Table 25: Defining purposes for the vehicle chosen in Situation Two by life cycle groups

Defining purpose chosen in **Situation Two** Count	**Life cycle** C0As	C1As	C2As	C3As	**Total**
Commute	49	33	34	30	146
Chauffeur Children	4	17	16	4	41
Weekend/Vacation	32	12	9	12	65
Styling	15	1	3	4	23
Total	100	63	62	50	275

Test	**chi-square**	**Prob.>chi-square**
Likelihood Ratio	39.380	0.0000
Pearson	36.848	0.0000

Table 26: Defining purposes for the preferred next car in Part One by life cycle groups

Defining purpose of next purchase in **Part One** (prior to choices offered in our study) Count	**Life cycle** C0As	C1As	C2As	C3As	**Total**
Commute	39	22	28	22	111
Chauffeur Children	12	29	11	6	58
Weekend/Vacation	25	10	12	12	59
Styling	24	2	11	10	47
	100	63	62	50	275

Test	**chi-square**	**Prob.>chi-square**
Likelihood Ratio	37.562	0.0000
Pearson	37.788	0.0000

We have established there is a statistically significant relationship between defining purpose and life cycle within the sub-sample of our potential hybrid households that both belong to one of the four largest life cycle groups and chose one of the four most frequent defining trip purposes. Next, we compare their choices of a defining purpose for the vehicle selected in Situation Two and their defining purposes for their preferred body styles. This provides insights into whether the choice set of vehicles we provided to our respondents affected their choice of defining purpose. That is, by offering households a greater variety of vehicles, did we allow them to reshape their vehicle holdings in ways they could not in a market that offers only gasoline vehicles? The answer to this question appears to be yes.

Table 26 on the previous page shows the cross-classification of the defining purpose of the preferred body style by life cycle for these same 275 households. This table also indicates there is a significant relationship between these two variables in this sub-sample, but examination of the table indicates the same type of relationships do not exist in this table as in Table 25. Over all life cycle groups, fewer households stated the defining purpose of their next new vehicle was to commute to work or school. This is especially true in households with older children. Also, nearly half the households with the youngest children stated the defining purpose of their preferred body style was to chauffeur children. Across all four life cycles, households were more likely to express that vehicle styling defined their preferred body style choice than they were to state that vehicle styling defined their body style choice in Situation Two.

Thus, there exists a relationship between life cycle and both the defining purpose of the preferred body style and the defining purpose of the chosen body style.[4] Not only is there a statistically significant change in the distribution of defining purposes of the preferred body styles and the chosen body styles, but the changes are different within different life cycle groups. Households chose to own different sets of vehicles in our choice experiments, than they had imagined they would own at the beginning of the questionnaire. The differences are related to the composition and age of the households.

To test for the combined effects of life cycle and defining purpose on the types of vehicles chosen in Situation Two, we estimate a model that includes all three variables.[5] Again, we restrict our analysis to the four most common defining purposes (commute, chauffeur

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[4] To test whether the differences between these two tables are significant requires we construct an hypothesis test based on log-linear models of the three variables in question—life cycle group, defining purpose of the preferred body style and defining purpose of the chosen body style. We construct the test by calculating a likelihood ratio chi-square for a model in which we hold the distribution of the fitted values constant across life cycle categories and another in which we allow the fitted values to vary by life cycle. We condition both models on the joint distribution of defining purpose of the preferred body style and defining purpose of the chosen body style. The likelihood ratio chi-square for the first model is 96.62, with 48 degrees of freedom; that of the second model is 79.28, with 45 degrees of freedom. The difference of two chi-square measures is itself chi-square distributed, with degrees of freedom equal to the difference in degrees of freedom. Thus the likelihood ratio for our test is 17.34, with three degrees of freedom. Based on the preceding result, we reject the null hypothesis that the joint distribution of defining purposes is independent of life cycle category.

[5] We estimate a log-linear model that includes life cycle, defining purpose and vehicle type of the chosen vehicle in Situation Two. The model that best reproduces this table includes interactions between life cycle and defining purpose and between defining purpose and vehicle type. The likelihood ratio chi-square is 24.63, with 24 degrees of freedom. Thus, we do not reject the null hypothesis that the distribution generated by the model is the same as the observed distribution.

children, weekend and vacation, and styling) and the four most common life cycle categories (all households with two or more adults, with or without children of any age). About 60 percent of our entire sample is in this sub-sample. We collapse all EV types into one category of vehicle type and retain reformulated gasoline and natural gas as distinct types. The observed distribution of households within the table identified by this three-variable model is shown in Table 27.

The model that best fits this data is consistent with the set of relationships shown in Figure 21. The decision-making process this model represents assumes that a household's life cycle is determined by choices made either prior to, or external to, vehicle purchase decisions. Given that a household is in a particular life cycle, it chooses a body style for the vehicle it will purchase next based on the travel needs of the household through the assignment of a defining purpose for the vehicles being considered for purchase and the fleet of vehicles the household owns. Once a defining purpose is chosen, the household then chooses the type of vehicle—electric, natural gas, or reformulated gasoline. The effect of this decision-making process on vehicle type choices can be seen in Table 28 where we show some of the observed vehicle type choice frequencies.

Figure 21: Model structure for life cycle, defining purpose and vehicle type

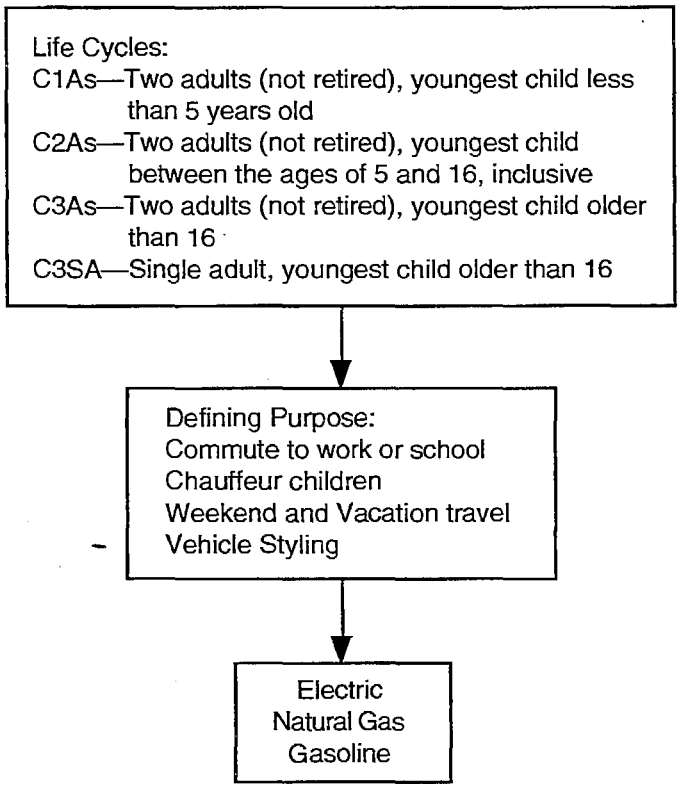


Table 27: Observed distribution of vehicle type chosen in Situation Two by life cycle and defining purpose

Vehicle Type: **All Electric vehicles (includes hybrids, NEVs, CEVs, REVs)**					
Defining purpose of Chosen Body Style	**Life cycle**				**Total**
Observed Count	C0As	C1As	C2As	C3As	
Commute	25	21	16	18	**80**
Chauffeur Children	2	11	10	1	**24**
Weekend/Vacation	8	2	1	3	14
Styling	6	1	2	3	12
Total	41	35	29	25	130

Vehicle Type: **Natural Gas**					
Defining purpose of Chosen Body Style	**Life cycle**				**Total**
Observed Count	C0As	C1As	C2As	C3As	
Commute	5	5	7	2	19
Chauffeur Children	2	1	2	3	8
Weekend/Vacation	6	2	0	5	**13**
Styling	4	0	1	0	5
Total	17	8	10	10	45

Vehicle Type: **Gasoline**					
Defining purpose of Chosen Body Style	**Life cycle**				**Total**
Observed Count	C0As	C1As	C2As	C3As	
Commute	19	7	11	10	47
Chauffeur Children	0	5	4	0	9
Weekend/Vacation	17	8	8	4	**37**
Styling	5	0	0	1	6
Total	41	20	23	15	99

Table 28: Observed vehicle type choices for selected subsets of life cycle category and defining purpose, percent

Household life cycle and defining purpose of the body style chosen in Situation Two	**Situation Two vehicle type choices of these households, %** [1]	
Two or more adults, youngest child is younger than 16 years old (C1As, C2As), defining purpose is to chauffeur children.	Electric	62
	Natural Gas	12
	Reformulated Gasoline	26
Two or more adults, youngest child 5 years old or younger (C1As), defining purpose is to commute to work or school	Electric	67
	Natural Gas	14
	Reformulated Gasoline	19
Two or more adults, youngest child is between 6 and 15 years old, inclusive (C2As), defining purpose is to commute to work or school	Electric	47
	Natural Gas	21
	Reformulated Gasoline	32
Two or more adults, youngest child is 16 years old or older (C3As), defining purpose is to commute to work or school	Electric	59
	Natural Gas	9
	Reformulated Gasoline	31
Single adult, youngest child is 16 years old or older (C3SA), defining purpose is to commute to work or school	Electric	60
	Natural Gas	0
	Reformulated Gasoline	40
Two or more adults (not retired), no children (C0As), defining purpose is to commute to work or school	Electric	52
	Natural Gas	14
	Reformulated Gasoline	33
Two or more retired adults, no children, defining purpose is weekend and vacation travel	Electric	0
	Natural Gas	50
	Reformulated Gasoline	50
All households	Electric	46
	Natural Gas	19
	Reformulated Gasoline	34

1. "Electric" includes REVs, CEVs, NEVs and Hybrids.

At the bottom of Table 28, we see that across our entire sample 46 percent of households chose one of the electric vehicles, 19 percent chose a natural gas vehicle and 34 percent chose a reformulated gasoline vehicle. Among households whose youngest child is 5 years old or younger and whose defining purpose for the vehicle they chose in Situation Two was either commuting or chauffeuring children, approximately two-thirds chose one of the EVs. Across all life cycles (except households whose youngest child is between the ages of 6 and 15 inclusive), more than half of the households whose defining trip purpose for the vehicle they chose in Situation Two was commuting chose an EV. Equally dramatic, no retired household that defined their Situation Two choice by weekend and vacation travel chose an EV.

Summary of Life cycle Definitions of Market Segments

Using the life cycle definitions from the Nationwide Personal Transportation Study, we identify some groups of households that are more likely to buy electric, natural gas or gasoline vehicles. Households with two or more adults (with or without children) appear more likely to buy EVs than are households of retired persons or households of single adults whose youngest child is older than 15. We offer no conclusions about other single adult households with children because so few appear in our sample. Households of two or more adults whose youngest child is 15 years old or younger are more likely to buy a regional EV than they are to buy gasoline vehicle. These are the only households that we can say are more likely to buy one particular type of EV than a gasoline vehicle. However, for all life cycle groups, all EVs taken together are chosen more often than are gasoline or natural gas vehicles.

We do observe differences across life cycle groups in the reasons why households choose a particular body style. Households of two or more adults who have young children chose commute vehicles and vehicles to chauffeur children. Households of two or more non-retired adults with older children primarily chose commute vehicles. Households of two or more adults who have no children at home either chose their next new vehicle for weekend and vacation travel or based on vehicle styling.

Analyzing life cycle, defining purpose for the vehicle, and vehicle type choices reveals that young families were very much more likely to choose an EV than any other type of vehicle, if their defining purpose for the vehicle was either to chauffeur children or commute to work or school. Commuting in general was associated with a higher probability of choosing an EV, regardless of life cycle. Among those households that did not choose EVs were retired households who selected a vehicle for weekend and vacation travel.

HOW GREEN IS THE MARKET?

The most significant reason for introducing electric vehicles is their potential to reduce emissions from the transportation sector. However, when the source of emissions are the vehicles operated by the millions of households in California, the environmental benefits of ZEVs will only be realized when large numbers of consumers cooperate towards attaining those benefits. Thus far, California has not imposed prices on energy and pollution that would encourage private choices that would produce improved environmental quality. The inability to appropriately price resources, products and services so that private choices actually achieve socially desired goals is a classic problem in a free marketplace. It is one reason that governments intervene in markets to ensure public health and security and to protect access to basic resources and rights. In the case of zero emissions vehicles, it is widely believed that some public subsidies of electric vehicles may be necessary to insure sales and spur innovation. Still, there remains the possibility that some consumers will be so motivated by the environmental benefits of ZEVs that they would buy electric vehicles even if they were priced much higher than gasoline vehicles. These consumers are green buyers.

Consumers have shown an increasing tendency in the recent past to purchase green goods or to participates in some other form of environmental consumerism (Turrentine 1995). Such activism has not always been predictable. The electric vehicle market, as a green market, has its own peculiarities that we discuss below. Of course environmental concerns vary from region to region, and person to person. Some studies of green consumerism show that education levels have a significant effect on environmental concern, as does location—those who live in urban centers linked closely to an area of scenic beauty are regularly among the most environmentally progressive.

Green products have been successfully marketed at a premium a price, but most often these products are common and relatively low cost items—recycled paper products are one example. Wealthy home owners have been willing to invest larger sums in energy efficiency products (Turrentine 1995). Additionally, consumer demand for some products has lead to new regulations, such as the Montreal Protocol, in 1992, which controls ozone aggressive products. That agreement resulted from consumer boycotts of ozone damaging aerosols (Kempton 1994). Consumers have also shown a willingness to participate in community sponsored recycling programs when curbside pickup is provided.

California has some of the strongest environmental sentiments, as well as some of the strongest movements to reduce regulation. Despite the current conservative trend in American politics, replete with its backlash against top down environmental regulation (as part of a more general backlash against perceived government "interference"), there is still widespread support for environmentalism as a way of life in American society. Polls continue to find that some 80% of Americans consider themselves to be environmentally concerned (Kempton 1994).

