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## **CHAPTER ONE**

# **RATIONALE FOR ALTERNATE FUEL VEHICLE TECHNOLOGY**

### **INTRODUCTION**

By January 1, 2000, the United States (U.S.) Department of Energy (DOE) must decide whether provisions of the 1992 Energy Policy Act (EPACT) concerning mandates requiring the purchase of alternate fuel vehicle (AFV) technology will be expanded from federal, state, and fuel supplier fleets to also cover municipal and private fleet operations. The decision may have a profound impact on municipal and private fleets nationwide (Federal Register, 1998).

This rulemaking is the culmination of a chain of events beginning in the 1970s. The genesis for EPACT's current AFV mandates and the pending rule making can be traced directly to the Arab oil embargo of 1973. In addition, the passage of the Clean Air Act (CAA) in 1970, provided considerable drive in this country for the development and utilization of both clean fuel vehicle (CFV) and AFV technology. The CAA has already directly affected municipal fleet operators. Now the pending EPACT mandates stand to have an even greater impact on municipal fleet operations.

A thorough discussion of the CAA (and amendments to it passed by congress in 1990), the EPACT, and how these (and many other regulations) impact municipal fleet operators and operations is beyond the scope of this paper. Provided here is a general discussion of the legislation, the principal reasons leading to its promulgation, and an overview of its potential impacts to municipal fleets. This will provide the municipal fleet

operator with a better understanding of and frame of reference for making future decisions about AFV technology.

## **LEGISLATIVE BACKGROUND**

### **The Clean Air Act of 1970 and Amendments of 1990**

Greater national concern for the environment, in particular improving air quality, was ushered in with the Clean Air Act (CAA) of 1970. Not long after that (October 1973), the country's complacency over how and how much energy it used was brought into sharp focus with the Arab oil embargo. For the most part, the oil embargo and subsequent events centering on the country's energy situation overshadowed an immediate concern to push hard for cleaner air. It was not until 1990, when amendments were made to the Clean Air Act (Clean Air Act Amendment of 1990, now referred to as the CAAA), that substantially greater emphasis was focused on the issue of cleaner air (Alternative Fuels Hotline, 1998). Embodied in the CAAA were several initiatives that reinforced one of the original goals of the CAA which was to reduce mobile source pollutants. A major thrust of the CAAA set forth expectations for manufacturers of mobile source emission products (including cars, trucks, buses, off-road vehicles, and planes) to achieve to improve air quality.

The CAAA required a more comprehensive approach to reducing pollution from motor vehicles of virtually all types. The cornerstones of this approach included:

- Production and use of cleaner fuels.
- Development of cars with improved emissions control systems capable of using the cleaner fuels. Fleet owners in "very"

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smoggy areas<sup>1</sup> were required to begin making purchases of new cleaner cars starting in the late 1990s.

- Specific requirements for vehicle inspection and maintenance programs.
- Beginning in 1994, achieve reductions of particulate materials from diesel engine vehicles (heavy-duty trucks and buses) by 90 percent or more, including an obligation requiring fleet owners to buy less polluting models in order to reduce pollution levels (smaller trucks in fleet operations would be covered by the same rules governing cars).
- Obligating local governments in the smoggiest metropolitan areas being obligated to change their transportation policies to discourage unnecessary automobile use and to encourage efficient commuting and use of public transportation. (Environmental Protection Agency, 1999)

Metropolitan areas not meeting NAAQS are classified by the EPA as “non-attainment areas” and are subject to additional requirements. Of significance for these areas is a requirement to develop and submit to the EPA a State Implementation Plan (SIP) to demonstrate the methods by which these areas plan to achieve air quality compliance. “If they do not meet these and other requirements, they face Clean Air Act required sanctions and other penalties, including possible loss of highway funds. Metropolitan Planning Organizations (MPOs) and the US Department of Transportation (DOT) must ensure that transportation plans, programs, and projects conform to these SIPs” (US DOT, 1999).

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<sup>1</sup> Based on National Ambient Air Quality Standards (NAAQS) for various pollutants established and monitored by the US Environmental Protection Agency (EPA) (US DOT, 1999).

One of the EPA initiatives resulting from the 1990 amendments was the Clean Fuel Fleet Program (CFFP) requiring fleets in cities with significant air quality problems to incorporate vehicles that will meet clean-fuel emissions standards. As indicated in Table 1-1, fleets in numerous cities and areas are already affected by this ruling. Fleets covered under the CAAA's CFFP include federal, state, municipal, fuel provider, and private. Table I indicates which cities / areas currently (as of July 1998) are classified as 1-Hour Ozone non-attainment areas.

**Table 1-1 One-Hour Ozone Non-Attainment Cities / Areas**

City / Area	Level of Severity
Los Angeles / South Coast Air Basin / Southeast Desert	Extreme
Sacramento	Extreme
Chicago / Milwaukee	Extreme
Houston	Extreme
Philadelphia / New York / Baltimore	Extreme
California's Central Valley / Area North of Los Angeles	Serious
San Diego	Serious
Phoenix	Serious
New Orleans	Serious
El Paso / Dallas / Ft. Worth	Serious
The Greater Atlanta Area	Serious
Washington, D. C.	Serious
Massachusetts / Rhode Island / Connecticut	Serious
Area east of Houston	Moderate
St. Louis / East St. Louis	Moderate
Louisville	Moderate
Birmingham	Moderate
Cincinnati	Moderate
Greater Pittsburgh Area	Moderate

Southern Most Portion of Maine  
Area West of Philadelphia

Moderate  
Marginal

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Source: US EPA, 1998, *Green Book: Non-Attainment Areas for Criteria Pollutants*.

Changes to and the process for adoption of new EPA NAAQS (new air quality standards issued in 1997) are more fully described on the EPA's web site: US EPA, Office of Air Quality Planning and Standards (<http://www.epa.gov/oar/oaqps>). The significance of these changes and their more direct impact on transportation air quality is detailed in the publication *Transportation Air Quality: Selected Facts and Figures*, US Department of Transportation Federal Highway Administration, January 1999. The net result of the adoption of the new, more stringent standards would likely mean a greater number of cities and areas of the country could be classified in the 'Non-attainment' category.

In the year 2000 the EPA will formally determine which areas of the country do not meet its new 8-hour ozone standard and designate them as "non-attainment." Based on most recent EPA data and projections, most of the cities and areas listed in Table I are likely to continue as "non-attainment" areas. In addition, EPA predicts new cities and areas will be added to this table. Beyond ozone, the "non-attainment" designation may also be applied to cities and areas not in compliance with meeting EPA requirements for carbon monoxide and particular matter levels.

As a direct result of the EPA CAA and CAAA initiatives, tremendous strides have been made in the effort to sustain and improve air quality in the US, across national boundaries, and globally (EPA, 1993). Even though today's oil-based internal combustion engine (ICE) vehicle pollutes on the order of 60 to 80 percent less than its counterpart of the 1960s, the sheer number of miles being traveled (emissions produced) more than offsets the improvements to the technology. While significant improvements have been achieved in reducing exhaust emissions

from mobile sources with a heavy emphasis on improving automobile efficiency, in America alone the annual vehicle miles traveled (cars only) has increased from one trillion in 1970 to an anticipated four trillion miles per year at the turn of the century (EPA, 1999). Considering the maturity of ICE technology, it is becoming increasingly more difficult to achieve more than marginal improvements in engine/exhaust technology for additional (significant) emissions reductions.

Much like the provisions in the CAA, which focused on automobile emissions requirements in the early years, the CAAA mandated that cleaner trucks and buses must be built beginning in 1994. The requirements stipulate that these cleaner buses and trucks must reduce particulate emissions by 90 percent, that buses should meet even more stringent emission requirements than trucks, that companies with “older” technology must buy the newer models, and that smaller trucks would be subject to the same emission provisions adopted for automobiles (EPA, 1999).

Federal, state, municipal, fuel provider and private fleets which meet specific tests are covered under the CFFP (see Appendix A). Under the CFFP, newer CFV purchases are mandated beginning in 1999. In the case of vehicles with a Gross Vehicle Weight Rated (GVWR) of less than 8,500 lbs., the percentage of vehicle purchase requirements ramps up from 30 percent beginning in 1999 to 70 percent in 2006. For fleet vehicles with a larger GVWR (greater than 8,500 lbs. but less than 26,000 lbs.) fleet operators, also beginning in 1999, must make 50 percent of their total purchases in any given year as CFVs. The percentage of purchases of larger GVWR vehicles remains at 50 percent through 2006 (EPA, 1998). Under this ruling, over time the CFVs will eventually become the standard as the older technology wears out and is replaced.

