California Consumer and Fleet Manager Reactions to Clean Vehicle Technologies

Results from Statewide Focus Groups and Surveys

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Forward
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This forward, written by Air Resources Board (ARB) staff, provides a summary and key findings of the following report *California Consumer and Fleet Manager Reactions to Clean Vehicle Technologies, Results from Statewide Focus Groups and Surveys* written and submitted to the ARB by Ross-Campbell, Inc.

The mission of the ARB is clean air for all Californians. Although there have been significant improvements in air quality over the last 50 years, more than 90% of Californians still breathe unhealthy air. Even with California having the strictest air quality standards in the world for cars and trucks, motor vehicles continue to be the largest contributor to our air quality problems. In addition to air quality, the ARB is also concerned with reducing California's global warming emissions and dependence on foreign oil.

ARB's motor vehicle emission standards that require manufacturers to sell cleaner vehicles in California are only part of the solution. It will take mass public acceptance and utilization of clean and alternative fuel vehicles to make significant impacts on air quality, energy security and reductions in global warming emissions. Understanding consumer knowledge and attitudes toward advanced vehicle technologies is a first step in increasing the use of these technologies by Californians – and ultimately producing the results our State needs. It is for this reason that the ARB conducted focus groups around the State. Findings from these focus groups will be used to help ARB establish a coordinated statewide communications campaign to address barriers to consumer acceptance of clean, advanced vehicle technologies.

The focus group research brought to light several themes in consumer attitudes toward clean vehicles:

- Today, the main characteristics consumers weigh in their vehicle purchase decision include fuel economy, purchase price, maintenance and reliability, safety, performance and personal or family needs.
- Californians are generally unfamiliar with most advanced technologies and alternative fuel vehicles, or have misperceptions about the vehicles and their capabilities, believing them to be small and lacking in power and style.
- Consumers agree that advanced technologies are better for the environment, but tend to be skeptical that vehicle emissions are a substantial problem.
- While consumers are generally favorable in concept toward cleaner vehicles, few of them believe their own vehicle choice makes a difference.
- Very few Californians factor into their purchase decision the impact of a vehicle on the environment.

- Consumers have little trust in new, “untested” technologies, but they tend to trust those they consider to be their peers with personal experience for vehicle validation.

With these findings in mind, the ARB will launch a statewide campaign in 2007/2008 that builds understanding and interest in advanced vehicle technologies – and begins to establish trust in the minds of consumers that non-traditional vehicles are an option worth considering to meet their personal needs.

Some strategies that will be important in the campaign include:

- Create and promote compelling messages in a way that will appeal to consumers and compete in the mainstream. Topics will include:
    - Information about the wide range of advanced vehicle technologies and alternative fuel vehicles – their availability and how they compare and compete with traditional vehicles
    - The link between personal vehicle choice and air quality, climate change and dependence on foreign oil
- Expand first-hand exposure to clean and alternative fuel vehicle technologies by getting more people in the vehicles, and seeking to demonstrate the capabilities of these vehicles (e.g., power, size, performance).
- Expand and promote ARB’s clean car buyer web site – www.DriveClean.ca.gov to enable first-hand input by “peers” through vehicle reviews
- Promote the label being developed per Assembly Bill1229 that will be placed on all model year 2009 and later vehicles indicating each car’s relative contribution to air pollution and climate change.
- Work to include environmental and sustainable energy considerations as part of the comparison criteria on car buyer web sites (Cars.com, Edmunds.com, etc.)
- Work to expand media coverage of advanced technology vehicles in nontraditional publications, including women’s and family magazines, car buff publications, celebrity media, etc.

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EXECUTIVE SUMMARY

This project was undertaken to assist the California Air Resources Board (ARB) in their continuing efforts to explore consumer awareness and attitudes regarding advanced technology or alternative fuel vehicles. Data were obtained from both focus group interviews and surveys of both general consumers and fleet managers. This section highlights the results of these assessments.

General Consumers

Focus group research revealed that the most important factors influencing California consumers' new vehicle purchase decisions are fuel economy, cost, maintenance and reliability, and safety. Performance and personal or family needs (e.g., children, dogs) were also top considerations. No apparent gender or regional differences were observed. Even so, women were more likely to mention style, luxury, amenities, color, and roominess, whereas men were more likely to emphasize price, durability or reliability, and gas mileage or fuel economy. Both men and women rely on spouses or partners and relevant periodicals, like *Consumer Reports* and *Car and Driver* magazines, for information relevant to making vehicle purchase decisions.

Overall, surveyed respondents were not all that familiar with any of the advanced technology or alternative fuel vehicles, including flex-fuel vehicles. Moreover, participants indicated virtually no familiarity with the acronyms important to vehicle emission levels. These findings remained, regardless of region and gender. Despite this lack of familiarity, they seemed favorable toward the technologies, indicating some concerns about fuel availability, car availability, the looks of the car, the price, and the "trust factor" associated with new, yet untested technology. They hold a "wait and see" attitude. For the most part, they did not want to be early adopters of the technology. Participants generally believed advanced technology and alternative fuel vehicles to be small and lacking in power and style.

Factors that would motivate or keep them from purchasing an advanced technology or alternative fuel vehicle included fuel economy/mileage, fueling convenience, price of fuel/vehicle, safety, looks, size, reliability, and power among others. General consumers indicated that they would be willing to pay more for an alternative fuel car up-front, if operating costs, such as lower fuel and maintenance costs, over the life of the vehicle made up for it.

California consumers generally agree that advanced technology or alternative fuel vehicles are much cleaner to operate than traditional vehicles. Similarly, they report that global warming is a serious problem, and believed that vehicle emissions affect global warming and/or pollution. Curiously, these same consumers reported that the cars they drive make little meaningful difference on environmental health. Still, many participants were skeptical and suspicious of the substantive impact of vehicle emissions on the environment. For those who recognized the environmental impact, they often cited reasons why it wasn't particularly salient to them. On the other hand, some more vocal individuals recognized the impact of emissions on the environment and believed that cars affected global warming. Participants suggested a variety of strategies and resources to reach uninformed California consumers about the implications of vehicle and fuel choices on energy security and the environment.

Previous archival research indicates that most Californians believe in the immediacy of global warming, voice concern about the environment, and support increased fuel efficiency. That said, they remain uninformed and unaware of the specifics of how vehicle emissions contribute to global warming or of the specific environmental benefits of advanced technology or alternative fuel vehicles. With increased gasoline prices, however, Californians indicate a greater willingness to purchase advanced technology or alternative fuel vehicles. These findings are generally consistent with the ARB research reported here on California consumers.

Fleet Managers

Unlike California consumers, California fleet managers from our single group were very familiar with the advanced technology and alternative fuel vehicles, with many of them having used all but hydrogen cars in their fleets. These vehicles were purchased primarily to meet regulatory requirements, set an "environmental example" to the community, and to reduce emissions harmful to the environment. Fleet operators reported that they were trying to "make a statement" by using clean technology vehicles. Rebates made the purchases attractive. Advantages and disadvantages were cited for electric, hybrid, Compressed Natural Gas (CNG), and Liquid Natural Gas (LNG) vehicles. Most fleet managers reported lower fuel and maintenance costs and comparable reliability with traditional vehicles.

The most important factors affecting their purchase decisions of advanced technology or lternative Fuel vehicles were the vendor's ability to deliver the car/truck, low emissions, low maintenance/High reliability, and safety. Also important were fuel economy, cost, ease of the purchase Process, the agency's ability to purchase, performance related to job, being less dependent on foreign oil, and making an environmental statement. Both style/image and whether the vehicle makes a "statement" were rated least likely to influence their decisions.

