL worked with the National Association of Fleet Administrators (NAFA), to conduct a survey of fleet managers. NCSL developed a survey that NAFA sent to its members. Of the 1,500 surveys sent, there were 305 responses. This approximate response rate of 20 percent was surprisingly high. Respondents included state, municipal, utility and private entities.

NCSL staff gathered and analyzed this information to reach the conclusions described in the body of this report. Representatives from the U.S. Department of Energy, fleet managers, and those in the natural gas, electric, automotive, environmental and state policymaking audience reviewed and commented on drafts of this report.





# EXECUTIVE SUMMARY

Almost 10 years after the enactment of the federal Energy Policy Act of 1992 and the creation of alternative fuel vehicle incentives in many states, it is time to assess how successfully these incentives achieved two goals: to reduce America's reliance on foreign oil imports, and to reduce air pollution resulting from America's dependence on fossil fuels for transportation.

This report assesses the effectiveness of state incentives and suggests incentives that might encourage new vehicle technologies. It does not assess whether a state should promote alternative fuel vehicles or whether such vehicles are the most effective means to reduce air pollution. Rather, the analysis analyzes the effectiveness of state incentives of the past decade and describes the characteristics of effective alternative fuel vehicle incentives and the fiscal implications for a state that is committed to support an effective alternative fuel vehicle program.

In general, state alternative fuel vehicle incentives have not stimulated widespread conversion to alternative fuels in the United States. This disappointing outcome is due partly to the design of the incentives themselves, partly to the early stage of technological development of some alternative fuel vehicle technologies, and partly to the fact that alternative fuels are competing against inexpensive and well-entrenched conventional fuels. Both anecdotal and quantitative evidence suggest that incentives currently are necessary for the alternative fuel vehicle industry. Absent incentives, the industry will falter in the short-term, and can hold no hope of a significant role in the nation's transportation industry in the long-term future.

Some state level incentives work better than others, as evidenced by the somewhat uneven distribution of alternative fuel vehicles around the country. The incentives that work well are:

- Focused on reducing emissions or petroleum use.
- Large enough to entice consumers to buy an alternative fuel vehicle.
- Grant-based in most cases.
- Easy for consumers to receive and for the state to administer.
- Focused on developing a fueling infrastructure in addition to encouraging consumers to buy alternative fuel vehicles.

*Focused on reducing emissions or petroleum use.* Some states have put incentives in place that seem to have done little to convince people to use alternative fuels—even though the incen-

tives might convince them to buy vehicles capable of operating on alternative fuels. The most recent and notable case is Arizona, which developed incentives for people to buy vehicles capable of running alternative fuels. However press reports from the state show that although some people bought vehicles that were dedicated to alternative fuel use, many bought vehicles capable of running on both gasoline and alternative fuel, and have no intention of actually running their vehicles on the alternative fuel. As a result of this loss of focus on emissions and petroleum use reductions, the state will have spent a great deal of money on incentives with little to no guarantee that incentives will achieve their goals.

*Large.* Incentives need to be big enough to offset much or all of the incremental cost of alternative fuel vehicles. Theoretical studies of consumer behavior, such as NCSL's survey of the nation's fleet managers and another one performed by Ford Motor Company, support this conclusion. Empirical observations of consumers' behavior also support this conclusion. Most fleet managers seem to feel that they are taking on a vehicle with performance and operational characteristics that are inferior to conventional vehicles when they buy an alternative fuel vehicle. Whether or not advocates of alternative fuels agree with the fleet managers' conclusion, it is clear that these fleet managers will not willingly pay extra for alternative fuel vehicles. Successful incentives will need to make up for most or all of the incremental cost of alternative fuels.

*Easy to administer.* Alternative fuel vehicle incentives need to be easy for consumers to get and for state government to administer and monitor. Some incentives may offer a good model, such as the California South Coast Air Quality Management District incentive. This incentive is administered through auto manufacturers. Auto dealers advertise a vehicle price that includes the incentive, and simply pass on the invoice for the incentive to the manufacturer. The manufacturer immediately reimburses the dealer, and then applies for reimbursement from the Air Quality Management District.

*Focused on infrastructure in many cases.* Alternative fuel vehicle advocates have long debated whether it is more important to have infrastructure or alternative fuel vehicles. This report concludes that infrastructure incentives are a critical component of any government incentive program. Evidence for this conclusion comes from a survey of fleet managers, empirical evidence from some states such as New York and California, and from discussions with states such as Connecticut that have almost no infrastructure incentives—and small numbers of alternative fuel vehicles. Further evidence for this conclusion comes the success of a new breed of advanced technology vehicle: the hybrid electric vehicle now offered by Honda and Toyota. Consumers have snapped up these vehicles quickly in part because they are more fuel efficient than conventional vehicles, in part because they are priced at levels comparable to gasoline vehicles, and in some part because they can use the existing fueling infrastructure.

*Grant-based, in many cases.* This report concludes that the most effective incentives are often grant-based. Non-taxable entities such as municipal government or non-profit organizations can use grants—and these are among the more promising markets for alternative fuel vehicles. Grants also offer certainty, and do not depend on the size of an individual's tax liability. A tax credit, for instance, often will be limited to the size of the taxpayer's tax liability in any given year. In some cases, tax incentives can work well. One example is of tax incentives that are incorporated into vehicle lease payments. Another is a so-called refundable tax credit, which is paid to the taxpayer regardless of tax liability in that year. Such refundable tax credits are still not helpful to non-taxable entities.

These several characteristics of successful incentives are best incorporated together in one package. Arizona, for instance, offered a package of very large, but unfocused, incentives that did not accomplish the state's goal of cleaning the air—and were far more expensive than the state could afford.

This report provides details from states that have developed incentives that possess at least some of these characteristics. It focuses heavily on states such as Arizona that have particularly aggressive alternative fuel vehicle programs, and seeks to glean lessons from these states' experiences.



# 1. INTRODUCTION

When President George Bush signed the Energy Policy Act in 1992, the United States had only recently completed a successful and expensive war to push Saddam Hussein's Iraqi troops back to the border with Kuwait. Years before the conflict began, the United States had grown highly dependent on oil imported from Kuwait, Iraq, Saudi Arabia and the countries in the Persian Gulf. It appeared clear at the time that the United States needed to adopt a strategy to reduce its dependence on foreign oil; the Energy Policy Act was enacted as part of this strategy.

The purpose of the Act was to lead the country away from dependence on oil and toward partial reliance on domestically produced alternative fuels like natural gas, methanol, ethanol, electricity and propane. It provided federal tax incentives for the purchase of alternative fuel vehicles and mandated some vehicle fleets to use alternative fuel vehicles. Congress and the president hoped that this combination of incentives and mandates would eventually free the nation from its risky dependence on imported fuels.

Forty-six states followed suit with their own incentives for alternative fuels, including some states that had adopted them before Congress passed the Energy Policy Act. By early 2000, the natural gas and electric utility industries; the ethanol, propane and methanol industries; the automotive industry; a host of small shops to support the alternative fuel vehicle industry; the federal government; and state and local governments had attempted to meet federal, state or local alternative fuel vehicle goals. States subsidized alternative fuel vehicles with incentives and put alternative fuel vehicles into their own fleets. A few municipalities—such as New York City and Denver, Colorado—adopted requirements that their own fleets purchase fuel-efficient or alternative fuel vehicles. Industry and state and local governments invested millions of dollars to build infrastructure, develop new automotive technologies and create a network to service the new technologies.

Almost 10 years after enactment of the federal Energy Policy Act and after many states have pioneered alternative fuel vehicle incentives, it is time to assess how successfully the incentives have accomplished their original goals: improving air quality and weaning the country from its dependence on imported oil. This report assesses the past 10 years of state-level incentives, and suggests incentives that might effectively encourage new vehicle technologies.

## 2. AN ASSESSMENT OF STATE INCENTIVES

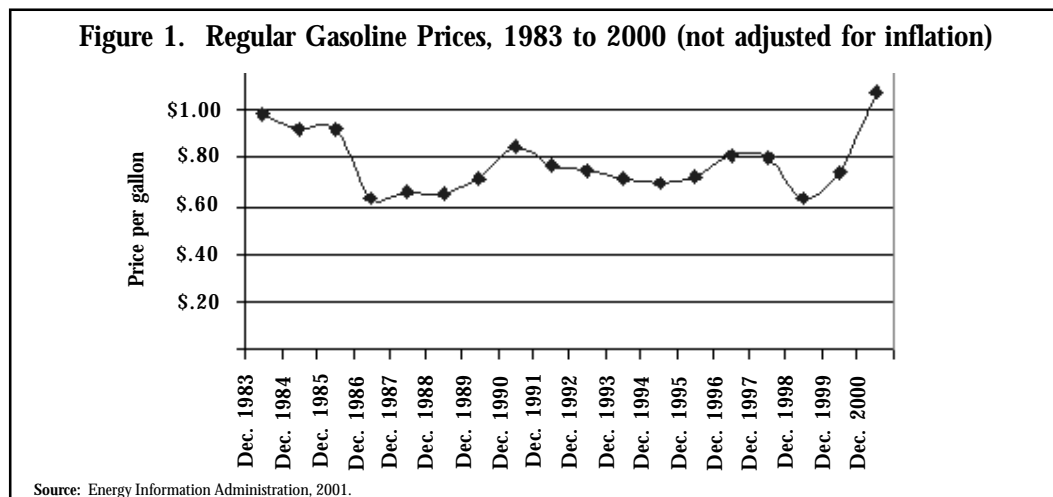
### General Considerations

Any assessment of the success or failure of alternative fuel vehicle incentives must be considered in the context of the market and environment in which alternative fuel vehicles compete. A few factors that may influence the success of the incentives have little to do with the design of the incentive itself. These are:

- Gasoline prices,
- Availability of alternative fuel vehicle technology,
- Geographical considerations, and
- Leadership within state government.

### *Gasoline Prices*

Gasoline prices almost doubled in many parts of the country during 2000. However, this increase in price follows an extended period of low gasoline prices, and even the relatively high gasoline prices still are below the prices that were seen in the mid-1970s (figure 1). Some studies indicate that the relatively high gasoline prices during 2000 have led Americans to buy lower grades of gasoline that cost less than premium grades. Higher prices may have caused them to take fewer trips than when gasoline prices were \$1 per gallon or less. Low gasoline prices create a difficult environment in which new alternative fuels must compete, since most drivers see little reason to switch from a widely available, relatively inexpensive fuel.



## *Availability of Alternative Fuel Vehicle Technology*

New vehicle technologies—especially battery-powered electric vehicles—still are not widely available. Even electric vehicle advocates point out that incentives for these new technologies will not have any immediate effect until the technologies are further developed and widely available.

## *Geographic Considerations*

Alternative fuels may work better in one part of the country than in another. Because many alternative fuel vehicles travel shorter distances before refilling than some gasoline vehicles, they may be more appropriate for urban and suburban areas than for rural areas. Montanans frequently travel long distances and live in a state that is not densely populated. This may account for the relatively small number of alternative fuel vehicles in Montana. Arizona, California and parts of New York stand in contrast to Montana. These more densely populated states have large urban areas. The driving habits of people in these areas more easily accommodate use of alternative fuels.

## *Leadership Within State Government*

Leadership from high levels of state government influences the effectiveness of alternative fuel vehicle incentives. New York Governor George Pataki and Arizona Speaker of the House Jeff Groscost spearheaded efforts to increase use of alternative fuels in their states. Governor Pataki required that state agencies to be accountable for the quantity of alternative fuels they use, and required agencies to report their fuel use. The governor also championed an Environmental Bond Act, a portion of the proceeds of which support state alternative fuel vehicle programs. Arizona's Speaker Groscost championed alternative fuel vehicle incentives in Arizona, and put in place one of the nation's most ambitious—and controversial—alternative fuel vehicle programs.

## **Assessment of Alternative Fuel Vehicle Incentives**

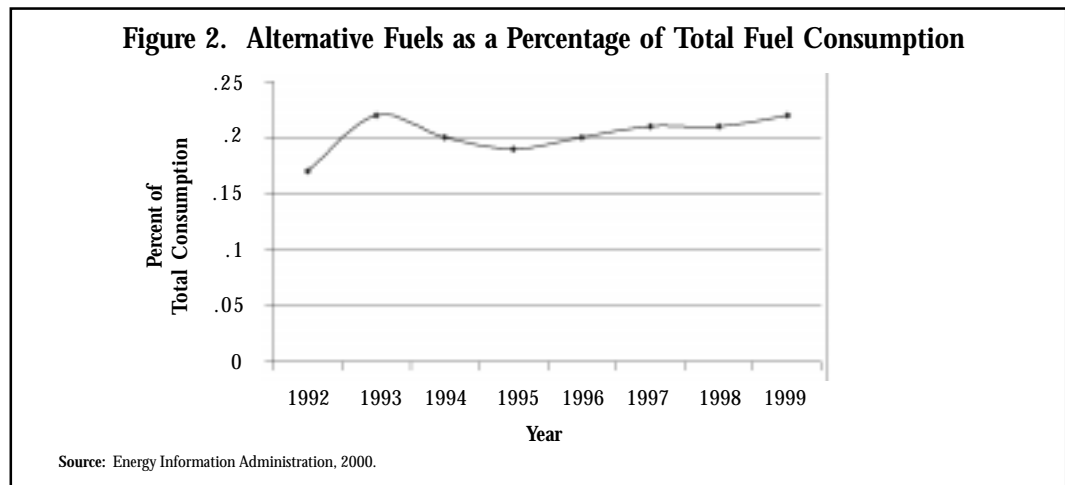
This report outlines five ways to measure the effect of alternative fuel vehicle incentives.

1. A comparison of the quantity of alternative fuel used in 1999 versus the amount used in 1992.
2. A comparison of the number of alternative fuel vehicles in use in 1999 versus those in use in 1992.
3. A comparison of the quantity of infrastructure available to serve alternative fuels with the infrastructure available for conventional fuels.
4. The demonstrated ability of incentives to create a sustained industry commitment to alternative fuels.
5. Air emissions effects of alternative fuels.

## *Alternative Fuel Consumption*

The first method of calculating the effectiveness of alternative fuel vehicle incentives is to compare the quantity of alternative fuel that Americans used in the early 1990s with the quantity of alternative fuel they used at the turn of the 21<sup>st</sup> century, almost 10 years later. In 1992, alternative fuels comprised a mere 0.17 percent of the total fuel that this country

used for transportation. By 1999, that proportion had increased to 0.22 percent. Although this increase in the use of alternative fuels was approximately 30 percent over a seven-year period, it remains that the use of alternative fuels comprises less than one-quarter of 1 percent of fuel used for transportation. (This figure does not include oxygenates such as ethanol that are mixed into gasoline, usually as a way to reduce vehicle emissions. Typically, 10 percent of a gallon of gasoline would consist of ethanol or some other oxygenate, in some parts of the country during certain times of the year.) Therefore, if the goal of alternative fuel vehicle incentives is to encourage the use of alternative fuels, and thereby reduce the United States' dependence on foreign oil, this indicator does not reveal great strides in that direction. However, some states do use more alternative fuel than others, indicating that certain factors—of which incentives are likely an important part—may be working better in some states than in others. Figure 2 shows the increase in alternative fuel consumption.



### *Alternative Fuel Vehicle Population*

The second way to measure the success of alternative fuel vehicle programs and incentives is to look at the number of vehicles powered by alternative fuels that traverse the roads and highways of the United States. Data show that 0.13 percent (or 251,352 vehicles) of the total vehicle population was capable of operating on an alternative fuel in 1992. By the turn of the century, this figure increased by about 50 percent to 0.19 percent of the total vehicle population (407,542 vehicles). Although the number of vehicles capable of operating on an alternative fuel increased by a large percentage, the total number of vehicles remains—similar to the indicator above—less than one-quarter of 1 percent. Confounding the situation further, many of these alternative fuel vehicles are flexible-fuel vehicles, meaning that they can be fueled with an alternative fuel or with gasoline or diesel fuel. Many owners of flexible-fuel vehicles report that they refuel their vehicles with gasoline or diesel because of the limited alternative fuel refueling infrastructure. These data are difficult to interpret, however, since the Energy Information Administration makes an effort to count only those vehicles that actually use alternative fuel; this is a difficult task. Again, this indicator shows limited success at converting a large proportion of the nation's vehicle population to alternative fuels. However, some states do show a greater population of alternative fuel vehicles than others, perhaps indicating a more effective set of incentives in some states than in others. Figure 3 shows the distribution of alternative fuels among the states, and the total numbers of these vehicles.