While the CAAA provides significant impetus for fleet operators to consider the merits of and act to adopt both CFV and AFV

technology, it has not been nor will it likely be as much of a force as the EPACT in bringing AFV technology directly into service. However, in a major undertaking by the US Department of Energy (DOE), under its Clean Cities program, DOE cites AFV deployment as a major mechanism of accomplishing goals of both the CAAA and EPACT (US DOE, 1995). What impact this will have on its eventual decision on the current ANOPR remains to be seen.

### **The Energy Policy Act of 1992**

The underlying events leading to promulgation of and goals established by the Energy Policy Act (EPACT) of 1992 can be traced back to the 1973 Arab oil embargo. An earlier embargo in 1967, a backlash of United States support of Israel, during the Six-Day War, was a “failure” (Yergin, 1992) and while notable, did not have the same level of historical impact as the embargo of 1973.

It was the 1973 oil embargo that acutely focused the nation’s attention on our general complacency concerning how much energy was used where, and where it all came from. Rising oil prices dictated by the Organization of Exporting Countries (OPEC), during the 1970s and the early 1980s, as well as the more fundamental issue of whether oil (gasoline) would be available at all, became a major concern and a much talked about problem.



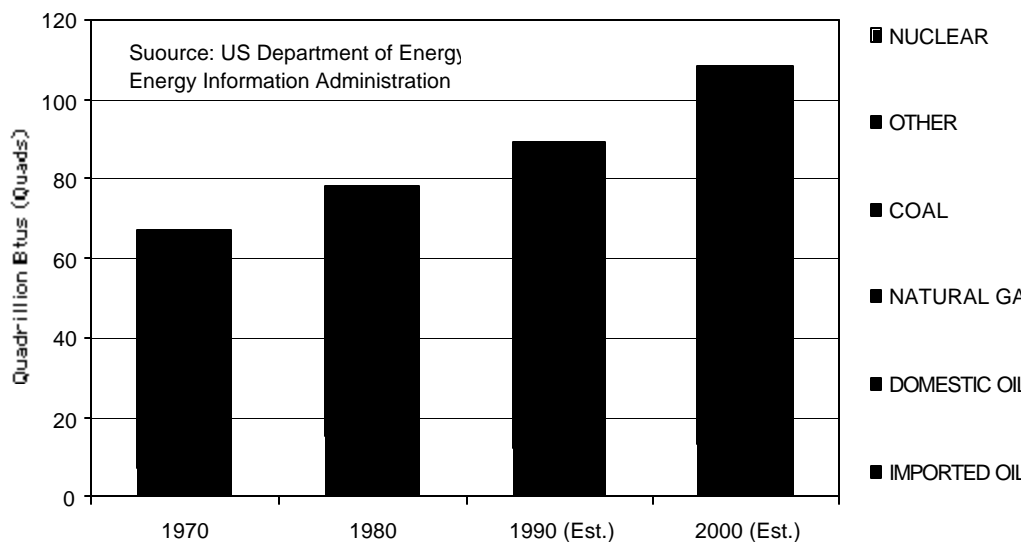
**A common sight at service stations  
during the 1973 oil embargo**

Source: U.S. DOE, 1997

Few realized how difficult it would be for one of the greatest nations on earth to work its way out of its self-created energy dilemma. In 1973, at the time of the Arab oil embargo against the United States, the administration unveiled with much fanfare a Project Independence. Said the President, "By the end of the decade we will . . . meet our own energy needs without depending on *any* foreign energy sources." [emphasis added] (National Geographic, 1981) By the end of the decade, total energy use in the US had increased from 67 quadrillion British Thermal Units (Quad Btus) in 1970 to 78 quadrillion Btus in 1980. A more disturbing trend, however, was that the level of oil imports was also up significantly (it had doubled). Note also from



Figure 1-1 that the government's Energy Information Administration (EIA), making optimistic projections in 1981 for the years 1990 and 2000, suggesting that there would be an overall decline in oil use in those future years. This was based on expectations that more conservation and innovative new sources of energy would be developed that would displace and reduce the country's need for imported oil.



**FIGURE 1-1 Total Energy Use by Source (Actual data 1970 and 1980, estimated by EIA for 1990 and 2000)**

Table 1-2 is linked with Figure 1-1. It highlights EIA's concerns in reflecting back over the almost 10 years since the oil embargo that oil use, by 1980 had increased by a factor of two. In looking forward the EIA made projections based on expectations that various government programs just going into effect would produce substantive results in a relatively short period of time. Today looking back from the year 2000, it is clear some of EIA's vision was correct. For example, power plants did convert from oil

to other fuels and homes and other buildings are built to codes with greater emphasis being placed on energy conservation. However, not all has gone according to forecasts: oil prices declined, development of synthetic fuels proved to be too expensive, interest in pushing for even tighter vehicle fuel efficiency waned, and nuclear power produced electricity ran into environmental problems, among a myriad of other events now has the country more dependent on oil, particularly foreign, than ever before.

**Table 1-2 EIA Reflections on and Projections for Energy Trends**

<u>1970</u>	<u>1980</u>	<u>1990 Estimate</u>	<u>2000 Estimate</u>
Oil in the United States was plentiful and cheap. In 1970, imports cost about \$3 billion. Despite the 1973 Arab oil embargo and subsequent soaring prices, the US more than doubled oil imports in the '70s.	By 1979, the US oil import bill had jumped and energy use peaked at 79 quadrillion Btus. In 1980, consumption declined, reflecting conservation and recession.	In the '80s, oil imports will be constrained, domestic production encouraged by price decontrol, and power plants will convert to coal. Prices and government actions will result in more <i>fuel-efficient cars</i> and homes. (emphasis added)	The economy will likely shift from oil and nature gas to coal, nuclear, and synthetics. Coal will become the nation's primary energy source, though nuclear may become the major producer of electricity.

Source: U. S. DOE, Energy Information Administration

Figure 1-2 shows 1973 and 1997 energy use by sector of the economy. Note that there has not been a significant shift in the percentage in overall energy use between sectors over the years. Of the total amount of energy used in the US in 1973, the transportation sector accounted for 25 percent. In 1997, the transportation sector accounted for 27 percent of the total energy consumed. However, when it comes to oil's contribution to each

sector, a clearer picture emerges of the important role oil has in the transportation sector.

Figure 1-2

As Figure 1-3 shows, the transportation sector's share of total US oil consumption in 1973 amounted to 51 percent. As the year 2000 is approached, transportation's share of total US oil consumption had risen to 66 percent. Note too (Figure 1-1), that while total US consumption of energy rose by roughly 22 percent (from 74.3 Quads per year to 90.6 Quads per year, in 1997), each of the sectors' percentage of the total remained basically the same.

Figure 1-3

With oil price and availability in question, the sectors which had other energy options either began to exercise them, or were forced to switch due to government mandates. Because oil and natural gas, more easily used in residential and commercial applications, utilities were encouraged, under mandates and also for economic reasons, to seek other energy resources (coal, nuclear, renewable) to generate electricity. The transportation sector had options too, but these were not so easily exercised as in the other sectors.

**Table 1-3 Sector Energy Use by Source (Percent)**

Energy Source	Transportation			Residential / Commercial			Industrial			Electric Utilities		
	1973	1980	1997	1973	1980	1997	1973	1980	1997	1973	1980	1997
Petroleum	95.8	96.5	96.9	18.2	11.8	6.7	28.9	31.1	28.1	17.7	10.7	2.5
Natural Gas <sup>a</sup>	4.0	3.3	2.9	31.6	29.4	25.9	32.9	27.4	31.3	18.9	15.5	9.2
Coal	0.0	0.0	0.0	1.1	0.6	0.4	12.8	10.3	7.2	43.6	49.5	55.9
Hydroelectric	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	15.0	12.6	11.7
Nuclear	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.6	11.2	20.3
Electricity <sup>b</sup>	0.2	0.2	0.2	49.2	58.2	67.0	25.2	31.1	33.3	0.0	0.0	0.0
Other <sup>c</sup>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.4
TOTAL	100	100	100	100	100	100	100	100	100	100	100	100

a Includes supplemental gaseous fuels. Transportation sector includes pipeline fuel and natural gas vehicle use.

b Includes electrical system energy losses.

c Energy generated from geothermal, wood, waste, wind, photovoltaic, and solar thermal energy sources.