Fleet managers identified a number of factors that would prevent them from purchasing advanced technology or alternative fuel vehicles for their fleets, ranging from their inability to purchase (rather than lease) and high cost of the vehicles to expensive maintenance and proprietary repair work.

Fleet managers all use and are required to continue to use these technologies. Some talked about the possibility of the hydrogen cars for future use as well. Respondents agreed rather emphatically that the alternative technologies are "not going away." However, fleet managers would like to see some stability and assurance that the alternative fuel infrastructure or vehicles they invest in will be around for a long period of time. All respondents agreed that they could justify paying higher up-front costs for a vehicle if they were able to save money on fuel and maintenance over the life of the product.

California fleet managers strongly believed that advanced technology or alternative fuel vehicles are much cleaner to operate than traditional vehicles. They also believed that Californians prefer cleaner cars and that their organizations would be willing to pay more for the use of cleaner operating cars. Finally, they held strong beliefs about the seriousness of global warming and the impact of emissions on the environment. Unlike general consumers, fleet managers are fully aware of the impact of vehicle emissions on the environment. They want to be *clean*; they know they can no longer continue to rely on *dirty* fossil fuels; and they would like to lessen our dependence on foreign oil. Fleet managers identified a number of professional associations as sources of information and networking that can be used to further inform fleet managers about the environmental impact of new vehicles.

BACKGROUND AND OBJECTIVES

Linking environmental concerns with energy choices and consumption is long overdue. How people perceive the environmental effects of energy alternatives influences their uses of those forms of energy. Many surveys investigate public attitudes toward the environment, energy alternatives, and their impact on people's views on issues ranging from political or policy issues to vehicle purchase choices. In general, these studies indicate relationships between environmental concerns and support for increased fuel

efficiency, tougher emissions standards, and support for alternative energy technologies. The current ARB study reinforces and extends previous research.

The overriding purpose of this project was to understand current California consumer and fleet managers' beliefs and attitudes concerning clean vehicle technologies and alternative fuels. Specifically, we designed and conducted research that revealed detailed information regarding the following objectives:

1. Explore the attitudes, opinions, and perceptions of target individuals regarding car purchases, clean vehicles, and related environmental issues.
2. Assess individuals' personal experiences regarding their purchase or planned purchase of clean vehicles.
3. Identify individuals' preferences for specific messages, communication channels, and media techniques important to their car purchase decisions.
4. Determine potential historical trends in individuals' attitudes, opinions, and preferences regarding clean vehicle technologies.
5. Identify potential similarities and differences in perceptions, opinions, and preferences based upon geographic location and demographic attributes.

RESEARCH DESIGN

In order to address each of the research objectives, we relied on two types of data: focus-group interviews and supplemental surveys. Focus-group interviews provide intensive, in-depth information; surveys yield additional, more objective data. Taken together, these data allowed us to make substantive observations.

Our focus group interviews probed two types of individuals living within California: 1) general consumers and 2) fleet managers. A total of eight group interviews were conducted during October and November, 2006. In an effort to assess participants' responses statewide, participants were recruited from cities throughout the state. Specifically, two focus groups were conducted in each of four targeted California cities:

Fresno (n = 19)
Sunnyvale (n = 20)
Riverside (n = 20)
Long Beach (n = 16)

Participant Demographics. A demographic profile of participants revealed that a total of 75 individuals were interviewed across the four cities. Sixty-nine participants were general consumers, and six represented fleet managers from the Southern California region. With the exception of one general consumer group, group members consisted of either all males or all females. The fleet group consisted of primarily males.

Other demographic information was obtained from the survey data collected by all actual and potential participants for the study. Because group membership is typically limited to a maximum of ten participants per group, five individuals completed the survey who were not also included in the groups. Data obtained from individuals revealed the following demographic profile for the general consumer sample:

- Age: Range = 20 to 74 years; M = 43 years.
- Gender: 37 females, 38 males.
- Marital Status: 45 married, 6 partnered, 23 single.
- Ethnicity: 44 Euroamerican, 17 Latino/a, 6 Asian American, 5 African American, and 3 who indicated "other."
- Political Orientation: 24 conservative, 33 moderate, 17 liberal, and 1 who did not indicate.

With the exception of two group members, all had purchased or leased a new vehicle within the last five years; 32 within the last year and 41 within the last two to five years. All but nine indicated that they anticipated purchasing or leasing a new vehicle within the next five years; 20 within the year and 45 within the next two to five years.

Estimated number of miles driven per day ranged from two to 100; the average estimate was 37 miles.

Demographic information obtained from the fleet managers revealed the following profile:

- Age: Range = 42 to 53 years; Mean = 46.
- Gender: 1 female, 5 males.
- Ethnicity: 4 Euroamerican, 1 Latino, 1 Native American.
- Political Orientation: 0 conservative, 4 moderate, 2 liberal.

On average, fleet managers indicated that their vehicles were driven 37 miles per day (range = 20 to 80 miles). All had added new vehicles to their fleet within the last five years; four within the last year and two within the last two to five years. All six indicated that they anticipated purchasing new vehicles again within the year. All six managers indicated that when purchasing vehicles, they were subject to requirements to use cleaner vehicles or fuels. When purchasing new vehicles, all but two indicated that they were required to rely on low-bid cost.

Interview Protocol. The length of the eight focus-group interviews averaged approximately 70 minutes. Each group interview was designed to facilitate answers to a set of standardized questions derived from the research objectives. Each group interview was conducted and videotaped at a professional facility. After the interviews were completed, the tapes were transcribed, analyzed, and coded. The coding procedures involved three coders, separately (and then together) analyzing the transcriptions and documenting common, overlapping responses ("response themes") to questions posed by the facilitator. When there was a question about either the genuineness or validity of a particular response theme, coders viewed the appropriate segments of the videotapes again. Following these coding procedures, conclusions and interpretations were drawn.

Facilitation. The focus groups conducted for this project employed a semi-structured discussion format with relatively small numbers of participants interacting in groups. The groups were designed and facilitated to obtain relevant information based on a protocol derived from the research objectives. Each of the groups conducted for this project successfully provided a milieu where participant disclosures were encouraged and nurtured by a trained, professional focus group interviewer. The interviewer of each group brought focus to the participants' disclosures by posing and moderating the responses to open-ended questions within a permissive and nonthreatening group setting. In these ways, each of the eight focus groups was conducted successfully, and thus, produced valuable and revealing participant responses regarding the issues being discussed.

All 76 participants indicated their willingness to be interviewed and recorded. Importantly, before each interview, participant anonymity and confidentially were assured. Moreover, the facilitator made it clear to the groups that he had no direct association with any regulatory or governing agency. Participants were told that the purpose of the interviews was to collect data "to help us better understand issues in and around purchasing new vehicles." Our experienced, professional facilitator reported that he had no trouble eliciting meaningful disclosures from any of the groups. In some instances, group discussion was difficult to end, with some participants wanting to continue the interviews beyond the allotted time. All the participants indicated that they had enjoyed the opportunity to discuss issues important to them.

Survey Questionnaires. Two separate survey instruments were developed and targeted toward either general consumers or fleet managers. Surveys were completed by all focus-group participants and, in

some cases, there were extra recruits who were not needed for the actual interviews. All surveys were administered and completed prior to the interviews; in this way, questions were designed to stimulate participants' responses to the facilitators' probes. Additionally, these data were used to supplement and extend the interviews.

Data were statistically analyzed in order to summarize participants' responses. These summaries are integrated into the findings of the focus-group interviews.

RESULTS OF THE DATA ANALYSES

General Consumers

Our analyses of the survey and interview data are reported and interpreted in response to questions focusing on seven issues important to the California consumers' reactions to clean vehicle technologies.

