## Section 5

## FLEET EXPERIENCE SURVEY REPORT

### THE SURVEY

The primary data-collection efforts of the AFV-FDP included tracking fuel use and mileage accumulation, and running emission tests on AFVs and control vehicles. In addition, a Statewide survey was conducted in 1993 of known/potential AFV operators to determine the current experiences of fleets operating alternative-fuel vehicles. In 1995, a more selective follow-up survey of prior responders was conducted to update the findings of the first survey and to see if any trends were developing.

These surveys collected information from fleet managers, drivers, and mechanics. The surveys consisted of five sections for the fleet manager to complete and one section for each driver/mechanic to complete.

**Survey Contents**

Each of the surveys included the following sections:

**Fleet Characteristics.** These questions were designed to provide a profile of the current fleet, including the number and type of vehicles operating on both conventional and alternative fuels. This inventory indicated which alternative fuels were being used and how much experience each fleet had gained with each fuel.

**Reasons AFVs Were Acquired.** These questions addressed factors that influenced the decision to obtain AFVs. The reasons alternative fuels were acquired indicates to some extent perceived advantages over conventional fuels. Reasons cited as strongly influencing the decision to acquire AFVs are usually thought of (by fleet operators) as advantages AFVs have over conventional-fuel vehicles. Reasons listed as not influencing the decision to acquire AFVs can reflect that fleet administrators are not completely knowledgeable about AFV performance, perceive no AFV advantage, or do not consider these reasons important to fleet operation, for whatever reason.

**Refueling Facility Characteristics.** These questions were designed to determine if the convenience and cost-effectiveness of the alternative-fuel refueling infrastructure used by each fleet might encourage/discourage the increased use of alternative-fuel vehicles. This section could provide information on areas of the refueling process that need improvement.

**Public Perception.** These questions sought to measure the volume and type of public feedback the fleet manager had received on the fleet's use of AFVs, to determine areas where the public sees advantages/disadvantages with AFV operations. Because of lack of response, this section was dropped from the second survey.

**Vehicle Characteristics.** These questions gauged AFV's impact on fleet operations and were designed to show how well AFVs were meeting expectations of fleet managers and how they compare to conventional-fuel vehicles. Fleet managers also were asked to distribute a single-page survey to the drivers so their experience with AFVs could be included. The driver's survey included a vehicle-description section (so the results could be classified according to fuel and vehicle type) and a vehicle-performance section. The survey was intended to point out day-to-day operating differences (both positive and negative) between conventional- and alternative-fuel vehicles.

**Who Was Surveyed.** In 1993, surveys were sent to 131 managers of fleets that were participating in the AFV-FDP, other fleets known to have AFVs, and fleets that had expressed an interest in purchasing AFVs. The 1995 follow-up survey was sent to 38 fleet managers who had responded to the first survey (including those who returned the survey but did not operate any AFVs).

**Who Responded.** Replies from the 1993 survey were received from 38 fleets, 32 of which operated 25,475 vehicles, including AFVs. The 1995 survey included new responses from nine fleets operating 5,565 vehicles. Rather than filling it in, several fleets responded to the follow-up survey by stating that opinions had not changed. These responses are not included in the results. All summarized data and percentages used in this report (when referring to survey data) are based on the responses from the fleets operating AFVs that actively responded to the surveys in 1993 and 1995. Figures 5.1 through 5.7 summarize the respondents' AFV inventories for different vehicle classes using data from both surveys. Generally, the 1995 survey showed few changes concerning fleet fuel mix.

## SURVEY RESULTS

Total fleet size ranged from 50 to more than 18,000 vehicles. AFVs represent from less than 1% to more than 42% of the fleets. The alternative fuels used included CNG, methanol (M85 in light-duty vehicles and straight methanol in trucks and transit buses), LPG, and electricity.

CNG was the most widely used of the alternative fuels. More than 90% of the survey AFVs were CNG-powered. Most of the CNG vehicles were aftermarket conversions. OEM-produced vehicles accounted for 31 (including seven light-duty) of the CNG vehicles in 1993 and 32 (including 15 light-duty) in 1995.