Source: U.S. Department of Energy, Energy Information Administration

As illustrated in Table 1-2, the transportation sector is 'driven' by oil (in 1997, 96.9 percent of the energy used by that sector came

from oil). In the other sectors, with the exception of the industrial sector, which utilizes oil principally as feed stock to manufacture other products, it is noted that oil use has successfully been reduced. With the exception of the industrial sector's use of oil as an ingredient of other products, it, residential and commercial, and the utility sectors have now switched most of their energy needs to natural gas and electricity (coal, hydroelectric and nuclear in the case of the utility industry).

It gradually became clear through the 1980s (refer to Table 1-3) that in spite of expectations for the leveling off or decline of oil consumption with escalating price, the trend was going the other way. By 1997, the transportation sector was consuming 189 percent of the total domestic production of oil – creating greater dependency on off-shore supplies than at any other time in history.

**Table 1-4 U.S. and World Petroleum and Consumption  
(million barrels per day)**

Year	Domestic crude oil production	U.S. petroleum consumption <sup>a</sup>	World petroleum consumption	Net imports as a percentage of U.S. petroleum consumption	U.S. petroleum consumption as a percentage of world consumption	Transportation petroleum use as a percentage of domestic production <sup>b</sup>
1973	9.21	17.31	56.39	34.8%	30.7%	98.3%
1975	8.37	16.32	55.48	35.8%	29.4%	106.9%
1980	8.60	17.06	63.07	37.3%	27.0%	111.3%
1985	8.97	15.73	60.10	27.3%	26.2%	109.8%
1990	7.36	16.99	65.99	42.2%	25.7%	149.1%
1995	6.56	17.73	69.93	44.5%	25.4%	178.8%
1997	6.41	18.58	c	47.9%	c	188.8%

a Best estimate for U.S. petroleum consumption in the amount of petroleum products supplied to the U.S. in a given year. This is not the sum of crude oil production and net imports due to processing gain and stock changes.

b Transportation petroleum use can be found in Figure 1-3.

c Data not available.

Source: U.S. Department of Energy, Energy Information Administration

The EPACT was enacted to stimulate the research, development, and accelerated introduction of technologies that have potential to shift the focus of national energy demand away from imported oil and toward renewable or domestically produced energy sources (US DOE, 1995).

Of particular interest to municipal, but also private, fleet operators is the new fleet vehicle purchase requirements section of EPACT and the CAAA, Table 1-4. The CAAA already mandates the use of CFVs, which would include AFVs. However, the EPACT, assuming the DOE adopts its currently pending rule making, would specifically require that AFVs be part of the mix (see Energy Policy Act highlights, Appendix A).

EPACT's goals for reductions in transportation petroleum use are 10 percent by the year 2000 and 30 percent by the year 2010. Just three years into the program (1995), the DOE was concerned about the ability to meet these goals with the programs it had in place. "Title V

**Table 1-5 CAA / EPACT AFV Purchase Requirements**

Year	Clean Air Act		Energy Policy Act			
	GVW Less Than 8,500 lb (% of CFVs)	GVW Less Than 26,000 lb (% of CFVs)	Federal [b] (% or Number of AFVs)	State (% of AFVs)	Fuel Provider (% of AFVs)	Municipal / Private [c] (% of AFVs)
1993	-	-	7,500 [a]	-	-	-
1994	-	-	11,200 [a]	-	-	-
1995	-	-	15,000 [a]	-	-	-
1996	-	-	25%	-	-	-
1997	-	-	33%	10%	30%	-
1998	-	-	50%	15%	50%	-
1999	30%	50%	75%	25%	70%	-
2000	50%	50%	75%	50%	90%	-

2001	70%	50%	75%	75%	90%	-
2002	70%	50%	75%	75%	90%	20%
2003	70%	50%	75%	75%	90%	40%
2004	70%	50%	75%	75%	90%	60%
2005	70%	50%	75%	75%	90%	70%
2006	70%	50%	75%	75%	90%	70%

- a As required by Executive Order No. 12844
- b Fiscal year for Federal Fleet Acquisition requirements; model year for all others
- c May be required by regulations if DOE finds these voluntary acquisitions unlikely to be met.
- d New vehicle purchases or leases

Source: Office of Transportation Technologies

of the Energy Policy Act establishes ambitious goals for the replacement of petroleum-based motor fuels. Despite wholehearted and aggressive steps to increase alternate fuel use by state and local governments, industry, Clean Cities, and fleets, it is uncertain whether these efforts will be adequate to attain the EPACT goals. DOE is investigating additional programs that may be needed. For example, DOE is analyzing potential contributions of the alternative fuel fleet programs and increasing energy efficiency in meeting the motor fuel displacement goals. The Department is encouraging an ongoing public dialogue on these issues, and will publish proposed programs and determinations in the Federal Register, providing ample opportunity for public comment.” (US DOE, 1995)

On April 17, 1998, the DOE ‘s Office of Energy Efficiency and Renewable Energy published an Advanced Notice of Proposed Rule Making (ANOPR): Alternative Fueled Vehicle Acquisition Requirements for Private and Local Government Fleets. As required by statute, the notice solicits and provides the opportunity for public comment on the proposed rulemaking. The focus of this rulemaking is, “whether alternative fueled vehicle acquisition for certain private and local government automobile fleets should be promulgated under the terms of section 507(g) of the Act. (and) . . . whether DOE should propose the inclusion of alternative fueled urban bus acquisition



requirements for private and local government fleets in conjunction with a fleet requirement program that may be established under section 507(g) of the Act.” (Federal Register, 1998)

The ANOPR describes the concerns of the EIA about the future of oil needs for the transportation sector. “Today, the US consumes 4 million barrels per day more than it produces for transportation purposes alone; that gap is projected to rise to 8 million barrels per day by the year 2010. According to the latest projections by the EIA, the transportation sector will consume 15.8 million barrels per day of petroleum in 2010, if no significant changes are made to usage patterns and vehicle efficiency. About 8.4 million of these barrels are projected to be used by light duty vehicles. The transportation sector represents one of the major sources of energy vulnerability for American society and the American economy today.” (Federal Register, 1998)

The major thrusts of the CAAA and EPACT are to:

- Reduce oil imports;
- Improve the health of the economy; and
- Reduce emissions of greenhouse gases.

This legislation, and requisite mandates, has the potential to achieve these noble goals if successful. However, as was clearly indicated by EIA’s own analysis and forecasts of 1981 about the US energy situation in 1990 and 2000, making accurate projections of energy use and forecasting potential benefits of actions taken today, e.g., mandating the purchases of CFV, replacement fuels, and AFV technologies, is difficult. However, leaving solutions to these problems, especially the US dependency on others for supplies of oil which so clearly support the operation and commerce of the nation, to the “free market” has not proved successful.

Provisions of the CAAA have achieved much in reducing tailpipe emissions from automobiles. Emission reduction requirements for large vehicles and the CFV purchase mandates of the CAAA hold similar promise for these classes of vehicles. EPACT's emphasis on AFV's could do much to reduce oil imports, but its requirements may place yet additional burdens on fleet operators. These include, but are not limited to: concerns about the newer technology's timely availability to meet purchase mandates; its ability to meet owner mission requirements; price uncertainties (capital, operating, and maintenance); and requirements for the development and deployment of potentially whole new refueling infrastructure and its associated cost.

Chapter II, Situation Analysis, addresses these issues and the current status programs designed, in whole or part, to help fleet operators comply with the legislation. Also discussed is the current position of organizations representing municipal fleet operators on the legislation. In Chapter III, a model business strategy is developed and offered as a tool to help facilitate the process of the municipal fleet operator forced by the mandates to incorporate AFVs into their operations.

## **CHAPTER TWO**

### **SITUATION ANALYSIS**

#### **INTRODUCTION**

It is anticipated that DOE will adopt the proposed rules for municipal and private fleet operators, as it did for the other fleets. This chapter discusses the reasoning behind this likely outcome. It also addresses what the other fleet operators have and are experienced, and what programs are in place and being considered to help fleet operators in coming to terms with these mandates.