Issue 1: What factors most influence individuals' new vehicle purchase decisions?

Responses to survey questions revealed that individuals rely on a number of diverse issues when making decisions about purchasing a new vehicle. Across all regions of California, the most important factors influencing their decisions are maintenance and reliability, safety, cost and fuel economy. Also important are performance and personal or family needs (e.g., children, dogs). No apparent gender differences were obtained from these statewide samples. Tables 1 and 2 summarize these survey data by region and gender. Response options ranged from 5 (*very likely*) to 1 (*very unlikely*).

Table 1. Factors Influencing Vehicle Purchase Decision by Region

	City			
	Fresno	Sunnyvale	Riverside	Long Beach
	Mean	Mean	Mean	Mean
Low Maintenance/Reliability	5	4	5	5
Safety	5	4	5	5
Cost	5	4	4	5
Fuel Economy	5	4	4	4
Performance	4	4	4	4
Personal/Family Needs	4	4	4	4
Power	3	4	4	3
Style/Image	3	3	4	4
Less Foreign Oil	4	2	4	3
Low Emissions	4	3	3	3
Brand Loyalty	3	3	4	3
High Tech	3	3	3	3
Amenities	3	3	3	2
Makes Environmental Statement	2	2	3	3
Makes a "Statement"	2	2	3	3

Table 2. Factors Influencing Vehicle Purchase Decision by Gender

	Gender	
	Female	Male
	Mean	Mean
Fuel Economy	4	4
Performance	4	4
Power	4	3
Cost	5	4
Personal/Family Needs	4	4
Low Emissions	3	3
Less Foreign Oil	3	3
Makes a "Statement"	2	2
Makes Environmental Statement	2	3
Low Maintenance/Reliability	5	4
High Tech	3	3
Style/Image	3	4
Safety	5	4
Brand Loyalty	3	3
Amenities	3	3

When given the opportunity to discuss these factors in a group context, participants cited many of the same reasons. When making a vehicle purchasing decision, common response themes included:

- Reliability
- Dependability
- Safety
- Looks and style
- Compatibility with family needs (size, roominess, 4-door)
- Mileage
- Price
- Power
- Amenities (navigational system, DVD, leather, IPOD)

Many of the same factors identified in the survey were also reflected in the focus-group interviews. These attributes were common to both men and women and across regions. Both men and women emphasized price, safety, and dependability. Additional attributes appeared to distinguish men from women. Women, for instance, more frequently mentioned style, luxury, amenities, color, roominess, whereas men were more likely to emphasize price, durability or reliability, and gas mileage or fuel economy.

Representative female responses:

- *The looks of the car.*
- *Cost is #1. Safety, but I do like luxury cars.*
- *I have a nice size car that I can take my parents around in, and they could be comfortable without having to climb behind the seat or anything. It's a 4-door. And color is very important to me.*
- *I'm all about the extras. I want the XM radio, the DVD players for the kids, low profile tires … the leather seats.*

- *Safety. I have two kids, and they need to be safe.*
- *Price, definitely and then luxury …. The leather, the power, automatic. Size is a factor and the 4-wheel drive.*
- *Comfort to me is something that the kids can get in and the dogs can get in and the animals can get in…. The seat should fold down so I can have room for camping … and hauling things.*
- *The amenities, the navigation all the way.*
- *My favorite thing in my two new cars is my navigation system. That's the ultimate accessory.*

Representative male responses:

- *First of all the price … and then the quality.*
- *Safety is #1 and then the mileage.*
- *Cost definitely, mileage, the quality of that certain product.*
- *I think the first one is definitely price…and then definitely safety … and then durability.*
- *Reliability is #1.*
- *Dependability, safety, cost, and mileage.*
- *Reliability, functionality, safety, cost, and style.*
- *Price and dependability.*
- *Cargo, weight, and strength.*

Survey responses also suggested a number of sources who were most likely to influence their vehicle purchase decisions. Table 3 summarizes these sources by gender. Response options ranged from 5 (*very likely*) to 1 (*very unlikely*). No gender differences were obtained, with both males and females relying primarily on spouses or partners and relevant periodicals, like *Consumer Reports* and *Car and Driver* magazines.

Table 3. Sources of Influence by Gender

	Gender	
	Female	Male
	Mean	Mean
Spouse/Partner	4	4
Friends	2	3
Manufacturer Ads	3	2
Auto Dealer Sales Staff	2	2
Periodicals	4	4
Latest Trends	2	3

Issue 2: How familiar are general consumers with advanced technology or alternative fuel vehicles?

Survey responses to the itemized list of advanced technology or alternative fuel vehicles revealed no meaningful or substantive differences by either region or gender. Overall, respondents were not all that familiar with any of the technologies (5 = *very familiar*). Average familiarity ranged from 1 (*not at all familiar*) to 3. Among all the regions, Riverside participants were slightly less familiar with the technologies (see Table 4). Males reported slightly more familiarity with the technologies than females (see Table 5).

Table 4. Familiarity with Advanced Technology or Alternative Fuel Vehicles by Region

	City			
	Fresno	Sunnyvale	Riverside	Long Beach
	Mean	Mean	Mean	Mean
Fuel Cell	2	2	2	1
Hydrogen	2	2	2	2
Electric	3	3	2	3
Hybrid	3	3	3	3
Plug-In	2	3	2	2
Ethanol	3	2	1	2
Diesel	3	3	3	3
Biodiesel	2	2	1	1
Natural Gas	3	2	2	2
PZEV	2	2	1	1

Table 5. Familiarity with Advanced Technology or Alternative Fuel Vehicles by Gender

	Gender	
	Female	Male
	Mean	Mean
Fuel Cell	2	2
Hydrogen	2	2
Electric	2	3
Hybrid	3	4
Plug-In	2	3
Ethanol	1	2
Diesel	3	3
Biodiesel	1	2
Natural Gas	2	2
PZEV	1	2

On a scale of 1 (*very unfamiliar*) to 5 (*very familiar*), mean scores across all general consumer groups, regardless of region or gender, indicated virtually no familiarity with acronyms important to vehicle emission levels. Table 6 summarizes these results.

Table 6. Familiarity with Acronyms Associated with Advanced Technology or Alternative Fuel Vehicles

	Mean
LEV	2
ULEV	1
SULEV	1
PZEV	1
AT-PZEV	1
ZEV	1

Focus-group interviews revealed a similar pattern of limited familiarity. With some exceptions, women reported knowing very little about the vehicles listed for the group. Regardless, women seemed favorable

about the technologies. They indicated some concerns about the cost of these vehicles and problems associated with refueling. Sample responses included:

- *I couldn't know any of those.*
- *I've heard about it [hydrogen fuel vehicles]. I don't know much about it.*
- *They [hybrid car drivers] get to ride in the car pool lane.*
- *They're [hybrid cars] really expensive. I heard they're so expensive that it doesn't really pan out for paying for the gas versus paying for a regular car.*
- *I have friends that have one [Prius].*
- *I've heard the name, but I don't know anything about it [hydrogen vehicles].*
- *I've seen the outlets at Costco [for electric vehicles].*
- *I wasn't aware that there were so many in the list.*

Men indicated some familiarity with a number of the prompts provided. Most well known were hybrids, diesel, and electric vehicles. Others knew about hydrogen, biodiesel, and ethanol fuels. Sample responses included:

- *I think each one has so many problems.*
- *Yes, I've heard of them just a little bit about the technology.*
- *I've heard of them.*
- *I've seen some busses that say "powered by natural gas."*
- *Well, the hybrid, it just sounds like the mileage is awesome in it.*
- *What I've seen on billboards and magazines.*
- *No, I've never driven one [natural gas vehicles].*
- *I don't think the performance is good enough on them yet.*
- *We don't have the long-term on the batteries, either.*
- *I think all those kinds of cars, all those alternative fuels, [belong to] a small category of people that are into that …. The people I know who have them are unique in their characteristics. They're not your "average Joes" walking around; they're gadgety people.*

Both male and female participants were equally favorable in concept toward these new vehicle technologies, but they were concerned about a number of issues, including fuel availability, car availability, the looks of the car, the price, and the "trust factor" associated with new, yet untested technology. Both women and men wanted to be convinced by credible facts that the technology would meet their requirements before they would consider buying one.