In the case of electric vehicles, there are large differences of opinion as to whether some consumers will be sufficiently motivated by their environmental concerns to pay a premium for a clean vehicle. Recent opinion polls have shown wide popularity for the idea of zero emissions vehicles and electric vehicles in particular (e.g., Dohring 1994). In our own preliminary work on the EV market, we found the idea of EVs to be immensely popular with a group of Pasadena residents who test drove EVs (Turrentine et al 1992).

As discussed in the introduction to this report, some market studies have tried to identify consumers with particularly strong environmental sentiments—the green consumers who might be willing to pay a premium for electric vehicles. While this strategy is attractive to car makers who wish to identify those who will pay more for their products, it unduly constrains the potential market and fails to identify those consumer whose lifestyles match well the capabilities and characteristics of electric vehicles.

Understanding the "feel good" effect in surveys

Understanding the impact of social concerns on consumer responses to hypothetical choice situations, such as those posed about electric vehicles, is a thorny issue. There is the risk we may elicit what some researchers call "feel good" answers, especially in studies of consumer attitudes toward things perceived to be socially desirable. After all, who is against clean air? But the *feel good* label overemphasizes the affective (emotional) quality of consumer responses and under emphasizes their political, expressive and communicative intentions. In responding to a hypothetical question, consumers may be expressing both an affective intention to pay higher prices for an electric vehicle (the "feel good" or "I'm a good person" answer) but may also be taking the opportunity to express a political opinion they hope will influence the policy outcome of the survey. In a real purchase situation, they may not be able to carry out their affective intentions or express their political opinion. What blocks them is their budget, not their sincerity. Such optimism is not solely constrained to social issues such as clean air. We see evidence in this survey of unfulfilled wants and desires with respect to more prosaic features of the cars our respondents would like to buy—a higher than expected percentage of households expressed the intention to buy a sports car or a full size car for their next new vehicle than we would expect based on actual vehicle registrations and sales.

Dealing with this problem is not easy, yet it affects the confidence researchers can have in whether responses to their hypothetical choice experiments mirror "real" purchase intentions. We cannot second guess consumers intentions. On the other hand, we must expect a certain amount of optimism among consumers in a survey situation if we are presenting something socially desirable, whether its a zero emission vehicle or a shiny red sports car. And such optimism should not be merely written off as "feel good" answers. Consumers are expressing desires. In the case of the shiny red sports car, the response of manufacturers would not be to simply dismiss the overly optimistic desires of consumers, rather they would find a way of giving the consumer what they want within the households' budget.

We have made every effort to reduce the problem of simplistic and overly optimistic answers. We did so by better educating the consumer about the features of electric vehicle technology and by grounding household responses to EVs in their own behavior. Because we would expect some optimism, we emphasized practical impacts of EV technologies on household lifestyle choices and expressions. We allowed respondents to express their environmental opinions and attitudes toward the environment separate from vehicle purchases making it clear that such attitudes are not compromised by a decision to purchase something other than an electric car. Only after they have spent several days chronicling their travel and activities and learning about EV technology do we ask them to express a purchase intention.

One important type of influence on consumer purchases in an actual market for electric vehicles will be social and cultural issues. These are dependent on many historical variables, such as consumer education programs, the political climate, the promotional efforts of auto companies and communities and the sense of urgency about the quality of air. Below we explore some attitudes about such market variables.

Are we poised to launch a green transportation market?

When we sought alternative explanations to the hybrid household hypothesis, we looked first at environmental attitudes. We found that no single measure of environmentalism explained choices between EVs and gasoline vehicles as well as our initial hypothesis. But we find several reasons to believe that we live in a society still very concerned about the environment. Based on those concerns, we believe certain historical conditions are correct for the beginning of a new environmental ethic in the market for private transportation services.

There is a high degree of concern with the environment. Recall from Figure 7 that 80% of our respondents felt environmental problems were the biggest, or among the biggest, of our times. With different degrees of urgency, all these people felt lifestyle changes will be required to solve environmental problems. We showed that concern translates into a greater likeliness of choosing an EV. Lastly, virtually the entire sample indicates they will pay something more for products that are less polluting. Sometimes this is very little, 3%, and some times it is substantial, 30% or more.

Perceived toxicity and unpleasantness of gasoline

Another historical process, concomitant with a developing market for ZEVs, is evolving consumer perceptions of gasoline itself and the possibility of directing a public health campaign against this fuel when cleaner alternatives become available. In the absence of any alternatives, consumers cannot overtly express their perceptions of gasoline. The smell and perceived toxicity of gasoline are background issue for consumers. That is, without an alternative product in the market for comparison, little concern is voiced by consumers about exposure to gasoline and researchers have not asked about these perceptions. We believe that as alternatives come to market, perceptions of gasoline may become more important influences on consumer choice and politics. Electric and natural gas vehicles

offer consumers this opportunity. We developed this hypothesis after hearing several participants in focus groups and interviews discuss their dislike of the smell of gasoline. To examine this issue, we asked our respondents about their perceptions of the toxicity and smell of gasoline.

We find that people generally have very negative perceptions of gasoline. In Figure 22, we see that nearly half our sample perceives gasoline to be extremely toxic. Only 7 percent perceive it to be relatively safe. Equally important, very few people are undecided, only 10 percent indicate they don't know whether gasoline is toxic. Almost everyone has an opinion of the toxicity of gasoline, and almost all those opinions are strongly or moderately negative. Perceptions of the smell of gasoline are less strong, but still quite negative. Almost two-thirds (63%) of our respondents find the smell of gasoline unpleasant and only 11% find it pleasant. Twenty-six percent of respondents indicate they don't particularly notice the smell of gasoline.

Figure 22: Perceived Toxicity of Gasoline

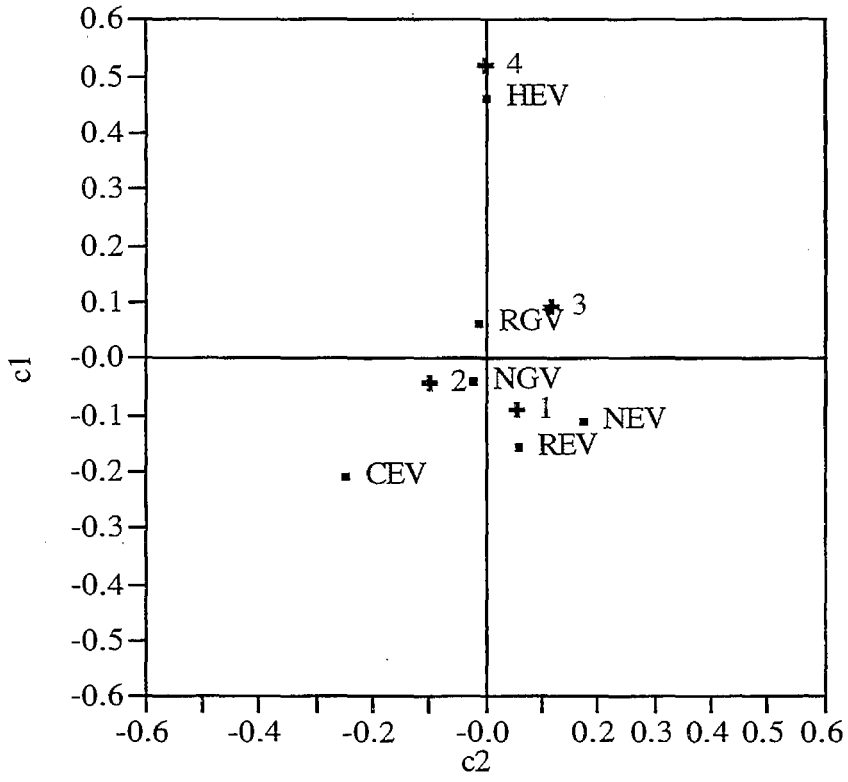
We find there is a correlation between the perceived toxicity of gasoline and respondents choices of vehicle types, but not between perceptions of the smell of gasoline and vehicle type choices. We show the results of a correspondence analysis between vehicle type choices in Situation Two and perceptions of the toxicity of gasoline in Figure 23. The cross-tabulation of the data is given in Table 29. Since we asked both respondents in each household, to respond to these questions, the sample size in this table is larger than the number of households.

Recall that correspondence analysis presents a visual presentation of the relationships in a cross-classification table. Each point represents a row or column from the table and the

figure illustrates which rows or columns are distributed more like each other. The horizontal axis separates vehicle types into one group of pure electric and natural gas vehicles and another group of reformulated gasoline (RGV) and hybrid electric vehicles. Also, people who do not believe gasoline is particularly toxic or do not have an opinion are located on one side of this axis—the same side as those who chose a gasoline vehicle or hybrid EV. People who believe gasoline is moderately or strongly toxic are located on the other side with the groups of people who chose electric and natural gas vehicles.

The distribution of vehicle type choices in Situation Two is more similar among households who believe gasoline is toxic than it is to households who do not believe, or do not know, whether gasoline is toxic. Further, a belief that gasoline is toxic is associated with a greater likeliness to choose a pure electric or natural gas vehicle than we would expect if perceptions of gasoline toxicity and vehicle type choice were independent. It is interesting to note, that the hybrid electric vehicle, whose range extender motor runs on reformulated gasoline, is perceived to be more like a gasoline vehicle than an electric vehicle on the attribute of gasoline toxicity.

Figure 23: Correspondence Analysis of Gasoline Toxicity and Vehicle Type Choice in Situation Two



1. extremely toxic 2. somewhat toxic 3. don't know 4. relatively safe

Table 29: Vehicle type choice in Situation Two by perceived gasoline toxicity.

Vehicle Type Count	**Perceived gasoline toxicity**				**Total**
	Highly Toxic	Moderately Toxic	Relatively Safe	Don't Know	
Neighborhoods EV	**22**	11	2	3	38
Community EV	22	**27**	2	2	53
Regional EV	**116**	85	**18**	12	231
Hybrid EV	30	28	**7**	**20**	85
Gasoline, Reform	130	113	**22**	**35**	300
Natural Gas	**81**	62	6	16	165
	401	326	57	88	872

Chi-square Test	**Chi-Square**	**Prob.>chi-square**
Likelihood Ratio	34.827	0.0026
Pearson	36.827	0.0013

The cells in Table 29 shown in **bold** contain more households than the null hypothesis of independence predicts. These cells verify the conclusions of the correspondence analysis. The test statistics for Table 29 indicate we reject the hypothesis that perceptions of gasoline's toxicity and choice of vehicle type are independent .

Though the smell of gasoline does not elicit systematic choices of vehicle type, we believe it may become an important symbol of gasoline as an environmentally inferior fuel. We note two recent news stories that indicate our position is plausible. First, a story regarding alleged adverse health effects from exposure to reformulated gasoline vapors during vehicle refueling in Wisconsin received national coverage. Second, a major oil company has begun an advertising campaign touting that its fuel pumps have been refitted with improved vapor recovery systems and higher speed fuel delivery systems. We note that refueling is the one occasion when motorists are in closest proximity to gasoline. While the advertisements do not point this out, the new pumps clearly have the capability to reduce consumers exposure to gasoline fumes by reducing the exposure time and the level of vapors.

It is possible that like the current anti-cigarette campaign, consumers may become more sensitized to the smell of gasoline. The campaign against smoking gained momentum when the dangers of "second-hand smoke" were documented. However, the social mores that support the campaign were formed over the last few years. One stimulus to this social change was the smell of cigarette smoke. Many negative images of smoking have their basis in our sense of smell, e.g., the smell of someone else's smoke ruining your dining experience or your dry cleaning bill to remove the smell of co-workers' smoke.

Responses of participants to current environmental problems

We also probed about how this group is currently responding to environmental problems.

- 17 households said they are actively protesting environmental problems
- 315 households said they are working on their own lifestyles
- 82 households said they are sympathetic but uninvolved
- 36 households said they working on other problems but not the environment

We asked what are the major obstacles to better environmental lifestyles in their own lives

- 54 households said they are too lazy
- 109 households said they don't have enough time
- 175 households said the world is not set up to do the right thing
- 28 households said green products cost too much
- 20 households said green products don't work as well

We also asked what kinds of things they are doing to improve the environment. On this question they could check more than one category.

- 435 households said they recycle
- 383 households said they conserve water
- 191 households said they buy green products
- 164 households said they try to reduce car use
- 126 households said they make donations to action groups
- 13 households said they take direct political action
- 4 households said they do nothing

In a question designed to elicit attitudes about how environmental problems should be handled, we asked participants *How we should handle the disposal of toxic household batteries which have become a problem in landfills?*

- 6 households agreed we should fine manufacturers
- 16 households agreed we should make disposable batteries illegal
- 195 households agreed we should develop a community disposal program
- 235 households agreed we should have a public education program to encourage use of rechargeable batteries and alternatives.

Summary of environmental responses

We believe only a small group of affluent, environmentally motivated consumers will be able to purchase EVs if they are sold at high prices—a widely expected, but not necessary, condition of the early EV market. Most car buyers we have interviewed in previous research have already stretched their budgets to buy the cars they own. But as we have discussed here and elsewhere, consumers demonstrate very positive attitudes towards EVs and express a willingness to investigate the potential purchase and use of electric vehicles. Once they begin these investigations, we believe a significant number (indeed, most) of potential hybrid households will find their adaptations to EVs with driving ranges of 100 miles or less are so minimal that the environmental benefits will overshadow these minor adjustments in travel. Thus while we do not expect most potential hybrid households to pay high premiums, we do expect them to choose EVs over gasoline when all else is equal (or nearly equal) to gain environmental benefits. The environmental attitudes expressed in this study show that there is broad support for the idea of zero emissions vehicles and a government sponsored campaign to promote clean transportation alternatives such as EVs.

While affluent consumers can be counted on for a small percentage of sales of higher priced vehicles in the early years of the market, efforts to create a green market should be targeted at hybrid households. The goal should be to provide high quality, high amenity, short range electric vehicles at comparable prices to gasoline vehicles and to promote the health benefits as well as the practicality of electric vehicles to this market segment. The efforts of government to support sales among this segment should be measured and constant, an effort at a reliable partnership with a critical set of clients, a partnership not unlike that of curbside recycling programs.