Much as did their counterparts in federal, state, and fuel provider fleets in advance of the current rulings, municipal (and private) fleet operators are beginning to study more carefully the mandates and their potential impacted. Unlike their federal and state counterparts, municipal fleet operators now have at least some history, albeit it brief, and the recent experiences of others (some even in municipal settings) to draw on when predicting the rule's potential effect on them. Indeed, some of the major impacts have been considered and a list of concerns and recommendations has been prepared and was posted by the Americana Public Works Association (APWA, 1999) on May 12, 1999, on the Internet web site of the American Public Transit Association (APTA). These concerns are also discussed in this chapter.

#### **WHAT IS AT STAKE**

It is beyond the scope of this paper to address and/or attempt to develop predictions of when oil, and consequently gasoline and diesel, prices will begin to escalate and by how much. Suffice it to say that with the enactment of EPACT, and other

legislation similarly aimed at reducing this country's dependence on oil, the US is acknowledging and trying to prepare for an almost certain future. The Institute of Petroleum (IP, 1998) notes the following based on the BP Statistical Review of World Energy, 1995: "Oil is important for two reasons. It is the raw material for many useful products – plastics, fertilizers, medicines, etc. – and it is also a valuable fuel for transport. In some cases, it is vital. Aviation fuel (kerosene) cannot be obtained from any other source. So far, the discovery of fossil fuels – coal, oil, and gas – has more than kept pace with demand. But they will run out someday, though it is difficult to give a precise date for this to happen. If current reserves are divided by current annual production a rough forecast can be made of how long the fossil fuels will last:

- oil, 43 years
- natural gas, 66 years
- coal, 235 years."

When the amount of oil projected to be used in the transportation sector alone is considered, there appears to be ample rationale for the development and introduction of AFV technology into the mix of transportation options available for this nation's and the world's future. "The transportation sector accounts for about two-thirds of the petroleum used in the US – roughly one-fourth of all the energy consumed. Petroleum used in transportation alone exceeds total domestic oil production by 2 million barrels per day. This gap is growing, and is projected to reach nearly 6 million barrels per day by the year 2010. And every additional gallon of gasoline consumed requires even more imported oil!" (US DOE, 1997)

The country's dependence on foreign supplies of oil has reached record levels with the trend still moving in an upward direction. Though oil prices have been relatively stable over

the last several years, as imports grow they continue to have mounting consequences to the nation's balance of trade.

As long as the tenuous "peace" in the middle east (following the Gulf War) is maintained, no new political instabilities arise in the area, and OPEC remains a shell of its former self, it might be expected that the "status quo" will hold. However, at some point world demand for oil will begin to outpace discovery of new reserves. If this country, and indeed the rest of the world, is not prepared for this eventuality or if unforeseen events abruptly curtail supply and delivery, major economic and possibly political upheaval is a distinct possibility. "Economic realities and trends are setting the stage for a potential oil shock sometime in the future. Economic development in the Pacific rim is contributing to a growth in world oil demand that could outstrip the growth of world capacity. In addition, the major oil sources within the western world (North Sea and Alaska North Slope) during the '70s and '80s are expected to start ebbing, as are some other non-OPEC sources. These conditions increase the possibility of an oil supply shortage within the next five to ten years." (US SOE, 1997)

### **EPACT ASSESSMENT: WHY COVERAGE OF PRIVATE AND LOCAL GOVERNMENT FLEETS UNDER THE MANDATES LOOKS CERTAIN**

By DOE's projections, with AFV purchase mandates in place and fully working in the federal, state and fuel provider fleet arenas, it is estimated that by 2010, only on the order of .4 to .5 million AFVs will be in service. If private and local fleets are included in the mandates, the possible number of total AFVs in service would climb to 2.4 million ((US DOE, 1995). This represents a strong incentive for DOE to extend the program. Not choosing to implement the rules for these fleets would seriously impact DOE's abilities to meet its oil savings goals at

a time when it is already expressing concerns that the longer-range goals are, at best, going to be difficult to achieve. "Displacing thirty percent of light duty motor fuel by 2010 also appears feasible, however, feasibility is based on several assumptions that may not be realized without additional alternative fuel incentives." (Federal Register, 1998)

A Technical and Policy Analysis, required under the EFACT, and electronically available through the Office of Energy Efficiency and Renewable Energy's Transportation Technologies Internet web site at [www.ott.doe.gov/office.rules.html](http://www.ott.doe.gov/office.rules.html), notes, ". . . the Act's suggested goals of displacing 10 percent of transportation's fuels in the year 2000 and 30 percent in the year 2010 would require that AFV sales:

- grow to between 35 and 40 percent of total new light duty vehicle sales by 1999 to meet the 2000 goal; and
- stay in the range of 30 to 38 percent to build an AFV population sufficiently large enough to meet the 2010 goal.

If the 30 percent goal applied to 2020, instead of 2010, the analysis states that AFV growth would have to:

- double every year between 1995 and 2000, going from approximately 30,000 to 500,000 sales per year;
- increase by 50 percent per year to 4,000,000 in the period from 2001 through 2005; and
- remain at a constant 32 percent of total light duty vehicle sales in the period 2005 through 2010."

These numbers will be difficult to achieve. However, by DOE's estimates they may be well worth striving for. DOE estimates that the net annual economic value of meeting the goals in 2010 might be worth as much as \$10.3 billion. To this might be added an additional \$3.7 billion annual benefit derived from reduced emissions (Federal Register, 1998). As noted earlier, these benefits can not be achieved unless more vehicles are subject to the mandates.

"Title V (of EPCACT) mandates certain fleets to acquire AFVs. These mandates are not intended to provide major reductions in US petroleum use. Instead, they are intended to pave the way for alternative fuel use and fuel flexibility by demonstrating the practicability of the technology on a substantial scale. They are also designed to accelerate the development of an alternative fuel refueling infrastructure. These fleet operations would also provide the necessary critical mass to catalyze US industry into making alternative fuels and vehicles readily available at competitive prices. In this way, Title V programs would plant the seeds for growth of alternative fuel vehicle use." (US DOE, 1997)

## **ADDED RISKS FOR PRIVATE AND LOCAL GOVERNMENT FLEETS**

The rules as they apply to federal, state, and fuel provider fleets have had an impact on their costs and operations as they work at trying to comply with them. However, there is an added dimension when these rules are applied to private and local government fleets. In these fleets, vehicles are much more closely aligned with the business' ability to directly generate revenue and/or customer "good will." If a federal or state fleet vehicle breaks down, it would be an inconvenience and likely result in some cost impact and lost productivity. If a vehicle in a private or municipal fleet breaks down the losses could be substantially greater. The

additional losses might include the prospects of not being able deliver packages (as would be the case with trucks used in a parcel delivery service), or leaving passengers (school children or mass transit riders) stranded until a replacement vehicle could be brought into service.

While these kinds of events do happen with conventional vehicles, the current track record for AFV technology suggests reliability equivalent to conventional technologies is still a goal yet to be achieved. This is and will remain a concern for all fleet operators. Municipal fleet operators should take note that:

“Section 507 (k)(2) [of EPCACT] allows the Secretary, by rule to include new urban buses, as defined by the Environmental Protection Agency (EPA), under title II of the Clean Air Act, in a fleet requirement program established under section 507 (g), if it is determined that this inclusion would contribute to achieving the goal described in section 502 (b)(2)(B) (or such other date as is established under section 504). A DOE decision to include new urban buses in a fleet requirement program established under section 507 (g) is dependent upon a determination that this inclusion will be consistent with energy security goals and the needs and objectives of encouraging and facilitating the greater use of such urban buses by public transit entities.” (Federal Register, 1998)

## **DOE IMPLEMENTATION STRATEGIES AND SHORTCOMINGS**

Recognizing the difficulties and costs associated with introducing (mandating) new and more expensive technological options, the DOE is working hard to expand



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existing programs and come up with creative ways to make AVF integration into fleets go smoothly.