Overall, men reported being cautious about purchasing the new "experimental" technology. Although favorable about the concept of alternative fuels and advanced technology, they remained skeptical about their stage of development at this point. They hold a "wait and see" attitude. For the most part, they did not want to be early adopters of the technology. A few participants indicated a willingness to purchase the hybrid even if it cost more.

Issue 3: What would motivate general consumers to purchase or keep them from purchasing an advanced technology or alternative fuel vehicle?

Very often motivators and demotivators were discussed as flip sides of the same coin. Most common factors included the following:

- Fuel economy/mileage
- Fueling convenience

- Price of fuel
- Price of vehicle
- Safety
- Looks and style (wanted the vehicle to look more like conventional cars)
- Size (roominess)
- Rebate incentives
- Environmental impact
- Warranties
- Reliability
- Use of the carpool lane
- Power
- Maintenance feasibility and cost
- Re-sale value

Representative responses that either motivated or demotivated included:

- *It has to look like a normal car…. It has room and it has power and it has all the things you would get in a normal car.*
- *I was looking at cars, but the price was way up there and it's like at this point in time I wasn't willing to spend that much and wait for something that I could get that is already there. They have it [regular car] on the lot and I could take it home.*
- *I don't want to drive all over the place trying to find a special fuel or am I going to have to wait for an hour so I can plug in my vehicle next. …[I]t's got to be convenient.*
- *In addition to convenience, reliability. Does it break down a lot?*
- *You can use the car pool lane.*
- *The money that I save [on a hybrid] doesn't nearly compensate for the price that I'm paying for the car.*
- *The equivalent hybrid didn't have the same kind of power and performance. So, I ended up with a non-hybrid model.*
- *I would say if all things were equal to the car that I was most interested in buying, and I had the exact same options, same color choices, same performance, everything was there, I would choose the hybrid, the one that's better for the environment. But all things would have to be equal.*
- *I always thought they [diesel] smoked too much. They're too loud. They're loud.*
- *The price …, the maintenance, and the longevity of the car.*
- *The price is a demotivator.*
- *They're ugly.*
- *I looked at one of the hybrids… and the thing that turned me off was the trunk; there was no trunk space.*
- *I was thinking of waiting for the hybrid to come out, but the price was so much higher that you cannot make it pay…. The only thing that concerns me is long-term battery life and reliability in the long term.*
- *It just doesn't seem natural yet. I'd like to see a couple of my friends own one, and then if it works out for them, then that's what I want.*
- *I guess as soon as they come out with something bigger, I might be more likely [to buy it].*
- *When hybrid technology gets to the point where it's similar to or almost identical to what we have now, and I really don't have to make a choice, it's just which one do I want.*

- *Safer, I'd like to see bigger cars …. Definitely cost.*
- *I'd want to see a comparison between say, a new technology and the old gas technology, in terms of operating costs and things.*
- *I definitely look first at the price. Motivators would be regulatory and market incentives.*
- *Motivators: gas mileage, much better for the environment.*
- *It would have to look like a car. And not like a Toyota Prius.*
- *I wouldn't be interested in buying any of them. I just feel it wouldn't work for me. It wouldn't be comfortable.*
- *Having them around long enough that you know there's enough mechanics who know how to work on it.*
- *For me it would be less reliance on oil. To me, that's a big thing.*
- *Right now the average of a hybrid is only 40 miles to the gallon. So, it's really not that great. I have an Audi, and it makes 33 in its gas.*

Issue 4: Would general consumers pay more for advanced technology or alternative fuel cars up-front, if operating costs, such as lower fuel and maintenance costs, over the life of the vehicle made up for it?

Both women and men said yes, they would. This affirmation was true for respondents across all the groups. Some indicated caveats, such as the need for longer warranties, serviceability, comfort level with the car, and overall reliability.

Issue 5: If a car could run on two different types of fuels (a so-called "flex-fuel" vehicle that could be fueled with either gasoline or an alternative fuel), what factors would influence consumers' decision to use the alternative fuel?

Even with prompts (e.g., distance to refuel, cost of fuel, convenience, refueling time), respondents were somewhat confused by this question, a function in part, of their minimal or no understanding of flex-fuel vehicles. For those who had some grasp of this technology, the following factors were observed:

- Ease of transition or changeover from one fuel to another
- Cost to use the alternative
- Length of time between refueling
- Convenience of fueling
- Availability of fueling (distance, location)
- Cost versus benefit
- Cost of maintenance
- Type of driving (commuting long distances vs. shorter routes)
- Cost of fuel
- Fuel economy or mileage
- Refueling time
- State or market incentives
- Fuel safety
- Potential harm to engine

Representative responses included:

- *Where do you go to buy hydrogen fuel? Where do you go to buy ethanol? I've never seen it sold anywhere in Riverside.*
- *You have to know where to get it.*

- *I would want something clean smelling; I hate the smell of gasoline.*
- *The main thing is availability. Is it available here, how much is it going to cost, and whether it's going to be made in the United Sates.*
- *The safety of it. …[W]hat's going to happen if you get in an accident? You know, they're talking about hydrogen … they've had a lot of explosions because of it.*
- *People don't like change.*
- *You're driving to Vegas and in the middle of the desert, it breaks down. Who do you call? The service can tow you, but who can fix it?*
- *They're getting better. Just think: If you could plug your car in and see you've got excess electricity; you know, plug it into an outlet in your house, like your dryer, and we're good to go.*
- *I think it's a good idea. It would have to be convenient, though. Knowing you could get gas or whatever, having the two options is important.*
- *Convenience. I think it would kind of ease you into it knowing that you have that safety net of the gas in case you are out somewhere where you can't get the alternative fuel.*
- *I think just the availability. It has to be available.*
- *I think convenience is important.*
- *To tell you the truth, the cost, the price. If it costs more than gasoline and it's hard to get it, then I'd rather stick with gas.*
- *The big thing would just be what the market incentives are.*
- *It would be the availability, the access to it, along with the cost. Everybody gets in their comfort zone, and especially I do. We don't like change.*

Issue 6: To what extent do general consumers believe that vehicles contribute to environmental problems locally or nationally? How serious are issues of air pollution and/or global warming to California consumers?

Mean scores (M = 4) from the survey data revealed that California consumers generally agree (1 = *disagree*, 5 = *agree*) that alternative vehicles are much cleaner than traditional vehicles. Similarly, they report that global warming is a serious problem (M = 4). These attitudes were maintained across regions and gender. Moreover, they disagreed (M = 2) that vehicle emissions have no effect on global warming or pollution. Whether Californians would pay more for a cleaner car (M = 3) or would even prefer cleaner cars (M = 3; for Sunnyvale M = 4) is less clear. Finally, California consumers reported that the cars they drive make little meaningful difference on environmental health (M = 2 or 3). Tables 7 and 8 report consumer attitudes about alternative vehicle technologies and the environment by region and gender, respectively.