Several historical processes coincide with the introduction of ZEVs. There is still widespread belief that environmental problems are among our most important and immediate issues. Environmental problems are seen as so important that they warrant lifestyle changes and most people are willing to pay something more for products that are less polluting. The process of introducing alternatives to gasoline will embody other historical processes that have not been previously addressed. As electric vehicles become available, and consumers are able to act on their environmental and health concerns through the purchase of EVs, not only tailpipe emissions, but contact with, and smell of, gasoline itself may be stigmatized in a similar manner to tobacco smells.

CONCLUSIONS

The Market for ZEVs

Throughout our research, we have emphasized the role of fundamentally new attributes of limited driving range, home recharging, and zero tailpipe emissions on likely consumer response to electric vehicles. Given that emphasis, this survey was based on a mix of assumptions. Some are grounded in demonstrated technologies. Others are based on expected developments. Still others were chosen because they furthered our primary cause—to understand how households that own more than one car are likely respond to the mix of new and familiar attributes represented by EVs.

Based on our assumptions about our sample and on demonstrated EV technologies, the results of our choice experiments indicate there is adequate consumer demand for electric vehicles to meet or exceed the 1998 CARB mandate for the sale of ZEVs in California. These vehicles include small (sub-compact) and compact sedans, wagons, sport-utility vehicles, pick-up trucks and sports cars with driving ranges of 60 to 150 miles and mid-size body styles with ranges of 60 to 80 miles. Based on the conclusions reported here, we believe that the potential market for these vehicles will be no less than 7 percent of the total light-duty vehicle market. Based on a projection of 1.4 million new light-duty vehicle sales in California in 1998, this represents the sale of 98,000 electric vehicles. This estimate does not include any sales to commercial or government fleets, nor does it include any sales to households who lie outside our sample of *potential hybrid households.*

The mandate requires in 1998 that 2 percent of light-duty vehicles offered for sale be ZEVs. For purposes of the mandate, only light-duty vehicles whose laden weight is less than 3,750 lb. are subject to the mandate. Also, in 1998, only manufacturers who sell more than 30,000 vehicles per year in California are subject to the mandate. Again, using a total light-duty vehicle sales projection for the year 1998 of 1.4 million vehicles and adjusting for the laden weight limit and the limit on affected manufacturers, we believe the ZEV mandate will require that no more than 20,000 ZEVs be offered for sale in 1998.

By the year 2003, the ZEV mandate requires that 10 percent of light-duty vehicles offered for sale in California be ZEVs. The same weight restriction applies, but all vehicle manufacturers who sell more than 3,500 light-duty vehicles in California will also be required to meet the mandate. To meet these higher sales figures will require one or more of the following: sales of EVs of the same body styles and range capabilities described above to households that do not meet the definition of a *potential hybrid household* used in this study; sales of such vehicles to commercial and government fleets; or the development of electrical energy storage technologies that allow the construction of mid-size electric vehicles with driving ranges up to 140 miles.

The size of the market gap between sales of vehicles based on current technology and the year 2003 requirement is about 50 percent of the projected ZEV market demand. That is, if

there are about 98,000 ZEVs sold in 1998, about half this many more, or a total of about 150,000 ZEVs, will need to be sold in the year 2003. If mid-size vehicles can be built that have the range capabilities of our regional EVs, the market potential for electric vehicles expands to between 13 and 15 percent of the light-duty vehicle market, or between 185,000 and 215,000 vehicles. Thus this development alone would allow the ZEV mandate to be fulfilled. If changes and improvements to energy storage technologies do not allow for mid-size electric vehicles with ranges up to 140 miles by the year 2003, then it would appear that approximately 50,000 EVs would have to be sold to market segments that are not represented in this study.

Though we offered only one of many possible different hybrid EV designs to our participants, we note that if "range-extender" hybrid EVs are built, and sold as ULEVs, the total electrified share of the light-duty vehicle market rises to between 16 and 19 percent.

Validation of Hypotheses and Research Design Assumptions

The Hybrid Household Hypothesis

The basic conclusions of this study substantiate several of our research design hypotheses and assumptions. The *hybrid household hypothesis* has been supported strongly by the evidence in this study. Within our sample of *potential hybrid households* a driving range limit on one household vehicle is not a significant barrier to the purchase of an EV.

To reiterate our definitions for readers who have passed over earlier sections, a *hybrid household* is a one that combines electric and gasoline vehicles in its stock of vehicles. In contrast to a hybrid vehicle—that combines electric and heat engine drive systems in one vehicle—a hybrid household chooses two vehicles with different types of energy systems and then must allocate household travel accordingly. We note that a household that chooses a hybrid electric vehicle is also a hybrid household. For purposes of this study, we defined *potential hybrid households* as those households who own two or more light-duty vehicles, own at least one vehicle that is not a full-size vehicle, own relatively newer vehicles, and buy new vehicles. We note this definition specifically excludes several types of households that may buy EVs. However, we believe that the barriers to EV purchase and use faced by the households that meet our selection criteria are inherently smaller than those faced by households outside our sample. We discuss this further in the following section on market development. In fact, the responses to the survey indicate an even greater market share for limited range, home recharged electric vehicles

The market for EVs will be segmented by demand for driving range

We have demonstrated that our assumption that the market for EVs can be segmented by driving range is true. Any number of households opted for shorter range electric vehicles when longer range EVs were available. Any number of households opted for a short range EVs when long range gasoline vehicles were available. It is precisely this demonstrated willingness of households to choose shorter range vehicles that opens up the market for ZEVs to electric vehicles that can be built and sold based on today's EV technology.

We believe from the results of this study and previous studies we have done, that it is more important and more profitable to market less expensive battery-powered EVs capable of traveling between 40 and 120 miles than it is to develop more expensive battery-powered vehicles with ranges in excess of 150 miles. The marginal utility for electric vehicles with ranges beyond 150 miles will be small so long as there are gasoline vehicles on the road that have 300-400 miles of range. Therefore, so long as people persist in believing that EVs must mimic the long range and short refueling times of gasoline cars, practical and profitable EVs will elude us until new electric energy storage technologies can be commercialized. However, we argue that the utility of short range, home recharged EVs lies primarily in their complementary relation to gasoline vehicles, in their ability to provide diversified transportation services in a hybrid household. Marketed as such, it appears to us that both the state of the art in technology and consumer demand are adequate to launch the market for ZEVs.

Households are the unit of analysis

We designed this survey to allow the household to participate in the vehicle purchase and use decisions. The choice of households as the unit of analysis has several corollaries. Analysis of households implies the choice of the next new vehicle is made within the context of the household's resources, including the vehicles it already owns. It implies that the value a household places on a vehicle being considered for purchase is partly a function of the vehicles the household already owns, not just on the attributes of the vehicle being purchased.

Do household members make decisions together about vehicle purchases and use? Over 70 percent of the households in our sample indicated that more than one person in the household was involved in the decision-making process. The households most likely to have only one person making the decisions were households of one adult whose youngest child is older than 16. Do households consider their existing vehicle holdings when making vehicle purchase decisions? The evidence here is less direct, but the fact that households will change from a preferred body style and will change the defining purpose for a particular vehicle indicates they are considering not only what vehicles they own, but all the vehicles they will own once they have actually purchased their next new vehicle.

An Image of EV Market Development

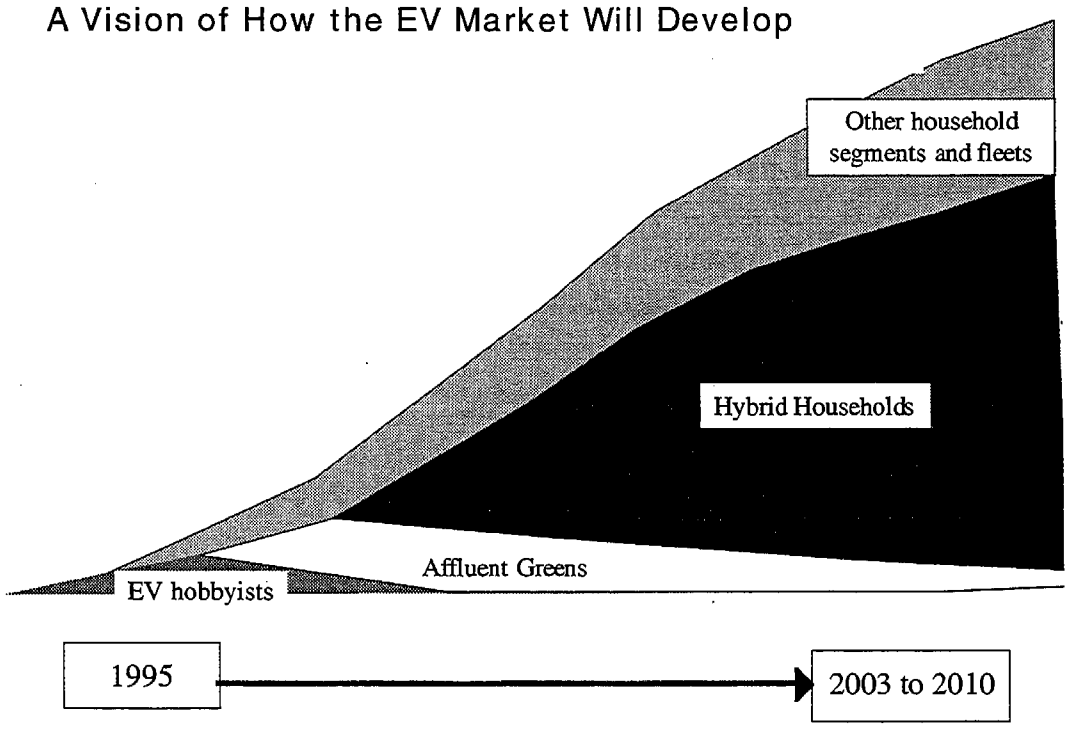
We present an image of the development of a market for electric vehicles in Figure 24. The concepts illustrated are based the results of this survey and the preceding three years of market research the authors conducted at ITS-Davis. We show conceptually how we believe the market will grow through the increasing participation in the market for EVs by new market segments over time. The image we develop in Figure 24 is not a forecast. It is a tool to organize the results of several different research projects we have undertaken in the past four years. We do not put a precise time line on the development depicted in the figure; the rate of development of the market is contingent on the marketing of technologies assumed in this study and the promotional efforts of industry and government to insure a stable policy and market development context. We will primarily address the role of three

main household market segments—EV hobbyists, affluent environmentalists, and hybrid households. We discuss fleets and other households secondarily.

Hobbyists, Affluent Environmentalists and Hybrid Households

We have already entered the phase where EV hobbyists and affluent, environmentalists are shaping the emerging market. EV hobbyists have been building EVs and converting gasoline vehicles to electricity for years. Many of these people are not interested in buying an OEM electric vehicle; building their own cars is what they do. But many others are part of the entrepreneurial and consumer vanguard of the emerging EV market (Kurani and Turrentine, 1994). They are not only early buyers of EVs, they are among the technological innovators and business risk takers. Their numbers are of course small compared to the total market, but they are busy creating the future of electric vehicles. Also among the consumer vanguard are affluent, environmentally conscious buyers. These consumers will be very influential in both promoting and illustrating the use of EVs.

Figure 24: Our Concept of the Potential Development of the EV market



Just as EV hobbyists and affluent environmentalists act early in the market, so to do some electric utilities and government agencies supportive of the emerging EV market. These fleet buyers are important to build momentum and to insure the mandate level is met in its first years. After waiting for EVs to prove themselves reliable among EV hobbyists and affluent greens, hybrid households begin buying EVs. Every year thereafter, the hybrid household segment grows, eventually becoming the most significant market segment.

Range and Body Style Market Segments for Electric Vehicles

None of the segmentation strategies that we applied to the households in this study were as successful in identifying buyers of EVs as were two of our initial premises—identify potential hybrid households and segment the market by demand for driving range. We defined potential hybrid households to be those who own more than one vehicle, buy new vehicles and own at least one vehicle that is not of a full-size body style. Within this population a driving range limit on one household vehicle is not an important barrier to the purchase of an EV. These households do show wide variation in just how low that range limit can be. The ability and willingness of different households to chose electric vehicles of different ranges defines market segments based on the technological feasibility of supplying EVs to a sufficiently large market to meet the ZEV mandate.

In addition to driving range, vehicle body style will affect the ability of manufactures to use existing EV technology to provide the types and styles of vehicles our households say they will buy. Across electric, natural gas and gasoline vehicles, mid-size sedans constitute the single most frequently selected body style. Existing batteries will not provide the driving range we offered in the longest range class of EVs in mid-size vehicles. So those potential hybrid households that want a mid-size vehicle will either have to wait, or choose to buy a smaller, or shorter range, vehicle. In Figure 24, these households would enter the market later than buyers of smaller cars, or would join their ranks in order to buy an EV sooner.

Within a rich information context that allows them to become familiar with the novel attributes of new types of vehicles and to reflect on the impact of those attributes on their lifestyle choices, households demonstrate flexibility and adaptability when faced with choices of new vehicle technologies. Our analysis of the affect of body style, and the intended use of the next new vehicle demonstrates that households will construct very different household fleets of vehicles if offered an expanded array of vehicle types. Households change the intended body style of the next new vehicle and the defining use of that body style choice. Households tend to choose smaller vehicles than they indicate they would prefer. Yet this is not due to any onerous constraint imposed by the lack of full-size EVs in the choice situations. The shift to smaller vehicles is evident even in those households that chose gasoline and natural gas vehicles. Households also assigned different defining trip purposes to the vehicles they chose. These shifts in intended use of a vehicle were related to the type of vehicle chosen. A choice between a vehicle whose defining purpose is to commute to work or school or to chauffeur children and a vehicle whose defining purpose is to take weekend and vacation trips or to haul large loads separates households that chose an EV from households that chose natural gas or gasoline vehicles.

Household market segments for EVs

Analysis of household life cycles indicates that younger families in our sample are more likely than other households to buy EVs while older households are less likely. Also, in households with no children, households in which the heads of household are middle-aged are more likely than other households without children to choose an EV. We showed that these changes are related to the defining purpose of the vehicle being chosen. Young families are most likely to chose a vehicle whose defining purpose is to chauffeur children. Sixty-two percent of households in which the youngest child is less than 16 years old and whose defining purpose for the vehicle the selected in Situation Two was chauffeuring children, chose an EV. Retired families were more likely to have assigned weekend and vacation travel to their next new vehicle, and therefore were more likely to have chosen a gasoline or natural gas vehicle. Households in all life cycles that contained working adults were likely to assign commuting as the defining purpose of their next new vehicle. These households were likely to choose an EV, but especially young families. Sixty-seven percent of households whose youngest child was less than 6 years old and whose defining purpose for the vehicle selected in Situation Two was commuting, chose an EV.