**Figure 3. Number of Alternative Fuel Vehicles per Capita (1997 data)\*  
Sorted According to Population per AFV**

Rank	State/ Jurisdiction	Population	AFVs	Population per AFV
1	Oklahoma	3,346,713	16,030	225
2	Utah	2,099,758	5,562	378
3	Wyoming	480,907	1,218	384
4	Nevada	1,746,898	4,209	415
5	Oregon	3,281,974	7,613	418
6	New Mexico	1,736,931	3,919	438
7	Iowa	2,862,447	6,019	455
8	Texas	19,759,614	42,874	461
9	Nebraska	1,662,719	3,308	463
10	Colorado	3,970,971	8,016	476
11	California	32,666,550	68,455	477
12	District of Columbia	523,124	960	510
13	Montana	880,453	1,573	547
14	Michigan	9,817,242	16,280	572
15	Indiana	5,899,195	9,798	579
16	Wisconsin	5,223,500	8,983	581
17	Idaho	1,228,684	1,986	601
18	South Dakota	738,171	1,152	604
19	Mississippi	2,752,092	4,464	605
20	Tennessee	5,430,621	8,749	608
21	Illinois	12,045,326	18,591	622
22	Ohio	11,209,493	18,554	626
23	Arizona	4,668,631	7,193	649
24	North Dakota	638,244	985	651
25	Georgia	7,642,207	11,478	666
26	Kentucky	3,936,499	4,020	694
27	Washington	5,689,263	7,516	757
28	North Carolina	7,546,493	8,995	815
29	Missouri	5,438,559	5,182	856
30	Pennsylvania	12,001,451	12,935	888
31	West Virginia	1,811,156	1,793	947
32	South Carolina	3,835,962	3,831	974
33	Maryland	5,134,804	5,084	1,010
34	Virginia	6,791,345	5,309	1,136
35	Louisiana	4,368,967	3,747	1,144
36	New York	18,175,301	14,652	1,326
37	Florida	14,915,980	11,092	1,345
38	New Jersey	8,115,011	5,593	1,375
39	Rhode Island	988,480	703	1,404
40	Alabama	4,351,999	3,057	1,417
41	Massachusetts	6,147,132	4,284	1,421
42	Connecticut	3,274,069	2,278	1,437
43	Arkansas	2,538,303	1,493	1,445
44	Delaware	743,603	513	1,452
45	Kansas	2,629,067	1,721	1,453
46	Minnesota	4,725,419	2,933	1,611
47	Vermont	590,883	317	1,864
48	Maine	1,244,250	545	2,283
49	New Hampshire	1,185,048	448	2,645
50	Hawaii	1,193,001	420	2,840
51	Alaska	614,010	113	5,339

Sources: Population data for July 1, 1998: [www.census.gov](http://www.census.gov); AFV info: "Alternate Fuel Transportation Vehicles," [www.eia.doe.gov/cneaf/solar/renewables/alt\\_trans\\_fuel97/table3.html](http://www.eia.doe.gov/cneaf/solar/renewables/alt_trans_fuel97/table3.html), 2000.

### *Number of Alternative Fuel Vehicle Fueling Facilities*

The third indicator deals with fueling infrastructure. Late in 2000, there are just over 6,000 fueling stations around the country that dispense alternative fuels, compared to more than 180,000 stations that dispense conventional vehicle fuels. Some parts of the country have large concentrations of refueling facilities, while others have almost no refueling facilities. The U.S. Department of Energy and others are developing “Clean Corridors,” or networks of fueling stations placed strategically around major highways in selected parts of the country. These networks should allow people to travel from one city to another along major highways. Figures comparing the total number of alternative fuel stations today with the total number in the early 1990s are not available. It is evident, however, that the infrastructure available to serve conventional vehicles still dwarfs the infrastructure available to serve alternative fuels. The fact that alternative fuel fueling stations are far less common than conventional refueling facilities restricts the flexibility of alternative fuel vehicle drivers. This problem continues to pose a major challenge for the alternative fuel industry. Figure 4 shows the number and type of alternative fuel vehicle stations throughout the country.

### *Commitment of Industry to Alternative Fuels*

The fourth indicator examines the industry commitment to alternative fuel vehicles and fuel supply. A healthy, sustained level of support from industry would indicate that incentives have been successful.

The support of several major industries provides a foundation for the alternative fuel vehicle industry. Natural gas companies, electric companies, ethanol suppliers, propane suppliers and automakers must support the industry. Yet, although they have by no means abandoned the alternative fuel industry, their participation is more hesitant and less substantial than it was 10 years ago.

The fuel supply industry offered early support for alternative fuels. Natural gas utilities built most of the natural gas fueling stations in the country, and electric utilities supported advanced battery and charging station technology research. Although figures are not available for the utilities’ total investment in these new products, it is likely that the investment totals are in the hundreds of millions of dollars. Automakers researched and built at least small numbers of vehicles capable of operating on methanol, ethanol, natural gas and electricity throughout the 1990s. The support from all these industries dwindled in the second half of the 1990s.

#### *Electric Utilities*

As the electric utility industry prepares for more competitive markets, it has dropped much—but not all—of its support for electric vehicles. Northeast Utilities, one of the early supporters of electric vehicles in the northeastern United States, has almost eliminated its electric vehicle program. Consolidated Edison of New York, Niagara Mohawk of New York and others have done the same. California’s Southern California Edison initially set up a subsidiary—Edison EV—that it has since dismantled. On the regulatory front, the California Public Utilities Commission and other utility commissions have issued rulings to disallow utilities from using ratepayer money for alternative fuel vehicle activities. A few

**Figure 4. U.S. Refueling Sites by State and Fuel Type (as of Oct. 29, 2000)**

State/ Jurisdiction	M85	CNG	E85	LPG	Electric	LNG	All
Alabama	?	15	?	151	35	2	203
Alaska	0	0	0	12	0	0	12
Arizona	0	28	1	97	46	3	175
Arkansas	0	7	0	130	0	0	137
California	35	207	0	519	333	9	1,103
Colorado	0	44	1	93	0	2	140
Connecticut	0	25	0	48	1	0	74
Delaware	0	6	0	2	0	0	8
District of Columbia	0	3	0	0	1	0	4
Florida	1	38	0	109	3	1	152
Georgia	0	67	0	80	27	2	176
Hawaii	0	0	0	24	3	0	27
Idaho	0	8	1	28	1	0	38
Illinois	0	21	8	64	2	0	95
Indiana	0	34	1	47	1	3	86
Iowa	0	5	5	69	0	0	79
Kansas	0	5	1	123	0	1	130
Kentucky	0	6	2	24	0	0	32
Louisiana	0	14	0	25	0	0	39
Maine	0	0	0	58	0	0	58
Maryland	0	25	0	17	1	2	45
Massachusetts	0	15	0	69	3	0	87
Michigan	0	31	4	266	6	1	308
Minnesota	0	13	42	83	0	1	139
Mississippi	0	3	0	62	0	0	65
Missouri	0	7	4	295	0	0	306
Montana	0	10	1	59	0	1	71
Nebraska	0	5	7	44	0	0	56
Nevada	0	18	0	56	0	0	74
New Hampshire	0	1	0	68	1	0	70
New Jersey	0	22	0	25	0	0	47
New Mexico	0	14	1	243	0	1	259
New York	4	58	0	98	6	0	166
North Carolina	0	9	0	93	7	0	109
North Dakota	0	4	2	15	0	0	21
Ohio	0	48	0	57	1	1	107
Oklahoma	0	53	0	35	0	0	88
Oregon	0	15	0	30	0	1	46
Pennsylvania	0	54	0	99	1	1	155
Rhode Island	0	6	0	9	0	0	15
South Carolina	0	4	0	74	1	0	79
South Dakota	0	4	7	29	0	0	40
Tennessee	0	4	0	38	0	0	42
Texas	0	70	0	234	2	7	313
Utah	0	62	0	22	0	1	85
Vermont	0	0	0	62	7	0	69
Virginia	0	27	1	40	8	3	79
Washington	1	26	0	88	6	1	122
West Virginia	0	39	0	14	0	0	53
Wisconsin	0	22	1	114	0	0	137
Wyoming	0	18	0	34	0	1	53
<b>Total</b>	<b>41</b>	<b>1,220</b>	<b>90</b>	<b>4,175</b>	<b>503</b>	<b>45</b>	<b>6,074</b>

Source: U.S. Department of Energy Alternative Fuel Data Center, 2000.

electric companies—such as the New York Power Authority—continue to actively engage the alternative fuel vehicle market, and some offer financial support for the efforts of the Electric Vehicle Association of the Americas.

### *Natural Gas Companies*

Many natural gas utilities lost money on their investments in natural gas vehicle stations and also are going through a period of retrenchment. One utility representative in New York described himself and one other utility representative from the state as the “last men standing” from the utility side. Montana had approximately 600 to 800 natural gas vehicles in the mid-1990s; there now are fewer than 300 to 400 natural gas vehicles in the state. 11 fueling stations have decreased to seven. Montana Power alone has reduced the size of its natural gas fleet from 225 to 125 vehicles. In California, however, natural gas vehicles and infrastructure continues to grow. The state boasts more than 10,000 vehicles and more than 200 refueling stations. Besides California and a few other states such as Arizona, it seems that the early excitement surrounding the Energy Policy Act has died down, and many electric and gas utilities now focus their energy elsewhere.

### *Automakers*

Since the early 1970s, the auto industry has produced a steady stream of cars that have been progressively cleaner. Many observers assert that the industry has produced these vehicles only under pressure from federal and state regulators and that, without this pressure, the industry might not have produced lower-emitting vehicles. Whatever the motivations of the automakers, it is clear that each of the major producers has devoted millions of dollars in research and production to vehicles powered by non-conventional fuels. Late in 2000, automakers were offering a full line of alternatively fuel vehicles for sale. However, the demand for these vehicles has been small, and automakers have devoted far fewer resources to marketing these vehicles than to marketing conventional vehicles. Instead of the types of alternative fuel vehicles that most states target—those powered by ethanol, methanol, natural gas, propane or battery-electric—automakers have focused their efforts on two areas not targeted by most incentives: lower-emitting conventional vehicles powered by gasoline, and hybrid electric vehicles.

### *Conventional Vehicles Are Becoming Cleaner*

One example from Ford Motor Company is the 2000 model year F-series truck, which meets low emission vehicle standards. The company will produce 2 million F-series pickup trucks. Since Ford's model year 1999, all of its mini-vans and sport utility vehicles also meet low emission vehicle standards. Volvo's V70 wagon, available in 2000, also meets low emission vehicle standards. Honda has the first gasoline SULEV (2000 Honda Accord EX), and 85 percent of all U.S. Honda vehicles for the 2000 model year use advanced low emission technology. These efforts—largely the result of the emissions requirements placed on auto manufacturers—likely would have not been developed or produced without the regulatory requirements.

### *Automakers Now Are Exploring New Technologies Such as Hybrid Electric Vehicles*

A new technology on the market could well eclipse any of the alternative fuels that existed when President Bush signed the Energy Policy Act in 1992. Honda and Toyota sell hybrid electric vehicles that run on a small gasoline motor which, in turn, charges batteries to run

an electric motor. Already, these two companies advertise their 40 miles per gallon to 70 miles per gallon hybrid vehicles in mainstream magazines and predict that they could command a sizable market share. Meanwhile, domestic manufacturers have announced their own plans to offer hybrid electric vehicles for sale. An advantage these vehicles hold over natural gas or conventional battery-only electric vehicles is that they do not need new fueling or charging stations. Yet, most state alternative fuel vehicle incentives do not include or provide for hybrid electric vehicles.

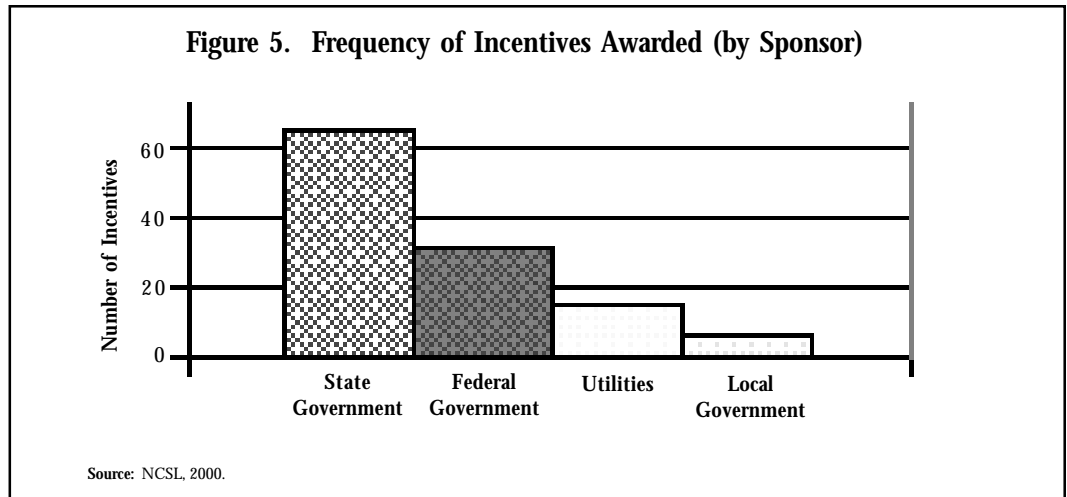
### *Air Emissions Effects of Alternative Fuels*

This report does not analyze detailed emissions benefits from alternative fuel vehicle programs except to make one point: only significant penetrations of clean-burning alternative fuel vehicles are likely to make a major contribution to improving air quality. Small numbers of vehicles—no matter how little pollution they release in to the air—will not make a major difference in overall air quality. Alternative fuel vehicles have yet to make major inroads into the mainstream vehicle fleet. Much of that conventional vehicle fleet is, as a whole, becoming a less-polluting vehicle fleet. Disagreement also exists about how to quantify the full pollution-reduction benefits of vehicles that are capable of running on both gasoline and alternative fuels, the benefits of different natural gas vehicle technologies, and how electric vehicles operate in different parts of the country with different fuel mixes. So long as each of these alternative fuel vehicle technologies provides at least some emissions benefit, it is reasonable to further assume that large numbers of those vehicles will make a significant contribution to improving air quality. The meager numbers of vehicles to date in the nation's vehicle fleet do not yet justify the conclusion that alternative fuel vehicle programs are making a significant contribution to improving air quality.

### **Conclusions**

If the 10 years from the early 1990s to 2000 leave any impression at all about the alternative fuel industry, it is that of a fledgling industry fighting an uphill battle in a world of inexpensive and entrenched fuel and vehicle technologies. By most measures that this report examines, alternative fuel vehicle incentives did not stimulate American drivers to buy alternative fuel vehicles or fuels and their use did not significantly reduce the nation's dependence on foreign oil.

However, a few parts of the country and a few vehicle markets been more successful than others in incorporating alternative fuels into their vehicle fleets. The distinction between a lack of success and even modest success appears to be the type and design of incentives for alternative fuel vehicles. Indeed, it seems that, without well-designed incentives, alternative fuels will not prosper in the short-term. A survey of fleet managers, summarized in figure 5, shows just how important vehicle fleet managers believe that state alternative fuel vehicle incentives are (appendices C and D contain other survey results).



Only a very well-designed incentive could make alternative fuels succeed in an atmosphere dominated by the formidable barriers described earlier.

### 3. LESSONS FROM ALTERNATIVE FUEL VEHICLE PROGRAMS

Chapter 2 concludes that most state-level incentives have not been effectively designed to entice large numbers of people to buy alternative fuel vehicles. This chapter assesses why that has been the case. It looks more closely at incentives that have been effective, and examines what characteristics are shared by the more successful incentives.

Some successful incentives stand out among the 200 or so state alternative fuel vehicle incentives around the nation. The successful incentives are:

- Focused on reducing emissions or petroleum use.
- Large enough to entice consumers to buy an alternative fuel vehicle.
- Grant-based in most cases.
- Easy for consumers to receive and for the state to administer.
- Focused on developing a fueling infrastructure in addition to encouraging consumers to buy alternative fuel vehicles.

The best incentives combine all the characteristics into one package. Incentives that fail to meet even one of these criteria often fail to meet their goals. For instance, an incentive might be large enough to entice people to buy alternative fuel vehicles, but if they buy vehicles that are capable of operating on an alternative fuel—yet run them only on gasoline—the incentive is not meeting its goal of reducing petroleum use or improving air quality. In a similar vein, incentives that are well-focused, but small, generally seem to falter.

One overarching conclusion from many incentive programs is that they appear to be disconnected from two primary early adopter markets for alternative fuel vehicles: the government or quasi-government fleets and the individual green market for the vehicles. These individual and government consumers receive little benefit from tax credits or tax deductions because they either pay no taxes at all—in the case of government fleets—or have only a small state tax liability—in the case of most individual consumers. This small tax liability places an upper limit on the size of the tax benefit they can receive. Therefore, one reason that incentives have failed to transform the market is that many of them are aimed toward the large, private sector market, while the small, public sector market may be most likely to convert to alternative fuels.

This chapter includes examples from programs in several states that have particularly aggressive alternative fuel vehicle programs, or that have programs that contain elements other states may want to emulate. It focuses on Arizona more than any other state because Arizona has pursued alternative fuels with vigor, although not always with the results that its leadership desired. It, and other states, offer some valuable lessons for states that are considering alternative fuel vehicle programs.

## The Best Incentives Are Focused on Reducing Emissions or Petroleum Use

Most states set a goal of reducing emissions or petroleum use; few use care to set up their incentives in the best way to meet their goals. For instance, some states still offer a more sizable incentive to vehicles that have been *converted* to operate on natural gas, although converted natural gas vehicles have a poorer emissions profile than so-called original equipment manufactured (OEM) vehicles made by the major automakers. In addition, few states require consumers to use an alternative fuel; most offer the same incentive for vehicles that are capable of operating on an alternative fuel, regardless of whether it actually does so. Only a few states design their incentives to encourage the cleanest vehicles.

Examples of well-focused incentives exist in Colorado and California. Arizona's incentive program, which ran throughout 1999 and part of 2000, contained some well-focused elements. Other elements, however, were less focused. As a result, state leaders reassessed the types of incentives that the state should offer.

### Colorado

Basing incentive amounts on certifiable emission levels allows a state to reward consumers for producing less pollution. Colorado is one state that offers incentives based on the emissions level of the alternative fuel vehicle, as shown in figure 6.