Table 7. Consumer Attitudes about Alternative Vehicle Technologies and the Environment by Region

	City			
	Fresno	Sunnyvale	Riverside	Long Beach
	Mean	Mean	Mean	Mean
Alternatives vehicles are much cleaner	4	4	4	4
Californians prefer cleaner cars	3	4	3	3
I would pay more for a cleaner car	3	3	3	3
Global warming is a serious problem	4	4	4	4
Emissions have no effect on global warming	2	2	2	2
Emissions have no long-term effect on pollution	2	2	2	2
My car does not make a difference	2	2	3	3

Table 8. Consumer Attitudes about Alternative Vehicle Technologies and the Environment by Gender

	City	
	Female	Male
	Mean	Mean
Alternatives vehicles are much cleaner	4	4
Californians prefer cleaner cars	3	4
I would pay more for a cleaner car	3	3
Global warming is a serious problem	4	4
Emissions have no effect on global warming	2	2
Emissions have no long-term effect on pollution	2	2
My car does not make a difference	3	3

Focus group interviews revealed that, for the most part, participants were skeptical and suspicious of the substantive impact of vehicle emissions on the environment. In particular, participants reported little or no concern for issues associated with global warming. For many of those who recognized the environmental impact, they often cited reasons why it wasn't particularly salient to them. On the other hand, some more vocal individuals recognized the impact of emissions on the environment and believed that cars affected global warming. What follows are representative comments transcribed from the videotapes:

- *It's a big problem. Anybody that lives in Fresno knows that. Like every other kid has asthma.*
- *We've got too many people driving, and it's causing a big problem.*
- *I don't know. I'm not really an environmentalist.*
- *The only thing I know is Al Gore is up there for global warming. That's all I know. I don't know what it is; I have no clue. I don't have time to read the paper. I have no idea what it is or what his movie is about, so I don't know.*
- *It does its part. When we don't have rain or wind in the valley, you can see the smog.*
- *Probably 20/30 percent.*
- *Well, it probably doesn't impact my decision a lot.*
- *To me it's a lot, so I would say it's about 70 percent.*
- *I do think that cars and pollution have quite an impact on the environment. You can see it in the air, you can feel it on your skin, and it's really obvious that it's doing something to the environment. I wish that it influenced my position more*

about which car I selected, but it doesn't really. I feel a bit guilty about this.

- *I think that cars have a lot to do with global warming.*
- *I'm one person and I'm not going to make that much of a difference [if I drive a clean car].*
- *It doesn't affect me at all.*
- *I think they contribute, but I think there are so many other factors that are just as bad or serious, and people/scientists don't know fully what's going on.*
- *I don't think they [scientists] know enough [about global warming] to know, in my opinion. I think they have found that the earth's core underneath us is heating up.*
- *I think the car is one of the primary factors of pollution in society today.*
- *It wasn't on my "top five" list because I think global warming is going to happen either way.*
- *In local air quality, maybe. On the grand scheme of global warming, not particularly.*
- *I don't think global warming would be something that would affect my decision, mostly because it's not scientifically proven that the cars we drive cause global warming.*
- *It's a factor, but I think the cars that are on sale these days, all of them have improved immensely from what they were 10 – 15 years ago.*

Issue 7: What would be the best way to inform consumers about the implications of vehicle and fuel choices on the energy security and the environment?

Participants offered a wide range of suggestions for disseminating relevant information to consumers. Sample comments follow.

- *If you could change the image of it, it would go a long way. Not this marginal, fringe. I mean, it's gone from when someone mentioned that they were buying a hybrid and it was almost like, "Oh, you weird hippy kind of person" to "It's hip; it's cool; it's trendy." Because that's what we like.*
- *Reader's Digest.*
- *Find out who they are, who the influencers are in the community and get them to communicate the information to those around them. Willie Nelson does bio-diesel!*
- *NASCAR.*
- *Scientific American.*
- *NPR.*
- *I would find out my information on the Internet. That would be my main source. I don't read the paper, but I definitely read the Internet and all the, like headlines.*
- *The Internet.*
- *My husband would never go on the Internet and look for stuff. He only knows where Ebay is.*
- *Newspaper.*
- *Focus groups.*
- *Real Simple magazine.*
- *I think you learn more, you learn a lot of things from a group.*
- *Word of mouth. Like she said, her friend had the car. People on TV? I don't know those people.*
- *Testimonials.*
- *Consumer Reports.*
- *I think what gets most people's attention are car ads.*

- *I think it should be up to the auto makers to start pushing it a little bit more.*
- *It has to be a credible person, like Ed Bagley.*
- *There are forums for everything online, and usually, it's people who have the car [who participate] and have had good and bad experiences with the car and know a lot about the product.*
- *Auto magazines.*
- *I would look at independent third parties, places like Consumer Reports, folks that didn't have an economic incentive to tell you one thing.*
- *Very, very specific: Half-time at a Raider's game. I'll stay there, and I'll sit there, and I'll watch it. I remember most of the commercials.*
- *Talk radio.*

To summarize, what would be the best way to inform?

- Inform through kids at school, not the media. Educate the children; the parents will follow.
- Provide testimonials from actors and others with credibility and/or have used the car themselves.
- Target children via PBS.
- Inform students in driver's training classes.
- Target information relevant to various audiences (NASCAR, scientists, etc.)
- Use key influencers, such as celebrities, politicians, and teachers.
- Utilize group discussions.
- Advertise at sporting events.

To summarize, who do consumers go to for information?

- Air Resources Board
- Air District
- Researchers
- Internet, particularly websites that end with *edu* or *gov*
- Message boards (customer reviews) on the Internet
- Advertisements
- *Consumer Reports*, *Real Simple* Magazine
- Auto magazines (e.g., *Car and Driver*)
- Talk radio
- People I trust
- Online forums; testimonials from people who already own the car
- Word of mouth
- Testimonials from friends, co-workers, or family
- Newspaper
- TV, particularly ads during sporting events
- Radio is a good source for commuters
- Car dealers online
- Car manufacturers online

Fleet Managers

Only one of the eight groups interviewed was comprised of fleet managers and participants in that group only represented Southern California. Consequently, any knowledge claims must be viewed in that context. Both the small number of participants and representatives of only one region of the state suggest that any conclusions are subject to regional bias.

Issue 1: What are fleet managers' experiences with advanced technology and alternative fuel vehicles? What do they like/dislike?

Survey data revealed that fleet managers from this group were somewhat or extremely familiar with the advanced technology and alternative fuel vehicles. Table 9 provides the average degree of familiarity with each technology (5 = *very familiar*).

Table 9. Fleet Managers' Familiarity with Advanced Technology or Alternative Fuel Vehicles

	Mean
Fuel Cell	3
Hydrogen	3
Electric	4
Hybrid	4
Plug-In	4
Ethanol	3
Diesel	5
Biodiesel	4
Natural Gas	4
PZEV	4

When asked to translate each acronym on the survey, all but one individual accurately accomplished the task for LEV, ULEV, SULEV, PZEV, and ZEV. For the acronym, AT-PZEV, only 2 translated the term successfully.