**Figure 5.1 Inventory of Vehicle Types in Survey Respondents' Fleets**

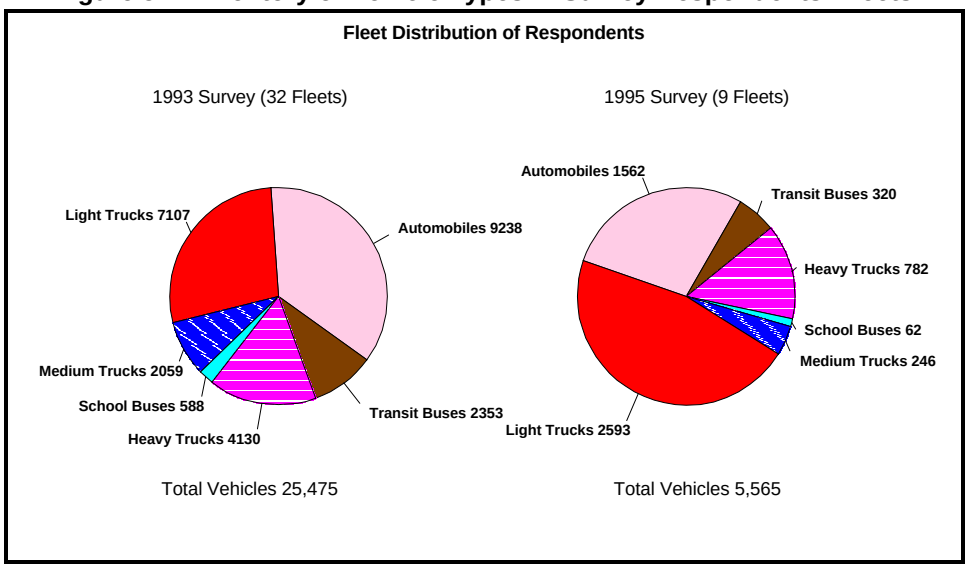
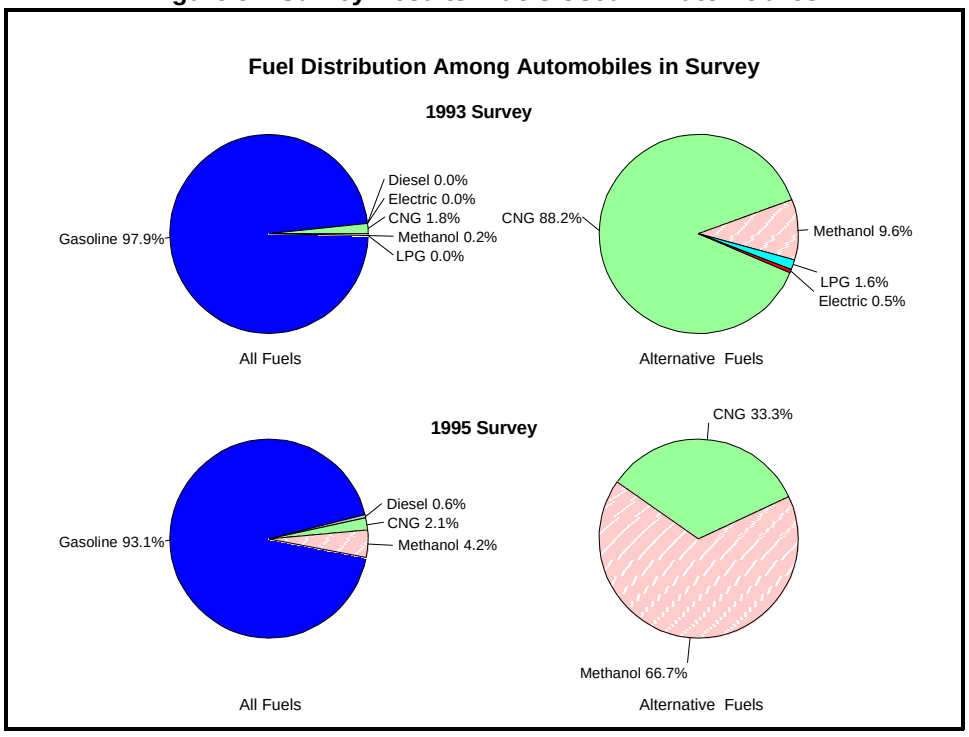
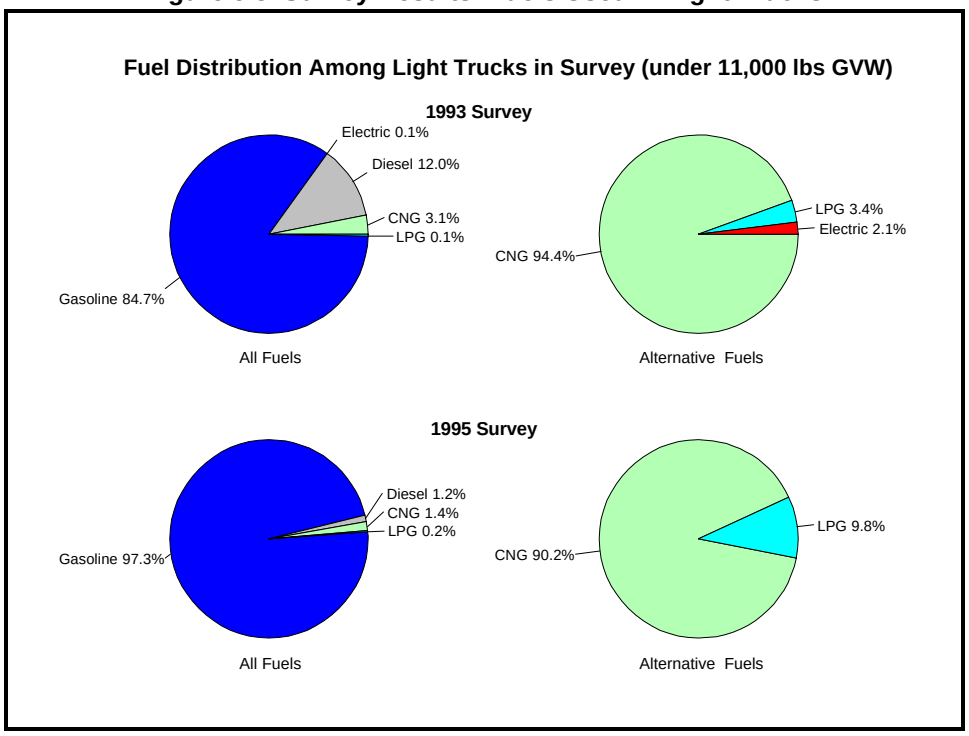