Emission Level	1998-2006	2006-2009	2009-2011
LEV	50% of incremental cost*	25% of incremental cost	0% of incremental cost
ILEV or ULEV	75% of incremental cost	50% of incremental cost	25% of incremental cost
SULEV or ZEV	85% of incremental cost	75% of incremental cost	50% of incremental cost

\* Incremental cost is the additional cost, above that of a comparable gasoline vehicle, that customers pay for an alternative fuel vehicle.

Source: Colorado Office of Energy Conservation, 2000.

The incentive, in the form of a tax credit or a rebate, depends on the taxable status of the recipient. It would be doubled (to a maximum of 100 percent) if the alternative fuel vehicle is replacing a vehicle or engine that is at least 10 years old.

The Colorado incentive meets the general criteria of keeping incentives focused on a goal and using the incentive to reward behavior that makes steps toward improving air quality. It has not successfully convinced large numbers of drivers to purchase alternative fuel vehicles. The Colorado Department of Environment reveals that approximately 25 people have taken advantage of the incentive. It is possible that this low success rate may result from the fact that the small incentive covers only a portion of the incremental cost of the vehicle.



### California

California's Carl Moyer Program offers rewards targeted toward low-emission vehicles. The program awards money to both on- and off-road heavy-duty vehicle programs if they can reduce air pollution (heavy-duty vehicles are those that weigh more than 14,000 pounds gross vehicle weight [GVW]). The project must reduce pollution in a cost-effective way (measured in dollars per ton of emissions offset).

The Carl Moyer Program funds programs that reduce pollution at a cost of up to \$12,000 per ton, although some programs have been able to achieve a \$3,000 per ton cost effectiveness. Some projects focus on alternative fuels, while others promote advanced technologies to reduce nitrogen oxide emissions (at least a 30 percent reduction in the pollutants that contribute to the formation of ozone). Heavy-duty vehicle programs include off-road (forklifts must be electric); marine vessels; locomotives; heavy-duty on-road; line-haul and urban transit (over 14,000 pounds GVW); stationary agricultural engines; agricultural pumps; and airport ground support. California closely monitors the Carl Moyer Program.

The Mobile Source Review Committee (MSRC) manages a mobile source air pollution reduction program in the South Coast area, and formulates a strategy each year based on the successes or failures of previous years. This strategy can include ways to improve the program or to further reduce pollution. Administrators regularly report on progress and improvements. This capability is critical to secure not only continued support and funding, but also to create the most effective program. This type of committed effort toward specific and well-defined goals is proving to be successful.

California has been refining pollution reduction measures for a long time. As a result of California's efforts, of which the Carl Moyer Program and the MSRC are a part, in the summer of 1999, Southern California did not exceed ozone standards for the first time in 50 years.

### Arizona

Arizona has a similar program that bases awards on emission levels. Arizona's incentive is much larger than Colorado's, however, and offers a rebate based on a percentage of the entire vehicle cost, not on the incremental cost; in addition, rebates cover the entire incremental cost of the alternative fuel vehicle. Arizona's program is described in figure 7.

**Figure 7. Arizona Incentive Levels (Based Upon AFV Emissions)**

<b>Emission Level</b>	<b>New AFV (based on <i>total</i> vehicle cost)</b>	<b>Used AFV (based on <i>total</i> vehicle cost)</b>
LEV	Greater of 30% of cost or \$5,000	Greater of 15% of cost or \$2,500
ULEV or ILEV	Greater of 40% of cost or \$7,500	Greater of 20% of cost or \$3,750
ZEV or SULEV	Greater of 50% of cost or \$10,000	Greater of 25% of cost or \$5,000
Heavy Duty LEV (gross vehicle weight more than 12,000 pounds)	Greater of 30% of cost or \$30,000	Greater of 15% of cost or \$15,000

Source: Arizona Department of Commerce, 2000.

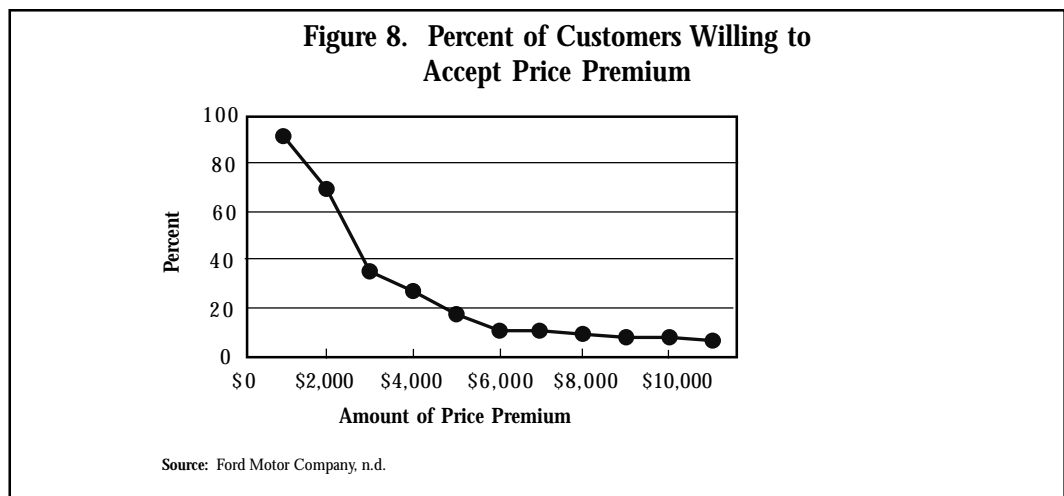
Arizona's incentive program is at least double that of Colorado's, and also is a graduated incentive that rewards purchasers of vehicles that can operate on alternative fuels.

One component of Arizona's incentive package that some observers have criticized is the lack of any requirement that the vehicle actually operate on an alternative fuel. According to the wording of Arizona's incentive law, a vehicle would qualify for the incentive if it were capable of operating on an alternative fuel. For instance, a user could install a small natural gas tank on the vehicle, but rely on gasoline for most driving needs. This flexibility could nullify many of the emissions gains from the incentive. A further discussion of Arizona's incentive program is included in the next section.

## Incentives Should Be Large

Observers from both the alternative fuel vehicle industry and fleet managers point out that incentives need to reduce the cost of alternative fuel vehicles down to a level that is competitive with conventional vehicles. In most cases, this means that, aside from a small cadre of enthusiasts, buyers do not want to pay a higher price for an alternative fuel vehicle.

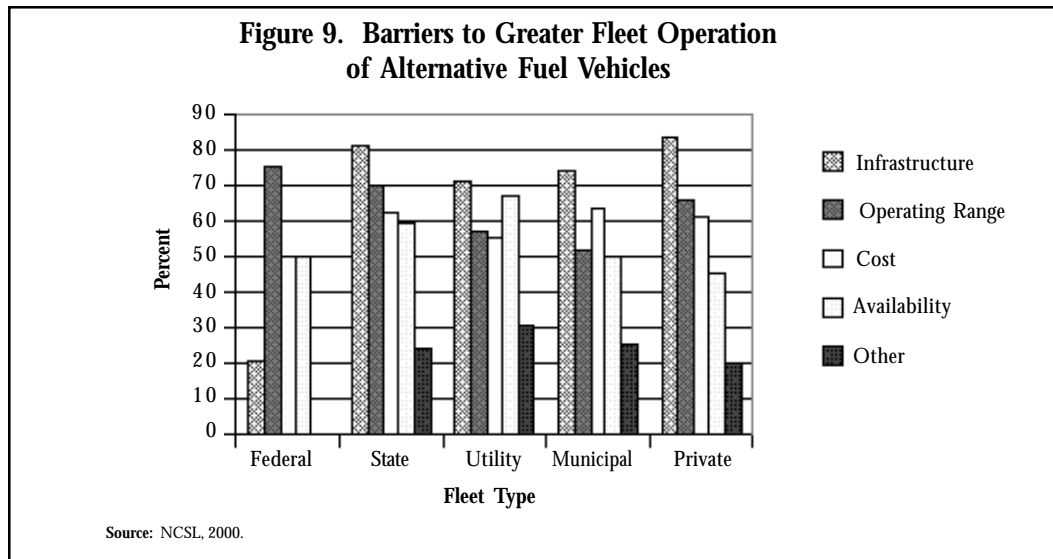
Ford Motor Company studied the willingness of consumers to pay a higher price for an electric vehicle. Their examination of consumer behavior and preferences showed that most consumers are not willing to pay a substantial incremental cost. In fact, at the level of a \$2,000 incremental cost (which is less than the incremental cost on most vehicles) only about 30 percent of the respondents Ford surveyed were willing to purchase an electric vehicle. A graphical representation of Ford Motor Company's findings is shown in figure 8.



Fleet managers consistently cite the additional cost of alternative fuel vehicles as a significant barrier to purchase. Many suggest that they already were reluctant to purchase a new technology. The general attitude of most fleet managers is that they are in the business of operating vehicles, not testing new technologies. As shown in figure 9, few expressed willingness to pay a higher price for these new technology vehicles that, in their view, had a performance penalty.

Experience with state incentives seems to bear out this cost barrier. Fleet managers and observers from the alternative fuel vehicle industry in Connecticut, Montana and many

other states suggest that incentives are too small to persuade the industry to buy alternative fuels; these two states have small or shrinking alternative fuel vehicle fleets. Other states like Arizona and California, however, have offered larger incentives and have had much greater consumer response.



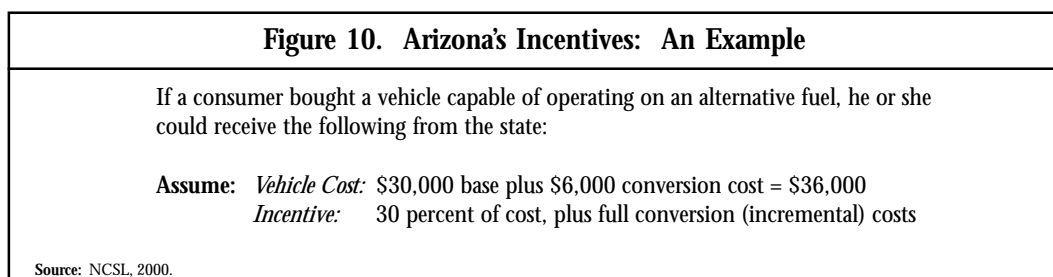
### California

California’s Carl Moyer Program focuses on offsetting the vehicle’s entire incremental cost, which, when compared to other states, is a “large” incentive. In its first two years, the program awarded its entire awards allocations of \$25 million and \$19 million, respectively.

### Arizona

Arizona sought to use alternative fuel vehicles to improve its air quality, and offered incentives that were vastly larger than the incentives in any other state. In Arizona, tax figures for 1995 through 1998 show a nearly seven-fold increase in the amount of tax dollars claimed from AFV incentives, reflecting the gradually increasing size of the incentives. However, when Arizona legislated a dramatic increase in the size of its incentives in 1999 and again in 2000, the state saw a tremendous growth in the number of people taking advantage of its incentive. Most state officials acknowledge that the incentive was in fact too large, and had lost its focus on improving air quality.

Arizona’s incentives are detailed in figure 10. They amount to the largest incentive ever given to alternative fuel vehicle purchasers.



The incentive would be larger for even lower-emitting vehicles; so few of those are available from manufacturers, however, that only a small number of Arizonans have taken advantage of the larger incentive amounts.

Arizona's incentive package was enacted in two stages: far-reaching legislation enacted in 1999, and small—but tremendously significant—changes made in the 2000 legislative session. The 1999 legislation set up the largest incentives ever offered by a state, previously detailed in figure 1. Although these incentives were more popular than the state's previous incentives, they did not spark tremendous interest. The changes made by the 2000 legislature did spark interest, however—and more than the state had anticipated. Figure 11 details the use of Arizona's incentives. Note the dramatic increase in 2000, which occurred only between April and October of 2000.

**Figure 11. Tax Incentives Claimed: Arizona**

	Number of Claimants	Total Amount Claimed
<b>1995</b>	24	\$11,026
<b>1996</b>	35	\$23,772
<b>1997</b>	36	\$27,695
<b>1998</b>	82	\$71,813
<b>1999*</b>	1,273	\$8,400,000
<b>2000**</b>	~5,000	~\$100,000,000

\* Approximately 1,100 of these claims were for neighborhood electric vehicles, which are low-speed vehicles slightly larger than a golf cart.  
 \*\* Before emergency changes to the incentive law, 21,000 people had applied for the incentive at a total projected cost to the state of \$479,000,000.

Source: Arizona Department of Commerce; Arizona Office of Alternative Fuel Recovery; Arizona Department of Revenue, 2001.

Arizona changed its alternative fuel vehicle incentive in 2000 to structure it more like a grant. In other words, the credit was termed a “refundable tax credit,” which meant that the purchaser received a single check from the state in reimbursement of the full credit. (In the example in figure 11, the purchaser would receive one check for \$15,000.) A more typical tax credit—and the type of credit that had existed in Arizona until the 2000 legislative session—is only a credit against a taxpayer's annual tax liability. If a taxpayer owed the state \$1,000 in 2000, the tax credit would, in this case, be limited to the total \$1,000 amount. The taxpayer could carry this credit forward for several years to use against future tax liabilities. Therefore, most taxpayers' total benefit from the credit would be small and spread over five years. Again, as shown in Figure 1, the credit of \$15,000 would be worth only \$5,000 spread over five years for a taxpayer with an annual state tax liability of \$1,000. Only a few wealthy individuals with high taxable incomes would be able to take full advantage of the tax credit as it was structured prior to the changes in the 2000 legislative session.

Arizona's incentive program also sought to encourage people to buy electric vehicles, although few full-size electric vehicles were on the market at the time the incentive was enacted. A new type of vehicle—known as a neighborhood electric vehicle or low speed vehicle—was on the market, however. These vehicles, limited to a maximum speed of 35 miles per hour and slightly larger than a golf cart, are meant for on-road use. They sell for approximately \$6,000 to \$8,000. Thousands of such vehicles were sold in Arizona and qualify for the \$10,000 tax credit for ZEVs. People who purchased these vehicles received the \$10,000 minimum incentive for an electric vehicle, even if the vehicle cost only \$6,000.

Arizona placed a limit on the program of 1 percent of the total fleet of vehicles registered in the state—or about 40,000 vehicles—per year. Were Arizonans to have reached the full complement of about 40,000 vehicles, the total cost to the state could have approached or exceeded \$1 billion. In October, however, after only a few months of operating the program, the legislature imposed a moratorium on the program at close to \$500 million.

Arizona's experience shows that large incentives can spark interest in buying vehicles. However, the experience also may provide some other lessons about large incentives.

- States should be aware of the potential fiscal impact of incentives and make provisions to cap their total liability. Arizona had capped its total liability at one percent of all registered vehicles; some state officials have suggested that a far more reasonable cap would be at one percent of all new vehicle registrations. This lower cap would have kept the total number of claimants below 3,000.
- States should continue to link incentives to the goal of their program—whether it is through a requirement that consumers use alternative fuel or through larger incentives for dedicated vehicles. Arizona's incentive had no such linkage, and indeed had dropped the requirement that claimants use an alternative fuel during the 2000 legislative session.
- States should be certain that they are not offering an incentive that is too large. It is possible that Arizona's 30 percent tax incentive offered in one payment, regardless of the taxpayer's total tax liability, was larger than was required. Incentives that total only slightly more than the incremental cost—to allow for the inconvenience of current alternative fuel vehicle technologies—may be sufficient, rather than an incentive the size of Arizona's.

### *Small Incentives Are Ineffective Unless Packaged With Big Incentives*

Some smaller incentives—for example, the fuel price discount and sales tax exemptions—do not appear, by themselves, to offer much support for alternative fuels. They are simply too small to command attention.

#### ***Fuel Tax Discount***

In all, 33 states offer a fuel discount, usually in the form of a tax exemption. Fuel price discounts encourage people to use alternative fuels, rather than simply purchasing a vehicle capable of operating on alternative fuels that they then fuel with gasoline. However, a discount on either fuel price or a tax exemption yields insignificant savings.

Fuel retailers sell fuel to recover their investment in infrastructure and are, therefore, limited in how much they can discount fuel by the need to recover their investment. Because of the small size of the total alternative fuel vehicle market, they do not feel assured of a large enough increase in sales volume to make up for a significant fuel price discount.

Although taxes on fuel can be an important factor, a fuel tax reduction does not approach a discount large enough to attract a significant new market except in a few of the fleets-like taxis—that drive far more than the national average. As shown in figure 12, a 10 percent reduction in the sales price for fuel, for instance, might lead to a \$75 yearly fuel savings.