Focus-group interviews further indicated that all participants were familiar with and highly knowledgeable about the advanced technology and alternative fuel vehicles, with many of them having used all but hydrogen cars in their fleets. These vehicles were purchased primarily to set an "environmental example" to the community and to reduce emissions harmful to the environment. Fleet owners reported that they were trying to "make a statement" by using clean technology vehicles. Rebates made the purchases attractive. Advantages and disadvantages were cited for each. For example:

Electric:

- *Perfect application for parks, airports, school districts and those kinds of things.*
- *The range of the vehicle [RAV4 Electric], the distance you're able to travel gets less and less as the battery develops a memory, similar to your cell phone.*
- *You have to have specific charging equipment hardwired in to be able to charge the vehicle, and those units are high maintenance and they're specialized with circuit boards. So when they go out, it's not like you just fix it. You're down until … a technician come out and fixes that for you.*
- *We have a lot of electric cars [at the university] because all of our vehicles … are staying around on campus…. We've dramatically decreased our gasoline….*
- *Because we have our own electric utility, we like the idea of vehicles that run on the type of energy that we produce.*
- *We've mixed results with battery-electric vehicles…. Often the trucks don't have enough range for one day…. But overall, people liked the technology. They liked the idea that there was nothing, there was no tailpipe.*
- *Our city, our engineers, and the people who use [electric vehicles] were thrilled with them…. And the infrastructure was there; we had them at the markets, we had them in most of our garages, so it was very convenient…. So, our experience with electric vehicles was outstanding.*
- *I drive 110 miles each day. Electric vehicles will barely get me back home again.*

Hybrid:

- *I like hybrids the best myself [Toyota Prius, the Honda Civic]. It gives consumers the flexibility, the range. And they come with great warranties, relatively low maintenance. And the customers like them. Greater flexibility and range.*
- *You can actually plug the car in [plug-in hybrids], you don't need to go to a special charging station. You can use a 110 volt, and the cord is already in the car…. Of course, it's going to be a slower charge.*

CNG:

- *I like them. I drove one for 5 years…. But in order to get the range again, I had to have extra tanks…. So there again, you're limited operationally; range.*
- *Real clean, relatively no difference in the performance. With a fast fill CNG station, it's relatively comparable to filling with just unleaded gas. No real inconvenience there.*
- *I like CNG because I think it's the cleanest fuel in British technology to hydrogen. It appears … to be the best alternative fuel emission wise, cost savings, and grants that are available from agencies.*
- *I work at the university, and we don't have the luxury of having fueling stations. So if we're going to use CNG or these other alternative fuels, we've got to send somebody off campus, locate a fueling station, maintain these vehicles.*

LNG:

- *Our refuse trucks and street sweepers run on LNG. The problem with the LNG vehicles is the fuel supply. We have one vendor that comes out of state and delivers a couple of trucks ….*

Tables 10A through 10D provide indices of fleet managers' experiences with advanced technology or alternative fuel vehicles. Each table represents managers' responses to a different type of experience with the technology, ranging from fuel costs to overall reliability.

Table 10A. Fuel costs are higher (than traditional vehicles), lower, or about the same?

Most fleet managers in the group reported lower fuel costs for alternative vehicles; one found the fuel costs higher; no one reported the costs to be about the same.

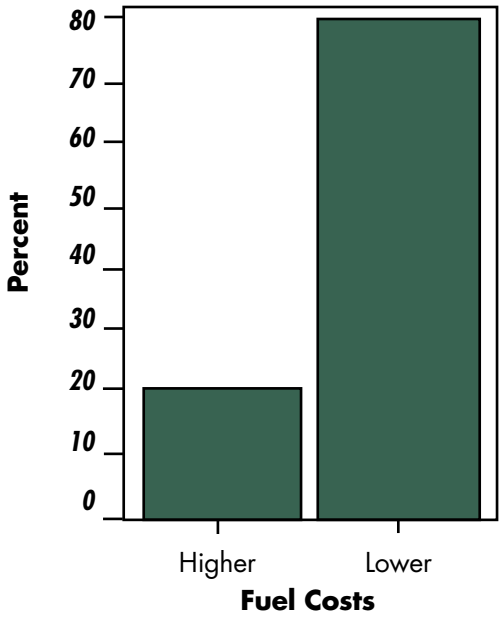


Table 10B. Capacity to fuel on site or must fuel at public facilities?

Group responses were mixed. Two managers relied on fueling at public facilities, and three were able to fuel on site. Responses indicated that on-site fueling was generally limited to larger fleets.

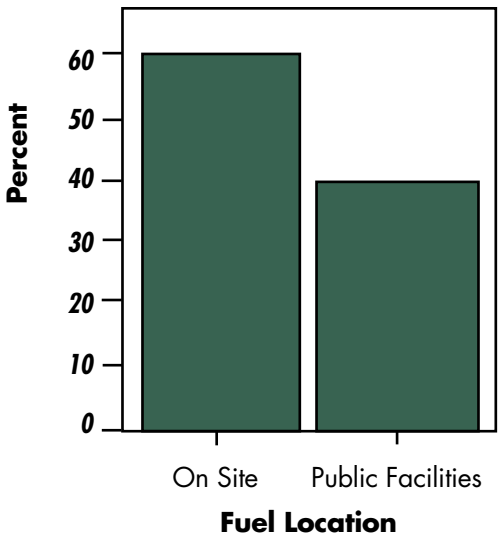


Table 10C. Maintenance costs higher (than traditional vehicles), lower, or about the same?

Only one fleet manager found the cost of maintenance higher with alternative vehicles; another found the cost about the same. Most (n = 3) found the costs to be lower.

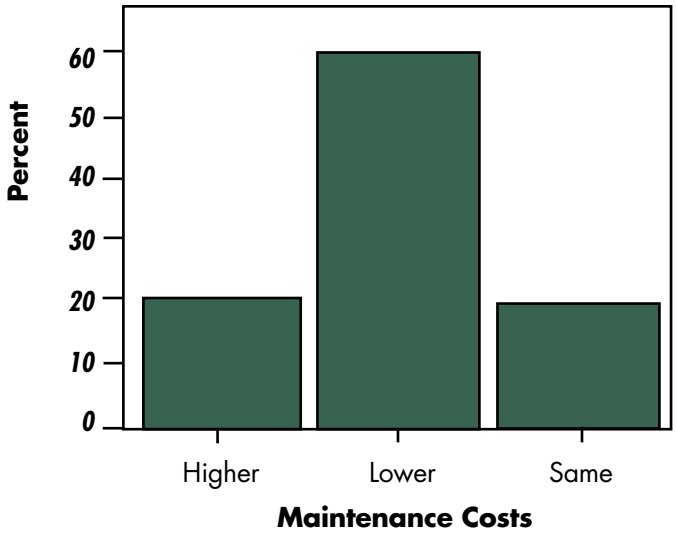
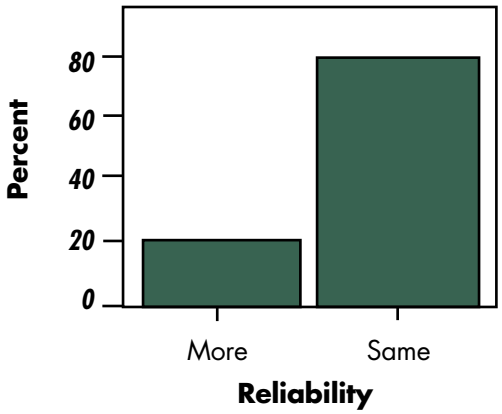


Table 10D. Vehicles are more reliable (than traditional vehicles), less reliable, or about the same?

Most fleet managers in the group perceived alternative vehicles at least as reliable as traditional vehicles; some found them even more so. In no case did a manager report them as less reliable.



Issue 2: What would motivate fleet managers to purchase an advanced technology or alternative fuel vehicle for their fleet?

Survey data revealed that a number of factors influenced fleet managers' purchase decisions. Table 11 provides the average likelihood of relying on each of the factors listed (5 = *very likely*). The top 4 factors included the vendor's ability to deliver, low emissions, low maintenance/ reliability, and safety. Also important were fuel economy, cost, ease of the purchase process, the agency's ability to purchase, performance related to job, being less dependent on foreign oil, and making an environmental statement. Both style/image and whether the vehicle makes a "statement" were rated least likely to influence their decisions.