All fleet operators, but particularly operators of private and local government fleets who have the potential to be impacted by the proposed rules, are strongly encouraged to research EPACT statutes and begin making determinations about how they will respond when the rules apply to them. In particular, it is recommended that private and local government fleet operators and the local government agencies overseeing them become familiar with what has transpired in this arena since the first fleets came under the rules. A good starting point for this would be DOE's publication: EPACT Initiatives for Alternate Fuel Vehicles, An integrated Approach For Implementing The Energy Policy Act, March 1995. As it states:

“DOE has developed an integrated, five-point approach for implementing (Titles III through V) of EPACT. This approach emphasizes voluntary, cost effective partnerships and relies on regulations only when necessary.” (US DOE, 1995) This document goes on to stress:

**“Foundations** for wider use of alternative transportation fuels are being established through public information campaigns, the certification of training programs for mechanics, the setting of standards for fuels and vehicles, the creation of labeling requirements, and continued research and development.

**Voluntary Commitments** are being sought to bring necessary AFV infrastructure, supply, and demand on-line simultaneously. Fuel suppliers are being asked to build stations, automakers are being asked to build vehicles, and fleets to use those vehicles. Voluntary participation reduces the need for mandates and allows users to determine which technologies best meet their

needs. DOE's **Clean Cities** program is working effectively to leverage Federal fleet AFV purchases by encouraging local public and private investments.

**Incentives Programs** to stimulate investment in alternative fuel vehicles and supporting infrastructure are being developed through Federal tax incentives and grants to states. Through these funding mechanisms, states will be rewarded for developing local incentive programs that encourage the early adoption of alternative fuels and vehicles.

**Fleet Leadership** is being sought from the Federal fleet, state fleet, and alternative fuel provider fleets. It is appropriate that these fleets assume a vital pioneering role in the greater implementation of AFVs, and their initial leadership is being secured through statutory requirements.

Replacement Fuel Goals are being examined to determine whether it is technically and economically feasible to displace 10 percent of petroleum use by 2000 and 30 percent by 2010. Numerous analyses and determinations will be made on this issue, and information on the process and results will be broadly disseminated through the Federal Register." (US DOE, 1995)

DOE progress in achieving EPACT goals, even with the ambitious approaches put in place early on, has not been without difficulties. In the June 1999 issue of Utility Fleet Management magazine, David Rogers, director of the DOE's Office of Technology Utilization (OTU), gave a frank assessment of progress being made to the Edison Electric Institute's Fleet Management and Policy Committee. "Rogers acknowledged that the law's federal, state, and fuel provider (e.g., utilities) fleet programs are 'not doing very well.'" (Bailey, 1999)

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Rogers said that DOE is limited in what it can do to promote EPACT because it has no authority to require that an alternative fuel infrastructure be built, or to force the OEMs to build alternative fuel vehicles. The hope was that the organizations covered by the act – such as utility fleets – would create such a market for infrastructure and vehicles that suppliers and manufacturers would come up with what was needed.

“The goals are achievable, Rogers said, but not unless DOE gets some more muscle, courtesy of the Congress, in the form of additional incentives.” (Bailey, 1999) The term “incentives” can mean several things – rewards, grants, and other inducements to encourage compliance, or much harsher / enforceable penalties for non-compliance. Positive incentives were discussed which included:

- Forgiving the road tax for alternate fuels and adding taxes to gasoline.
- Offering more tax credits for alternate fuels.
- Offering bigger tax credits for buying alternate-fueled vehicles.
- Requiring a minimum percentage of non-petroleum components in gasoline and diesel.
- Exempting certain AFVs from transportation control measures.

Many of these incentives would not be of benefit to local government fleet operations, but could prove beneficial in the private sector.

Mr. Rogers did not elaborate on other approaches DOE might also pursue with Congress. Recall here that EPA has considerable leverage in getting states to comply with the CAAA, since it can levy sanctions and other penalties, including possible loss of highway funds (US DOE, 1999).

It was observed in the article that other fleet operators (fuel suppliers in this setting) were having difficulties embracing EPACT mandates when federal fleets have themselves been notoriously lax about complying. The fuel suppliers, according to the article, believed that their participation would come in line when the federal fleet operators were **forced** to live by the same rules. [Emphasis added.]

The article goes on to note, “Rogers chided utilities trying to win exemptions based on the unavailability of vehicles or infrastructure. “These requests send a bad message to the manufacturers and the general public.” Additionally, “The fleet management position seemed to be that the general public would be a lot more unhappy about poor service and soaring utility rates if electric utilities are forced to buy expensive EVs inadequate to the task.” Note here that the Edison Electric Institute (EEI), as one of its many major initiatives and as its name suggests, represents the special interests of electric utility fleet operators. These fleet operators are not very interested in AFV technologies other than those which operate on electricity.

Some of the specific concerns about AFV and infrastructure availability raised by electric utility fleet managers are already shared by their counterparts in the public sector.

## **AMERICAN PUBLIC WORKS ASSOCIATION EPACT CONCERNS**

As noted in the introduction to this Chapter, the APWA has developed a list of concerns and recommendations regarding DOE's ANOPR, and posted these on the APTA web site. A synopsis of these is presented here to highlight the challenges private and local government fleet operators will be facing. Many of these issues have surfaced as other fleet operators respond to the mandates. In many instances, the issues are not trivial. Regardless, because DOE's goal of creating the mass critical to the long-term success of the AFV strategy to reduce oil use clearly hinges on having very large numbers of vehicles involved, private and local government fleets should anticipate a positive outcome on mandate expansion.

### **Synopsis of AWPAs EPACT Concerns**

#### Overview:

APWA supports the Energy Policy Act (EPACT) of 1992 and its intent to reduce United States dependence of foreign petroleum products. APWA also supports the Department of Energy's (DOE) proposal to achieve EPACT objectives by increasing the use of domestically available alternative fuels. The conversion of personal motor vehicles along with private- and public-sector motor vehicles to alternate fuels will have a profound and positive impact on the US economy as well as producing an energy independent nation.

- In general, APWA supports the conversion of local government fleets, including those owned, operated, or maintained by public works agencies, to alternate fuels.
- Under current and proposed plans, only vehicle fleet owners and operators have implementation requirements.
  - Programs need to be introduced to ensure participation by automobile manufacturers, alternative fuel providers, and the general public -

- broader participation is needed to ensure EPACT objectives are met.
- APWA is extremely concerned with any unfunded federal mandate.
    - The proposed DOE program represents additional construction, acquisition, and operating costs for local governments.
    - Since EPACT is a national agenda issue, it is appropriate that it receive national funding
    - APWA recommends the development of incentive and matching grant programs for local governments, automobile manufacturers, and fuel providers to make conversion to alternative fuel vehicles a cost competitive alternative.
  - APWA applauds DOE's decision to place initial procurement requirements on federal and state government fleets, as a pilot program. Lessons learned by federal and state agencies have proven useful in evaluating future program participation by other fleet owner and operators.
    - APWA feels early indications show that the program has not been completely and successfully implemented among state government fleets.
  - Based on state fleet experiences and results to date, APWA feels it is unclear whether requiring municipal and country fleets to procure alternative fuel vehicles will significantly impact the amount of foreign petroleum products purchased by the United States.
  - APWA recommends excluding local government fleets from any acquisition requirements until DOE is able to demonstrate full participation by state government fleets, and show how inclusion of local fleets will have a significant impact on foreign petroleum imports.
  - APWA understands DOE's intention to limit mandatory participation to vehicle fleets located in large metropolitan areas since these fleets will have the

greatest potential for successful implementation due to market concentration.

- However, APWA cautions against assuming that vehicle fleets located in the same metropolitan area will cooperate or be able to effectively coordinate political subdivisions to establish joint implementation plans and fueling facilities.
- APWA endorses DOE's decision to limit mandatory participation in the program to vehicle fleets meeting certain characteristics.
  - Limiting the program to centrally fueled vehicles is essential, since fleet owners and operators can not rely on the availability of commercial fueling stations providing alternative fuel at reasonable prices.
- APWA recommends increasing the fleet size threshold from 20 vehicles as currently proposed. Fleets of only 20 vehicles will most likely procure only two or three vehicles per year, often only in any one vehicle class. Establishing and maintaining procurement procedures, fueling facilities and maintenance/operations programs for two or three vehicles is an unreasonable financial burden in the early years of any mandated program.
- Overall, APWA supports the Clean Air Act Amendments of 1990 and the Environmental Protection Agency's (EPA) Clean Fuels Fleet Program (CFFP). Imposing emissions standards and requiring procurement of clean burning fuel vehicles on fleets located in ambient air non-attainment areas is fair and reasonable.
  - However, APWA is concerned with the dual requirements from EPA and DOE for alternative fuel vehicles. The differences between EPA and DOE requirements for fuel type, fleet size, and fleet type creates a burden on municipal and county fleets.
  - APWA recommends that EPA and DOE develop a consolidated/joint federal program with ongoing coordination of related activities for the use of alternative fuel vehicles.