We make the following observation about the class of non-freeway neighborhood EVs. The life cycle groups that do, and do not, choose NEVs must be interpreted with care. While we did expect households of middle age parents with children to be more responsive to EVs (based on prior research), the low cost of NEVs confounds any expectations we may have had based on household income. The apparent disinterest toward NEVs shown by households made up of retired persons should not dissuade us from believing that households of retired people will be an important market for NEVs. These households in particular highlight the importance of the specific community in which the NEV might be used. While it is possible that retired households in our sample did not choose NEVs because they do not foresee enlarging their stock of vehicles and because they tend to define the purpose of their next new vehicle as weekend and vacation travel, we have documented elsewhere (Kurani et al, 1995) that within appropriate environments, retired households will be important NEV market segments.

RECOMMENDATIONS

1. One assumption in our choice experiments is that EVs will be priced comparably to gasoline, natural gas and other alternative fueled vehicles. There are concerns by many, including the OEMs, that EV costs will be higher. We recommend that the California Air Resources Board investigate the probable prices of mass produced EVs and identify strategies to mitigate large price differences, if such differences are found to exist. If the focus is upon reaching the 1998-2002 mandate years, we recommend that analysis center upon the costs of small and compact vehicles with driving ranges from 60 to 150 miles and mid-size vehicles with ranges of 60 to 80 miles. We believe we have demonstrated there is sufficient demand for such EVs to exceed the mandated sales. Given that, there is a need to support policy makers and inform consumers with the evidence that such vehicles are technologically viable and economically competitive with gasoline vehicles. If the focus is upon reaching the mandated levels of 2003 and beyond, our research suggests an evaluation of the probable prices of mass-produced mid-size electric vehicles with driving ranges of 100 to 150 miles would provide direction for continued growth of the EV market in the next century.

2. Given the importance of understanding the nature of the stocks of vehicles that households buy and own (at the household level, not some aggregate level) it is important that data on household vehicle transactions and stocks be publicly available. The single most uncertain aspect of this research is our estimate of the share of the annual light-duty vehicle market that our potential hybrid households represent. We have had to construct what we believe is a plausible estimate from two different sources, neither of which is entirely satisfactory. We have been given some private indications from researchers with access to proprietary data bases that our estimate is probably conservative. If our potential hybrid household segment does represent a larger share of the market than we have assumed, then the market shares for EVs are larger than stated in this report.

3. The many different possible designs of hybrid electric vehicles pose complex research, policy and marketing problems. The issues of consumer response to hybrid electric vehicles, whether a hybrid EV satisfies the ULEV or ZEV definitions, and the technological hurdles to building a hybrid EV are all intertwined. We have only tested household responses to one possible hybrid EV. At some point in the near future, CARB may wish to investigate more carefully the impact of hybrid EVs on both the light-duty vehicle market and emissions. We have demonstrated in this survey research the types of research techniques required to assess both.

4. Also, this report covers a small portion of the results of this survey. Our choice experiments were designed to answer questions beyond those merely of market segments for EVs. For example, we can assess demand for recharging under different scenarios of recharging infrastructure development. These scenarios can include fast charging at stations, opportunity charging at other away-from-home locations, and home recharging. The survey included spatial, temporal and intensity of demand for

these services. This data could be of use to those promoting infrastructure development.

5. Finally, one of the primary findings and underlying premises of this research is that currently households are not well informed about electric vehicle technologies. We recommend that in the interests of fulfilling the development of the markets described in this study, that the state assist the design and implementation a marketing campaign that educates potential hybrid households about the potential benefits of electric vehicles and fosters their exploration of the lifestyle implications of electric vehicles.

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APPENDIX A

This appendix contains Parts One, Two, and Four of our survey instrument. Part Three was an informational video produced for the survey and reprinted articles from newspapers, magazines, and newsletters. We do not have permission to distribute the copyrighted articles in this report. References are provided in Appendix B. If you wish to review a copy of the video, please contact the University of California Transportation Research Center located at the University of California, Berkeley.

Part One: Household demographics, fleet holdings, environmental attitudes

Part Two: Diary, Map and Travel behavior questions

Part Three: Video (not included but available from University of California Transportation Research Center, Berkeley), Reprinted articles—because of copyright laws, we do not include articles which were offered to participants

Part Four: Vehicle choice answer book & Price work-book.

PART ONE: Household Description

The information in this section will be used only for descriptive purposes. We need to know how well our respondents match the descriptions of households who buy new cars in California.

*For each household member (except household heads) please enter one of these numbers under **"relation"**:*

***1**= child of one or both of the household heads;*
***2**= other family relation of one of household heads;*
***3** = person unrelated to one of household heads.*

*Under **"Work status"** please use these descriptions:*

***1** = family care giver, not employed outside the home;*
***2** = full- or part-time employed at an away-from-home location;*
***3** = full- or part-time employed in a business located at home;*
***4** = presently unemployed;*
***5** = retired.*

*Under **"Student status"** use these descriptions:*

***1** = non-student **2** = student. **3** = pre-school*

Person	Relation	Name	Age	Work Status	Student Status	Drivers License yes/no
1	Female H-hold Head					
2	Male H-hold Head					
3						
4						
5						
6						
7						
8						
9						

You and your cars

Your Household's Motor Vehicles

1.1. How many motor vehicles (cars, vans, or light duty trucks) does your household own?

_____Vehicles total

1.2. Please fill in the table below. If you own more than three vehicles, include the three most recently acquired vehicles which your household drives on a regular basis.
If used less than monthly (like an RV used for vacations), write an X next to its make.

	EXAMPLE	VEHICLE 1	VEHICLE 2	VEHICLE 3
Make	Ford			
Model	Taurus			
Body Style	station wagon			
Model Year	1992			
Own or Lease	Lease			
Acquired new or used	new			
Air conditioned	Yes			
All-Wheel Drive or 4x4	No			

1.3. Now, consider the next new household vehicle you believe you are likely to acquire. How soon do you believe your household will buy or lease its next new car, van or light duty truck?

- ❑within the next 6 months.
- ❑between 6 months and 1 year from now.
- ❑between 1 and 2 years from now.
- ❑between 2 and 5 years from now.
- ❑more than 5 years from now.

1.4. What is the body style of this new vehicle most likely to be?

❑Sports car	❑Sport utility vehicle
❑Compact pickup truck	❑Full-size pickup truck
❑Small wagon/hatchback	❑Compact wagon/hatchback
❑Mid-size wagon/hatchback	❑Full-size wagon/hatchback
❑Small sedan (sub-compact)	❑Compact sedan
❑Mid-size sedan	❑Full-size sedan
❑Mini-Van	❑Full-size Van

❑Other (specify_____)

1.5 People often buy a specific body style with a certain type of trip in mind. For example, a household might buy a sport utility vehicle with a ski trip in mind, even though most days they would use it to commute to work. *Please complete this statement in the way that best describes why you are interested in the body style and size of the vehicle above :*

We would buy this style and size of vehicle to:

Check only one box

- ❑commute to work or school on a regular basis
- ❑chauffer children or other non-drivers
- ❑chauffer business clients and associates
- ❑run business errands
- ❑take weekend and vacation trips
- ❑haul large loads
- ❑I/we chose the body style because of the way it looks
- ❑other (specify:_____)

1.6. Of the vehicles you now own which one will this new vehicle replace?

- ❑ None, it will be an addition to our vehicles.
- ❑ Vehicle 1 (from table on 2nd page)
- ❑ Vehicle 2
- ❑ Vehicle 3
- ❑ A household vehicle not listed on the first page

1.7. Is there another style or size of vehicle you are also considering in addition to the one you indicated in question 1.4? If so, what is this other likely body style choice?

- ❑ No other body style choice
- ❑ Sports car
- ❑ Compact pickup truck
- ❑ Small wagon/hatchback
- ❑ Mid-size wagon/hatchback
- ❑ Small sedan (sub-compact)
- ❑ Mid-size sedan
- ❑ Mini-Van
- ❑ Sport utility vehicle
- ❑ Full-size pickup truck
- ❑ Compact wagon/hatchback
- ❑ Full-size wagon/hatchback
- ❑ Compact sedan
- ❑ Full-size sedan
- ❑ Full-size Van
- ❑ Other (specify_____)

1.8. Going back to the body style and size you indicated in 1.4, think about all the vehicles your household will own after buying this new vehicle. Including yourself, what is the largest number of people you would absolutely want this new vehicle to carry?

- ❑ One
- ❑ Two
- ❑ Three
- ❑ Four
- ❑ Five
- ❑ Six
- ❑ Seven
- ❑ Eight
- ❑ Nine
- ❑ Ten or more

1.9. What type of luggage or cargo must this vehicle be able to carry?

The vehicle my household will next acquire must be able to carry the equivalent of at least:
(Check only one of the following boxes)

- ❑ a few bags of groceries.
- ❑ luggage for a weekend trip for two.
- ❑ luggage for two for an extended trip.
- ❑ luggage for four for an extended trip.
- ❑ luggage for more than four people for an extended trip.
- ❑ large bulky items such as furniture, lumber, large boxes, etc.

1.10. I plan to regularly use roof racks, bicycle racks, ski racks or similar equipment on this vehicle to increase its cargo capacity.

❑ No ❑ Yes

1.11. Within the general body styles and sizes of vehicles in which you are interested, which, if any, specific makes and models would you consider buying?

❑ No specific makes and models considered yet.

First Choice: Make:_____

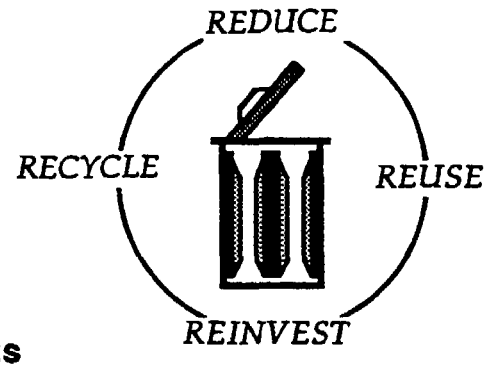
Model:_____

Second Choice: Make:_____

Model:_____

Third Choice: Make:_____

Model:_____



Your opinions about products and activities designed to improve the environment.

1.12. How would you characterize your feelings about the world's environmental problems?

- ❑ The biggest crisis and challenge of our times. The solutions require immediate international effort and major changes in our economies and lifestyles.
- ❑ Among our biggest problems. The solutions require cooperation of government and citizens. Time to reconsider our lifestyles and make changes .
- ❑ Environmental problems exist, and need some attention, but are minor compared to other problems in our world.
- ❑ Environmental problems are not an important problem. There is no need to change the way we live.

1.13. Pick what you think are the 1st , 2nd and 3rd worst environmental problems from the following list? Write 1, 2 and 3 on the line next to your three selections - **leave the other options blank.**

Utility power plants ___
Household waste ___
Ozone Depletion ___
Pesticides ___
Oil spills ___
Green House Effect ___
Rainforest destruction ___
Farmland errosion ___
Automobiles ___
Other_____ ___

1.14. How would you describe your response to environmental problems?

Check only one box

- ❑ Actively protesting abuse of the environment.
- ❑ Working on my own to make changes in my lifestyle.
- ❑ Sympathetic, but not working on environmental problems
- ❑ More active in other problems than environmental ones.

1.15. What things do you do to solve environmental problems?

Check all boxes that apply

- ❑ participate in recycling
- ❑ purposefully reduce my use of cars
- ❑ support environmental groups with donations
- ❑ participate in political actions to stop pollutors
- ❑ purchase 'green' products
- ❑ conserve water
- ❑ nothing
- ❑ other_____

1.16. Which do you think is the biggest obstacle in your life to helping improve the environment.

Check only one box

- ❑ I have been too lazy to make the changes
- ❑ I don't have enough time
- ❑ The world is not set up to do the right environmental thing
- ❑ "Green" products cost too much
- ❑ "Green" products just don't work as well
- ❑ other_____

*1.17. How much **more** are you willing to pay for products which don't pollute compared to products which do pollute?*

❑0% ❑3% ❑5% ❑10% ❑20% ❑30% ❑50% ❑100%

1.18. Scientists have found that the household batteries, like those used in flashlights, are a serious toxic waste problem in local landfill.

*Which one of the ideas below do you think is the **best** response to the problem?*

Check only one box

- ❑ Battery manufacturers should be fined for the costs of clean-up.
- ❑ Disposable household batteries should be illegal.
- ❑ Set up a collection program to keep used batteries out of landfill.
- ❑ Consumers should be taught and encouraged to use and recycle alternatives, like rechargeable batteries.

1.19. Which of these statements fit your opinions best?

Check all boxes that apply

- ❑ electric vehicles are a bad idea
- ❑ electric vehicles would work with a little planning
- ❑ electric vehicles are not much better than golf carts
- ❑ electric vehicles are small cars
- ❑ electric vehicles will be cheap to operate
- ❑ electric vehicles are clean cars
- ❑ electric vehicles are not powerful enough
- ❑ electric vehicles are fast cars
- ❑ electric vehicles pollute like any other car
- ❑ I/we've never heard of electric vehicles before
- ❑ I/we know very little about electric vehicles.

1.20. Given what you know about electric vehicles, if an electric car was available to buy next time you buy a car, how likely would you be to purchase one, if it were the same price as a gasoline car?

❑ very unlikely ❑ unlikely ❑ not sure
❑ likely ❑ very likely

Some questions about your home

1.21. Do you rent or own your residence?

❑Rent ❑Own

1.22 Is your residence a single family home or one of a multi-family unit?

❑Single family home
❑Cottage or "granny flat" located on property with another, but separate, residence
❑Duplex, triplex, or four-plex (some residences in each unit share at least one common wall)
❑Apartment or apartment style condominium
❑Other (please specify:_____)

1.23 Do you have space to park at least one of your household vehicles reserved solely for your household's use?

❑No reserved parking spaces. We park all vehicles either in a shared use lot or on the street.
❑Yes, we have at least one reserved space in a shared use parking lot
❑Yes, we have at least one reserved on-street parking space
❑Yes, we have space to park at least one of our vehicles on our own property (either in a driveway or in a garage/ carport).