**Figure 12. Results of Reduction in Sales Price for Fuel**

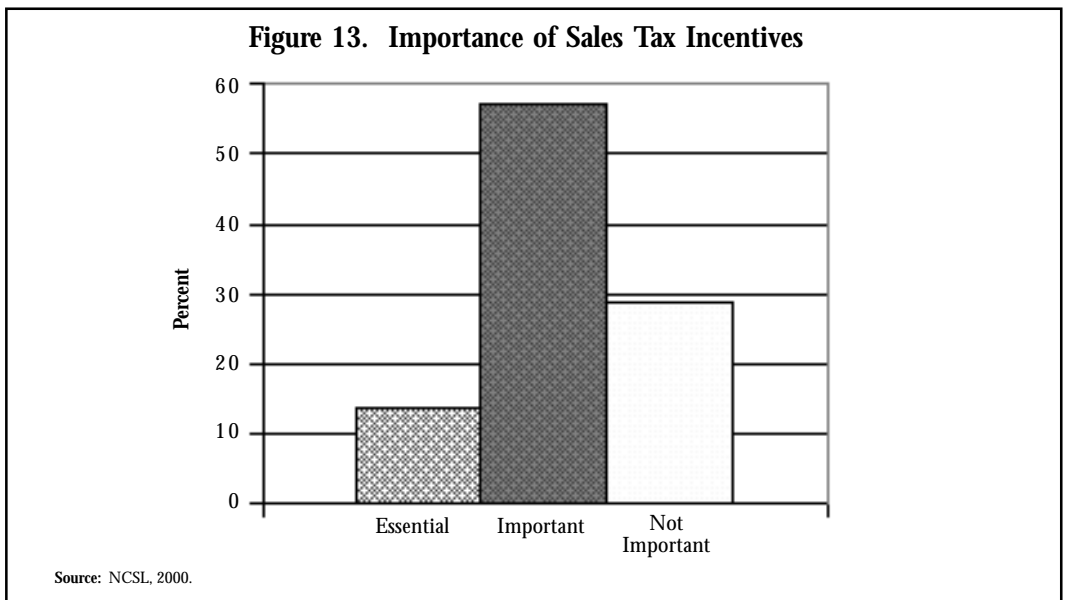
<b>Assumptions:</b>	Fuel price:	\$1.50/gallon
	Average mpg:	20
	Miles driven per year:	10,000
	Average gallons consumed per year:	500
<b>Results:</b>	10 percent fuel discount:	\$75 per year
	20 percent fuel discount:	\$150 per year

Source: NCSL, 2000.

Very high mileage fleets might drive up to 100,000 miles per year. Their savings from this incentive are more significant, at \$750 to \$1,500 per year. However, few fleets drive this much in a year, and even \$1,500 is still too small a discount to attract most vehicle fleets to alternative fuels.

**Sales Tax Reduction**

A sales tax reduction or rebate is similar to the fuel tax discount. At a high sales tax rate of 8 percent, and an incremental cost for some alternative fuel vehicles of \$5,000, the sales tax rebate is worth only \$400. This is significant, but falls short of the amount necessary to encourage people to make the switch to alternative fuels. Some observers suggest that sales tax incentives are well-suited to the used vehicle market because this market is apparently more price-sensitive and smaller incentives can be more motivating. Figure 13 illustrates this point.



**Fiscal Implications of Large Incentives.** State policymakers must balance the costs of incentive programs with their benefits. Although it appears that successful programs need to achieve cost parity or better to be effective, it is expensive to offer such a large incentive. Arizona’s experience offers ample evidence of an incentive that became too large for the state to maintain.

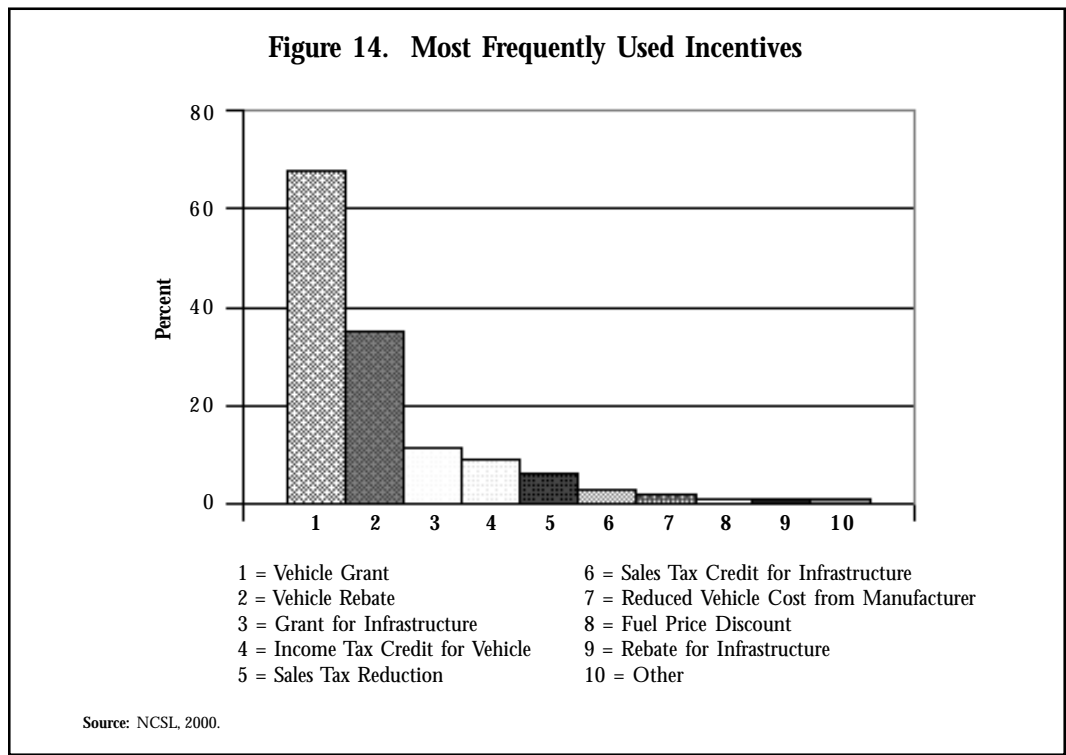
Such figures may prompt policymakers to compare the emissions benefits of AFVs with other emissions reduction strategies. The effects of the new low emission technology in

standard gasoline vehicles on pollution reduction may encourage a decision to focus on these gasoline vehicles or to focus incentives on heavy duty vehicles and infrastructure. Others may opt for AFVs. Given the magnitude of these costs, such decisions require careful analysis.

### Incentives Should Be Grant-Based in Most Cases

States offer many types of incentives. Most can be broken into four categories: outright grants and rebates, loans, tax-based incentives and non-monetary incentives, such as preferential parking or access to high-occupancy vehicle lanes for alternative fuel vehicles. Each of these functions differently and each appeals to different types of fleets and vehicle owners.

It appears clear, however, that grants and rebates are among the most successful incentives for the majority of fleets. Consumers more readily take advantage of grant and rebate programs than they do most tax-based incentives, and express a clear preference for this type of incentive. Data from a survey of fleet administrators, summarized in figure 14, show a preference for grant and rebate incentives.



In general, grants and rebates seem relatively popular because:

#### *They Are Available to Non-Taxable Fleets*

The primary market for alternative fuel vehicles currently is government or quasi-governmental fleets. These governmental agencies pay no taxes, so a tax-based incentive is of little use. They can—and often do—use grant and rebate programs, however.

### *They Are Available to Low-Income Earning Fleets*

Small companies, such as local florists, are another potential market for alternative fuel vehicles. These small companies represent a portion of the “green” consumer market, and exemplify the kind of fleet that values the positive public image they receive because they operate an electric, natural gas or other alternative fuel vehicle. These small companies earn little net income, however, and, in fact, have an incentive to show as little income as possible on their tax returns so that they can reduce their income taxes. Fleets that report little or no taxable income express a clear preference for grant and rebate programs.

### *They Offer Certainty*

Customers know how much the grant or rebate is worth at the time it is offered and can incorporate a specific dollar amount into their calculation of how much they will pay for a car. Until customers know their tax liability, they often will not know the dollar value of a tax benefit.

### *They Offer Immediate Benefit*

Grants and rebates are available to customers as soon as they purchase their vehicle or build infrastructure, while tax-based incentives can require that the customer wait to receive the tax benefit until the end of the tax year.

### *Tax Incentives Work Well for Leased Vehicles*

Tax benefits can be helpful, and offer immediate benefits if they are incorporated into a lease payment. Fleets that lease alternative fuel vehicles may see benefits to tax-based incentives. Many government fleets still do not lease vehicles, however, because they are unable to commit to multi-year leasing agreements.

### *Loans Can Work in Some Cases*

Some states have offered loan programs to encourage alternative fuel vehicles, but only Oklahoma successfully used such a program. In general, loan programs are less successful than an outright grant or rebate program. Interviews with representatives from two states that operated both loan and grant programs revealed that loan programs were rarely used. Those interviewed suggested that the reason for the lack of success of the loan programs has been that grant programs are much more popular. Another state, New Mexico, rejected a loan program in its deliberations about the best alternative fuel vehicle incentives, since the success of loan programs is closely tied to having a large differential between natural gas and gasoline prices. With the more-than-doubling of natural gas prices in 1999-2000, this differential is too small in most places to allow for a workable loan program.

Oklahoma's loan programs have been more successful. They focus on public fleets and are actively marketed by the state. The program has loaned out several million dollars. Its success may be unique to the southwestern states because it relies on a substantial differential between the price of natural gas and gasoline and diesel—a difference that is not so pronounced in other parts of the country, where the price differential between the fuels is not as great. The doubling and tripling of natural gas prices during 2000 will also diminish the fuel savings from using natural gas, even though retail gasoline prices have increased by 30 percent to 50 percent.



## Incentives Should Be Easy to Use and Administer

Some promising incentives fail to attract consumers because they either require the consumer to fill out paperwork to apply for the incentive or contain burdensome reporting requirements. In some cases, the purchasers are not even assured of the size of their incentive when they buy the vehicle. As a rule, an incentive should have the following characteristics to maintain accountability and prevent fraud but also remain reasonably easy to use and administer:

- It may best be offered through the vehicle dealer, but fulfilled through the manufacturer.
- It allocates significant and adequate money for a state agency or other responsible party to administer and market the incentive.
- It is in place long enough and funded at a consistent level so that fleet managers can predict that it will be available.
- It has funding and a plan in place for monitoring its success or failure.

### *It May Best Be Offered Through the Vehicle Dealer, but Fulfilled Through the Manufacturer*

Consumers want to know the net cost of a vehicle, including incentives. They may be happy to know that they are receiving a good deal on the product, but they are most interested in knowing the final vehicle cost.

Although many states offer incentives on the vehicle purchase, few are highly successful. Some require that customers fill out an application for a grant with no assurance that they will receive the grant. Some states do not guarantee the exact amount the consumer will receive.

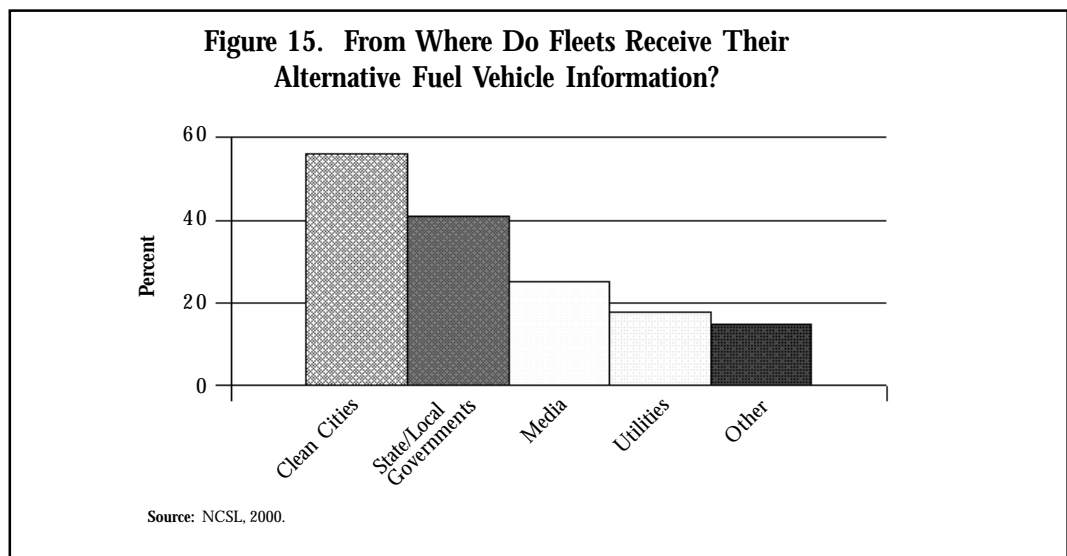
Other, more effective incentive programs enable the vehicle dealership to offer the incentive as an immediate discount from the price of the car. One example is California's Mobile Source Pollution Reduction Review Committee (MSRC) with the South Coast Air Quality Management District. In this example, because dealers tend to operate on thin profit margins and tight cash flows, the dealer immediately requests reimbursement from the manufacturer for the incentive. The manufacturer then applies for the rebate from the state or air quality district.

This design keeps the incentive in the background for the consumer, yet provides an immediate and certain cash benefit. Dealers, in turn, do not have to wait for the government to reimburse them for the cost of the incentive, but receive it from the manufacturer. This is important not only because of the thin cash flow margins on which most dealerships operate but also because it may free the dealers from having to complete the paperwork for reimbursement of the incentive. As larger organizations, manufacturers may be better equipped to handle such paperwork. This type of vehicle incentive design may be worthy of consideration by other states.

*It Allocates Significant and Adequate Money For a State Agency or Other Responsible Party to Administer and Market the Incentive*

Oklahoma's successful loan program to government agencies is well-marketed and administered. Success of this program is attributed partly to the efforts of its dedicated staff. This also is true in Arizona. The Arizona State Energy Office has a dedicated, knowledgeable and user-friendly staff who are responsible for distributing timely incentive information and managing some AFV programs. Again, the success of the programs can be partly attributed to marketing efforts and staff.

Clean Cities is another source of timely and reliable information about incentives. In fact, it is the leading source of information, according to NCSL's survey of members of the National Association of Fleet Administrators, detailed in figure 15.



Incentives also are best coordinated with one another so that all or most incentives are available from one source. This coordination of incentives is sometimes referred to as one-stop-shopping.

*It Is in Place Long Enough and Funded at a Consistent Level so That Fleet Managers Can Predict that It Will Be Available*

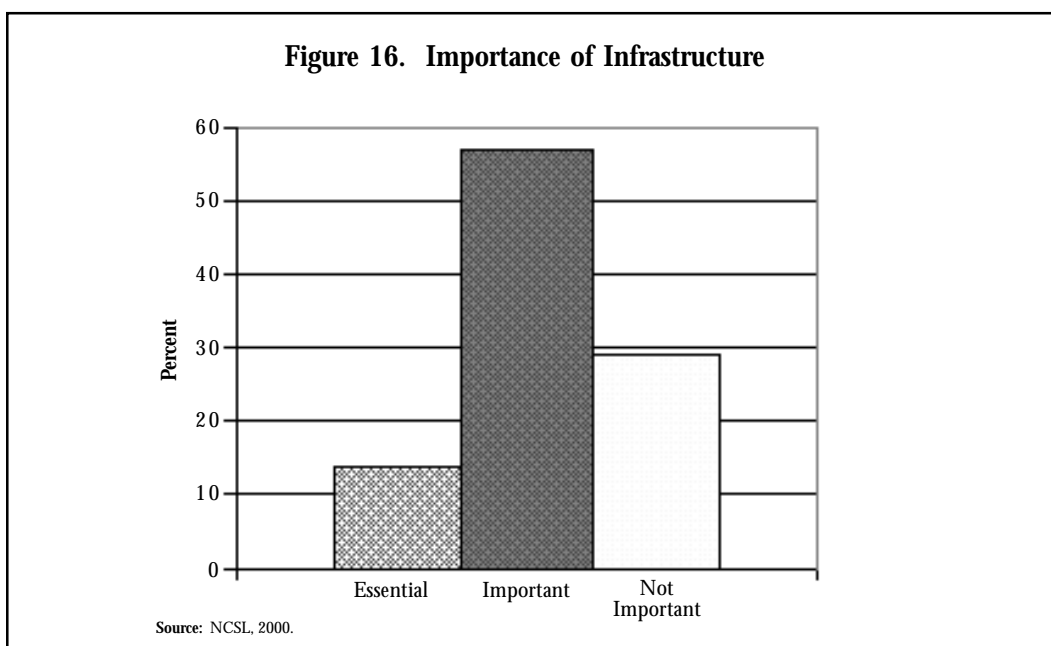
Many states, such as Colorado, specify funding levels for subsequent years. This enables fleets to plan for future purchases.

*It Has Funding and a Plan in Place For Monitoring its Success or Failure*

Whenever possible, quantitative monitoring of incentives should be a part of AFV programs. In many states, it is impossible to find the number of claimants for an AFV tax credit because the tax credit forms do not indicate that the credit comes from an AFV purchase. Arizona and California, among other states, monitor the use of incentives and track progress toward meeting the program's goals.

## Incentives Are Best Focused on Developing a Fueling Infrastructure and Vehicle Acquisition

Many observers argue about whether the alternative fuel industry requires incentives for infrastructure or for vehicles. Since the early 1990s, this question has plagued people who are trying to design alternative fuel vehicle incentives. The NCSL survey and analysis on incentives and state alternative fuel vehicle programs indicates that, at least for natural gas vehicles, infrastructure incentives are critical. Indeed, many participants in the industry cite the lack of infrastructure as the critical barrier to the growth of alternative fuel vehicle programs. Infrastructure incentives that encourage the construction of new fueling facilities give drivers the ability to travel freely without worrying about where to fuel their vehicle. Respondents to the NCSL survey cited infrastructure incentives as important, as shown in figure 16.



New York has attempted to solve the infrastructure issue by building a number of large fueling stations surrounded by satellite fueling facilities located in strategic sites around the state. Funded in large part by the state’s environmental bonds, this strategy may become a relatively low cost way to meet the state’s AFV infrastructure needs.

Observers from Connecticut’s alternative fuel vehicle industry described the state’s alternative fuel vehicle program as slow to develop, and commented that the lack of infrastructure is a significant part of the problem. Much of the state’s incentives for alternative fuels are earmarked for vehicle acquisition, with very little dedicated to infrastructure. Thus, the utilities have had most of the responsibility for developing infrastructure. The result has been that, although Connecticut’s geography, urban/rural demographics, and politics is similar in many respects to that of New York, Connecticut has built relatively little fueling infrastructure.