Table 11. Factors Influencing Fleet Purchasing Decisions

	Mean
Fuel Economy	4
Performance	3
Power	3
Cost	4
Vendor Can Deliver	5
Ease of Purchase	4
Ability to Purchase	4
Performance Related to Job	4
Low Emissions	5
Less Dependent on Foreign Oil	4
Vehicle Makes a Statement	2
Vehicle Makes Environmental Statement	4
Low Maintenances	5
High Tech	3
Style/Image	2
Safety	5
Brand Loyalty	3

Comments from the focus-group interviews reinforced those scores.

- *It's good for business when we demonstrate what we're doing, because you are saying we use zero emission or clean air vehicles.*
- *The city was doing what was environmentally correct for them.*
- *Costs. You know, some people looked at it and said, "Well gosh, it's nice, but wow, it's kind of expensive."*
- *Clean and sound and reliable transportation is obviously a big motivator. The demotivator is just costs.*
- *For the full-size cars, the demotivator would be because it's such a special piece of equipment you don't have the people, the capabilities to maintain those. So, you're reliant on the manufacturers to send out their personnel to come and take care of them.*
- *Takes specialized technicians to work on them.*
- *Range of vehicles.*
- *Limited space. You've got to put extra tanks in important places.*
- *Customer apprehension about the vehicles. A lot of people, "CNG gas? I'm going to blow up."*
- *Fueling infrastructure, whatever it is. Whether it's electrical, whether it's CNG and you have a slow-fill station.*
- *They can ride in the carpool lane.*
- *Another motivator is obviously the PR and the public view.*
- *Fuel economy.*
- *They have a high warranty, 100,000 miles on the battery, or on the hybrid.*

Issue 3: What would keep fleet managers from purchasing an advanced technology or alternative fuel vehicle for their fleet?

Responses to this issue were dispersed throughout the group's discussion. Relevant response themes include:

- Couldn't purchase an electric vehicle; forced to lease.
- High cost.
- Problem with the infrastructure; more recharging stations are needed.
- Insufficient demand; no profit incentive for manufacturers to advance the technology.
- Insufficient grants available.
- City budgets are decreasing.
- Expensive maintenance and proprietary repair work.
- Newness and unknowns associated with the technology.
- Changing refueling technologies; manufacturers stop production.
- Insufficient range.
- Customer apprehension about safety (CNG cars)
- None of the technology is cost effective yet (although the hybrid comes close).

Issue 4: Do drivers require special training to operate or refuel these vehicles? What did they need to know?

Fleet managers indicated that drivers had no problem operating the vehicles. Fueling requires some training. The electric car requires specific charging procedures. CNG requires no fueling training. LNG requires a trained person to do all refueling.

Responses included:

- *There's a tracking procedure on our electric vehicles and all, but that's it.*
- *It's small training. There's no certification required.*
- *We do it on an annual basis, and we review and refresher train.*
- *We have trained guys who fuel all the [LNG] vehicles every day.*
- *CNG is like filling up your gasoline. You pull a nozzle out of the dispenser…. You leave it there until the meter says it full, just like your gas dispenser says…. Disconnect it and drive away.*

Issue 5: Do fleet managers still have alternative vehicles in their fleet? Do they plan to expand their use of these technologies?

Yes, they all use and are required to continue to use these technologies. Some talked about the possibility of the hydrogen cars for future use as well. Respondents agreed rather emphatically that the alternative technologies are "not going away." Some indicated a preference to limit the technologies in their fleets to two or three types, rather than try every new technology that comes along, in order to develop expertise and a level of comfort among drivers and mechanics.

Issue 6: Could they justify paying a higher up-front cost if they were able to save money on fuel and maintenance over the life of the vehicle?

A definite yes to this question; all respondents agreed that they would.

Issue 7: To what extent do fleet managers believe that vehicle emissions contribute to environmental problems locally or nationally? How important is this issue to them when making a purchase decision for their fleet?

Survey findings revealed intensely held beliefs about this issue. Specifically, they strongly believed that alternative vehicles are much cleaner than traditional vehicles. They believed that Californians prefer cleaner cars and that their organizations would be willing to pay more for the use of cleaner cars. Further, they held strong beliefs about the seriousness of global warming and the impact of emissions on the environment. Table 12 summarizes the extent to which respondents agreed to each of the factors listed (5 = *agree*).

Table 12. Fleet Managers' Beliefs about Advanced Technology or Alternative Fuel Vehicles and the Environment

	Mean
Alternative vehicles are much cleaner	5
Californians prefer cleaner cars	4
My organization would pay more for cleaner cars	4
Global warming is a serious issue	5
Emissions have no effect on global warming	1
Emissions have no long-term effect on pollution	1

Focus-group discussions confirmed these beliefs. Fleet managers indicated that the issue of the environment is very important to them. They continually move toward the use of cleaner and cleaner vehicles. By law, they are required to test and use the newer technologies. They believe that it is the role of government to lead by example and serve as pioneers of cleaner technologies.

- *From my standpoint, there's no real discussion about that. I mean, it's not like we sit down and plot how much we're going to reduce emissions. It's simply an everyday occurrence for us.*
- *All this is kind of geared toward California's need to reduce greenhouse gas emissions. We want to be the leader in the country.*
- *We continue, just continually, go and get cleaner and cleaner vehicles. We're required to. It's all part of our thought process.*
- *And then there's the Legislature. You can't have a diesel engine that's close to a classroom.*
- *To minimize dependence, to minimize greenhouse gasses.*
- *Our city council recently elected to sign onto the United Nations Urban Environmental Courts, which has goals similar to Kyoto Protocols. It wants to be seen as a green city, as a sustainable community.*

Unlike general consumers, fleet managers are fully aware of the impact of vehicle emissions on the environment. They want to be clean; they know they can no longer continue to rely on dirty fossil fuels; and they would like to lessen our dependence on foreign oil.

Issue 8: What would be the best way to inform fleet managers about the environmental impact of new vehicles? Who would they go to for more information about advanced technology or alternative fuel cars and trucks?

The following associations were identified as sources of information and networking:

- Municipal Equipment Maintenance Association
- California County Fleet Managers Association (e-mail networking system among fleet managers throughout the state)
- Department of General Services
- South Coast Air Quality Management District
- CSU Fleet Manager Group (e-mail networking system among fleet managers in the California State University system)
- Electric Power Research Institute (EPRI)
- American Council for an Energy Efficient Economy (ACEEE)
- American Public Power Association (APPA)
- Southern California Public Power Authority (SCPPA)
- Air Resources Board

RESULTS OF ARCHIVAL DATA RESEARCH

This analysis focuses on the relevant research documents provided by the Air Resources Board (ARB) for the purposes of this project, primarily the Public Policy Institute of California (PPIC) surveys, with additional research included as appropriate.

Public attitudes toward energy alternatives (e.g., gas, nuclear, and coal) are often associated with public perception of the impact of those alternatives on the environment (Farhar, 1994). However, most studies and reports also find that other considerations, such as cost, figure strongly into public attitudes toward and choice to use energy alternatives (Green Coast, 2005; Schweinsberg, 2006). The present ARB study reinforces the findings of previous studies, regarding the link between environmental concerns and alternative energy choices. Unlike many previous studies, the present ARB study directly addresses the specifics of potential consumer interest in advanced technology and alternative fuel vehicles based on a California-wide, broad population demographic.

The Public Policy Institute of California (PPIC) surveys have consistently shown that Californians are concerned with global warming. All of the PPIC surveys have addressed issues of air pollution and global warming. The wording of questions about these environmental issues often varied from survey to survey. In addition, some of the items most relevant to the present ARB survey, such as questions about public attitudes toward alternative fuel vehicles, were not asked in each and every PPIC survey. Despite the inability, in most cases, to directly compare the surveys, general trends in public attitudes are evident.