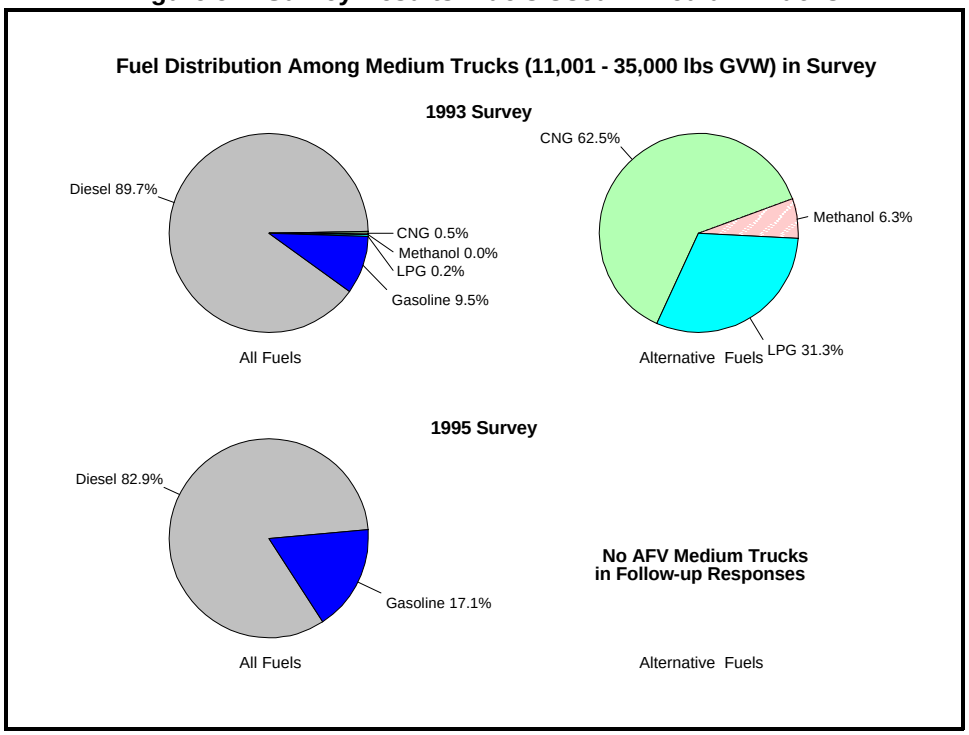

**Figure 5.2 Survey Results: Fuels Used in Automobiles**



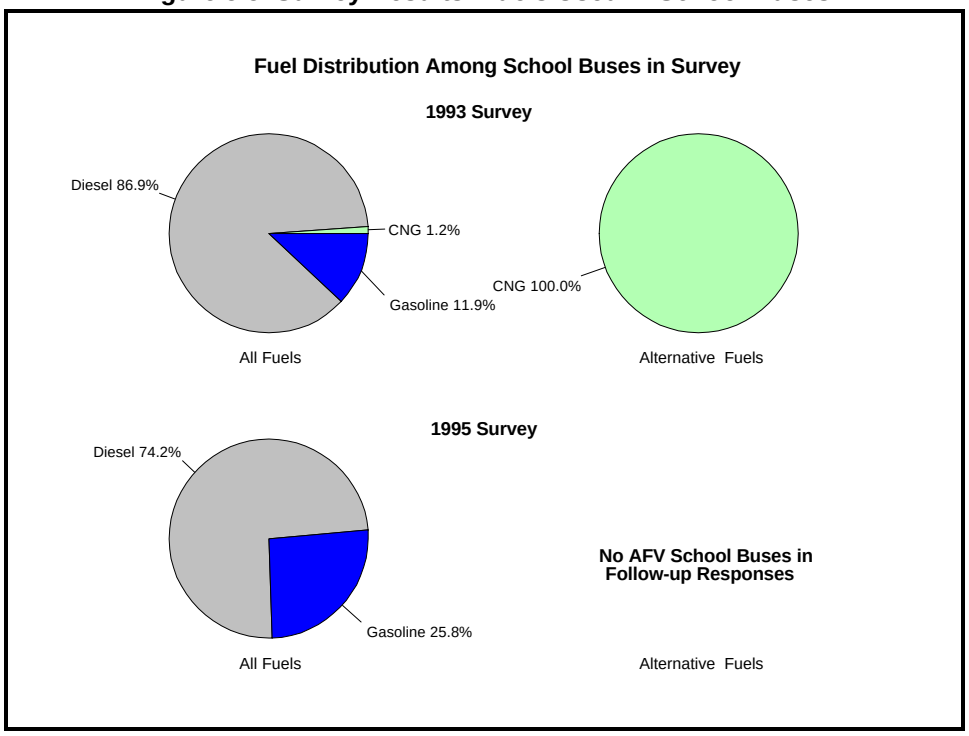
## Figure 5.3 Survey Results: Fuels Used in Light Trucks