This is disappointing for advocates of alternative fuels. It also has had economic consequences for the companies building the fueling facilities. If builders expect that 500 ve-

hicles will fill up at a station with regularity, they will build a filling station to meet that demand. A station for 100 vehicles would be smaller and less expensive. Miscalculating of the numbers of vehicles that run on alternative fuels leads to losses for the companies that build the fueling facilities.

Incentives can fund additional infrastructure beyond that which businesses would build on their own. These incentives also must take into account realistic predictions of the amount of fuel throughput so that incentives are neither too large or too small. Incentives are inadequate if they are built on an analysis that concludes that each fueling facility would have a throughput of 5,000 equivalent gallons each month, when the actual throughput is 1,000 equivalent gallons per month.

## **Additional Lessons**

### *Electric Off-Road Vehicles*

A new and potentially significant market for electric vehicles is the off-road market. Such vehicles as airport transport, forklifts for warehouses, and small neighborhood electric vehicles for use at low speeds represent a potentially important and significant market. Yet few incentives target these vehicles. Many in the industry suggest that one of the best short-term opportunities for these vehicles may be in the off-road market. States may wish to consider developing incentives that target this class of vehicles.

### *Access to High-Occupancy Vehicle Lanes Is an Attractive, Nonmonetary Incentive*

As of 2000, six states allow single passenger alternative fuel vehicles to use high-occupancy vehicle lanes. Each alternative fuel vehicle is given a special decal or license plate identifying it as an alternative fuel vehicle. Fleet managers from the private sector also find this nonmonetary incentive attractive. In large cities such as New York, some observers noted that preferential parking privileges also would be a helpful encouragement for alternative fuels.

### *Native American Tribes Should Be Able to Take Advantage of Incentives*

Some state observers noted that tribes should be allowed to take advantage of incentives. Connecticut observers noted a particular interest among tribes in alternative fuels because they could use alternative fuels as a means to obtain the offsets required by state and federal air quality regulations.

### *Alternative Fuel Vehicles Can Be Acquired Through a State Procurement Contract*

Most state agencies noted the difficulty of obtaining alternative fuel vehicles when they were not on the regular state procurement contract. Placing the vehicles on the state contract simplifies the procurement process. The acquiring agency simply needs to specify to the state's general services agency that it wants an alternative fuel vehicle.

### *Incentives Should Be Flexible Enough to Accommodate Proven New Technologies Such as Hybrid Vehicles*

Most state incentives did not include hybrid vehicles. Yet, each automaker now has made a sizable commitment to hybrid electric vehicles. These vehicles may or may not qualify for state incentives. States may want to approach incentive packages for hybrid vehicles with care, taking into consideration the following points.

#### *Not All Hybrid Vehicles Are Created Equal*

A hybrid vehicle is defined as one that operates on electricity and another fuel, whether the other fuel is diesel, gasoline, natural gas or another alternative fuel. Hybrids can offer very high mileage, as do the first two small hybrid vehicles on the market offered by Toyota and Honda. On the other hand, some other hybrid vehicles may offer only small improvements in mileage, and their emissions profile also varies.

State policymakers may wish to consider a graduated incentive package that offers increasing incentives for improved gas mileage or better emissions.

#### *Automakers already are selling hybrid vehicles without subsidies*

Most incentives are designed to encourage people to buy a product that they would not otherwise buy, or to encourage companies to manufacture a product they otherwise would not produce. Yet, early reports indicate that hybrid vehicles are selling better than either Toyota or Honda had expected. How worthwhile, then, is a subsidy?

## 4. CONCLUSION

With more than 200 state-sponsored incentives around the nation, there is no shortage of AFV experience in all kinds of geographic, climatic, political, demographic or other circumstances. The experiences from the many states that have tried to encourage alternative fuel vehicles illustrate how incentives function or fail to function. The higher cost of most alternative fuel vehicles and infrastructure, and the comparatively low cost of gasoline vehicles, fuel and infrastructure represent one set of factors to overcome. The technological limitations of some alternative fuel vehicles represent another set of factors for incentives to overcome. Most incentives have failed to lead the industry through these challenges in order for alternative fuels to have a significant effect on gasoline use or air quality. This analysis suggests that incentives need to be precisely and carefully designed in order to help alternative fuels and vehicles overcome these obstacles. They also must be more substantial than most states have been willing to offer.

To be effective, incentives need to adhere to the following five principles. They must be:

- Focused on achieving a well-defined goal.
- Large enough to entice consumers to buy an alternative fuel vehicle.
- Grant-based in most cases.
- Easy for consumers to receive and for the state to administer.
- Focused on developing a fueling infrastructure as well as on vehicle acquisition.

A number of incentives stand out as having met these goals. California's Carl Moyer program is clearly focused on air quality improvements from medium and heavy-duty vehicles. Its provisions relate clearly to that goal and that market, and it has earned respect within California for its clarity of focus.

Arizona's program was tremendously successful at enticing people to purchase vehicles capable of operating on an alternative fuel. It, like California's Carl Moyer Program, maintained at least some focus on improving air quality. It also is comprehensive, with special programs for used vehicles, and offers adequate financial incentives to make people change their buying patterns. However, it does not appear that the program encouraged people to run their vehicles on an alternative fuel, nor did Arizona's law provide cost containment for the state. Not every state may want to commit the same financial resources to alternative fuels, but many may be able to learn from Arizona's experiment with large incentives.

Many factors—including politics, gasoline prices, physical climate, air quality and demographics—can push alternative fuels to the pinnacle of success or the brink of failure. Even

the best-designed incentive may not guarantee a swift transformation of the vehicle and fuel market away from gasoline and diesel towards the alternatives. Yet, a poorly designed incentive may contribute nothing, and leave the alternative fuel market dormant even in a state that is otherwise quite hospitable to the new technology.





# APPENDIX A. DEFINITIONS OF STATE ALTERNATIVE FUEL VEHICLE INCENTIVES

Seven categories of alternative fuel vehicle incentives exist, as well as a catch-all category of other incentives.

- 1. Grants—Money is given directly to the purchaser to help offset AFV costs.**  
Arizona, California, Delaware, Florida, Georgia, Indiana, Nevada, New Mexico, Pennsylvania, Rhode Island, Texas, Virginia, West Virginia and Wisconsin are all states that offer grants as incentives for the purchase of AFVs.
- 2. Rebates—A certain amount of money is returned to the consumer.**  
Arkansas, Colorado, Illinois, New Jersey and Pennsylvania all offer rebates for the purchase of an AFV.
- 3. Tax credits—A certain amount is deducted from tax liability.**  
Arizona, Colorado, Georgia, Kansas, Maryland, Montana, New Jersey, New York, Ohio, Oklahoma, Oregon, Rhode Island, Utah, Virginia, and West Virginia offer income tax credits for the purchase of an AFV. Arizona, Colorado, Kansas, North Carolina, North Dakota, Oregon and Virginia offer income tax credits for AFV infrastructure. Ohio offers a tax credit for alternative fuels.
- 4. Tax deductions—A certain amount is deducted from income before taxes.**  
Indiana offers an income tax deduction for improvements to ethanol producing facilities or soy diesel producing facilities. California, Arkansas, Hawaii, Iowa, Kansas, New Jersey, Maryland, Massachusetts, Mississippi, Montana, South Dakota and Washington all offer fuel tax deductions.
- 5. Loans—Low interest loans are offered for AFV purchase and infrastructure development.**  
Florida, Iowa, Kansas, Nebraska, New Mexico, Oklahoma, Oregon, Rhode Island, Texas and Utah offer loans for vehicles or infrastructure development in both government and non-government fleets.

- 6. Tax Exemptions—Consumer is exempted from paying certain taxes.**  
Alaska, California, Connecticut, Georgia, Hawaii, Idaho, Illinois, Iowa, Kentucky, Louisiana, New York, Missouri, Nebraska, New Hampshire, Oklahoma, Virginia, West Virginia and Wyoming all offer fuel tax exemptions. Arizona, Connecticut, Florida, Louisiana, Maine and Maryland offer retail sales tax exemptions.
- 7. High Occupancy Vehicle Lanes—Some states offer HOV lane use to AFVs without requiring a minimum number of passengers.**  
Arizona, California, Colorado, Georgia, Hawaii and Virginia allow AFVs in the HOV lanes.
- 8. Various others—Many states or municipalities offer their own unique incentives for vehicles and infrastructure.**  
States offer many types of other incentives. The City of New York, for example, offers preferential parking privileges. States, such as North Dakota and Nebraska, offer ethanol fuel production incentives. Michigan, among other states, offers emission credits programs.

# APPENDIX B. SELECTED STATE CASE STUDIES

## Arizona Case Study

### *Summary and Overview*

Until October of 2000, when it put a moratorium on its alternative fuel vehicle program, Arizona offered the nation's most aggressive alternative fuel vehicle and infrastructure incentive package in the U.S. Arizona's incentives included the following.

- Tax credits and grants covering the full incremental cost of alternative fuel vehicles plus up to 30 percent of the total vehicle cost for vehicles. In April of 2000 the tax credit was a refundable tax credit, meaning that taxpayers would receive a check from the state no matter how big their tax liability (a non-refundable credit would count against the taxpayer's tax liability, but the refund check could not exceed the taxpayer's tax liability in that year). This program was capped at an annual figure of one percent of the total vehicle population of the state each year, or about 40,000 vehicles per year. Figure 17 shows the design of the tax credit on the purchase of alternative fuel vehicles.

**Figure 17. Design of Arizona's AFV Tax Credit**

Emission Level	New AFV (based on <i>total</i> /vehicle cost)	Used AFV (based on <i>total</i> /vehicle cost)
LEV	Greater of 30% of cost or \$5,000	Greater of 15% of cost or \$2,500
ULEV or ILEV	Greater of 40% of cost or \$7,500	Greater of 20% of cost or \$3,750
ZEV or SULEV	Greater of 50% of cost or \$10,000	Greater of 25% of cost or \$5,000
Heavy Duty LEV (gvw >12,000 lbs.)	Greater of 30% of cost or \$30,000	Greater of 15% of cost or \$15,000

Source: Arizona Department of Commerce, 2000.

- Grants for fueling stations including, as of April of 2000, full tax credits for home natural gas refueling stations.
- 98 percent reduction in licensing fees
- High Occupancy Vehicle lane access
- Sales tax exemptions

The size of the state's incentive was impressive, as figure 18 illustrates.

**Figure 18. Arizona's Incentives: An Example**

If a consumer bought a vehicle capable of operating on an alternative fuel, he or she could receive the following from the state:

<b>Assume:</b>	Vehicle Cost:	\$30,000 base plus \$6,000 conversion cost = \$36,000
	Incentive:	30 percent of cost, plus full conversion (incremental) costs
	Rebate:	\$9,000 + \$6,000 = \$15,000

Source: NCSL, 2000.

The incentive would be larger for even lower-emitting vehicles; so few of those are available from manufacturers, however, that only a small number of Arizonans have taken advantage of the larger incentive amounts.

Another example of the Arizona incentive was for Zero-Emission Vehicles—usually defined as battery-powered electric vehicles. The tax credit for such vehicles was \$10,000. Yet at one type of vehicle that qualified for this credit—a small, vehicle with speed usually restricted to below 35 miles per hour known as a “neighborhood electric vehicle” vehicles generally cost only \$6,000 to \$8,000 each. People who bought these vehicles got a free vehicle plus \$2,000 to \$4,000 from the State. In all, this program cost the state approximately \$10,000,000 according to the State Energy Office.

Arizona's incentives were more flexible than those in some other states. Beginning in April of 2000, for instance, the incentives were available for both dedicated and dual fuel vehicles, with no requirement that the vehicle actually operate on an alternative fuel. And because Arizona's Speaker had worked hard to convince the U.S. EPA to certify sport utility vehicles outfitted with a natural gas engine to be classified as low emission vehicles, sport utility vehicles could also qualify for the tax credit. The state had also imposed a limit of one vehicle per family up until April of 2000, but removed that limitation as well.

The combination of large, flexible incentives with few safeguards to be sure that the incentives were encouraging people to buy clean vehicles created a bonanza for car dealers and consumers alike.

Figure 19 shows the use of those incentives, beginning in 1995, and continuing through late in October 2000, when the legislature put a moratorium on the program.

**Figure 19. Use of Arizona AFV Tax Incentives, 1995 to 2000**

	Claimants	Amount	Estimated Numbers of AFVs in Arizona *
1995	24	\$11,026	Not Available
1996	35	\$23,772	Not Available
1997	36	\$27,695	5,804
1998	82	\$71,813	7,441
1999**	1,273	\$8,400,000	8,869
2000***	~5,000	~\$100,000,000	Not Available

\* Energy Information Administration data  
 \*\* Approximately 1,100 of these claims were for neighborhood electric vehicles, which are low-speed vehicles slightly larger than a golf cart.  
 \*\*\* Before emergency changes to the incentive law, 21,000 people had applied for the incentive at a total projected cost to the state of \$479,000,000.

Source: Arizona Department of Commerce; Arizona Office of Alternative Fuel Recovery; Arizona Department of Revenue, 2001.

- The 1999 tax credits are anticipated to be much higher due to the increase in tax credit amounts and the allowance of Neighborhood Electric Vehicles as a ZEVs.

A few examples of the practical effects of Arizona's program follow:

- Car dealers in some parts of the state stayed open 24 hours a day to meet the demand for vehicles.
- Many consumers bought neighborhood electric vehicles—essentially high-quality, low speed golf carts, at a cost of \$6,000-\$8,000 and received a tax rebate of \$10,000 for the purchase—to put it another way, they received a free vehicle, *plus* \$2,000 from the state. The state's total outlay for this program was about \$10 million.
- Many documented cases exist of people buying vehicles with leather seats, high quality stereos, and many other luxury items, 30 percent of which were paid for by the state taxpayers.
- One taxi company converted 600 vehicles to dual fuel natural gas-gasoline operation, and received a tax credit for each one based on his original cost of the vehicles, purchased a couple of years ago.
- A home developer offered houses for sale, including a free sport utility vehicle as an added incentive.

Arizona has also had a number of other incentives in place targeted at the municipal and school markets. A description of these incentives follows.

### *Public Access Fuel Stations*

Between 1994 and July 1999, \$1,616,250 in grants was awarded for 39 public access fueling stations. Most of those stations were for electric charging, but CNG, propane and LNG stations also were funded. The total project costs totaled \$6,391,839. In 2000 the state offered a new refundable tax credit for the installation of home refueling stations. Figures on the use of this tax credit are not available from the Department of Revenue.

### *School District Grants*

The 1999 funding for school district grants totaled \$2,636,756. This funding translates to:

- 70 buses (new and converted)
- 36 vehicles (new and converted)
- 12 fueling stations
- 48 people trained
- 19 tools/materials

### *Municipal Grants*

The 1999 funding for municipal grants totaled \$5,083,562. This translates to:

- 375 vehicles (new and converted)
- 76 buses (new and converted)
- 9 fueling stations
- 191 people trained
- 3 tools/materials

### **Analysis of Incentives**

#### *The Arizona Context*

The Arizona legislature has been supportive of alternative fuel vehicles as a means of reducing air pollution, and its alternative fuel vehicle incentive programs were directed towards meeting air quality goals throughout much of the 1990s. To some degree, the U.S. EPA forced the state to come up with creative ways to improve its air quality when it presented Arizona's policymakers with a dilemma: either solve the state's air quality problems or face growth restrictions. The legislature also saw the air quality problem as a business and economic development issue that, if resolved, could allow development of new businesses in Arizona.

Arizona funds its alternative fuel vehicle programs partly through tax credits and partly through the Arizona Clean Air Fund which receives money from the "In-Lieu Inspection Fee." The rationale for the fee is that new vehicles (the four most recent model years) almost always pass vehicle emission inspections. Arizona requires that these newer vehicles pay the inspection fee (the "in-lieu" fee), but does not require them to take the emission test. This has caused some controversy because some of the vehicle owners do not want to pay for something that they do not actually receive.

#### *Effectiveness of Incentives*

Arizona met many of the criteria that this analysis defines, until mid-2000. The state's incentives were large, easy to use, and targeted towards emissions reductions until that time. Up until April of 2000, the state had struck a balance between offering a large incentive and keeping the incentive focused on improving air quality.

In April of 2000, Arizona's incentives simultaneously lost their focus and grew larger. To qualify for a 30 percent discount on their new car, individuals no longer had to actually use an alternative fuel; they could simply buy a vehicle *capable* of running on an alternative fuel even though they might never run it on the alternative fuel. In addition, Arizonans could get a check for more than 30 percent of the car's value immediately. For this combination of factors, it is hard to say for sure whether the state's incentives worked, since it is impossible to tell how many people intended to run their vehicles on the alternative fuel. The state's incentives, while large, were unfocused.

Some of the experiences from Arizona provide lessons that parallel the more general lessons offered in this report:

- Incentives need to be both focused and large. Arizona's incentives were large, but unfocused.
- Incentives for dual-fuel vehicles will encourage people to buy dual fuel vehicles—but offer no guarantee at all that they will use the alternative fuel. States should approach such dual-fuel vehicle incentives with caution.
- Although Arizona's incentives were generally structured as a tax credit, they were a *refundable* tax credit, and therefore had a great deal in common with grants. When Arizona switched from a tax credit to a refundable tax credit, its incentives became much more popular. This fact would seem to bolster the view that a grant-like incentive is most effective, since it offers certainty and immediate benefit. A tax refund still will not benefit non-taxable fleets, however.
- States should probably consider putting a cap on the total incentive amount; Arizona had a cap, but its cap was far larger than state officials could justify, in the end.
- Arizona's incentive program was large and focused throughout much of 1999. Yet fewer than 150 people bought vehicles with the incentives. It is hard to tell within this limited timeframe why so few people bought alternative fuel vehicles. However the experience in 1999 may offer a warning sign that imposing challenges remain for the alternative fuel vehicle industry.