- APWA is greatly concerned that only a few automobile manufacturers are offering alternative fuel vehicles.
  - APWA is also concerned that alternative fuel vehicles typically cost 20 percent more than traditional gasoline/diesel vehicles.
- It is unlikely that an adequate alternative fuel distribution system, driven by private enterprise, will be in place by 2002 without federal intervention or financial support. Unless DOE is able to create an alternative fuel distribution system, by incentive or mandate, then local government fleets should not be mandated to procure alternative fuel vehicles.
  - It is unreasonable to expect local governments to fund facility and infrastructure improvements to meet an unfunded mandate.
- APWA believes, the addition of alternate fuel vehicles will increase the costs for training of existing mechanics and vehicle technicians.
  - Training budgets are one of the most vulnerable areas in a local government's budget, often the first area to be cut in the budget process.
  - APWA encourages SOE to develop low- or no-cost training programs on alternative fuel combustion systems for mechanics and vehicle technicians employed by local government agencies.

## **SPECULATION ON PUBLIC COMMENT**

As stipulated in the ANOPR, public comments were due to DOE by July 16, 1999. While it was not possible to access and analyze the full set of comments formally submitted at the time of the writing of this paper, they would be most interesting to review. Equally interesting would be to know specifically who and which organizations offered comments.



Although no “public comments” were found posted by APTA on their web site regarding EPACT, it was of interest to find a document that did allude to APTA’s position on the issue. This document, Strategic Goals for the 21<sup>st</sup> Century: a report to the Mobility for the 21<sup>st</sup> Century Task Force, was prepared by APTA in cooperation with the Institute for Alternative Futures. Goal number two highlights a strategy to “Invest in Innovative Sustainable Technologies.” More specifically, two of this goal’s sub-elements call for APTA and its partners to work together to:

1. Accelerate development of energy-efficient vehicles and non-fossil fuel propulsion systems for public transit, fleet vehicles, and automobiles.
2. Create R&D and demonstration projects to speed development of “flexible vehicles,” including Personal Rapid Transit (PRT) and other fully automated vehicles, rail/road, smart shuttles, minibuses, and electric station cars.

At this time it can only be speculated that the comments received through the public comment period will look similar to the APWA assessment summarized earlier. However, there would be two interlocked additional key issues warranting particular attention. Much like their utility (fuel provider fleet operator) counterparts, private and local government fleets rely on their vehicle to generate revenues. While federal and state fleet operators are undoubtedly sensitive to both capital and operating costs, there is a less immediate and direct consequence to their operations, if the vehicles fail to perform – the vehicle must provide service at least as well (reliability and operating/maintenance costs) as the vehicles they would replace or supplant. Additionally, there will be a significant impact if the technology costs more to buy in the first place.

The second issue centers on the possible inclusion of buses in the mandates. AFV buses are available and will be discussed in more detail in Chapter III. However, it is fully anticipated that many transit operators will have serious concerns about the additional costs of these vehicles, necessary supporting fueling infrastructure, added maintenance costs, the technology's "unproven" track record, and how bus operators may view or treat this "new" technology. It may be argued during the comment period that this option, in particular because of the significantly greater cost differential between a conventional bus and an AFV bus, should not be mandated; rather, it should be promoted through an incentives program leading to voluntary application.

## **CHAPTER THREE**

### **MODEL BUSINESS STRATEGY**

#### **INTRODUCTION**

In Chapter Three, a model business strategy is developed to assist private and local government fleet operators in preparing for the eventual integration of AFV technologies into their fleets. The ultimate goal of this exercise is to develop and implement a sound AFV Program Plan. The plan, at a minimum, will guide the organization's needs to be responsive to the mandates, spelling out schedule, cost, and performance targets for all business areas within the company and defining who has the responsibility in each area for ensuring success. It will also serve to identify and quantify opportunities beyond simply, "meeting the letter of the law".

The issues to be addressed in developing and implementing an AFV integration strategy will be slightly different for these two entities (private and local government fleets). These differences would be most prevalent in the areas of constituency (in private business, stockholders; in the local government, ultimately the voters); how each might go about team and coalition building; and how each would go about financing of vehicle purchases. Moreover, the kinds of incentives available to each will be somewhat different. However, because overall these differences are slight and/or readily apparent, the discussion of fleet operations will encompass both private and local government operations, though emphasis is placed on local government operations.

Even if the DOE decided to forego enactment of the rules for private and local government fleets, there may be a strong rationale in some instances for voluntary AFV purchase and

integration into a fleet. As will be highlighted at the end of this chapter, some municipal and local government fleets have taken it upon themselves, in the absence of mandates, to experiment with AFVs. These demonstration projects can serve as guides for fleets of similar makeup and/or to provide benchmarks for those just starting the process of AFV integration. The proposed model business strategy and program plan can easily be adopted and/or modified to suite a fleet operator who may not be subject to the mandates, but still interested in the technology's application to meet their needs.

For the purposes of completeness in developing this model business strategy and plan, and therefore making it universally useful, it is assumed that the fleet operator who might be subject to the new mandates has not monitored the evolving situation. Those who have monitored the situation and are already familiar with the issues have a head start in preparing an appropriate response based on their own fleet's operation. They can use the introductory part of the plan's development to confirm that they have approached the problem in a sound way.

## **MODEL BUSINESS STRATEGY FOR AFV INTEGRATION INTO LOCAL GOVERNMENT FLEETS**

### **Getting started**

A critical element for the development and implementation of an AFV Program Plan for any organization is a need to have a sound overall business plan in place first. "Sound" means one that has an established vision and mission statement, is well understood, broadly accepted within the organization, and meets organizational, employee, and community needs. As the AFV business strategy is developed the organization's

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overall business plan will serve as a benchmark against which various decisions to be made with respect to AFV integration will be measured.

Why would this be so important? While for the most part AFV cars, trucks, and buses look like their gasoline and diesel fueled counterparts, it must be appreciated that they are, in spite of already making earlier inroads into other fleets, still a “new” technology and the introduction of new technology into a company constitutes change. Without a strong, well accepted business plan in place, one which acknowledges ; embraces change as part of everyday business, even greater than normal difficulties in implementing AFV technology into fleet operations are almost a certainty.

A company’s business plan and adherence to it are a direct reflection of the management’s (and the rest of the company’s) attitude about how the company is run. Suppose for a moment that a company’s management made it abundantly clear it resented being told by the government that it had to buy more expensive and less serviceable equipment for conducting its business. Additionally, suppose management made it clear it thought AFV technology was destined to fail and it would only reluctantly meet the letter of the law. The “message” sent by management would be embraced by the employees, and the likelihood of successful implementation of AFV technology into the fleet would become at best a remote possibility.

On the other hand, if management made it clear it envisions AFVs as a critical component in its and the country’s future and that, in spite of the fact that the technology is new, more expensive, and not yet as reliable as what it is replacing, it was bound and determined to make it work, employees would adopt this same philosophy. One of the most important elements on the road to making AFVs a success has to be

support and backing at the highest levels of the company (and country).

It is assumed for purposes of further discussion, that the local government fleet operator is intending to pursue the latter rather than the former strategy, to embrace this change and make it work for their fleet.

### **Business Strategy Key Elements**

As mentioned, the development of a workable AFV Program Plan and its implementation will require information gathering, current business practices assessment, understanding of regulatory requirements, and strategic planning. Operating under the assumption that management is supportive of AFV integration and that the organizational culture is able to adapt to the changes this will bring about, the development of an AFV Program Plan becomes identical for virtually all local government fleets. The key elements in the strategic development of the plan are outlined here and then each is discussed in greater detail. Additionally, an AFV Program Plan is discussed to provide a sense of what elements would be critical to successful AFV integration.