1.24. If your residence has a garage (or car port) do you regularly park at least one of your vehicles in the garage or carport?

❑No ❑Yes

1.25 Please indicate the category which includes your household's total pre-tax income for tax year 1993.

- ❑ 0 - $9,999
- ❑ $10,000 - $19,999
- ❑ $20,000 - $29,999
- ❑ $30,000 - $39,999
- ❑ $40,000 - $49,999
- ❑ $50,000 - $59,999
- ❑ $60,000 - $69,999
- ❑ $70,000 - $79,999
- ❑ $80,000 - $89,999
- ❑ $90,000 - $99,999
- ❑ greater than $100,000
- ❑ decline to state

1.26 How many of your household members contributed to this 1993 tax-year income?

_____persons

Thank you for completing PART ONE. Check to see if you missed any questions.

Put PART ONE back into its envelope and put it in the mail as soon as you can.

Your next step is to go to PART TWO and begin your 3 day travel diaries.

Full name of household member filling out this booklet_____

Car one_____

Full name of primary driver of car one_____

Car two_____

Full name of primary driver of car two_____

PART TWO:
Post-Diary Household Travel Questionnaire

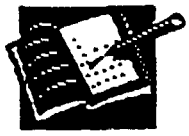
Dear Participant,

By now you have completed a three day survey of your driving. At this point you should clear a table, spread out your diary, pull out the red and black pens from your diaries, this questionnaire, and the map in PART 2 with the two sheets of bright dots, (the dots are for use with the map questions on pg. 4).

*There are **two copies** of this questionnaire, one for each of the two primary drivers in your household. Please be sure that each driver fills out their own copy. There is **one map** to be shared by both drivers.*

In this section, we want to learn more about your household travel patterns. The next set of questions use the map and diaries as reference.

Questions about your travel diaries.



*2.1. How typical was the **number of trips** you took each day during the diary period?*

- ❑ I made a **typical** number of trips all three days
- ❑ I made **fewer** trips than typical on:
  - ❑ day 1 ❑ day 2 ❑ day 3
- ❑ I made **more** trips than typical on:
  - ❑ day 1 ❑ day 2 ❑ day 3

*2.2. How typical were the **daily distances** you traveled each day during the diary?*

- ❑ I traveled a **typical** distance on all three days
- ❑ I traveled **fewer** miles than typical on:
  - ❑ day 1 ❑ day 2 ❑ day 3
- ❑ I traveled **more** miles than typical on:
  - ❑ day 1 ❑ day 2 ❑ day 3

2.3. Thinking about your travel in general, not just the diary days, would you say the distance you travel is about the same every day or do you travel very different distances each day?

- ❑ Almost always the same distance each day
- ❑ About half the time, the same distance each day
- ❑ Seldom the same distance each day

*2.4. What is the **longest trip** you almost always make **weekly**, even if you didn't happen to make it during this diary?*

Destination: _____

Nearest intersection: _____

One-way distance in miles: _____

*2.5. What is the **longest trip** you almost always make **monthly**, even if it didn't happen during this diary?*

Destination: _____

Nearest intersection: _____

One-way distance in miles: _____

2.6. Recalling which vehicles you have labeled "car one" and "car two", how often do you use each of these cars for a trip more than fifty miles from home?

Car one ❑ daily ❑ weekly ❑ monthly ❑ rarely ❑ never

Car two ❑ daily ❑ weekly ❑ monthly ❑ rarely ❑ never

2.7. How often might both cars be used for trips more than fifty miles from home on the same day?

Both cars ❑ daily ❑ weekly ❑ monthly ❑ rarely ❑ never

*2.8. How often do you **swap or trade** cars with the other principal driver in the household?*

❑ daily ❑ 1or 2 days a week ❑ 1 or 2 days a month ❑ rarely ❑ never

*2.9. When you take a trip out of town, do you tend to use **car one** or **car two**?*

❑ always **car one** ❑ usually **car one**
❑ either car equally
❑ usually **car two** ❑ always **car two**

2.10. Which car is used for vacation travel?

❑ always **car one** ❑ usually **car one**
❑ either car equally
❑ usually **car two** ❑ always **car two**

Now for the map.

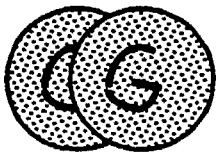
Mark your important destinations.

Using the colored dot labels, mark on the map the several destinations listed in the table on the next page. Write the symbols from the table on the dots with the **black pen**. Use the **orange dots for Driver #1** and the **green dots for Driver #2**. Stick the dot/symbol in the right location for your household on the map.

Here is an example of a dot with a work location symbol.

If any of these destinations are **off the map**, place the dot and symbol for that destination in the map margin in the direction of that destination.

If any of these destinations are the **same** for both drivers, overlap one green and one orange dot.



√	Location	Symbol
	Home	H
	Work.	W
	Schools (all that you or your children access by car).	S1,S2,...
	Usual grocery store.	G
	One important location -- a church, theater, club, restaurant, sports venue or other place you consider an important part of your life.	R
	Most often visited family or friends.	F
	Doctors Office, Dentists Office	D1,D2
	Emergency Medical Services	E
	Usual gas station (if there is one you most always use)	X

Mark your longest regular destinations.

Using the dots, mark the destinations of your longest weekly and monthly trips (from questions 2.4 and 2.5) with the symbols ***L W*** *(long weekly) and* ***LM*** *(long monthly) on the map. If either is not on the map, put its symbol in the map margin in the direction of the destination. If you have already marked either destination with one of the symbols from the table of destinations above, please mark it again with the LW or LM.*

Draw a boundary around where you live.

Draw a boundary on the map around the area in which you do most of your activities (Red Pen for Driver 1, Black Pen for Driver 2) -- working, shopping, attending school, regularly visiting family and friends, other socializing and recreation, banking, business or personal errands -- in short, draw a boundary around the area in which you live. If part of this area is off the map, make a note in the map margin. Use the locations you have already drawn on the map plus any other activities you consider important to your lifestyle to help you define this area.

Locating one last important destination.

*Is there any **one** destination either inside or outside the boundary you just drew, or even off the map, which you feel you must be able to reach on any given day no matter what? It can be one you have already marked or one you have not marked yet. It is the kind of place that if your car was in the shop, and the other car was gone for the day, you would go to the trouble to borrow a car, rent a car, hire a cab, or make some other arrangements in order to get there.*

2.11A. Important Location _____

2.11B. Please estimate the one-way travel distance _____miles

2.12. Of your destinations marked with symbols on the map, which, if any, would you be willing to reach by walking, bicycle or transit? (use same destination symbols in boxes below)

Walking:
Bicycle:
Bus or rail transit:

2.13. Not counting vacation travel, do you ever rent cars to travel in your local area, for instance, when you have out-of-town guests, or one of your cars is in the shop?

❑No ❑Yes

2.14. Do you have family or friends nearby from whom you feel you could borrow a car in an emergency situation?

❑No ❑Yes

2.15. Look back over your trip diary and your map. How easily could you have completed travel in your diary if you had not been able to drive on any freeway or expressway?

Choose <u>one</u> answer.

❑ I could have <u>easily completed all 3 diary days</u> without ever travelling on a freeway or expressway.

❑ <u>With some changes</u> to the routes I drove or by some other change, I could have completed <u>all 3 diary days</u> without travelling on a freeway or expressway.

❑ <u>With some changes</u> to the routes I drove or by some other change, I could have completed <u>at least 1 diary day</u> without travelling on a freeway or expressway.

❑ It would have been <u>impossible</u> for me to complete even 1 of my diary days without travelling on a freeway or urban expressway.

Questions About Refueling Your Car

2.16. In the household vehicle you drive most often, how many miles total can you drive on a full tank of fuel? (not miles per gallon !)

_____miles

2.17. Is this vehicle equipped with a "low fuel" indicator light?

❑ No **(If no, skip to 2.18)** ❑ Yes **(Answer 2.17A)**

2.17A. **If yes:** *When the light first comes on, about how far do you think you can drive before you run out of gas?*

_____more miles

2.18 Do you personally refuel the household vehicle you most often drive?

***Check <u>one</u> statement** below which best applies.*

❑ I always refuel the vehicle I most often drive.

❑ I refuel this vehicle more than half the time.

❑ I refuel this vehicle about half the time.

❑ I refuel this vehicle less than half the time.

2.19 Do you routinely refuel your car while making other trips or do you make a special trip?

Choose <u>one</u> statement.

❑ I normally refuel on my way <u>to</u> work or school.

❑ I normally refuel on my home <u>from</u> work or school.

❑ I normally refuel while making trips other than going to or from work or school.

❑ I normally make a special trip just to refuel.

❑ I have no routine of refueling.

2.20. If you are also the person who most often refuels the other household car, do you routinely refuel it while making other trips or do you make a special trip to refuel the other car?

- ❑ I don't refuel the other car.
- ❑ I normally refuel on my way to work or school.
- ❑ I normally refuel on my home from work or school.
- ❑ I normally refuel while making trips other than going to or from work or school.
- ❑ I normally make a special trip just to refuel.
- ❑ I have no routine of refueling.

2.21. Which one of these statements below best describes when you choose to refuel?
Answer either A,B,C or D

A ❑ I try to refuel as soon as the tank gauge reaches a certain level, and that level is:

- ❑ more than half full.
- ❑ between one half and one fourth.
- ❑ between one fourth and one eighth.
- ❑ less than one eighth.
- ❑ on empty

B ❑ I use the odometer to tell me how far I have driven and refuel according to how far I have traveled.

C ❑ I use the low fuel indicator light and refuel when:

- ❑ the light first flashes on.
- ❑ the light stays on steadily.
- ❑ some time after the light stays on steadily.

D ❑ Other (Please describe:_____

_____

_____

_____)

2.22 How do you find the smell of gasoline?

❑Unpleasant ❑Don't notice ❑Pleasant

2.22A *Gasoline is ---(choose one)*

❑ Extremely toxic ❑ Somewhat toxic
❑ Relatively safe ❑ Don't know

Question 2.23 asks you to imagine different situations. Try to imagine yourself in each of the situations. Look back over your maps and diaries if it helps.

*2.23 If you had a gas gauge which told you exactly how many **miles** of gas you had left at all times, how low would you let the tank get (in miles) before you refilled it at the first available gas station in each of these situations?*

23A. If you were driving in an unfamiliar city and you don't know how far it is to the next gas station.

_____miles

23B. If you were driving in a familiar area, within 5 minutes of familiar gasoline stations.

_____miles

23C If you were driving on a long highway trip and you didn't know how far it was to the next station.

_____miles

23D If you were returning home and trying to decide whether to fill today or leave it until tomorrow.

_____miles

If you travel to work or make trips during the day related to your work, please turn to the next (and last) pages of this section. **Otherwise, skip to PART THREE now.**

CHECK TO SEE IF YOU SKIPPED ANY PAGES

Trips to Work and Work-Related Travel

2.24 How many days per week do you commute to your workplace?

❑ Zero **(Go to 2.27)** ❑ One ❑ Two ❑ Three
❑ Four ❑ Five ❑ More than five

2.24A If you commute one or more days per week, how far do you commute (one way)?

_____ miles

2.25. Do you ever take a carpool, a vanpool, or some other form of transit to work?

❑ I take a carpool or vanpool at least once a week
❑ I take a bus or train at least once a week
❑ I walk or bike at least once a week
❑ I take a carpool or vanpool occasionally, but not every week
❑ I walk or bike occasionally, but not every week
❑ I take a bus or train occasionally, but not every week
❑ I always drive alone in one of our cars.

2.26. At work, what is the shortest continuous amount of time your car is parked either in a parking lot provided by your employer or in public garage? (Be sure to consider trips you might make during the day which would interrupt this time.)

❑ never ❑ 1-2 hours
❑ 3-4 hours ❑ more than 4 hours

2.26A. Is this length of time fairly regular from day-to-day?

❑ Always parked for the same length of time
❑ Usually parked for the same length of time
❑ Almost never parked for the same length of time

CONTINUED ON BACK

2.27. Not counting your drive ***to*** *work, how often do you also drive your own car* ***for other work related trips*** *-- say, to call on clients, attend meetings, or do other business errands-- during the day?*

- ❑ Virtually everyday.
- ❑ At least once a week.
- ❑ About once a month.
- ❑ Less than monthly.
- ❑ Never drive my car for work related trips.

2.28 If you need to travel for work related purposes during the course of your workday and you do not wish to take your own car, are other vehicles available for you to use?

❑ No ❑ Yes

You are now done with PART TWO.

Keep PART TWO diaries and the map out for use in PART FOUR.

But for now, you are ready for PART THREE which is not much work at all, just watching a 15 minute video and reading some reprinted magazine articles.

HH#_____

PART FOUR

Answer Booklet - Start Here ⇓

Instructions

In Part Four you will pretend you are shopping for your next vehicle.

While this study is about the potential market for new types of environmentally improved vehicles, please don't be too idealistic - give us your best prediction of what purchases you would make given your lifestyle plans, your budget along with your ideals; we understand that cars are expensive and central lifestyle tools. On the other hand don't be too skeptical- these vehicles will be available, much as we describe them and they have features which suit many lifestyles.

Part four has 2 booklets, the one you are reading - the **"Answer Booklet"** and the **"Price Workbook"** which is legal sized and stapled along the side. Both are divided into 2 alternative purchase situations for your next vehicle. You will choose a vehicle for each alternative situation.

> In **Situation One** you will choose between 2 types of vehicles, electric and gasoline.
>
> In **Situation Two** you will choose between 6 types of vehicles: reformulated gasoline, compressed natural gas, hybrid electric, regional electric, community electric, and neighborhood electric vehicles.

The **"Price Workbook"** has the full descriptions and price sheets for the vehicle types in Situations 1 and 2.

-instructions continued inside -

Use the price sheets like a workbook.