## Figure 5.4 Survey Results: Fuels Used in Medium Trucks



## Figure 5.5 Survey Results: Fuels Used in School Buses




## Figure 5.6 Survey Results: Fuels Used in Heavy Trucks

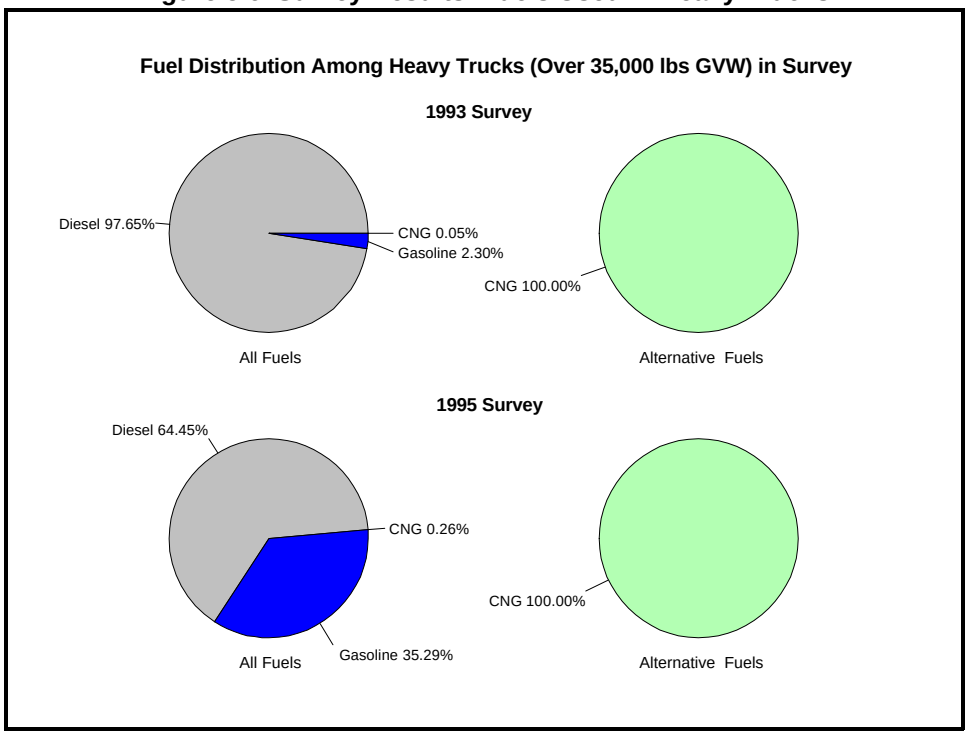
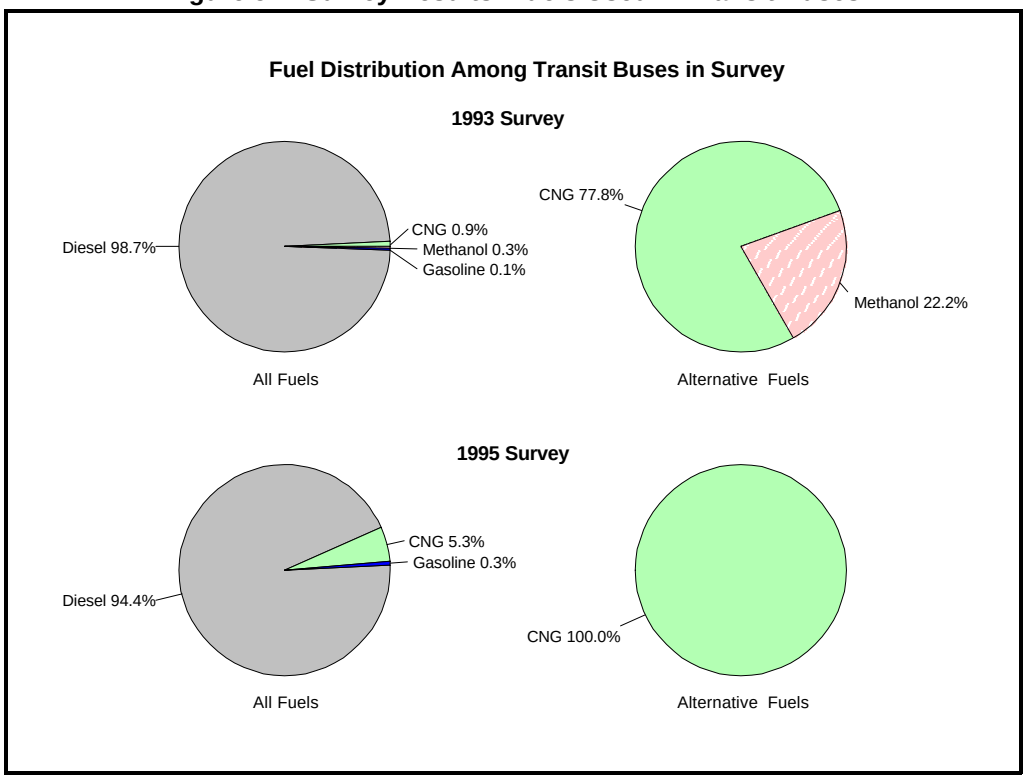


**Figure 5.7 Survey Results: Fuels Used in Transit Buses**




## Why Were AFVs Acquired?

Although the data sample is small, trends are apparent. Many fleet managers had similar feelings about AFVs, both about why they had acquired them and about how well they functioned in the fleet. The reasons AFVs were acquired included lower emissions, availability of outside funding, and a desire to see how they operated in a fleet environment.

The questionnaire asked each fleet manager to rate different factors in the decision to acquire AFVs as either:

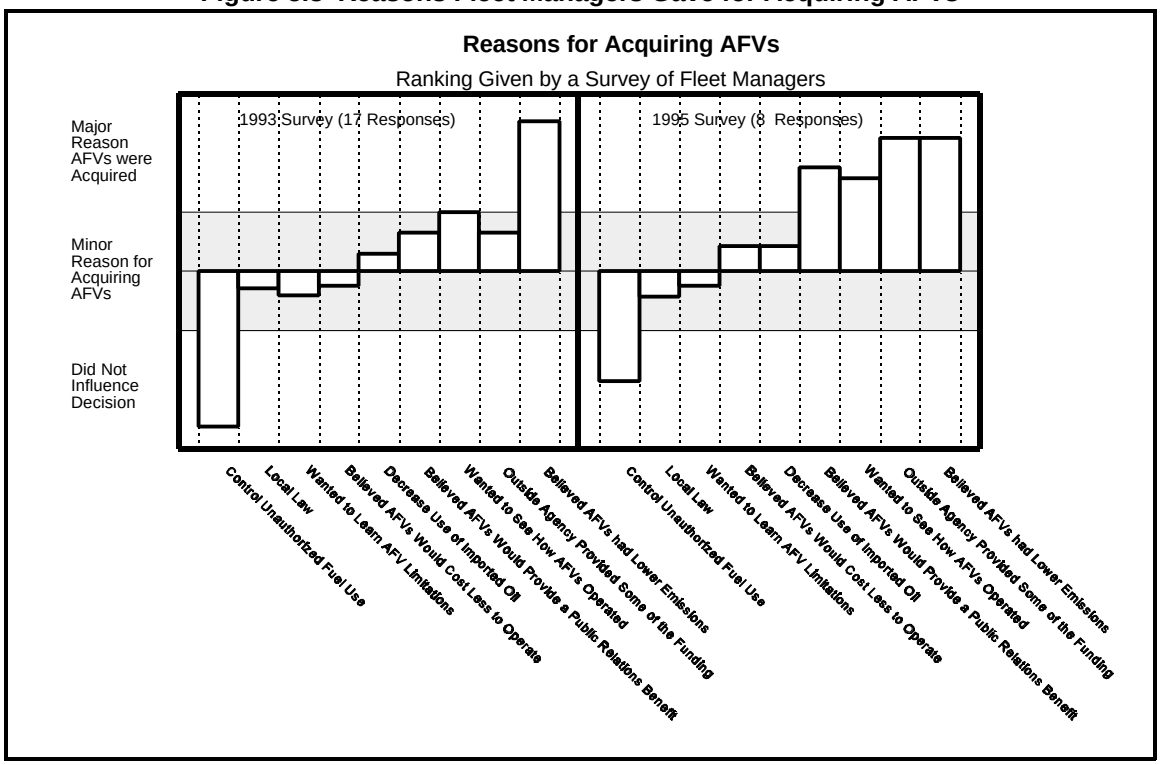
- Not influencing the decision
- Minor influence
- One of the reasons AFVs were considered
- One of the primary reasons AFVs were acquired.

Factors included:

- Local law or administrative policy
- Wanting to learn if AFVs could meet the needs of their operation
- Thought AFVs would be less costly to operate
- Thought AFVs would have lower emissions
- Believed the fleet would gain good publicity by operating AFVs
- Wanting to learn limits of AFVs
- Wanting to reduce United States dependence on imported oil
- Wanted to control unauthorized fuel use
- Availability of funding from an outside agency.

To present these data the responses were assigned a -2 when a factor did not influence a decision, -1 for a minor influence, +1 for one of the reasons AFVs were acquired, and a +2 for a primary reason AFVs were acquired. This system allows the reasons to be presented in order from the most influential to the least influential. These results are shown graphically in Figure 5.8.

**Figure 5.8 Reasons Fleet Managers Gave for Acquiring AFVs**



**How Did Fleet Managers Rate AFVs?**

Fleet managers were asked to compare AFV operations to conventional-vehicle operations in nine key areas, including:

- Fuel cost per mile
- Maintenance cost per mile
- Initial vehicle cost
- Exhaust emissions, noticeable smoke, or odors
- Operating range
- Drivers' acceptance
- Overall vehicle reliability
- Miles between breakdowns
- Refueling procedure.

When comparing AFVs to conventional vehicles, the fleet managers were asked if they performed much worse, slightly worse, about the same, slightly better, or much better. Again, each response was assigned a numerical value, from -2 for much worse to +2 for much better than conventional vehicles. Data were collected for each fuel type, but the number of responses for some fuels was too small to include. Figure 5.9 shows the results graphically for the fleets operating CNG vehicles. As can be seen, the only attribute in which the fleet administrators felt AFVs had an advantage over conventional-fuel vehicles was emissions. There were three areas where AFVs ranked lower than conventional-fuel vehicles. These areas were, in order of increasing AFV disadvantage: refueling procedures, operating range, and initial purchase price. Responses to the second survey showed fleet managers' opinions on miles between breakdowns, reliability, and fuel cost for CNG vehicles had improved somewhat. This may be due to improvement of vehicle technology between 1993 and 1995 or to improvements in conversion equipment installations.

**How Did Fleet Managers Rate AFV Refueling Facilities?**

Fleet managers were asked to rate the convenience of using AFV refueling facilities. For each fuel, managers were asked to compare alternative-fuel refueling facilities with conventional refueling facilities in the following categories:

- Initial refueling facility cost
- Facility operating expenses
- Facility reliability
- Overall refueling convenience

- Personnel needed for refueling operation
- Distance from the base of operation.

Alternative-fuel refueling facilities were generally rated inferior to conventional-fuel refueling facilities. In only three areas were any alternative-fuel refueling facilities rated superior to conventional refueling facilities: electric recharging facilities were rated as being closer to the base operations than conventional offsite refueling facilities, and LPG facilities were rated as having lower operating expenses and better reliability than conventional-fuel facilities. (The electric and LPG facilities that received positive results reflect the opinions of one or two fleet operators, and may not be representative of the overall opinions of electric and LPG fleet managers.)