#### Strategic Planning

Statement of Management Support / Guidance / Company Team

Information Gathering

- . Regulatory / Regulations Assessment
- . SWOT Analysis
- . Fleet Audit / Technology Assessment
- . Collaboration Opportunities
- . Marketing Analysis / Public Relations
- . Decision Making

#### AFV Program

AFV Program Plan

- . Vision and Mission Statement
- Program Management
- . Cost / Budget
  - . Schedule
  - . Performance

### **Statement of Management Support / Guidance / Company Team**

As discussed earlier, it will be management who sets the tone for how well this kind of program will be received within the company and/or entity with responsibility for local government fleet operations. A strong positive statement by management announcing the company's intention for supporting the introduction of AFV technology into the fleet and rationale behind taking this step, will engender support in helping to make it come about. In the earliest of stages, this should be an announcement to the employees which makes the program's goals and objectives clear; it should be clear that management solicits and welcomes employee support and suggestions as the strategy is developed and implemented. Ideally, the company team (leader and key participants) working on the strategy and developing the Plan would be announced along with its goals and objectives.

Periodic additional announcements to employees about the strategy's advancement might be considered if and when appropriate. An alternative / complementary strategy would be the periodic update of employees through an employee newsletter or web site, if available. It should be anticipated that it might take six to nine months to prepare an AFV Program Plan, depending on the resources applied. Since the first purchases would not be immediately required under the currently proposed rule, there would be no compelling reason to speed through the planning process. Alternatively, it may be desired to accelerate the process if opportunities are identified early on to apply for grants and demonstration

funding for AFV purchases or the buying and installation of infrastructure necessary for fleet support.

Development and announcements of the program to the general public would be decided on and made as part of the strategy's launch plan.

In advance of making the announcement to its employees, it would be most appropriate to have a clear understanding between management and the manager/team leading the development of the AFV business strategy. This understanding would address issues associated with what the team's makeup should be, each participant's roles, responsibilities, reporting requirements, and other general guidelines necessary to manage a program of this magnitude. This will become important over time as various areas of the company are impacted by the program's implementation.

A suggested on team would include an upper level manager, legal counsel (or ready access to legal advice), and strategic representation from operations (management and operators), public relations, marketing, finance, and planning.

In a union shop, union representation on the team might also be appropriate. Bringing in this new technology will call for new training of mechanics and operators. In a union environment, it would be fully appropriate to have their participation (and understanding) in how AFV introduction and use will impact them.

## **Information Gathering**

### Regulatory / Regulations Assessment

One of the first activities for the company team to undertake is information gathering. This activity will span several areas and tasks within it can be conducted in parallel. Information gathered during this phase of the strategy development will



serve to support decision making as issues arise across all of the areas that have to be addressed (e.g., technology assessment, financing, marketing, collaboration development).

The initial focus of the information gathering exercise should be to develop a firm understanding of the mandate's impact on the company's or local government fleet operations. Specifically, the answer to the question, "What are we required to do under the law to be in compliance?" needs to be developed. This "base case" will serve as the basis for which additional measures, beyond meeting the minimal requirements will be measured. This information will also aid in the development of a SWOT analysis.

Preliminary information should be gathered at this stage on:

- what the final EPACT rulemaking outcome was;
- a review and assessment of all of the comments received by DOE during the process and their bearings on this particular fleet and its operations, if any [member organizations such as APWA and APTA may be good sources for this kind of information];
- a review of the latest information on how other fleets (federal, state, fuel provider) are performing with regards to the mandates, and why; and
- what AFV technologies are currently being used by others (i.e., federal, state, fuel providers), why these technologies were chosen, and how well they are meeting mission requirements.

It should also become a matter of standard practice to stay abreast of the latest developments in Washington at both the EPA and the DOE. This can be done quite easily with the

advent and prevalence of information being made available over the Internet. The EPA, DOE, and many other organizations have web sites where the latest information regarding rules and regulations of fleets and fleet operations is readily available.

It is observed here that, while the requirements for meeting the CAAA and EPACT rules are slightly different, the information gathering mentioned above can serve in large part to address both obligations. Since DOE's rule making and EPA's announcement of non-attainment areas (some of these areas which may be new) both occur in 2000, it would be wise to consider addressing the impacts of the CAAA at the same time, especially if the local area is under an EPA "pollution watch".

#### SWOT Analysis

SWOT stands for Strengths, Weaknesses, Opportunities, and Threats. On an ongoing basis, but in particular when a program of this magnitude presents itself, every company should assess its internal resources and competencies. This process, which is a component of strategic planning, involves "a way of analyzing, planning, and thinking that evaluates and anticipates the relationship between the organization and its environments." (Cook, Hunsaker, Coffey). Core questions that generally guide the development of this analysis are:

1. What business are we in?
2. What are our internal strengths and weaknesses?
3. What external opportunities and threats do we face?
4. What business should we be in?
5. How do we get there?

## 6. How do we know we are still on the right course?

As noted earlier, the company's overall business plan should already embody answers to several of these core questions. However, all of the questions might be revisited as part of and in the context of this exercise. For example, a transit agency whose mission includes positioning itself as one of being "environmentally friendly" may weight the commitment to and investment in AFV technology higher than one who sees its charter as one of providing the least cost service.

If the SWOT analysis is done well and is considered a dynamic process (regularly reviewed and updated), it provides a solid basis for evaluating further decisions. It also instills a discipline in all those involved to commit to a plan of action and routinely measure and evaluate progress. The process of routinely measuring and evaluating progress affords the best opportunities for identifying and making course corrections in a positive and timely fashion.

### Fleet Audit / Technology Assessment

Armed with preliminary knowledge about the mandate's requirements, Operations will have a major task in supporting the development of the final AFV Program Plan. This task involves the performance of a fleet audit and systems requirements assessment, and necessarily requires the operations staff to become more fully knowledgeable about AFV technologies. Sound, yet somewhat simplistic information about the current status of AFV technology can be accessed through DOE's Alternate Fuels Data Center (<http://www.afdc.nrel.gov.html>). However, before deciding which AFV technologies make the most sense for this fleet, a thorough understanding of all of the various AFV technologies strengths and weaknesses must be developed. This task would include, but not necessarily be limited to:

1. identifying how many different types of vehicles are in the fleet and which ones would be subject to the mandates;
2. determining what the life expectancy is for each of these vehicles;
3. determining the vehicle mix purchase needs are for the coming years (note the percentages of AFV purchases ramps up from 20 percent in 2002 to 70 percent in 2006);
4. identifying what types of AFV vehicles are available, or may become available in the next few years, to meet the mission requirements of the new vehicles purchases for the fleet;
5. determining what kind of infrastructure requirements (refueling and/or other) are needed and by when to accommodate the various new vehicles which might be purchased;
6. developing a preliminary new vehicle purchase plan and budget for vehicle and infrastructure requirements;
7. determining possible funding scenarios for vehicle and infrastructure purchases (demonstration project funds, funding for AFVs available through Congestion Management and Air Quality (CMAQ) under the Transportation Equity Act for the 21<sup>st</sup> Century (TEA 21), Federal Transit Administration (FTA) or other grant programs);
8. identifying any special maintenance and maintenance training issues to be in place in advance of AFV arrival;  
and

9. developing and preparing driver training programs as necessary (may include all company vehicle operators, or a special program for bus operators if buses are included in the mandates).

Depending on how well versed the operations personnel already are with respect to AFV technology, this group of tasks may take the longest lead-time in an AFV Program Plan development. Critical to the strategy is ensuring that first, the types of technologies selected to meet the mandates are capable of meeting mission requirements; and second, that an appropriate budget and timeframe for implementation is allowed.

Major decisions hinge on the outcome of this analysis. A complication in evaluating which clean fuel vehicle and/or AFV strategy best meets the demands of fleet's service requirements is the fact that there are several fuels to choose from: liquefied petroleum gas (LPG), compressed natural gas (CNG), liquefied natural gas (LNG), methanol, ethanol, electricity, and under test now but clearly much farther in the future, hydrogen. Along with choosing which fuel might work best, the decision is also compounded by the fact that, while the internal combustion engine still remains a dominant technology, new drive technologies (e.g., electric motors, hybrid systems, and fuel cells) are emerging to challenge the old.