## California Case Study

### *Summary and Overview*

California gives grants for AFVs from its Air Quality Management Districts. These districts receive money from the state to fund air pollution reduction programs.

California also sponsors the Carl Moyer Program, which awards money based on the project's ability to reduce air pollution. The project must meet certain criteria, including it must be cost effective in dollars per ton. California has several EV programs, including a \$5,000 "buy-down."

### *Use of Incentives*

#### *EV Sacramento Program*

The program covers the first-year lease costs for state and local agencies. The program also covers up to \$1,000 in infrastructure costs.

1. 120 vehicles are available.
2. Each participant must lease five or more vehicles.

Although for three years prior to EV Sacramento there had been few electric vehicle leases, agencies now are very interested in program.

#### *Carl Moyer Program*

1. The goal of the program is NOx reductions.
2. Heavy-duty engines are the focus of the program.

3. Some areas have a date of 2005 for attainment, others 2010.
4. \$25 million has been appropriated for the first year, and \$23 million for the second year. Funds will be distributed to the air districts based on attainment date and population.
5. The money for the program came from General Fund (~ 20 percent) and Oil Overcharge Funds (~80 percent).
6. ~20 percent of funding went to the CEC for its programs, and the rest went to the ARB for the Air Districts.
7. Projects must adhere to cost effectiveness standards (dollars per ton). The average cost effectiveness is \$3,000/ton. The maximum amount allowable is up to \$12,000/ton.
8. Project goals must be real, quantifiable and enforceable.
9. Incentives are tied to reductions in emissions. Some projects focus on AFVs, while others promote advanced technologies that produce significant reduction (30 percent).
10. The program targets heavy duty equipment:
  - Ground equipment (forklifts must be electric)
  - Marine vessels
  - Locomotives
  - Heavy-duty on-road: line-haul, urban transit (over 14,000 gvwt)
  - Stationary agricultural engines
  - Agricultural Pumps
  - Airport ground support

## Analysis of Incentives

### *The California Context*

California has extreme air pollution problems and attempts to control pollution through programs sponsored by the California Air Resources Board (CARB), which distributes monies to the local Air Quality Management Districts. These programs include efforts at increasing the use of alternative fuel vehicles. Other agencies, such as the California Energy Commission, also sponsor programs for alternative fuels. Areas that have pollution problems have a date of either 2005 or 2010 to come into attainment for air quality, and many programs use these dates to help them prioritize state projects. All of the \$25 million allocated for 1999 has been used.

California also charges a \$4 fee through the Department of Motor Vehicles to help fund air pollution control projects. Approximately 40 percent, or \$1.60 of the fee, of the money goes to cities to implement emission reduction programs at their discretion. Another 30 percent, or \$1.20, goes to the South Coast Air Quality Management District (SCAQMD) for monitoring and studies of air programs. The final 30 percent, or \$1.20, goes to the Mobile Source Review Committee (MSRC) for cost effective programs as outlined by the ARB. The MSRC formulates a strategy for each year based on the successes and/or failures of the previous years.

### *Effectiveness of Incentives*

California's programs focus on targeting the heaviest polluters and the most cost effective programs. Most air districts fund programs that price around \$12,000 a ton. The Bay Area has funded programs for less than \$3,000 a ton. Not all of these programs, however, are focused on alternative fuels.



- CEC had a school bus replacement program that replaced pre-1977 buses with new ones. These buses were cleaner, more fuel efficient, and safer than the ones they replaced. At least 30 percent were run on alternative fuels. They placed nearly 800 buses in California school districts. For every bus received, a pre-1977 bus could no longer be used to transport passengers in California.
- In 1999, for the first time in 50 years, southern California did not exceed ozone standards. It is hard to credit the alternative fuel programs alone for this accomplishment, although these programs appear to have played a part.

### *Lessons Learned from California that Are Broadly Applicable to Other States*

- States have not set clear and definable goals for alternative fuels. With no goal, it is very difficult to determine market penetration and whether an incentive has met that goal. What results is a very segmented view of the AFV market.
- Incentives for electric vehicles haven't been as effective due to a lack of vehicle availability.
- When considering administrative ease, consider permitting rules.
- There are no mandates to *buy* alternative fuels.
- Cleaner burning gasoline came about from the "threat" of alternative fuels.
- Out of "fear" of regulations, heavy-duty vehicle operators have been more willing to get in on ground floor. For example, marine vessels anticipate regulations from the EPA and have begun to use AFVs and take advantage of incentives
- Incentives for incremental cost of fuel—Many incentives are tied to the hardware being replaced, not to operating costs.
- Customer based incentives are the kinds of incentives that affect decision to purchase. If consumer can see benefit beforehand, that may influence purchase decision. In the Carl Moyer program, the consumer receives money, and manufacturer helps fill out paperwork.
- Continued funding for incentives should be long-term and guaranteed. It is difficult for fleets to purchase AFVs if it appears that future funding for programs will vanish.
- More infrastructure incentives are needed.
- Technician training is a problem area.
- Education is a key component because consumers do not like change.

### **Connecticut Case Study: Lessons Learned from Connecticut's AFV Experience**

Connecticut's alternative fuel vehicle programs appear to be floundering, even in the words of some of the primary participants in the state's programs. The utilities are reevaluating their commitment to alternative fuel vehicles, and are likely to be cutting back on their programs. Connecticut was one of the first states to enact incentives, creating a model that some other states later adopted. However, the incentives now appear to be somewhat outdated and are not used a great deal. As in many other states, Connecticut's alternative fuel vehicle incentives are aimed at private fleets, while almost all alternative fuel vehicle activity is taking place among municipal and state government fleets.

Connecticut's primary electric utility, Northeast Utilities, has been under financial pressure for a number of years, is undergoing a merger, and is cutting back on its alternative

fuel vehicle program. Although the company has had a small, active and committed team of people devoted to attempting to make alternative fuel vehicle programs work in the state, that team has been unable to stimulate a significant market for alternative fuels by itself. A similarly dedicated team of Clean Cities coordinators work on this market, but have been stymied by difficult market conditions, as well. Approximately 10 General Motors electric vehicles now operate in the state. In addition, a small number of other electric vehicles operate in the state. Unfortunately, the lack of vehicles available from manufacturers has made it difficult to develop a market for electric vehicles.

The natural gas vehicle programs have been more successful, however they too suffer from an apparently outdated and inadequately marketed set of incentives. According to one person who markets alternative fuel vehicles, very few people either know about or use the incentives. In addition, some organizations including government entities appear to be purchasing alternative fuel vehicles, such as E85 vehicles and operating them on gasoline. They are in essence meeting the standard, technically, for acquiring alternative fuel vehicles. However very few of the government agencies are operating the vehicles on ethanol.

Connecticut has successfully raised more than \$2 million from the private sector and close to \$1 million from the state Department of Transportation to support its alternative fuel vehicle program. These amounts plus other contributions from municipalities and grants from the U.S. Department of Energy have helped to bring into service some 25 natural gas powered police cars, three natural gas powered school buses, a 100-plus vehicle natural gas taxi program and some other alternative fuel vehicles.

### *Suggestions from Connecticut Interviews on How to Improve Incentives*

- Switch incentive from its current emphasis on conversions, and substitute a greater incentive for OEM vehicle purchases.
- Develop an incentive for people to purchase the fuel, rather than simply to purchase the vehicle (whether or not it runs on the alternative fuel).
- Find a way to have the incentive follow the vehicle through its various owners, such that a used vehicle might also receive an incentive.
- Offer grants to municipalities and other non-taxable entities so that they can take advantage of some type of incentive.
- Offer incentives for off-road vehicles, particularly electric vehicles such as forklifts.
- Offer incentives for infrastructure.
- Make incentives such that Indian Tribes can take advantage of them. For instance, some tribes are looking at the possibility of buying alt fuel vehicles so they can receive credits for offsetting pollution and building from the construction of their casinos.
- Tax deductions are not as good as tax credits, nor are deductions useful for low-income-earning businesses.

- Find a way to deal with school districts running on AFVs that are required to sell the buses after four years of operation. The buses cost more when they are new because they run on natural gas, but are worth less on the resale market because they run on natural gas.
- Perhaps offer a greater incentive for vehicles with a greater driving range.
- The paperwork in Connecticut is burdensome, up to 10 pages. Instead, the paperwork should be one page long, with the VIN number and proof of sale of the vehicle.
- Even more important than the incentives is leadership. The state agencies, especially the DOT and DEP must be committed to the program from the very highest level.

### **New York State Alternative Fuel Vehicle Case**

New York has one of the nation's more successful alternative fuel vehicle programs. This program has a set of incentives and funding targeted toward the main groups that appear to be considering alternative fuel vehicles: state and local government. New York's incentives are substantial, and the leadership from within the state government is strong. This lies in stark contrast to most other states, with the exception of California. Nonetheless, there has still been only muted interest from the private sector in alternative fuel vehicles. Almost all the activity has been from state and local government agencies, with some notable exceptions, including a well-funded program in New York City to convert taxis to natural gas.

Electric vehicles are at an earlier stage of technological development than are natural gas vehicles. Few vehicles are yet available for the general fleet user and as a result are still uncommon. The early stage of development of the technology means that few people use the vehicles and the incentives rarely get used for electric vehicle purchases. There does appear to be an interest in off-road electric vehicles, small electric vehicles, hybrid electric buses and electric vehicles at airports. In general, this market cannot take advantage of the incentives.

Natural gas vehicles have been notably more successful. The state has been able to use approximately \$40 million from an environmental bond fund to support its own purchase of alternative fuel vehicles and infrastructure. In addition, Governor Pataki has been an outspoken supporter of alternative fuels. He has required that each state agency meet specific goals for purchase of alternative fuel vehicles, and that those vehicles operate on alternative fuels. If the vehicles do not operate on alternative fuels for a given percentage of the time, the fleet operators are required to document the reasons for the failure to operate on the alternative fuel.

In addition, the state has developed an adequately-funded plan to build the infrastructure to support the alternative fuel vehicles. This plan involves a network of large fueling stations surrounded by 30 smaller fueling stations for mid-day fill ups. This plan has been developed by the state agencies' fleet managers, and is funded by the money from the environmental bond act. As a result of Governor Pataki's policy, natural gas use has increased dramatically.

Private fleets have taken some interest in alternative fuels, but the interest has remained limited. Some fleets on Long Island are converting, and a large (more-than-400-car) taxi

fleet conversion is underway in New York City. This conversion is funded to a large degree with money from the CMAQ program.

### *Lessons from New York*

- Incentives for off-road electric vehicles could be very helpful.
- Leadership from the top is critical to a successful program.
- A program needs to be well-funded.
- State incentives are still not marketed well to the private sector, and may not be large enough, given the relatively low gasoline prices.
- CMAQ money may be a key to offering grants to get some fleets to convert.
- Tax credits appear to be somewhat more effective than tax deductions. Low-income businesses are leery of alternative fuels, and cannot always take advantage of the incentives.
- Few people complained about paperwork.

## **Wisconsin Case Study**

### *Summary and Overview*

Grant programs within the State of Wisconsin have gone from being available to any municipality within the state to only being offered to municipalities within an eleven county ozone non-attainment zone. Fueling infrastructure and vehicle range are problems voiced by AFV users but these problems are not being actively addressed through state incentive programs. There is interest in operating AFVs within the state and both natural gas and ethanol fuel producers are interested in promoting these alternative fuels, but the State itself will not promote any fuel in particular.

### *Use of Incentives*

State incentives for alternative fuel vehicle use have been offered from two different programs. The Local Governments Grant Program ran from 1991 to 1996, and offered funds to local government fleets for either the purchase or conversion of alternative fuel vehicles. This money was made available from Oil Overcharge Funds; \$660,215 was used to fund 345 vehicles. Since 1995, the University of Wisconsin-Milwaukee Center for Alternative Fuels has offered a CMAQ Alternative Fuels Grant Program. These grants are available to Wisconsin municipalities in an 11-county ozone non-attainment area. The counties include; Milwaukee, Waukesha, Racine, Kenosha, Walworth, Washington, Ozaukee, Sheboygan, Manitowoc, Kewaunee, and Door. As of November 1999, \$188,536.34 had been used in 20 different grants to fund 35 vehicles. Between 1997 and 1999 the estimated number of alternative fuel vehicles operating in Wisconsin rose from 8,642 to 9,023. Alternative fuel vehicle use is also encouraged by Governor Tommy Thompson's "2000 by 2000 plan" which would put 2000 alternative fuel vehicles in the state fleet by the year 2000, surpassing both EPACT and CAAA requirements.

### *Analysis of Incentives*

#### *The Wisconsin Context*

Previously, with the Local Government Grant Program, incentives were available to any Wisconsin municipality (any public entity with taxing powers). Currently, the CMAQ

grant program is administered through the University of Wisconsin at Milwaukee Center for Alternative Fuels. Through this program, grants are available to municipalities within in an eleven county ozone non-attainment zone in Southeastern Wisconsin (six of these counties are in severe non-attainment). This southeastern portion of the state contains both population and industrial core areas. However, some of these areas are in non-attainment zones due to pollution that drifts over Lake Michigan from places like Chicago and Gary, Indiana into the counties located on the border of the lake. Grants are awarded on a competitive basis with consideration given to levels of pollution in the area and they type of vehicle purchased. OEM vehicles are given the highest priority.

The biggest problems facing Wisconsin AFV users are range and lack of fueling infrastructure. The Wisconsin Department of Transportation does offer some infrastructure grant programs but these grants are specifically reserved for public stations and The CMAQ grant program works with fleets, most of whom prefer on-site fueling facilities. Most other reluctance to use AFVs stems from problems that are more perceived than actual. Concerns are voiced about safety issues, or concerns with the reliability of the vehicle in the cold, but due to technological advances in AFVs, these issues no longer pose large problems to Wisconsin's drivers.

Officially, Wisconsin is a fuel-neutral state and no alternative fuel is promoted by the state over any others. However, electric and gas companies within the state are very active in promoting CNG as an alternative fuel by offering incentives like rebates on the purchase or conversion of vehicles, and by offering technical assistance to users. Most state run fleets use vehicles that run on ethanol. Increased use of ethanol as a fuel can help increase employment and revenue in a state that produces ethanol. Wisconsin is one of those states.

### *Effectiveness of Incentives*

The state offers no tax credits for alternative fuels or AFVs. Due to the current political climate, this probably will not change soon.

There are no aggressive incentives for alternative fueling infrastructure, and without the infrastructure available, fleets are reluctant to purchase AFVs.

What may ultimately hurt the alternative fuel vehicle industry in Wisconsin is that the Clean Fuel Fleet Program is not fuel specific as long as emissions standards are met. Therefore, with improvements in emissions standards of gasoline powered vehicles, fleet operators opt for LEV gasoline powered vehicles because fueling infrastructure is already readily available and no adjustments need to be made for these vehicles.

### *Lessons Learned from Wisconsin*

- Infrastructure incentives are very important.
- Public education about AFVs and the advancements made in AFV technology are very important. If people understand that advancements have been made to improve the safety and reliability of AFVs, this may increase public interest in the technologies.

## APPENDIX C. USE OF ALTERNATIVE FUEL VEHICLE INCENTIVES: A SURVEY

Data in this appendix is based on interviews with the incentive managers from the states listed. This data is not meant to represent the results of every incentive in every state. Because of limitations on data availability, some states' incentives may not be included.

### Alaska

Alaska currently offers no state incentives for alternative fuel vehicle use.

### Alabama

Alabama currently offers no state incentives for alternative fuel vehicle use.

### Arkansas

An income tax credit of 30 percent of the cost of buildings, equipment, higher education partnerships and licenses necessary to manufacture advanced biofuels is available in Arkansas. This credit has been available since 1997 but has not been used.

In 1993, a \$250,000 fund was established for rebates on the cost of converting vehicles to alternative fuels.

Year	Total amount	Number of rebates used
1993	\$360.25	2 LPG
1994	\$6,617.70	24 LPG, 1 CNG
1995	\$32,576.07	20 LPG, 13 CNG
1996	\$31,160.87	17 LPG, 10 CNG
1997	\$13,742.20	5 LPG, 5 CNG
1998	\$2,860.00	3 LPG
<b>Totals</b>	<b>\$87,317.09</b>	<b>71 LPG, 29 CNG (100 vehicle rebates)</b>

## Connecticut

Since 1993, corporations have been offered a tax credit of:  
10 percent for purchase of vehicles exclusively using alternative fuels;  
50 percent for conversion; and  
50 percent for construction or repair of alternative fueling stations.

Between 10 and 20 corporations claim this credit every year. Fifteen were claimed last year. Credits average between \$75,000 and \$100,000. The credits cannot be broken down between purchase, conversion, and infrastructure, because it just goes on one line of the form.

## Delaware

Delaware Energy Office offers a rebate program to fund the incremental cost of AFV conversions or purchases for state, county, or municipal fleet operators. Initially, \$66,000 was available and \$10,000 has been used (over the period of two years) towards the purchase of five vehicles.