**How Did the Public Respond to the Use of AFVs?**

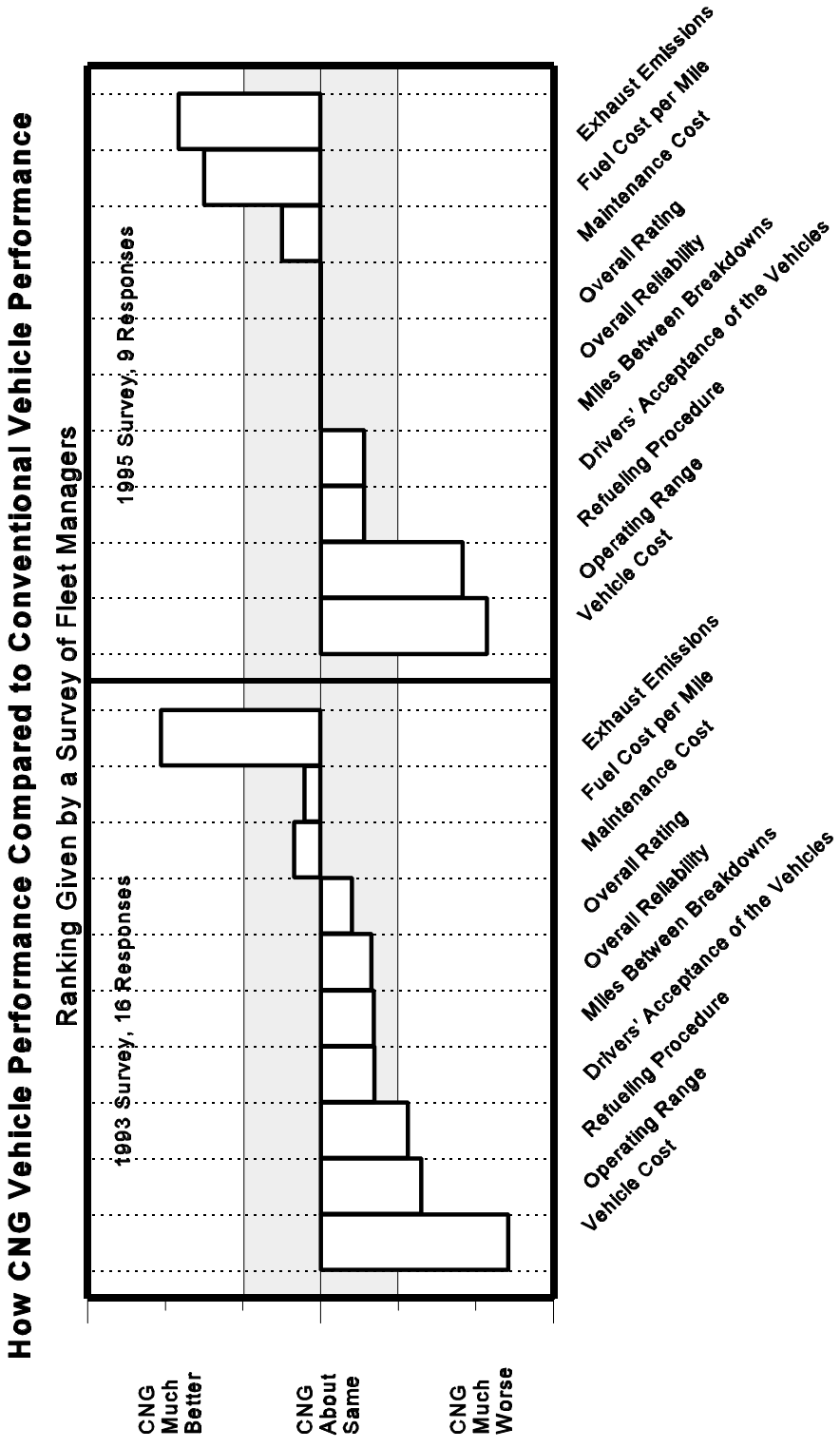
Fleet managers were asked to gauge the volume and type of public comments received for each fuel. The managers were asked to note the method of public response:

- Letters published in local newspaper
- Letters to local officials
- Comments at public hearings
- Letters to fleet operator
- Public outreach programs (surveys, opening ceremonies, etc.).

For each of six topics, the fleet managers were asked to describe the type of comment (i.e., good, bad, or indifferent). The topics included:

- Overall program cost
- Less visible exhaust
- Less exhaust odor
- Domestic energy source
- Refueling facility appearance
- Refueling facility noise.

Figure 5.9 How Fleet Managers Rated CNG Vehicle Performance



In addition to the type and topic of the public comments received, the managers were asked about the volume of comments for each topic. The results of the survey indicate that the public does not normally comment actively on the operation of AFVs. Of the 16 fleet managers whose fleets included AFVs, only four had received any comments on their use of AFVs from the public, and these four reported they had only received comments on three of the topics mentioned in the survey.

One fleet received numerous comments on the overall cost of the program. The fleet manager classified most of these comments as negative. This fleet was a school district, which usually has a budget approved by voters. The other fleets mentioned receiving numerous comments concerning lower emissions and less exhaust odor. Public comments were not received on the other topics suggested by the survey form.

**How Did Drivers Rate AFV Performance?**

Drivers were asked to compare AFV performance to conventional-fuel vehicles. The survey's seven areas of performance included:

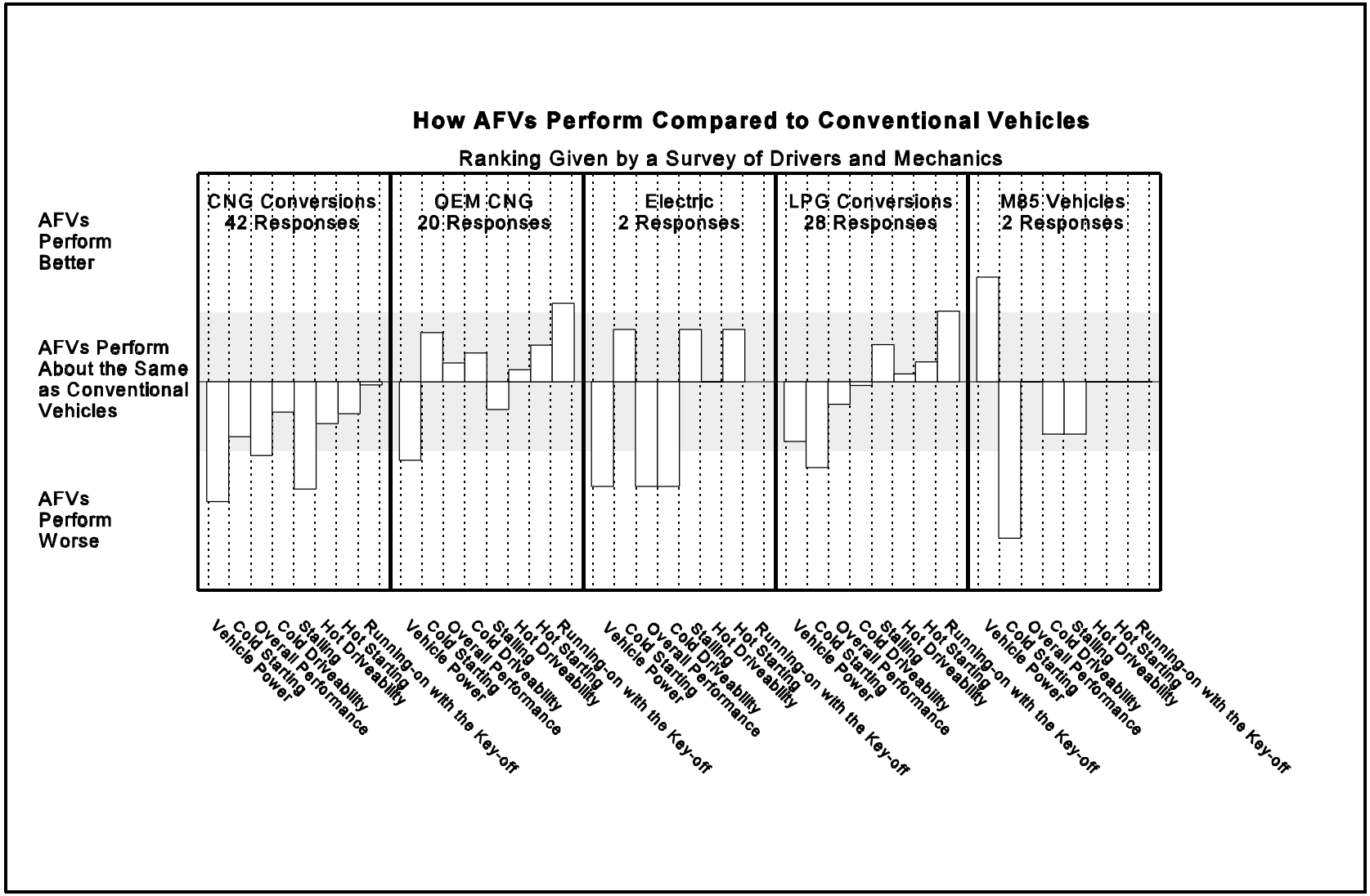
- Cold-starting
- Hot-starting
- Cold drivability
- Hot drivability
- Engine power
- Stalling
- Dieseling (running after the engine is switched off).

Again, for each area the drivers were given a choice of:

- AFVs perform much worse than conventional-fuel vehicles
- AFVs perform slightly worse than conventional-fuel vehicles
- AFVs perform about the same as conventional-fuel vehicles
- AFVs perform slightly better than conventional-fuel vehicles
- AFVs perform much better than conventional-fuel vehicles.

Drivers' responses were assigned a numerical value between -2 and +2, depending on how well they rated AFV performance. Figure 5.10 combines results from the two surveys, showing how drivers rated each of the fuels compared to conventional fuels.

**Figure 5.10 How Drivers of AFVs Rated Vehicle Performance Compared to Conventional Fuel Vehicles (results from 1993 combined with results from 1995)**



- Vehicles converted to operate on CNG were rated as performing poorly compared to OEM CNG vehicles. The conversions were especially downrated for reduced power, stalling, and reduced overall performance.

- The OEM CNG vehicles were rated about equal to conventional vehicles except for decreases in power and better performance with regard to dieseling (running when the ignition has been turned off).

- Electric vehicles were rated much better with regard to dieseling (a non-issue with electrics) and much worse with regard to cold drivability, vehicle power, and overall performance.

- LPG vehicles were cited as being harder to cold-start, and having somewhat less power. They were rated as dieseling somewhat less than their conventional counterparts.

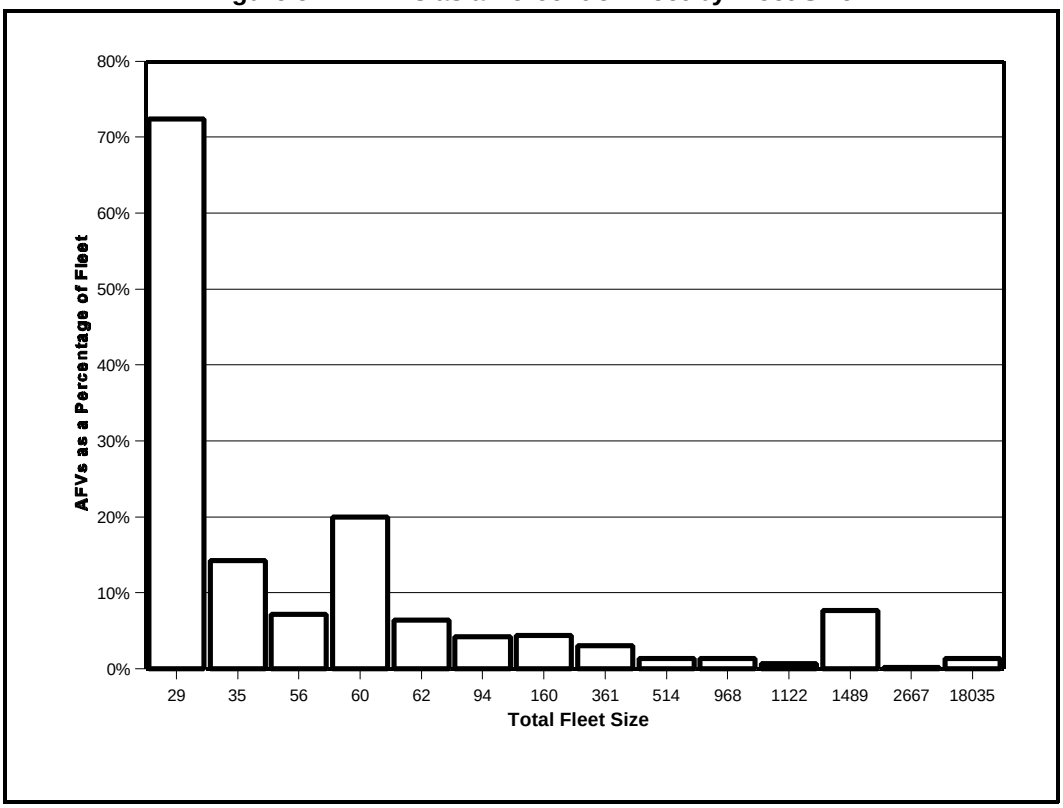
- Methanol vehicles were rated worse than conventional fuels with regard to cold starting, cold drivability and stalling, and rated slightly better than conventional fuels with regard to power.