It may be appropriate, even desirable, depending on available staff time, available budget, and experience to consider hiring consultants well versed in AFV analysis and planning. The consultant's support might range from preliminary research on the fleet's present and future vehicle plans and how these might be impacted by percentage purchases of AFVs to the development and recommendation of a complete turn-key proposal for fuel type selection and vehicle purchase timing recommendations. This strategy would allow the staff to

provide input to the process while still performing their normal duties. Local alternate fuel providers (e.g., the local electric company or gas company), might also be a valuable source of information and expertise.

In their roles as 21<sup>st</sup> century fuel providers, replacing the oil companies, they would likely have a vested interest in this new and expanding market. Additionally, they have already developed a similar knowledge base as a result of incorporating AFVs into their own fleets.

### Collaboration Opportunities

The organization's marketing and public relations departments would be tasked with researching and evaluating the benefits of being involved with or developing collaborative opportunities.

There is a distinct advantage to private and local government fleets falling under the mandates at what might be considered the end of the line (last fleets to be considered) rather than at the beginning. Coming in to the process of AFV adoption with others leading the way affords the opportunity to learn and profit from what the federal, state, and fuel provider fleet operators have already experienced. Additionally, as was mentioned earlier, various incentive programs developed and implemented by the DOE over the course of several years are now becoming better established.

Of particular interest to the private and local government fleet operators in addressing the mandates for the first time is the ease and convenience of finding out what has been tried, and more importantly, what has been successful. It is anticipated that the company's team leader would assign responsibilities for assessing the merits of "going it alone", joining an existing coalition, or taking the lead in starting a new coalition to key members of the team. A convenient starting point for this research would be the DOE Clean Cities Coalition web site (<http://www.ddities.doe.gov>). This program aids cities

through the process of goal setting, coalition-building, and commitments that are necessary to earn a Clean Cities designation (US DOE, 1995).

There are currently over 75 cities designated as Clean Cities under the DOE program. If the private or local government fleet is located within an area which has already established a Clean Cities Coalitions program, learning more, quickly, about the benefits of participation could be accomplished by contacting the local Clean Cities Program leader. If the city in which the fleet is located is not currently a participant in this program, it might be advisable to research the benefits associated with taking the lead in developing a local Clean Cities Coalition.

#### Market Analysis / Public Relations

In concert with the assessment of the opportunities to join or start a collaborative effort in helping to bring about AFV integration, the organization will want to perform a careful market analysis. Many if not most, local government fleets are generally overseen by elected officials and are highly visible in the community. Where bus and paratransit operations exist, it would be anticipated that along with the operator's logo, the operator also sells advertising space on or in the vehicle. Introduction of "new, green" vehicles into the fleet can represent a potential bonanza of high caliber public relations opportunities and possibly attract more riders. At the same time, if not very carefully orchestrated and executed, this can potentially represent a public relations nightmare if the technology fails to perform properly or breaks down during a press event.

Fleet public relations and marketing personnel must develop sound strategies, working with general the manager and operations personnel, to make sure any public events showcasing the fleets commitment to cleaner air and oil use reduction are a success. This would require the general

manager and his or her staff working from an early stage with the fleet's governing board. Because of the highly visible nature of the fleet and the board's political exposure in conjunction with it, they must understand and be willing to accept the risk that goes with public events touting the fleet's conversion.

The public too has a stake in how well this works. The investment in new technologies, which the public makes through taxes paid, will be more expensive than the status quo. This means either more money required for support of the "same" level of service, or the same amount of money paid, but a lesser degree of service being provided. This outcome holds true wherever the new technology does not provide at least the equivalent level of service for the same cost as what it replaces. For example, a commitment may be made to purchase CNG and CNG cars, trucks, or buses to replace their gasoline or diesel counterparts. Not only do the CNG vehicles cost several hundreds to several thousands of dollars more each, a refueling infrastructure to support these vehicles must also be purchased and installed. Due to the dearth of CNG refueling facilities, these vehicles will have to travel to one location to refuel, and they will not have the flexibility of the ones replaced to 'gas up' virtually anywhere.

Care will be required to build public support in overcoming the new technology's current shortcomings or make them transparent to the public. This task will fall squarely to the marketing and public relations departments.

### Decision Making

Once information has been gathered, and a strategy has been developed for integrating AFVs and/or clean fuel vehicles into the fleet, some difficult decisions must be made to define the appropriate path for the AFV Program Plan. The heaviest burden in the decision making process resides with operations in recommending the 'right' technology or



technologies for the fleet. Their recommendation(s) must be passed from the project team to the general manager, and in turn, to the governing board for final approval. The AFV technology recommendation(s) might be made in a “stand alone” form, or may be a nested component in the larger proposed AFV Program Plan. The general manager should make the decision on how best to approach the board. The goal will be to have the AFV strategy and Program Plan team, the general manager, the organization, and the governing board all comfortable with the commitments being made.

### **AFV Program Plan**

The possible risks and rewards of integrating AFVs into the fleet should be well understood as strategizing materializes into a plan of action to. As in any business venture, the risks can be minimized and the rewards maximized with careful planning and execution. The AFV Program Plan aims to make sure, using a team approach, this happens.

#### Vision and Mission

It will be important for the overall conduct of the AFV Program Plan that a vision and mission statement be prepared. This would be a good opportunity for an internal announcement of progress and provide another chance for management to reinforce its commitment within the organization to this program. All AFV Program Plan development team members should take part in the crafting of the vision and mission statement. This will help to promote a stronger team commitment to achieving the Plan’s specific goals.

#### Program Management

Along with the development of the vision and mission statements, other key components of the Plan will have resulted from the earlier strategic planning. These components address the Plan’s cost, schedule, and performance criteria.

At the outset, with the assignment to the AFV Program Plan development team, the team leader and participants will have developed an implementation timetable consistent with the requirements set forth in the final rulemaking for meeting the mandates. This timetable must take into account the need to construct an AFV Program Plan for the organization and allow sufficient time for its implementation.

The team members working with their own business areas, will have been tasked with the responsibilities of developing necessary staffing, budget, and task requirements to meet the emerging vision of the Plan. Through an iterative process, the team leader and its members will have merged each of the necessary components (operational elements and decisions, collaboration opportunities, market and public relations plans) into a wholly integrated Program.

The Plan will delineate how much money and other resources were required in which departments, by when, to facilitate Plan success; when specific tasks needed to be completed and by whom; and what the anticipated level of performance would be to satisfactorily achieve the Plan's goals and objectives.

The AFV Program Plan team will have ongoing responsibilities in maintaining the timetable and assuring the general manager and the board that the program is on track. Because the implementation schedule for percentages of AFV fleet purchases is clearly spelled out in the rules over the five years beginning in 2002, establishing plans for meeting these goals will be fairly easy. However, given the length of the program and the fact that DOE will be monitoring AFV conversion success nationally and can be anticipated to take corrective actions and/or adjust incentives over time, the team will have to continually monitor internal progress and success as well as external events.

## **AFV Buses**

If EPACT requires that buses be included in the AFV percentage purchase mandates, an added dimension of complexity to the private and local government fleet operators is added. There is a fairly wide array of experiences within the federal, state, and fuel provider fleets to draw from in developing, preparing for, and integrating conventional (automobiles and light duty trucks) AFV vehicles into private and local government fleet operations. However, there is considerably less experience when it comes to AFV bus technology.

Information on several case studies involving AFV bus applications are offered on the US DOE Alternative Fuels Data Center web site (<http://www.afdc.doe.gov>). Another useful source of information on AFV buses, relating particularly to electric buses, was compiled by the Electric Power Research Institute (EPRI) (EPRI, 1998). Similar case studies for other fuels are available through the Gas Research Institute (GRI).

These case studies involved transit agencies taking the initiative ahead of the mandates to experiment with new technologies. In some studies the operators justified their experiments with anticipations of garnering wide public recognition for being an innovator and risk taker; in other cases it was felt that the public relations benefits would exceed the additional costs; in still other cases, the fleet operators justified the investment based on fuel price savings and reduction of long-term concern over potential fuel shortages.

This pioneering spirit has not been without its trials. In an effort to offer followers the opportunity to learn from these early AFV adopters, EPRI compiled this list of comments from interviews with 21 case study participants, Appendix B.

Though the focus of these particular case studies involves electric vehicles, most of the comments would apply equally well for any AFV technology.

If buses are to be an integral part of meeting the mandates, this list should provide an excellent frame of reference for the fleet operator in developing a response for input into their own AFV Program Plan.