Since 2003, roughly three-quarters surveyed in the PPIC surveys have indicated that they believed some action should be taken to counteract the effects of global warming. Similarly, Californians have shown a consistent belief that air pollution is a significant problem and that vehicle emissions are a primary cause (as noted in other surveys and articles, most people do not distinguish between tailpipe emissions – "smog" – and greenhouse gases). In the 2006 PPIC survey, Californians identified vehicles as a primary cause of air pollutant emissions. Forty-four percent of people surveyed indicated that vehicle emissions contributed the most to air pollution, which compares similarly with 42% of those surveyed in July 2005 and 47% in July 2003.

However, it is not clear that Californians' environmental concerns would necessarily affect their personal behaviors and choices. In the 2003 survey, only 13% and 31% were personally very concerned or somewhat concerned, respectively, that their own vehicle(s) polluted too much. This question concerning their personal vehicles' contributions was not asked in subsequent surveys. Nevertheless, the 2003 finding shows a similar attitude to that found in the present ARB study. That is, California consumers remain skeptical and suspicious of the substantive impact of their own vehicle emissions on the environment.

In both the 2003 PPIC survey and the present ARB study, data support an apparent disconnect between Californians' general concerns about the role of vehicle emissions in polluting the environment and their personal beliefs about their vehicles' role (and, presumably the costs they should personally bear). This disconnect raises questions about the willingness of consumers to invest in advanced technology and alternative fuel vehicles based primarily on environmental concerns. In the present ARB study, both women and men said yes (with some caveats), they would pay more for advanced technology or alternative fuel cars up-front, if operating costs, such as lower fuel and maintenance costs, over the life of the vehicle made up for it. However, if the question of increased price for an advanced technology and alternative fuel vehicle was not associated with lower direct costs (such as fuel costs), but rather the fact that advanced technology and alternative fuel vehicles are cleaner, the question of whether they would pay more is less clear.

Californians also have shown support for increased fuel efficiency standards. As with their belief in the contribution of vehicle emissions with air pollution, it appears that many Californians perceive that contribution as someone else's problem. Previous PPIC data presents an unclear historical background due to variations in the surveys employed. In general, however, Californians have consistently supported increased standards for emissions and fuel efficiency. The support for increased fuel efficiency (often showing a similar level of support for increased emission standards) has remained relatively constant over the PPIC surveys from 2003 – 2005. While roughly three-quarters consistently supported increased emissions and/or fuel efficiency standards throughout the PPIC survey period, it is not clear that this increase has always translated into a belief that they would personally bear an increased cost, or feel the need to. For example, the 2003 PPIC survey showed that most Californians were very satisfied (28%) or somewhat satisfied (50%) with their primary vehicle's fuel economy. (This question was not repeated in subsequent PPIC surveys.)

As the surveys continued and gas prices climbed, survey questions increasingly focused on gas price issues and consumers' willingness to purchase more fuel efficient vehicles, such as advanced technology and alternative fuel vehicles, even with increased up-front costs. PPIC survey results show that by 2004, 63% would seriously consider buying or leasing a hybrid or electric vehicle – but only 47% would if it increased vehicle cost. In 2005, 69% would seriously consider buying or leasing a hybrid or electric vehicle – but only 56% would if it increased vehicle cost. (Specific questions targeting alternative fuel vehicles were not asked in the 2006 survey.) These results can be placed in the context of questions in both surveys that showed similar levels of willingness to purchase fuel-efficient vehicles because of increased gas costs.

The present ARB survey extends the PPIC results, revealing that consumers are willing to pay more for these vehicles upfront if they represented a decrease in operating costs, such as gas costs. It remains unclear whether *clean* vehicles would sufficiently motivate consumer purchase decisions. The present ARB survey further supports the importance of gas costs in decision-making, with fuel economy ranked highest as a motivator, followed closely by performance.

The current ARB survey showed that the public, in general, had very little specific knowledge of advanced technology and alternative fuel vehicles and even less knowledge of acronyms associated with these vehicles. These findings are supported by other research regarding consumer knowledge of alternative fuel vehicle technologies, including recent studies by Oak Ridge National Laboratory and the EPA (Nye, 2003; PRR, 2005). In context, this ARB study extends previous research identifying cost factors as primary in vehicle purchasing decisions. A Green Coast marketing survey found that even those considered "eco-friendly" weighted weekly fuel cost significantly higher than pollution as a factor in alternative fuel vehicle purchasing decisions (Green Coast, 2005).

Few recent surveys have examined fleet managers. The current ARB study supports and extends the findings of most surveys. Fleet managers generally reported that reliability and maintenance costs were similar, if not lower, than traditional vehicles; drivers reported few, if any difficulties in operating the vehicles; and fleet managers were aware and supportive of the environmental benefits of using advanced technology and alternative fuel vehicles (PHH Arval, 2004; Whalen, 1997; Whalen, 1999).

Overall, few surveys dealt specifically with the best outreach methods for the general public or fleet managers, though some did address problems with specific outreach/information sources (Nye, 2003; PRR, 2005). Thus, the current ARB findings meaningfully contribute to the extant literature.

FINAL REMARKS

The results from the ARB survey and focus group interviews provide insight into California consumer and fleet manager beliefs, attitudes, and opinions regarding advanced technology and alternative fuel vehicles. Given the limited number of participants in this study, our conclusions must be viewed as tentative rather than definitive. By framing findings within prior research, the following research-based profiles of California consumers and fleet managers can be made.

California consumers are largely unfamiliar with advanced technology and alternative fuel vehicles, and they are not particularly motivated to purchase such non-traditional cars and trucks. Concerns about the environment do not appear to influence their personal purchase decisions either. Currently, they would not likely make significant sacrifices with the vehicle they drive for the sake of the environment.

Consumers are skeptical about the relative impact of vehicle emissions on the environment overall, and they do not particularly believe that their own purchases or habits can significantly alter air quality or affect global warming. Global warming remains an abstract concept to them and beyond their personal control. Those who are unpersuaded by arguments of global warming might still be interested in advanced technology and alternative fuel vehicles as a means of reducing the U.S. dependence on foreign oil.

Consumers are unwilling or uninterested in becoming early adopters of the new vehicle technologies. Preferring instead to "wait and see," they are reluctant to try anything too new that may be unreliable, unsafe, or costly. They would rather wait a few years until the technology is perfected and the vehicle prices drop. Their apparent resistance might also be overcome by offering technologies that look and perform like their current, more traditional vehicles. Consumers indicated a willingness to consider the purchase of advanced technology and alternative fuel vehicle, only if the vehicle was substantially similar to their current conventional vehicle in size, features, power, and price.

A very different profile emerges for California fleet managers. Obligated by regulatory requirements to use advanced technology and/or alternative fuel vehicles, fleet managers report high familiarity and high levels of satisfaction with these technologies. Forced to innovate, fleet managers are experienced and comfortable with a variety of these vehicles. As early adopters, they are proud to associate with vehicles that "make a statement" to the larger community. Managers seem to be keenly aware of their leadership role in setting a good example for the residents in their jurisdiction.

As intense believers in the hazards of pollution and global warming, fleet managers recognize the adverse influences of vehicle emissions on the environment. Managers see the issue of air quality and global warming from a "big picture" perspective; they are aware that quality of life for their communities depends on finding solutions to problems of air quality. They are proactive in adopting or "trying out" the latest innovations in advanced technology and alternative fuel vehicles. At the same time, they urge manufacturers against making major and frequent changes in the technology that have the potential to disrupt their ability to conduct normal business operations.

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