**DISCUSSION**

The survey results help illuminate reasons why fleet operators have acquired AFVs. Underlying these motivations are statutory requirements (EPACT and CAAA) that will compel many fleet operators in New York State to operate AFVs in the near future (see Appendices H and I). Current operators of AFVs are moving in advance of these requirements and may be eligible for EPACT energy credits. These credits, like Clean Air Act emissions credits, may be traded/exchanged to provide better fleet planning or offsetting revenue. Most fleet administrator survey respondents acquired AFVs to reduce emissions. Other reasons cited for operating AFVs were to gain knowledge (learn if AFVs could meet the needs of their operation), good public relations, and the fact that outside agencies were willing to fund some of the incremental cost.

The actual emissions changes due to AFV operations will not be apparent to most fleet operators during the course of normal fleet operation. Fleets using AFVs should gain enough operating experience to better determine the suitability of AFVs for their operations. Most of the surveyed fleets appear to be operating enough AFVs to determine their capability for wider fleet use. Figure 5.11 shows the percentage of AFVs in the different fleets responding to the surveys. The fact that overall AFVs comprise less than 7% of the average fleet responding to the survey is an indication that fleet administrators are still trying to learn if AFVs have advantages over conventional-fuel vehicles. Figure 5.11 also shows that, in general, the smaller the fleet, the higher the percentage of AFVs being operated. This may indicate that a fleet operator must acquire a certain minimum number of AFVs to evaluate their capabilities, and this minimum number represents a larger portion of a small fleet.

**Figure 5.11 AFVs as a Percent of Fleet by Fleet Size**




Fleet operator surveys revealed and confirmed some of the key areas where AFVs and their supporting infrastructure must improve. The fleet operators expressed accurate and consistent opinions on their fleets and thus are contributing to the maturation of AFV technology.

**Perceived Advantages of AFVs**

By operating AFVs, fleets are gaining the knowledge they need to make informed decisions on how to meet future AFV statutory requirements. Fleet operation of AFVs is a good method of gauging some factors that make AFVs desirable for expanded fleet operation. The only area where fleet administrators feel AFVs offer a significant advantage over conventional-fuel vehicles is in emissions. Emission improvements, however, are difficult for a fleet administrator to judge based solely on vehicle fleet operation.

**Perceived Disadvantages of AFVs**

There are four areas where fleet administrators felt AFV performance was significantly below conventional-fuel vehicle performance. These deficient areas were surprisingly consistent across vehicle and fuel types.

Listed in order of relative deficiency, with the greatest relative deficiency appearing first, the factors where AFVs are at greatest disadvantage are:

- Purchase price
- Refueling procedure
- Operating range, and
- Drivers' acceptance.

**Purchase Price.** The premium paid for AFVs would likely decrease if production of the vehicles increases. For methanol vehicles, the vehicle purchase-price premium could be eliminated with increased production. For the other fuels, it would be difficult for the premium to be totally eliminated.

**Refueling Procedures.** Complaints related to refueling procedures were mostly attributable to the non-liquid alternative fuels. Fleet administrators saw no real difference between conventional-vehicle and methanol-vehicle refueling. Fleet administrators felt CNG refueling facilities were inferior because they were not available on site, were unreliable, had an initial cost that was too high, and were time-consuming and inconvenient. Some of these items could probably be addressed through improved facility design. Other aspects of CNG facilities could be improved, but are not likely to exceed the performance of current conventional refueling facilities. LPG facilities also received some negative comments, mostly related to location and convenience.

**Operating Range.** Limited operating range is due to the lower energy densities of most of the alternative fuels, which make it difficult to duplicate the range of conventional-fuel vehicles. Increased operating ranges can be designed into the vehicles, but trade-offs in other vehicle attributes (e.g., cargo-carrying capacity, acceleration, vehicle weight) may have to be made. New technology in lightweight CNG cylinders and higher-capacity batteries may help to narrow the operating-range gap.

**Drivers' Acceptance.** Drivers' acceptance can be improved by addressing areas where drivers rated AFV performance lower than conventional-fuel vehicles. The survey indicated two areas where drivers rated AFV performance below that of conventional vehicles: engine stalling and low power. Further vehicle development, particularly increased OEM AFV availability, should help to eliminate or decrease these performance weaknesses.