## Florida

The State Energy Office has allocated \$2.5 million to the Gold Coast Clean Cities Coalition for a no-interest revolving loan fund for AFVs for public and private fleets. No one has used these loans yet due to the grant program which is also available, but Gold Coast Clean Cities is currently working to get this money changed to more grant money. This grant money has been available since 1996

The State Energy Office has been provided with \$1 million in oil overcharge funds to assist state agencies in meeting alternative fuel fleet requirements. Thirteen grants have been given out to fund a total of 176 AFVs (at a cost of \$1 million). This includes both purchase and conversion of vehicles.

## Georgia

The State of Georgia will provide for an income tax credit of up to \$1500 per vehicle for the purchase or lease of an alternative fuel vehicle. The credit was first offered in 1998. During that tax year, one person claimed the tax credit for a total of \$1500.

Since the early 1990s the Georgia Environmental Facilities Authority has administered a Clean Fuels Grant Program available to local governments and authorities throughout Georgia to facilitate the introduction and expansion of fleet operations into the use of clean alternative fuels. Local governments and authorities must have a demonstrated commitment to the use of clean alternative fuels. Grants are funded up to \$50,000 per cycle. Thirty-six grants have been made to public entities throughout Georgia for clean fuel vehicle acquisition and infrastructure to support the vehicles. The grant program received and spent around \$2,500,000.

## Hawaii

The State of Hawaii offers income tax deductions, identical to the federal income tax deductions, for the installation of clean fuel refueling property. There is no further information about this credit available because the deduction is entered on the tax form under "other deductions."

## Idaho

Idaho offers a reduced tax on propane and natural gas used for fuel. Currently, diesel fuel is priced at \$0.25 per gallon, propane is \$0.181 per gallon, and natural gas is \$0.197 per gallon. Biodiesel fuel is taxed at the same rate as diesel fuel, but then consumers may apply for a refund of that tax. This is filed on a separate tax form after purchase. This program has been in effect since 1996. Approximately 6,000 refund claims are submitted with yearly tax forms and an additional 2,500 submitted separately every year. For fiscal year 1996, this translated to about \$1.52 million.

## Illinois

Illinois State Air Quality Agency offers a rebate of up to \$4000 to cover incremental cost of purchase, conversion costs, or additional costs of fuel (ethanol and biodiesel because they are both more expensive than gasoline). The program began in 1995, but due to legal problems with the legislation, funding was not available until the summer of 1998. The state is currently entering its first six month cycle where funds are available. The program will run until the year 2002. There are currently about 100 applications, all of which will be given rebates. The rebates will cost about \$360,000 with an average rebate of \$3200. Most of these are for purchase and conversion with only a few used for fuels. This program is open to anyone in Illinois and applications have been received from businesses, private corporations, and private citizens.

## Iowa

Organizations that qualify for Iowa Energy Bank funding (state facilities, city and county governments, hospitals, public schools, private schools, private colleges, and nonprofit organizations) can acquire a low-interest loan through the program and repay the loan through the savings achieved by purchasing and using alternative fuel vehicles. These loans have not yet been utilized.

## Kansas

Since January 1, 1996, Kansas has offered a tax credit of up to 40 percent of the cost of factory equipped vehicles up to \$2,000, or 5 percent of the total cost of the vehicle (up to \$750) may be taken as tax credit. A 50 percent tax credit is offered for purchase and installation of fueling equipment, compressors, and dispensers of alternative fuels. So far, less than five people have claimed this tax credit. There is no other information available, because until there are more than five people, it is not considered a statistic and the information is not publicly available.



## **Louisiana**

Since 1991, the State of Louisiana has offered a state income tax or corporate tax credit for 20 percent of the costs of converting a vehicle to alternative fuels, or up to \$1,500 for 20 percent of the incremental cost of purchasing a factory-equipped AFV. Tax records are not kept which would show exact numbers of credits claimed, but it is estimated to be around \$200,000 per year, funding around 150 to 200 vehicles.

In Louisiana, the owner of an alternative fuel vehicle may purchase a special fuels decal (for propane and natural gas) in lieu of paying the fuel tax of \$0.20 per gallon. Last year, 1,358 of these decals were issued. There were about 1,000 more than that in the previous year, which was the first year of the program.

## **Massachusetts**

In 1996, the Weld Administration issued an executive order to state fleet managers to comply with EPA's AFV purchase requirements. Massachusetts currently offers no other state incentives for alternative fuel vehicle use.

## **Michigan**

Michigan currently offers no state incentives for alternative fuel vehicle use.

## **Minnesota**

Minnesota currently offers no state incentives for alternative fuel vehicle use.

## **Missouri**

Missouri currently offers no state incentives for alternative fuel vehicle use.

## **Nebraska**

In 1991, the State of Nebraska began issuing motor fuel tax certificates to ethanol producers. The Nebraska constitution prohibits the state government from directly issuing cash incentives, so the certificates are then sold to oil producers (usually at a discount) who may use them as payment against tax liability for gasoline. There are six producers in the state currently receiving this benefit and one more will begin in November of 1999. The program has a budget of \$173 million; \$146 million has been issued.

Since 1991, the Dollar and Energy Saving Loan program has offered loans with an interest rate of 5 percent for energy saving projects including AFVs. Two loans have been issued for AFVs for a total of \$95,000.

## **Nevada**

Nevada currently offers no incentives for alternative fuel vehicles. From October of 1996 until September of 1999, DOE grants were available to cover the incremental costs of alternative fuel vehicles. Between 15 and 20 grants were awarded for a total of \$170,000.

## **New Hampshire**

New Hampshire currently offers no state incentives for alternative fuel vehicle use.

## **New Jersey**

New Jersey had received a grant from the Department of Energy for \$68,000 that was matched by \$252,000 from the New Jersey Division of Energy. This money was to be offered as rebates for the purchase of AFVs. The money had not been spent so a re-approval process was just completed and the grant was reapproved on October first. The money will be divided among municipalities and it will be up to the counties to decide how to spend the money but it will probably go towards the purchase of AFVs.

For the past six years, New Jersey has been using \$1.5 million in oil overcharge funds for either conversions or purchase of OEMs. So far, \$1.32 million has been spent, but the rest of the money is already allocated. Before 1999, the money was spent on conversions alone. Beginning in 1999, more money was spent on purchases.

Project Power Commute is a \$1.6 million project run by the New Jersey Department of Transportation and New Jersey Transit. New Jersey Transit purchased 21 retrofitted FEO Metro four-door electric cars. The cars are then leased for \$100 per car per month to companies that are located within five miles of a train station. The companies are required to have plugs installed (paid for by the Department of Transportation) and the cars must carry at least 2 passengers (2.9 is currently the average). There are special parking places for the cars at the train station, and the employees who use the cars take the trains to the station where they pick up the electric car and car pool to the office. This program has been extremely successful. It was initially a two year program, but has been extended due to its success.

## **New Mexico**

Since 1990, the Energy Conservation and Management Division of the Energy, Minerals, and Natural Resources Department of New Mexico has provided grants for projects that will reduce the overall energy demand and the consumption of petroleum products. This includes a number of different projects but has funded 45 alternative fuel vehicle projects including purchase (grants no longer include conversions) or fueling infrastructure development and improvements. Approximately \$4 million has been spent on these grants which are given out on a competitive basis.

## **North Carolina**

Since 1987, North Carolina has provided a corporate or personal income tax credit for the construction of certain new ethanol fuel plants in the state. Legislation has been passed requiring mandatory reports on the progress of increasing the number of AFVs in the public and private sectors, including information about the tax credits. Reports are due on Oct. 1, 2001. At the time of this survey there were no reports yet in progress.

## North Dakota

North Dakota currently offers no state incentives for alternative fuel vehicle use.

## Ohio

From July 1983 until July 1, 1997, Ohio offered a \$0.1 tax credit for the sale of E10. For the fiscal year of 1996, a total of 174,103,607 gallons qualified for the credit. For the fiscal year 1997, a total of 76,618,946 gallons qualified, totaling \$7.7 million of credits.

## Oklahoma

In 1991, Oklahoma began offering a 50 percent tax credit for the conversion of vehicles to AFVs. This credit is now also available for 50 percent of the purchase price of an AFV, not to exceed \$1,500. There is no study on the number of individuals claiming this tax credit, but the numbers have been declining. Last year, \$360,000 in credits were claimed and although the information is not separated by individual or corporation, the bulk of these claims were from corporations. In the fall of 2000, a more complete report will be published.

A private loan program through the Department of Commerce offers a 3 percent interest rate for conversion to an AFV or purchase of an OEM vehicles. So far, only two loans have been taken out, worth approximately \$30,000 each; both still are in the process of being repaid.

## Oregon

Since January 1980, Oregon has offered a tax credit against personal or corporate taxes for production of energy from renewable resources and a credit for the partial costs of conversion or purchase of an AFV. By late 1998, more than 5,000 had been awarded. Information is not available about the number of personal credits claimed because it is listed only as "other deductions". By late 1995, there were 223 corporations that claimed the credit, totaling \$6.24 million. There is no information available about totals since then.

## Pennsylvania

The Greater Philadelphia Clean Cities Program has two rebate programs available for the purchase of AFVs. The first program has been in effect since 1998. This rebate program is for the purchase of shuttles and it began with \$100,000. One rebate for \$36,000—for the purchase of three CNG powered school buses—was awarded in May 1999. The second program is for public and private fleets. This program has also been in effect since 1998 and was initiated with a fund of \$66,000. The first rebate, for \$8,000 was issued in January 1999 to Delaware County for the purchase of two dedicated CNG vehicles. The second rebate, for \$2,000, was issued to a private citizen for the purchase of a bi-fuel CNG/gasoline powered vehicle. Although bi-fuel cars are eligible for the rebate, they receive less money than does a dedicated vehicle.

## Rhode Island

Beginning in January 1999, the Rhode Island State Energy Office began offering no-interest grants to cover the incremental costs of purchase or conversion costs. No grants have been given because there is also CMAQ grant money available and people are opting for the grants instead of the loans. These loans have been available since mid-1997 and around \$500,000 was made available for the grants. Grant money is given out when the vehicle has been received. Thirty grants have been given out, 22 more are on order, and an additional 97 will be ordered. Approximately \$96,000 has been spent so far.

The state of Rhode Island offers a sales tax exemption for the purchase of alternative fuel vehicles. Information is not available about how many consumers have used the tax exemption. Fleets of 10 or more vehicles do not have to pay sales or fuel tax on the alternative fuels. There is no information available about how many people are using the tax exemptions.

## South Carolina

South Carolina currently offers no state incentives for the use of alternative fuel vehicles.

## Tennessee

Tennessee currently offers no state incentives for the use of alternative fuel vehicles.

## Texas

Since 1995, the Houston-Galveston Area Council has offered to pay up to 75 percent of the incremental costs of an OEM AFV or conversion costs. The money is not broken down between purchase and conversion.

Year	Total amount	New and converted vehicles funded
1995	\$691,680	179
1996	\$177,023	101
1997	\$0	0
1998	\$1,459,685	170 (including six buses)
1999 (through October)	\$345,380	114
<b>Totals</b>	<b>\$2,673,768</b>	<b>563</b>

## Utah

Since 1992, Utah has used state tax credit incentives for AFVs. The initial tax credit was offered until 1996 but legislation was passed to extend the tax credit into 2001. An income tax credit of 20 percent of the incremental costs to purchase an AFV (up to \$500) or 20 percent of the conversion costs (up to \$400) is offered.

Year	Total amount	New and converted vehicles funded
1992-1994	\$355,120	953
1995-1997	\$113,917	283
1998-1999	\$40,541	86
Totals since inception	\$509,578	1,322

## Vermont

Vermont currently offers no state incentives for the use of alternative fuel vehicles.

## Virginia

Between 1993 and 1998, the Virginia Alternative Fuels Revolving Fund offered grants to local governments and state agencies to help cover conversion costs. The number of vehicles funded is not really known, because of difficulties in interpreting the data. Seventy-seven grants were given out, but a number were returned because the local governments did not have enough money to fund their parts, or the suppliers (GM, Ford) were not consistent, or practical problems were involved (fuel access or reliability of vehicle). The amount of money spent is hard to determine since some grants were dropped and some have not been closed out.

From Jan. 1, 1994, until June 31, 1998, the state of Virginia also offered a reduction in tax on alternative fuels of \$0.10 per gallon. In 1998, that was changed to \$0.16 per gallon—the same as the rate for diesel fuels.

## Washington

Since 1998, the State of Washington has offered a state highway fuel tax reduction for propane and natural gas vehicles. Instead of paying the state motor vehicle fuel tax (\$0.23 per gallon), operators of propane and natural gas vehicles pay an annual license fee based on the vehicle's weight (\$91.25 for a passenger car)

Vehicle weight (in pounds)	Number of special fuel vehicles
0-6,000	1,986
6,001-10,000	1,070
10,001-18,000	566
18,001-28,000	766
28,001-36,000	339
36,001 and over	117

## West Virginia

The State of Virginia operates the Clean State grant program, which is a statewide version of the Clean Cities program. This program will cover the incremental cost to purchase an alternative fuel vehicle. Grants are available to local governments. The program has been in effect for two years; to date, six grants have been awarded for a total of \$145,000 (out of the \$200,000 available) to help fund 41 vehicles.

A local government grant program pays the incremental costs of purchase or conversion costs for county governments, incorporated municipalities, transit authorities, and school boards to purchase AFVs. This program has been in effect for four years, during which time, 26 grants have been awarded to fund 65 vehicles at a total of \$209,000 (\$400,000 is available for this program).

The state of West Virginia offers a tax credit for the incremental cost of purchasing an OEM AFV, or for the cost of conversion. The tax credit varies according to type and gvwt of vehicle but is available for personal or corporate income tax. It has been available since June 30, 1997, and expires June 30, 2007. No credits have been claimed at this date.

### **Wisconsin**

From 1991 to 1996, Wisconsin's Local Government Alternative Fuels grant program offered money to any Wisconsin municipality interested in purchasing alternative fuel vehicles. About \$600,000 in grants was awarded to fund 263 vehicles.

Since 1995, the University of Wisconsin at Milwaukee Center for Alternative Fuels has administered a CMAQ grant program to cover the incremental costs of alternative fuel vehicles. These grants are available only to municipalities in an 11-county ozone non-attainment area (Milwaukee, Waukesha, Racine, Kenosha, Walworth, Washington, Ozaukee, Sheboygan, Manitowoc, Kewaunee and Door). Currently, \$188,536.34 has been given out for 20 grants to help fund 35 vehicles. There is still \$400,000 available in this grant program. Grant limits are \$6,500 for a passenger vehicle and \$12,000 for vans, trucks or buses, with a total of \$50,000 per municipality.

### **Wyoming**

Wyoming currently offers no state incentives for the use of alternative fuel vehicles.

# APPENDIX D. NAFA FLEET SURVEY

## QUESTIONS AND RESPONSES

### TABULATED

The National Conference of State Legislatures (NCSL) is a nonpartisan, nonprofit organization that serves the more than 7,400 legislators and 13,000 legislative staff of the nation's 50 states, its commonwealths, and territories. NCSL is conducting a study on the effectiveness of state alternative fuel vehicle incentives. This study will be used to inform state legislatures about incentive policies and may help to improve the effectiveness of those incentives. Your input will make this possible. Thank you!

#### Fleet Manager Perspectives on Alternate Fuel Vehicle Incentives

1. What type of fleet do you manage?
  - Federal
  - State
  - Utility
  - Municipal
  - Private
  - Other \_\_\_\_\_
2. Where do you fuel your alternative fuel and conventional vehicles?
  - Own property (alternative or conventional?)
  - Utility facility (alternative or conventional?)
  - Public station (alternative or conventional?)
  - Other private facility (alternative or conventional?)
  - Other \_\_\_\_\_
3. Are you mandated to purchase alternative fuel vehicles?
  - Yes     Local or State requirement     Other \_\_\_\_\_
  - No
4. Are you aware of state, federal, local or utility incentives available for your purchase of alternative fuel, alternative fuel vehicles and fueling equipment/stations?
  - Yes
  - No

5. How did you hear about the incentive(s)?  
 Clean Cities Program  
 Local Utility  
 State or Local Government Agency  
 Print or Broadcast Media  
 Other\_\_\_\_\_
6. a. Have you leased/purchased an alternative fuel vehicle(s)?  
 Yes—Please continue the survey with part (b).  
 No—Please continue the survey with question 9.
- b. Did you utilize (an) incentive(s)?  
 Yes  
 No
- c. Who offered the incentive(s)?  
 Utility  
 State  
 Local/municipal  
 Federal
- d. Which incentive(s)?  
 Grant for vehicle / infrastructure (circle one)  
 Loan for vehicle / infrastructure (circle one)  
 Retail sales tax reduction /exemption (circle one)  
 Rebate for vehicle / infrastructure (circle one)  
 Income tax credit for vehicle / infrastructure (circle one)  
 Other\_\_\_\_\_
7. What motivated you to make your purchase?  
 Mandate  
 Incentive  
 Air quality benefit  
 Public image  
 Other—please explain\_\_\_\_\_
8. How important was the incentive(s) in your vehicle/infrastructure purchase decision?  
 Not important  
 Somewhat important  
 Important  
 Very important  
 Essential
9. (a) If you did not utilize an incentive, was there a barrier(s) within the incentive that prevented you from utilizing it?  
 Yes  
 No



(b) If so, what was that barrier(s)?

- Cost
- Reporting Requirements
- Ineligibility
- Other—please explain:

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10. What about the incentive or incentive package would have enabled you to buy or buy more vehicles?