- The prices will not be the same between vehicle types. Hybrid Vehicles for example cost a bit more because they are a complex technology.

- Also, the taxes will not be the same. The federal and state governments are offering purchase price tax credits to Ultra-Low Emissions and Zero Emissions Vehicles to soften the higher prices of these new technologies in the early market (This is a 1 time, not an annual tax credit).

- Assume that for all vehicles, the financing, car insurance and such is the same.

- Each price sheet lists several body styles in boxes across the top (like minivan, sports car, ect....) Note that electric vehicles are not available in all body types.

Sport Cars are 2 seaters like Mazda Miata, Porsche Targa.
Small Sedans are small 4 seat sedans like Honda Civics, or GM Geo.
Compact Sedans are larger, like GM Saturns or Toyota Corollas.
Midsize Sedans seat five or six, like the Ford Taurus, Toyota Camry
Fullsize Sedans are like the Olds 98, Cadillac Seville, Buick LeSabre
Minivans are - well - minivans
Small Sports Utility are like the Suzuki Samurai
Fullsize Sports Utility include Jeep Cherokees and Ford Explorers
Compact Pick-ups are like the Ford Ranger.
Fullsize Pick-ups and Vans are like Ford F-150s and Dodge Ram Vans

- In the column underneath each body style in the **Price Workbook** are the **base prices** for three levels of trim - economy, standard and luxury models.

- Below the trim choices are options like engine size, different sized battery packs for electric vehicles and air conditioning (and their added cost).

- Answer any questions found at the bottom of the price sheet of the vehicle you choose.

-go to next page-

Turn to **Situation One** (pages 1-5) of the **Price Workbook** and look at the descriptions and price sheets for electric and gasoline cars. Choose the electric or gasoline vehicle, a body type, a trim package (economy, standard, luxury), options, add the costs, subtract any tax credits - then return to this booklet and put your answer in 1.1 below.

1.1 Situation One selection **Enter Your Selection here**

	Example ⇓	
Vehicle type	*electric*	
Body style	*compact pick-up*	
Trim package	*economy*	
Tax Credit	*$4,000*	
Options	*type 2 battery*	
	heat pump air	
	solar panels	
	fast charge	
Price (minus tax credits if any)	$12,700	

1.2. People often buy a specific body style with a certain type of trip in mind. For example, a household might buy a sport utility vehicle with a ski trip in mind, even though most days they would use it to commute to work. *Please complete this statement in the way that best describes why you are interested in the body style and size of the vehicle above :*

We would buy this style and size of vehicle to:

Check only one box

- ❑ commute to work or school on a regular basis
- ❑ chauffer children or other non-drivers
- ❑ chauffer business clients and associates
- ❑ run business errands
- ❑ take weekend and vacation trips
- ❑ haul large loads
- ❑ I/we chose the body style because of the way it looks
- ❑ other (specify:_____)

1.3. In PART ONE *(which you already mailed to us)*, you told us which of your current vehicles you would replace next *(or that you would add a vehicle next).* Has anything changed? Are you still thinking to replace that same vehicle with the selection above? *(or would selection be an addition?).*

❑ **No change**, the same vehicle will be replaced *(or same added vehicle)*

❑ Yes, we changed our minds, the selection above would replace a different vehicle. Name of your vehicle to be replaced_____

❑ Yes, we changed our minds, we won't replace any vehicles, the selection above would be an added vehicle to our household.

1.4. *Who would be the main driver of the selection above?*_____

If your selection for situation one is: a gasoline vehicle, skip to 1.8
an electric vehicle, go to 1.5.

1.5 *The 1st and 2nd most important reasons we chose the electric vehicle were.*

Select only one 1st choice and one 2nd choice, mark 1 and 2 - leave tl rest blank

_____it is the most economical vehicle
_____the environmental benefits
_____the flexibility of recharging at home and other locations
_____electrics will be the car of the future
_____safety of refueling and operation
_____it's the most mechanically reliable vehicle
_____other _____

1.6 *Did you drop a preferred body size or style to get the electric,*
yes ❑ ***(If yes go to 1.7)*** *no* ❑ ***(If no, skip to Situation Two)***

1.7 *If yes, which of the styles below would have been your preferred body style?*
full sized sedan ❑ full sized sports utility ❑ full sized van or pick-up ❑

Electric vehicle choosers are done with Situation One, skip to Situation Two on page 6

1.8 *The **1st and 2nd most important** reasons we chose the gasoline vehicle were.*
Select only one 1st choice and one 2nd choice, mark 1 and 2 - leave tl rest blank

_____safety of refueling and operation
_____proven reliability of gasoline vehicles
_____emissions benefits
_____the gasoline vehicle is most economical
_____could not get the body style we/I wanted in the electric **column**
_____the ease of refueling
_____greater refueling range
_____other _____

1.9 If you did not even consider choosing the electric vehicle -answer A

A.We did not consider the electric vehicle because .....
(check all that apply)

- ❑ we wouldn't want a car with range limits
- ❑ recharging sounds like a hassle
- ❑ electrics don't come in the body style we/I wanted
- ❑ environmental benefits are small
- ❑ we need our next car for out of town travel
- ❑ our next car must handle heavy loads
- ❑ other _____

If you did consider the electric but chose a gasoline vehicle -answer B

B ❑ We considered the electric vehicle because of .....

- ❑ home recharging
- ❑ environmental benefits **check all that apply**
- ❑ other_____

but .....

- ❑ range limitations and /or **check all that apply**
- ❑ size limitations
- ❑ the lack of preferred body styles
- ❑ other_____

.....made an electric vehicle impossible given our lifestyle.

Gasoline choosers are now done with **Situation One**, go to Situation Two on page 6

Situation Two

In **Situtation Two** (pages 8-19) of the **Price Workbook** you will find 6 vehicle types. Below is very short description of those vehicles.

Page 8. Compressed natural gas vehicles: 80 or 120 miles of range, home refueling option, available in all body types, $1000 Ultra-Low Emissions tax rebate.

Page 10. Reformulated gasoline vehicles 300 miles range, redesignec for lower emissions, Low Emissions Vehicle (no tax rebate on LEV).

Page 12. Hybrid electric vehicles: Both electric battery and small gasoline motor, 40 or 80 miles of range on battery, 180 miles with gasoline, $1000 Ultra-Low Emissions tax rebate.

Page 14. Community electric vehicles: lower priced electric, 60 or 80 miles of range, $4000 Zero Emissions Vehicle tax rebate.

Page 16. Regional electric vehicles: high performance battery electric, 130 or 150 miles range on sports car (140 on midsized), battery life 50,000 or 5 years, $4000 Zero Emissions Vehicle tax rebate.

Page 18. Neighborhood electric vehicles: low priced, small 2, 3, and seat non-freeway electric, $2000 (small vehicle) Zero Emissions Vehicle tax rebate.

Now go to **Situation Two** in the **Price Workbook** and choose a vehicle type, bod style and options, add the costs, subtract any tax credits,answer any questions on the price sheet of the vehicle you choose and then return to this booklet and enter your Situation Two selection in 2.1 below.

2.1 Situation Two Selection **Enter Your Selection here**

	Example ⇓	
Vehicle type	*regional electric*	
Body style	*compact pick-up*	
Trim package	*economy*	
Tax credit	*$4000*	
Options	*type 2 battery*	
	heat pump air	
	solar panels	
	extended cab	
Total Price (minus tax credits if any)	*$14,800*	

2.2. People often buy a specific body style with a certain type of trip in mind. For example, a household might buy a sport utility vehicle with a ski trip in mind, even though most days they would use it to commute to work. *Please complete this statement in the way that best describes why you are interested in the body style and size of the vehicle above :*

We would buy this style and size of vehicle to:

Check only one box

- ❑ commute to work or school on a regular basis
- ❑ chauffer children or other non-drivers
- ❑ chauffer business clients and associates
- ❑ run business errands
- ❑ take weekend and vacation trips
- ❑ haul large loads
- ❑ I/we chose the body style because of the way it looks
- ❑ other (specify:_____)

2.3 In **Part One** and for **Situation One** you told us which of your vehicles you would replace next *(or some of you said that you would add a vehicle next).*

Has anything changed? Are you still thinking to replace that same vehicle given your **'Situation Two'** selection above? *(or would Situation Two selection still be an addition?).*

- ❑ **No change**, the same vehicle will be replaced *(or same added vehicle)*
- ❑ Yes, we changed our minds, the selection above would replace a different vehicle

  Name of your vehicle to be replace_____
- ❑ Yes, we changed our minds, we won't replace any vehicles, the selection above would be an added vehicle to our household.

1.4. *Who would be the main driver of the selection above?*_____

In the table below, find the vehicle type you selected for Situation Two and go to the questions for that vehicle type. Ignore questions for other vehicle types.

A. Compressed natural gas	**skip to page 8**
B. Reformulated gasoline	**skip to page 9**
C. Hybrid electric	**skip to page 10**
D. Community electric	**skip to page 11**
E. Regional electric	**skip to page 12**
F. Neighborhood electric	**skip to page 13**

A. Compressed natural gas vehicle

If you selected the: **gasoline vehicle in Situation One, skip to 2.5.**
electric vehicle in Situation One, go to 2.4.

2.4. *The **1st and 2nd** reasons I/we switched to the natural gas vehicle were*

Select only one 1st choice and one 2nd choice - leave the rest blank

_____it's more economical than the electric
_____it's more reliable than the electric
_____we wanted a larger vehicle
_____it's environmentally cleaner
_____it has home refueling
_____natural gas seems safer than the electric vehicle
_____it refuels faster than the electric
_____we were always most interested in the natural gas vehicle
_____other_____

2.5 *The **1st and 2nd** reasons I/we switched to the natural gas vehicle were*

_____it's more economical than the gasoline
_____it's more reliable than the gasoline
_____we wanted a large vehicle
_____it has home refueling
_____natural gas seems safer than the gasoline vehicle
_____it refuels faster than the electric
_____we were always most interested in the natural gas vehicle
_____other_____

2.6 *My / our second choice to natural gas vehicle was* **Check only one**

❑ neighborhood electric ❑ hybrid electric ❑ regional electric
❑ reformulated gasoline ❑ community electric

Natural gas choosers are done with Situation Two, skip to page 14

B. Reformulated Gas Vehicle

If you selected the: gasoline vehicle in Situation One, skip to 2.8.
electric vehicle in Situation One, go to 2.7.

2.7 *The* **1st and 2nd reasons** *I/we switched to the reformulated gasoline vehicle were*
Select only one 1st choice and one 2nd choice - leave the rest blank

_____its more economical than the electric
_____its more reliable than electric
_____its easier to refuel than the electric
_____it has better range than the electric
_____it refuels faster than the electric
_____other_____

2.8 *After reformulated gasoline, my second choice was.*

❑ compressed natural gas ❑ hybrid electric ❑ regional electric
❑ neighborhood electric ❑ community electric

Reformulated choosers are done with Situation Two, go on to page 14

C. Hybrid electric vehicle

If you selected the: **gasoline vehicle in Situation One, skip to 2.1(**
electric vehicle in Situation One, go to 2.9

2.9 *The* **1st and 2nd reasons** *I/we switched to the hybrid electric vehicle were*

Select only one 1st choice and one 2nd choice - leave the rest blank

_____It refuels and recharges at more locations.
_____It has more range than the battery only electrics.
_____It's has home recharging and liquid fuels.
_____It's cleaner than gasoline.
_____We were always most interested in the hybrid electric vehicle
_____other_____

2.10 *If you chose the gasoline vehicle in Situation One, complete this statement.*

The **1st and 2nd reasons** *I/we switched to the hybrid electric vehicle were*

Select only one 1st choice and one 2nd choice - leave the rest blank

_____It's more economical than the gasoline vehicle.
_____It's more reliable than the gasoline vehicle.
_____We were always most interested in the hybrid electric vehicle.
_____It's cleaner than gasoline.
_____It has home refueling
_____Hybrid seems safer than the gasoline vehicle
_____other_____

2.11 *Did you drop a preferred body style to get a hybrid?* *yes* ❑ *no* ❑

2.12 *If yes, Which of these styles would you have chosen?* **Check only one**
full sized sedan ❑ full sized sports utility ❑ full sized van or pick-up ❑

2.13 *My second choice vehicle type to the hybrid electric was*

❑ compressed natural gas ❑ reformulated gasoline ❑ regional electric
❑ neighborhood electric ❑ community electric

Hybrid choosers are done with Situation Two, now skip to page 14.

D. Community electric vehicle

If you selected the: **gasoline vehicle in Situation One, skip to 2.1!**
electric vehicle in Situation One, go to 2.14.

2.14 *The* **1st and 2nd reasons** *I/we chose the community electric vehicle were.*

Select only one 1st choice and one 2nd choice - leave the rest blank

_____The purchase price is lower than other electrics.
_____It's more reliable.
_____The range satisfies our driving needs.
_____The cost of batteries is lower.
_____We wanted home recharging
_____other_____

2.15. *If you chose the gasoline vehicle in* ***Situation One,*** *complete the following statement.*
The **1st and 2nd reasons** *I/we chose the community electric vehicle were.*

Select only one 1st choice and one 2nd choice - leave the rest blank

_____It costs less to run.
_____It's more reliable than the gasoline vehicle.
_____It's the best environmental vehicle.
_____It's price was much better.
_____We decided we didn't need the range of a gas vehicle after all.
_____other_____

2.16 *Did you drop a preferred body style to get a community electric? yes* ❑ *no* ❑

2.17 *If yes, Which of these styles would you have chosen?* **Check only one**
full sized sedan ❑ full sized sports utility ❑ full sized van or pick-up ❑

2.18 *My second choice vehicle type to the community electric was*

❑ compressed natural gas ❑ reformulated gasoline
❑ regional electric ❑ neighborhood electric ❑ hybrid electric

Community Electric Choosers are finished with Situation Two, now s to page 14.