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11. Except for a “free vehicle” incentive, if you could create the perfect incentive for your needs, what would it be and why?

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12. May we contact you to discuss your personal situation and experience?

- Yes (Please fill out the optional respondent information section)
- No

13. May we put you on our mailing list regarding a study on the effectiveness of alternative fuel vehicle incentives?

- Yes
- No

**Respondent Information:**

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Organization: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Phone: \_\_\_\_\_

Fax: \_\_\_\_\_

Electronic mail: \_\_\_\_\_

## Summary of Responses to NAFA Survey

### *Types of fleets that responded to the survey:*

- 37% Municipal (113/305)
  - 30% Private (92/305)
  - 16% Utility (49/305)
  - 12% State (37/305)
  - 7% Other (22/305)
  - 1% Federal (22/305)
- (other includes educational and university vehicles, law enforcement, water and sewer and executive fleets)

### *Fleets that have leased/purchased an AFV:*

- 82% of total respondents (249/305)
- 100% of federal fleets (4/4)
- 95% of utility fleets (37/49)
- 81% of state fleets (30/37)
- 64% of other fleets (14/22)
- 59% of municipal fleets (13/92)
- 14% of private fleets (13/92)

### *Factors that motivated fleets to lease/purchase an AFV:*

#### **Federal**

- 100% mandates (4/4)
  - 25% air quality concerns (1/4)
  - 25% public image (1/4)
  - 25% other (1/4)
- ("other" includes: customers wanted them)

#### **State**

- 80% mandates (24/30)
  - 40% public image (12/30)
  - 37% air quality (11/30)
  - 13% incentives (4/30)
  - 7% other (2/30)
- ("other" includes: preparation for possible mandates)

#### **Utility**

- 76% mandate (28/37)
  - 51% public image (19/37)
  - 35% air quality (13/37)
  - 24% incentive (9/37)
  - 19% other (7/37)
- ("other" includes: lower fuel costs, maintenance benefits, marketing for utilities, access to HOV lanes, support domestic fuel industry, increased vehicle range, get first hand experience, support "Clean Cities" program, EPACT, reduced costs)

**Municipal**

58% public image (39/67)

55% air quality (37/67)

49% mandate (33/67)

39% incentives (26/67)

19% other (13/67)

("other" includes: wanted experience with AFVs, to determine user acceptance, environmentally aware city council, readily available vehicles, testing in preparation for anticipated mandates, energy independence, support Clean Cities, future credits for mandate)

**Private**

69% public image (9/13)

54% other (7/13)

38% air quality (5/13)

15% incentives (2/13)

15% mandate (2/13)

("other" includes: promise of fueling station, get first hand experience, preparation in event of mandates, only engine available, learn more about vehicle and to test reaction of employees that drive them)

**Other**

57% public image (8/14)

50% air quality (7/14)

36% mandate (5/14)

21% incentive (3/14)

21% other (3/14)

("other" includes manufacturer's discount, officers wanted them)

***Fleets that used an incentive to help lease/purchase an AFV:***

56% of total respondents (87/156)

70% of municipal fleets (47/67)

61% of private fleets (8/13)

57% of other fleets (8/14)

47% of state fleets (4/30)

41% of utility fleets (15/37)

25% of federal fleets (1/4)

***Fleets that used incentives were aware of them through the following:***

56% Clean Cities (107/196)

41% state/local governments (82/196)

25% media (50/196)

18% utilities (36/196)

15% other (30/196)

("other" includes: NGV coalition, NAFA, internet, vehicle dealer, conference, seminars, leasing company, GRI, NGRI, committees, direct involvement in lobbying efforts, research, Department of Energy and Natural Resources, previous involvement, Edison Electric Institute, user groups, own research, COG, alternative fueling informational forum, AGA)

*Fleets that utilized incentives got them from the following places:*

- 64% state (56/87)
- 31% federal (27/87)
- 15% utility (13/87)
- 7% local (6/87)

*Fleets utilized the following incentives:*

- 67% grant for vehicle (58/87)
- 35% rebate for vehicle (30/87)
- 11% grant for infrastructure (10/87)
- 9% income tax credit for vehicle (8/87)
- 6% sales tax reduction (5/87)
- 1% rebate for infrastructure (1/87)
- 1% sales tax credit for infrastructure (1/87)
- 0% sales tax exemption (0/87)
- 0% loan for vehicle (0/87)
- 0% loan for infrastructure (0/87)

*Federal fleets utilized the following incentives:***State incentives**

- 100% used vehicle grants (1/1)

**Local/municipal incentives**

- 100% vehicle grants (1/1)

**Federal incentives**

- 100% vehicle grants (1/1)

*State fleets utilized the following incentives:***Utility incentives**

- 100% vehicle rebates (2/2)
- 50% infrastructure rebates (1/2)

**State incentives**

- 63% vehicle rebates (5/8)
- 50% vehicle grants (4/8)
- 13% infrastructure rebates (1/8)
- 13% sales tax reduction (4/8)

**Local or municipal incentives**

- 100% vehicle rebates (2/2)
- 50% infrastructure rebates (1/2)

**Federal incentives**

- 100% vehicle grants (5/5)
- 20% infrastructure grants (1/5)
- 20% vehicle rebates (1/5)

*Municipal fleets used the following incentives:***Utility incentives**

- 88% vehicle grants (7/8)
- 38% vehicle rebates (3/8)
- 25% infrastructure grants (2/8)
- 13% infrastructure rebates (1/8)

**State incentives**

- 85% vehicle grants (29/34)
- 24% vehicle rebates (8/34)
- 12% infrastructure grants (4/34)
- 3% vehicle income tax credit (1/34)

**Local incentives**

- 100% infrastructure grants (2/3)
- 67% vehicle grants (2/3)
- 50% vehicle rebates (1/2)

**Federal incentives**

- 71% vehicle grants (10/14)
- 43% vehicle rebates (6/14)
- 29% infrastructure grants (4/14)

**Utility incentives**

- 100% vehicle grants (1/1)

*Utility fleets utilized the following incentives:***Federal incentives**

- 50% vehicle credit (3/8)
- 38% vehicle grants (3/8)
- 25% sales tax reduction (2/8)

*Private fleets utilized the following incentives:***Utility incentives**

- 50% vehicle grants (1/2)
- 50% vehicle rebates (1/2)

**State incentives**

- 75% vehicle grants (3/4)
- 25% infrastructure grants (1/4)
- 25% rebate for vehicle (1/4)
- 25% vehicle income tax credit (1/4)

**Federal incentives**

- 100% vehicle grants (1/1)
- 100% vehicle income tax credit (1/1)

*Other fleets utilized the following incentives:***Utility incentives**

67% vehicle rebates (1/3)

33% vehicle grants (1/3)

**State incentives**

75% vehicle grants (3/4)

*Importance of incentive in decision to lease/purchase AFV:***Federal**

100% said not important (1/1)

**State**

36% somewhat important (5/14)

21% very important (3/14)

14% not important (2/14)

14% important (2/14)

14% essential (2/14)

**Municipal**

35% very important (15/48)

27% essential (13/48)

25% important (12/48)

10% somewhat important (5/48)

6% not important (3/48)

**Private**

37% very important (3/8)

37% somewhat important (3/8)

13% important (1/8)

13% essential (1/8)

**Utility**

27% somewhat important (4/15)

20% important (3/15)

20% very important (3/15)

20% essential (3/15)

13% not important (2/15)

**Other**

25% somewhat important (2/8)

25% important (2/8)

25% essential (2/8)

13% very important (1/8)

13% not important (1/8)

*Importance of vehicle grant to decision to lease/purchase and AFV:*

- 35% very important (21/60)
- 28% essential (17/60)
- 18% somewhat important (11/60)
- 17% important (10/60)
- 7% not important (4/60)

*Importance of infrastructure grant to decision to lease/purchase an AFV:*

- 36% somewhat important (4/11)
- 18% important (2/11)
- 18% very important (2/11)
- 18% essential (2/11)
- 9% not important (1/11)

*Importance of vehicle loan in decision to lease/purchase an AFV:*

- 100% not important (2/2)

*Importance of sales tax reduction in decision to lease/purchase an AFV:*

- 43% somewhat important (3/37)
- 29% not important (2/27)
- 14% very important (1/7)
- 14% important (1/7)

*Importance of vehicle rebate in decision to lease/purchase an AFV:*

- 24% somewhat important (8/34)
- 24% essential (8/34)
- 21% important (7/34)
- 18% not important (6/34)
- 18% very important (6/34)

*Importance of rebate for infrastructure in decision to lease/purchase an AFV:*

- 50% important (1/2)
- 50% very important (1/2)
- 50% essential (1/2)

*Importance of income tax credit for vehicle in decision to lease/purchase an AFV:*

- 47% not important (7/15)
- 33% somewhat important (5/15)
- 13% essential (2/15)
- 7% very important (1/15)

*Importance of income tax credit for infrastructure in decision to lease/purchase an AFV:*

- 100% somewhat important (1/1)

*Fleets that felt there was a barrier which kept them from using incentives:*

- 40% municipal (26/65)
- 35% state (8/23)
- 32% utility (11/34)
- 29% other (4/14)
- 11% private (9/84)
- 0% federal (0/3)

*State fleets encountered the following barriers:*

- 63% other (5/8)
  - 37% ineligibility (3/8)
- ("other" includes: incentive not available at time of purchase, no incentives were available for law enforcement or state vehicles, no incentives available for ethanol engines, and administration does not recognize importance of AFVs)

*Municipal fleets encountered the following barriers:*

- 42% cost (11/26)
  - 42% other (11/26)
  - 38% ineligibility (6/26)
  - 11% reporting (3/26)
- ("other" includes: not cost effective due to fuel costs, budget restraints, incentive did not take effect until after the purchase, lack of managerial interest, lack of infrastructure and fuel, do not borrow to purchase vehicles)

*Utility fleets encountered the following barriers:*

- 45% ineligibility (5/11)
  - 36% other (4/11)
  - 27% cost (3/11)
  - 18% reporting (2/11)
- ("other" includes: tax incentives beyond expertise and job scope, no incentive available for ethanol vehicles, expiration of availability for fueling station)

*Private fleets encountered the following barriers:*

- 44% cost (4/9)
  - 33% other (3/9)
  - 11% reporting (1/9)
  - 11% ineligibility (1/9)
- ("other" includes: not aware of incentives, fueling problems, and red tape)

*Other fleets encountered the following barriers:*

- 50% other (2/4)
- ("administration recognizing the importance of acquiring AFVs, location of fueling stations)
- 25% cost (1/4)
  - 25% ineligibility (1/4)



*Major obstacles to fleets operating more AFVs:***Federal**

- 75% operating range (3/4)
- 75% infrastructure (3/4)
- 50% cost (2/4)
- 50% availability (2/4)

**State**

- 81% infrastructure (30/37)
- 70% operating range (26/37)
- 62% cost (23/37)
- 59% availability (22/37)
- 24% other (9/37)

("other" includes: poor power and mileage compared to conventional fuel, inconvenient, apprehension about risks involved, personnel reluctance to use, poor design, lack of federal program to neutralize cost barrier, customer does not want to use them, no funding for mandate, no real economic benefit)

**Utility**

- 71% infrastructure (35/49)
- 67% availability (33/49)
- 57% operating range (28/49)
- 55% cost (27/49)
- 31% other (15/49)

("other" includes: little or no information about alternative fuels, lack of repair facilities, space/weight constraints, will not work in Alaska because of extreme temperatures, smaller carrying capacity, behavior and political problems, limited selection of vehicles, unable to perform to our requirements, lack of resale market, replacement cycles, lack of awareness)

**Municipal**

- 74% infrastructure (84/113)
- 63% cost (71/113)
- 52% operating range (59/113)
- 50% availability (56/113)
- 25% other (28/113)

("other" includes: no leadership interest in alternative fuels, fuel expenses, performance, lack of fuel stations, fuel tanks take up too much cargo space, safety concerns, funding, vehicles needed to perform job not available, no driver acceptance, no funds available for diagnostics equipment, training, etc. for technicians, lack of public interest, behavior and political problems, lack of resale market, no dealer support, no service support from local dealers, too many fuel choices, money issues, lack of incentives)

**Private**

- 83% infrastructure (76/92)
- 66% operating range (61/92)
- 61% cost (50/92)
- 45% availability (41/92)
- 20% other (18/92)

("other" includes: no resale value, lack of maintenance resources, liability, training for repair, lack of driver acceptance, choice of fuels, lack of information, lubricity flaws of LPG need to be addressed, not practical for needed use at this time, replacement parts availability and "down-time", refueling stations not readily available)

**Other**

- 95% infrastructure (21/22)
- 64% cost (14/22)
- 54% operating range (10/22)
- 46% availability (10/22)
- 14% other (3/22)

("other" includes: no resale market, maintenance concerns, training, not willing to undertake a new approach to vehicles that have risks involved, low fuel mileage)

*Fleets that felt the availability of incentives was important in the decision to lease/purchase an AFV felt the following were barriers to operating more AFVs:*

- 70% operating range (28/40)
- 63% infrastructure (25/40)
- 58% availability (23/40)
- 55% cost (22/40)
- 25% other (10/40)

("other" includes: poor power and mileage compared to conventional fuel, inconvenient, time/location of fuel source, lack of servicing vendors, fuel tanks in trucks take up too much cargo space, driver acceptance, politics, lack of interest, lubricity flaws of LPG need to be addressed, no dealer support for AFVs, lack of incentives for type of vehicle necessary)

*Fleets that felt air quality was important in the decision to lease/purchase an AFV felt the following were barriers to operating more AFVs:*

- 66% infrastructure (47/71)
- 62% operating range (44/71)
- 58% availability (41/71)
- 48% cost (34/71)
- 21% other (15/71)

("other" includes: time/location of fuel source, lack of servicing vendors, fuel tanks in trucks take up too much cargo space, funding, short range of vehicles, driver acceptance, lubricity laws of LPG need to be addressed, no dealer support, lack of availability of replacement parts, lack of incentives for type of vehicle needed, no real economic benefit, no resale value)

*Fleets that felt public image was important in the decision to lease/purchase an AFV felt the following were barriers to operating more AFVs:*

69% infrastructure (57/83)

65% operating range (54/83)

59% availability (49/83)

49% cost (41/83)

23% other (19/83)

(“other” includes: time/location of fuel source, lack of servicing vendors, fuel tanks in trucks take up too much cargo space, funding, driver acceptance, politics, lack of interest, lubricity flaws of LPG need to be addressed, smaller carrying capacity, limited selection of vehicles, replacement cycles, low fuel mileage, replacement parts not readily available, lack of incentives for vehicles needed, no real economic benefit, no resale value)

*Fleets that felt mandates were important in the decision to lease/purchase an AFV felt the following were barriers to operating more AFVs:*

63% infrastructure (59/93)

59% availability (55/93)

58% cost (54/93)

58% operating range (54/93)

(“other” includes: funding, personnel reluctance to use alt fuel in dual use vehicles, fueling infrastructure not readily available over long ranges, types of vehicles needed not available, no mechanical repair facilities, poor design, behavior and political problems, limited selection of vehicles, no dealer support, no federal program to neutralize cost barrier, customer does not want to use them, LPG technology needs improving, no funding for mandate, awareness)

*Refueling sites for fleets that considered fueling infrastructure a major obstacle to leasing/purchasing more AFVs:*

59% public—conventional (141/239)

57% own—conventional (137/239)

23% own—alternative (54/239)

13% public—alternative (30/239)

11% utility—alternative (27/239)

8% private—conventional (20/239)

6% utility—conventional (15/239)

2% other (4/239)

(“other” includes: government facilities, intergovernmental facilities, cardlock)

*Types of multi-state fleets that responded to the survey:*

71% private (81/113)

12% utility (14/113)

7% state (8/113)

5% other (6/113)

3% federal (4/113)

1% municipal (1/113)

(“other” includes: university, educational, bi-state, consumer product, executive)

*Types of multi-state fleets that leased/purchased and AFV:*

- 34% utility (13/38)
- 29% private (11/38)
- 13% state (5/38)
- 10% federal (4/38)
- 10% other (4/38)
- 3% municipal (1/38)

*Multi-state fleets encountered the following barriers to utilizing an incentive:*

- 50% ineligibility (2/4)
  - 50% other (2/4)
  - 25% cost (1/4)
  - 25% reporting (1/4)
- ("other" includes: incentives not available at time of purchase, no incentive available for ethanol)

*Multi-state fleets were motivated to lease/purchase and AFV by the following factors:*

- 58% have not purchased (65/113)
  - 19% mandate (21/113)
  - 17% public image (19/113)
  - 11% air quality (12/113)
  - 10% other (11/113)
  - 4% incentive (4/113)
- ("other" includes: promise of fueling station, fleet owned by fuel supplier, access to HOV lanes, prepare for mandates, customers wanted it, cheaper than same make of conventional vehicle, only engine available, EPACT, gain more knowledge of vehicle, employers wanted them)

*Major obstacles to multi-state fleets operating more AFVs:*

- 80% infrastructure (91/113)
  - 66% operating range (75/113)
  - 62% cost (70/113)
  - 50% availability (57/113)
  - 16% other (18/113)
  - 25% infrastructure grants (1/4)
  - 25% vehicle rebates (1/4)
- ("other" includes: resale value, lack of maintenance resources, liability, lack of willingness to undertake a new approach to vehicles that have risks involved, space/weight constraints, lack of driver acceptance, not practical, replacement cycles, low fuel mileage, hard-to-find replacement parts, lack of information about vehicles)