E. Regional Electric Vehicle

If you selected the: **gasoline vehicle in Situation One, skip to 2.2**
electric vehicle in Situation One, go to 2.19

2.19 *The* **1st and 2nd reasons***I/we chose the regional electric vehicle were..*

Select only one 1st choice and one 2nd choice - leave the rest blank

_____We needed more range.
_____Better performance.
_____We wanted fast charging.
_____We can afford the extra costs.
_____other_____

2.20 *If you chose the gasoline vehicle in Situation One, complete the following statement.*
The **1st and 2nd reasons***reason I/we switched to the regional electric were..*

Select only one 1st choice and one 2nd choice - leave the rest blank

_____It's more economical.
_____It's more reliable.
_____It's the best environmental vehicle
_____The regional electric provided the performance we wanted.
_____We decided we could use the range of an electric.
_____The regional electric provided the range we needed
_____other_____

2.21 *Did you drop a preferred body style to get a regional electric? yes* ❑ *no* ❑

2.22 *If yes, Which of these styles would you have chosen?* **Check only one**
full sized sedan ❑ full sized sports utility ❑ full sized van or pick-up ❑

2.23 *My second choice vehicle type to the regional electric was*

❑ compressed natural gas ❑ reformulated gasoline
❑ community electric ❑ neighborhood electric ❑ hybrid electric

Regional electric choosers are done with Situation Two, go to page 1

F. Neighborhood electric vehicle

If you selected the: **gasoline vehicle in Situation One, skip to 2.2**
electric vehicle in Situation One, go to 2.24.

2.24 *The* **1st and 2nd reasons** *I/we chose the neighborhood electric were.*

Select only one 1st choice and one 2nd choice - leave the rest blank

_____Home recharging meets all our needs.
_____We have experience with a small car and like it
_____ The range satisfies our driving needs
_____The cost of batteries is lower than other electrics
_____The purchase price is lower than other electrics
_____We don't need highway speeds
_____ We have thought of owning a small car in the past
_____other_____

2.25 *If you chose the gasoline vehicle in Situation One, complete the following statement.*

The **1st and 2nd reasons** *I/we switched to the neighborhood electric were*

Select only one 1st choice and one 2nd choice - leave the rest blank

_____It's more economical to run.
_____ It's more reliable than the gasoline vehicle
_____It's the best environmental vehicle
_____It's price was much better than the gasoline vehicle.
_____ We decided we could use the range of an electric after all
_____ other_____

2.26 *My second choice vehicle type to the neighborhood electric was*

❑ compressed natural gas ❑ reformulated gasoline
❑ regional electric ❑ community electric ❑ hybrid electric

Go to next page.....

Final Questions

2.27 Which of the following expresses best the way your household made decisions.

- ❑ One person made all the decisions
- ❑ Two persons decided together
- ❑ Choices were determined by the person who would drive the car
- ❑ other_____

_____

2.28 *If more than one person was involved in the decisions, were there major disagreements to be settled?* ❑ yes ❑ no

If yes, disagreements over what? **(Check up to two boxes)**

- ❑ the practicality of electric vehicles
- ❑ the practicality of home recharging or refueling
- ❑ the safety of electric vehicles
- ❑ the safety of compressed gas vehicles
- ❑ the practicality of compressed gas vehicles
- ❑ the importance of clean cars
- ❑ which vehicle was the most economic choice
- ❑ Which vehicle was the most realistic choice
- ❑ other_____

2.29 We asked this question before; which of these statements fit your opinions best? **Check all that apply**

- ❑ electric vehicles are a bad idea
- ❑ electric vehicles would work with a little planning
- ❑ electric vehicles are not much better than golf carts
- ❑ electric vehicles are small cars
- ❑ electric vehicles will be cheap to operate
- ❑ electric vehicles are clean cars
- ❑ electric vehicles are not powerful enough
- ❑ electric vehicles are fast cars
- ❑ electric vehicles pollute like any other car

2.30 Anything you want to add or comment about the study?

Thank you for your hard work.

Put the car diaries, the map and PART TWO questionnaire together with both PART FOUR booklets into the return envelope with the $2.90 cent postage stamp, and put into the mail as soon as is possible.

A check will be generated for you by the market research company who contacted you as soon as we receive this pack

HH#_____

PART FOUR

Price Workbook

Situation one

Electric Vehicle
Gasoline Vehicle

1. Read descriptions & price-worksheets for both vehicle types above

2. Choose gasoline or electric vehicle, body style, options, add costs, subtract any tax credits.

3. Answer any questions on the price sheet pertaining to the vehicle you have chosen.

4. Go to the Answer booklet, re-enter your selection on page 3 and answer a few questions about your choice.

Electric vehicle

Recharging: Do most of your refueling at home; no gasoline on your hands or fumes.

Slow charge 110 volt wall socket (8-10 hours if batteries fully discharged).

OR

Normal charge Install a 220 volt (2-4 hours if batteries fully discharged) circuit and outlet in your garage, carport or driveway of your home, condominium or apartment. Utility rebates available for installing new circuit.

Optional Fast charging: Recharge up to 80% of your battery in around 20 minutes at special fast charge stations.

Optional Solar: panels for roof and hood provide 10 extra miles on sunny days or can extend range by offsetting air-conditioning load.

Electricity Costs: 1-2 cents per mile, when charged at night,
6 cents per mile for daytime charging.

Battery pack options:

Type 1: 80-100 miles per charge depending on model, (replacement cost $1200).

Type 2: 100-120 miles per charge depending on model, (replacement cost $2000).

New range instrumentation: Tells precisely how many miles are left on the vehicle. "Smart instruments" estimate range based on how your drive.

Drive train: 120 horsepower, 3 phase, alternating current motor (no transmission in electric vehicles)

Top speed: 80 mph (speed is governed at 80 mph to reduce drain to batteries)

Acceleration: 0-60 in 10 seconds (some sports models faster).

Air conditioning: Interior of vehicle pre-cooled or heated while recharging.

Option: High performance heat-pump, high efficiency air conditioning

Maintenance: Battery and check up service each 10,000 miles. Battery life estimated at 25,000 miles

Warranty: 2 years or 24,000 miles warranty on electronics, 8 year or 100,000 mile warranty on motor and drive train, 25,000 mile warranty on batteries.

Meets Zero Emissions Vehicle requirements for State of California ($4,000 tax credits)

No smog check required

Economy models come with AM FM radio, pre-cooled and heated seats.

Standard models come with AM/FM and Cassette, anti-lock brakes, drivers air-bag, power windows and cruise control .

Luxury models come also with CD Stereo system, heat pump climate control, dual airbags, all power accessories, sunroof, keyless entry

ELECTRIC VEHICLE PRICE SHEET

Body Style	Sports car two- seater ☐	Compact pick-up ☐	Small sport-utility ☐	Small sedan ☐	Compact sedan ☐	Mid-size sedan ☐	Minivan ☐
	Choose economy, standard or luxury (air conditioning included in luxury model)						
Economy * Base price	$17,000 ☐	$13,000 ☐	$14,000 ☐	$14,000 ☐	$17,000 ☐	$19,000 ☐	$19,000 ☐
Standard * Base price	$20,000 ☐	$16,000 ☐	$17,000 ☐	$17,000 ☐	$20,000 ☐	$22,000 ☐	$22,000 ☐
Luxury * Base price	$24,000 ☐	$20,000 ☐	$21,000 ☐	$21,000 ☐	$24,000 ☐	$26,000 ☐	$26,000 ☐
Tax Rebate	* Zero Emission Vehicle Tax Rebate Subtract $4000 from base price above						
	Choose battery type / preferred range option						
Type 1 standard equipment	100 miles ☐	80 miles ☐	80 miles ☐	100 miles ☐	100 miles ☐	80 miles ☐	80 miles ☐
Type 2 battery	120 miles $800 ☐	100 miles $800 ☐	100 miles $800 ☐	120 miles $800 ☐	120 miles $800 ☐	100 miles $800 ☐	100 miles $800 ☐
	Choose options (heat pump air conditioning standard for luxury model)						
Fast charge setup	$900 ☐	$900 ☐	$900 ☐	$900 ☐	$900 ☐	$900 ☐	$900 ☐
solar panels setup	$1200 ☐	$1200 ☐	$1200 ☐	$1200 ☐	$1200 ☐	$1200 ☐	$1200 ☐
Four door	not applicable	not applicable	not applicable	$1000 ☐	$1000 ☐	$1000 ☐	not applicable
Wagon or extended cab	not applicable	$800 ☐	not applicable	$800 ☐	$1000 ☐	$1000 ☐	not applicable
heat pump air condition	$800 ☐	$800 ☐	$800 ☐	$800 ☐	$800 ☐	$800 ☐	$800 ☐

Please add your base price, subtract tax rebate, and add options.

Total price of your package $_____.00

If you choose this type of vehicle, please answer questions below

****

1. Can you specify some destinations (away from home) where you would like to be able to **NORMAL CHARGE (220V/2-4 hours)** your electric vehicle while it is parked.

Location 1_____

Location 2_____

Use green dots and the red pen and mark those locations on map or on margin with the symbol **NC**.

2. If you chose **FAST CHARGE**, can you specify some destinations where you would like to find a **FAST CHARGE STATION (80% in 20 minutes).**

Location 1_____

Location 2_____

Use green dots and the red pen and mark those locations on map or on margin with the symbol **FC**.

Gasoline Vehicle

Fuel and mileage This vehicle runs on regular grade gasoline, gets between 38 and 18 miles to the gallon (4-8 cents per mile) depending on the model

Powered by four, six or eight cylinder fuel injected combustion engines. Available in all sizes and models.

Maintenance: Oil change each 7,500 miles, Lube, safety check, belts, exhaust , minor tune up and safety check every 25,000 miles, major service at 75,000

Warranty: Four year or 50,000 miles on emissions system. Three year or 36,000 mile power train (engine and transmission): warranty, two year or 24,000 miles on rest of vehicle.

Options: Four wheel drive, air conditioning(standard on luxury models) four door models, and automatic transmission.

Meets Transitional Low Emissions Vehicle requirements for State of California

Annual smog check required

Economy: models come with AM/FM radio, and manual transmission (air conditioning is optional)

Standard: models come with AM/FM and Cassette, manual or auto transmission, anti-lock brakes, drivers air-bag, power windows and cruise control (air conditioning is optional)

Luxury: models: come also with CD Stereo system, automatic climate control, dual airbags, all power accessories, leather seats and sunroof, keyless entry

GASOLINE VEHICLE PRICE SHEET

Body Style	Sports car -2 seats ❑	Compact pick-ups ❑	Small sedan ❑ Small sport-utility ❑	Compact sedan ❑	Midsize sedan ❑	Full size sedan ❑	Minivan ❑ Full size sports utility ❑	Full sized pickup ❑ Full sized van ❑
	Choose economy, standard or luxury							
Economy Base price	$13,000 ❑	$9,000 ❑	$10,000 ❑	$13,000 ❑	$15,000 ❑	$17,000 ❑	$15,000 ❑	$12,000 ❑
Standard Base price	$16,000 ❑	$12,000 ❑	$13,000 ❑	$16,000 ❑	$18,000 ❑	$20,000 ❑	$18,000 ❑	$15,000 ❑
Luxury Base price	$20,000 ❑	$16,000 ❑	$17,000 ❑	$20,000 ❑	$22,000 ❑	$24,000 ❑	$22,000 ❑	$19,000 ❑
	Choose engine size							
4 cylinder	standard ❑	standard ❑	standard ❑	standard ❑	standard ❑	not available	standard ❑	not available
6 cylinder	$1000 ❑	$1000 ❑	$1000 ❑	$1000 ❑	$1000 ❑	standard ❑	$1000 ❑	standard ❑
8 cylinder	$2000 ❑	not available	not available	not available	not available	$1000 ❑	$2000 ❑	$1000 ❑
	Choose options (air conditioning and automatic transmission standard for luxury models)							
Automatic trans.	$900 ❑	$900 ❑	$900 ❑	$900 ❑	$900 ❑	$900 ❑	$900 ❑	$900 ❑
Wagons and extded cabs	not applicable	$1000 ❑	not applicable	$1000 ❑	$1000 ❑	$1000 ❑	not applicable	$1000 ❑
Four door model	not applicable	not applicable	not applicable	$1000 ❑	$1000 ❑	$1000 ❑	not applicable	$1000 ❑
Four wheel drive	not available	$2,000 ❑	$2,000 ❑	$2,000 ❑	$2,000 ❑	$2,000 ❑	$2,000 ❑	$2,000 ❑
Air conditioning	$800 ❑	$800 ❑	$800 ❑	$800 ❑	$800 ❑	$800 ❑	$1200 ❑	$800 ❑

Please add your base price, and options.

Total price of your package $_____.00

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1 If we were to give you the vehicle you chose above for only $1000, with all the amenities and features you wanted and in your favorite color, but it only had a three gallon fuel tank which you could not replace or alter, would you take such a vehicle for your vehicle. ❑yes ❑no

2. If no, Would you take it if you knew you could refill the tank each night at home.

❑yes ❑no

Situation two

Compressed Natural Gas
Reformulated Gasoline
Hybrid Electric
Community Electric
Regional Electric
Neighborhood Electric

1. **Read descriptions & worksheets for each of the 6 types above.**

2. **Choose one of the six vehicle types.**

3. **Answer any questions on the price sheet about your selection**

4. **Go to Answer Booklet, page 6, re-enter your selection there and answer a few questions.**

Compressed natural gas vehicle

Natural gas: The same clean and safe fuel used for heating and cooking at your home. Natural gas has been used for decades in New Zealand, Canada and other nations in place of gasoline to power vehicles. Available in all sizes of vehicles through full sized vehicles. Clean fuel and low engine wear. Impact resistant compression tanks, made of spun aluminum and wrapped with fiberglass.

Refueled: at quick-fill stations in about ten minutes,

Optional Home Refueling Appliance: can be slow filled overnight, 6-8 hours when empty.

Driving Range: Single cylinder (80 miles range)
Double cylinder (120 miles range)

Fuel price: the equivalent of paying 70 cents per gallon for gasoline

Dedicated: natural gas only vehicle -- not a dual-fueled conversion-- optimized for high octane natural gas, same high performance as gasoline.

Powered: by 4, 6 or 8 cylinder fuel injected combustion engines. Available in all sizes and models.

Meets California Ultra-Low Emissions Vehicles standards ($1000 tax credits).

Annual smog check required

Maintenance: Fuel cylinder safety test required every five years. Oil change each 7,500 miles, lube, safety check, belts, exhaust , minor tune-up and safety check, every 25,000 miles, major service at 75,000 miles, replace belts, catalytic converter.

Warranty: Lifetime warranty on cylinders. Four year or 50,000 mile on emissions system. Three year or 36,000 mile power train warranty, two year or 24,000 mile warranty on rest of vehicle (same as reformulated gasoline)

Economy: models come with AM/FM radio, and manual transmission (air conditioning is optional).

Standard: models come with AM/FM and cassette, manual or auto transmission, anti-lock brakes, drivers air-bag, power windows and cruise control (air conditioning is optional).

Luxury: models come also with CD Stereo system, automatic climate control, dual airbags, all power accessories, leather seats and sunroof, keyless entry.

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Home refueling appliance

The Sultzer Home Refueling Appliance is suggested for compressed gas vehicle owners who drive more than 20,000 miles per year or who value highly the convenience of home refueling. It is offered for sale and for lease. The gas company is offering a $400 rebate on purchase, and two months free on one year lease.

Do you want home refueling? ❑ no ❑ yes

Choose ❑ purchase $2500 or ❑ lease $60 per month

1. If you chose the home refueling option, how often might you expect to use away from home fast refueling stations.?

❑ daily ❑ weekly ❑ monthly ❑ rarely ❑ don't know

COMPRESSED NATURAL GAS PRICE SHEET

Body Style	Sports car -2 seats ☐	Compact pick-ups ☐	Small sedan ☐ Small sport-utility ☐	Compact sedan ☐	Midsize sedan ☐	Full size sedan ☐	Minivan ☐ Full size sports utility ☐	Full sized pickup ☐ Full sized van ☐
	Choose economy, standard or luxury							
Economy * Base price	$13,500 ☐	$9,500 ☐	$10,500 ☐	$13,500 ☐	$15,500 ☐	$17,500 ☐	$15,500 ☐	$12,500 ☐
Standard * Base price	$16,500 ☐	$12,500 ☐	$13,500 ☐	$16,500 ☐	$18,500 ☐	$20,500 ☐	$18,500 ☐	$15,500 ☐
Luxury * Base price	$20,500 ☐	$17,500 ☐	$16,500 ☐	$20,500 ☐	$22,500 ☐	$24,500 ☐	$22,500 ☐	$19,500 ☐
Tax rebate	*Tax rebate for Ultra Low Emission Vehicle, Subtract $1000 from base price							
	Choose engine size							
4 cylinder	standard ☐	standard ☐	standard ☐	standard ☐	standard ☐	not available	standard ☐	not available
6 cylinder	$1000 ☐	$1000 ☐	$1000 ☐	$1000 ☐	$1000 ☐	standard ☐	$1000 ☐	standard ☐
8 cylinder	$2000 ☐	not available	not available	not available	not available	$1000 ☐	$2000 ☐	$1000 ☐
	Choose fuel tank setup							
Single tank 80 miles	Standard ☐	Standard ☐	Standard ☐	Standard ☐	Standard ☐	Standard ☐	Standard ☐	Standard ☐
Double tank 120 miles	not available	$1000 ☐	not available	$1000 ☐	$1000 ☐	$1000 ☐	$1000 ☐	$1000 ☐
	Choose options (air cond. and auto- transmission standard for luxury models)							
Automatic trans.	$900 ☐	$900 ☐	$900 ☐	$900 ☐	$900 ☐	$900 ☐	$900 ☐	$900 ☐
Wagons and extded cabs	not applicable	$1000 ☐	not applicable	$1000 ☐	$1000 ☐	$1000 ☐	not applicable	$1000 ☐
Four door model	not applicable	not applicable	not applicable	$1000 ☐	$1000 ☐	$1000 ☐	not applicable	$1000 ☐
Four wheel drive	not available	$2,000 ☐	$2,000 ☐	$2,000 ☐	$2,000 ☐	$2,000 ☐	$2,000 ☐	$2,000 ☐
Air conditioning	$800 ☐	$800 ☐	$800 ☐	$800 ☐	$800 ☐	$800 ☐	$1200 ☐	$800 ☐

Please add your base price, subtract tax rebate and add options.

Total price of your package $_____.00

If you choose this type of vehicle, please answer questions below

2. If you chose the Compressed Natural Gas Vehicle - can you specify some destinations (away from home) where you would like to find a **FAST FILL station (ten minutes to fill a tank).**

Location 1_____

Location 2_____

Use green dots and the red pen and mark those locations on map or on margin with the symbol FF.

Reformulated Gasoline Vehicle

Fuel and mileage This vehicle runs on reformulated gasoline, which is a less polluting type of gasoline, is not different in any other ways from previous gasoline vehicles, gets between 18 and 38 miles to the gallon depending on the model.

Powered: by 4,6, and 8 cylinder fuel injected combustion engines. Available in all sizes and models.

Options: Four wheel drive, air conditioning (standard on luxury models) and automatic transmission.

Meets Low Emissions Vehicle requirements for State of California

Annual smog check required

Maintenance: Oil change each 7,500 miles, Lube, safety check, belts, exhaust , minor tune up and safety check every 25,000 miles, major service at 75,000

Warranty: Four year or 50,000 miles on emissions system. Three year or 36,000 mile power train (engine and transmission) warranty, two year or 24,000 miles on rest of vehicle.

Economy: models come with AM/FM radio, and manual transmission (air conditioning is optional)

Standard: models come with AM/FM and cassette, manual or auto transmission, anti-lock brakes, drivers air-bag, power windows and cruise control (air conditioning is optional)

Luxury: models come also with CD Stereo system, automatic climate control, dual airbags, all power accessories, leather seats and sunroof, keyless entry

REFORMULATED GASOLINE PRICE SHEET

Body Style	Sports car -2 seats ☐	Compact pick-ups ☐	Small sedan ☐ Small sport-utility ☐	Compact sedan ☐	Midsize sedan ☐	Full size sedan ☐	Minivan ☐ Full size sports utility ☐	Full sized pickup ☐ Full sized van ☐
	Choose economy, standard or luxury							
Economy Base price	$13,000 ☐	$9,000 ☐	$10,000 ☐	$13,000 ☐	$15,000 ☐	$17,000 ☐	$15,000 ☐	$12,000 ☐
Standard Base price	$16,000 ☐	$12,000 ☐	$13,000 ☐	$16,000 ☐	$18,000 ☐	$20,000 ☐	$18,000 ☐	$15,000 ☐
Luxury Base price	$20,000 ☐	$16,000 ☐	$17,000 ☐	$20,000 ☐	$22,000 ☐	$24,000 ☐	$22,000 ☐	$19,000 ☐
	Choose engine size							
4 cylinder	standard ☐	standard ☐	standard ☐	standard ☐	standard ☐	not available	standard ☐	not available
6 cylinder	$1000 ☐	$1000 ☐	$1000 ☐	$1000 ☐	$1000 ☐	standard ☐	$1000 ☐	standard ☐
8 cylinder	$2000 ☐	not available	not available	not available	not available	$1000 ☐	$2000 ☐	$1000 ☐
	Choose options (air conditioning and automatic transmission standard for luxury models)							
Automatic trans.	$900 ☐	$900 ☐	$900 ☐	$900 ☐	$900 ☐	$900 ☐	$900 ☐	$900 ☐
Wagons and extded cabs	not applicable	$1000 ☐	not applicable	$1000 ☐	$1000 ☐	$1000 ☐	not applicable	$1000 ☐
Four door model	not applicable	not applicable	not applicable	$1000 ☐	$1000 ☐	$1000 ☐	not applicable	$1000 ☐
Four wheel drive	not available	$2,000 ☐	$2,000 ☐	$2,000 ☐	$2,000 ☐	$2,000 ☐	$2,000 ☐	$2,000 ☐
Air conditioning	$800 ☐	$800 ☐	$800 ☐	$800 ☐	$800 ☐	$800 ☐	$1200 ☐	$800 ☐

Please add your base price, and options.

Total price of your package $_____.00

Hybrid electric vehicle

Range Extender: Hybrid vehicle has small engine to extend range of battery powered electric, has 40 horsepower reformulated gasoline engine to provide extra miles and gasoline refueling for long trips. Gasoline range extender automatically starts when batteries drop to preset level.

Battery Options:

Type 1: 40 miles on batteries, additional 100 miles on range extender (combined 140 miles)- recharge time on 220 volts is 1-3 hours depending on level of battery charge - replacement cost of batteries = $1000.

Type 2: 80 miles on batteries, additional 100 miles on ranger extender (combined 180 miles) - recharge time on 220 volts is 2-4 hours depending on level of battery charge - replacement cost of batteries = $1700.

Fast Charging: option available for Type 2, recover 80% charge in 20 minutes at fast charge station.

Top speed: 75 mph (speed is governed to reduce drain to batteries).

Accelerates: 0-60 in 13 seconds (some sports models faster).

Standard air conditioning: Interior pre-cooled or heated while recharging

Optional air conditioning: High performance heat-pump, high efficiency air conditioning (for driving)

Meets California Ultra-Low Emissions Vehicles standards ($1000 tax credits)

Annual smog check required

Maintenance: Oil change each 7,500 miles, lube, safety check, belts, exhaust, minor tune-up and safety check, every 25,000 miles, major service at 75,000 miles, replace belts, coolants, catalytic converter on range extender. Battery check-up every 10,000 miles, estimated replacement at 25,000 miles.

Warranty: 4 year or 50,000 mile on emissions system. 3 year or 36,000 mile power train and electronics warranty, 2 year or 24,000 on rest of vehicle. 25,000 mile warranty on batteries.

Economy: models come with AM/FM radio, and manual transmission (air conditioning is optional).

Standard: models come with AM/FM and Cassette, manual or auto transmission (electrics do not have transmissions) anti-lock brakes, drivers air-bag, power windows and cruise control (air conditioning is optional).

Luxury: models come also with CD Stereo system, automatic climate control, dual airbags, all power accessories, leather seats and sunroof, keyless entry.

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1. *Would you expect to use the range extender on any of your diary days ?*
   Car One Diary ❑Day 1 ❑Day 2 ❑Day 3
   Car Two Diary ❑Day 1 ❑Day 2 ❑Day 3

2. *Would you expect to use the range extender to get to your critical destination?* ❑*yes* ❑*no*

3. *How often might you expect to use the range extender?*

❑ daily ❑ weekly ❑ monthly ❑ rarely ❑ don't know

HYBRID ELECTRIC VEHICLE PRICE SHEET

Body Style	Sports car two-seater	Compact pick-up	Small sport-utility	Small sedan	Compact sedan	Mid-size sedan	Minivan
	Choose economy, standard or luxury (air conditioning included in luxury model)						
Economy * Base price	$18,000	$14,000	$15000	$15000	$18000	$19000	$20,000
Standard * Base price	$21,000	$17,000	$18,000	$18,000	$21,000	$23,000	$23000
Luxury * Base price	$25,000	$21,000	$22,000	$22,000	$25,000	$27000	$27,000
Tax Rebate	* Ultra-Low Emission Vehicle Tax Rebate Subtract $1000 from base price above						
	Choose battery type / preferred range option						
Type 1 40 miles	Standard	Standard	Standard	Standard	Standard	Standard	Standard
Type 2 80 miles	$1800	$1800	$1800	$1800	$1800	$1800	$1800
Fastcharge Type 2 only	$900	$900	$900	$900	$900	$900	$900
	Choose options (heat pump air conditioning standard for luxury model)						
solar panels setup	$1200	$1200	$1200	$1200	$1200	$1200	$1200
Four door	not applicable	not applicable	not applicable	$1000	$1000	$1000	not applicable
Wagon or extended cab	not applicable	$800	not applicable	$800	$1000	$1000	not applicable
heat pump air condition	$800	$800	$800	$800	$800	$800	$800

Please add your base price, subtract tax rebate, and add options.

Total price of your package $________.00

****

4. **If you chose the Hybrid Vehicle** - can you specify some destinations (away from home) where you would like to be able to **NORMAL CHARGE (220V/2-4 hours)** your hybrid electric vehicle while it is parked.

Location 1____________________________________
Location 2____________________________________

Use green dots and the red pen and mark those locations on map or on margin with the symbol **NC**.

5. If you purchased **FAST CHARGE**, can you specify some destinations where you would like to find a **FAST CHARGE STATION (80% in 20 minutes)**.

Location 1____________________________________
Location 2____________________________________

Use green dots and the red pen and mark those locations on map or on margin with the symbol **FC**.

Community electric vehicle

Recharging: Do most of your refueling at home; no gasoline on your hands or fumes.

Slow charge 110 volt wall socket (8-10 hours if batteries fully discharged). Or **Normal charge** Install a 220 volt (2-4 hours if batteries fully discharged) circuit and outlet in your garage, carport or driveway of your home, condominium or apartment. Utility rebates available for installing new circuit.

Optional Fast charging: Recharge up to 80% of your battery in around 20 minutes at special fast charge stations.

Optional Solar: panels for roof and hood provide 10 extra miles on sunny days or can extend range by offsetting air-conditioning load.

Electricity Costs: 1-2 cents per mile, when charged at night,

6 cents per mile for daytime charging.

Battery Options:

Type 1: 60 miles per charge. Warranteed to 25, 000 miles (replacement cost $800).

Type 2: 80 miles per charge. Warranteed to 25, 000 miles (replacement cost $1200).

New range instrumentation: Tells precisely how many miles are left on the vehicle (smart instruments estimate range based on how you drive).

Drive train: 60 horsepower, three phase, alternating current motor (no transmission in electric vehicle)

Top speed: 70 mph (speed is governed to reduce drain to batteries)

Accelerates 0-60 in 13 seconds (some sports models faster).

Standard air conditioning: Interior pre-cooled or heated while recharging

Optional air conditioning: High performance heat-pump, high efficiency air conditioning (for driving)

Maintenance: Battery and check up service each 10,000 miles.

Warranty: 3 years or 36,000 miles warranty on electronics, 8 years or 100,000 mile warranty on motor and drive train, 25,000 mile warranty on batteries.

Meets Zero Emissions Vehicle requirements for State of California ($4,000 tax credits)

No smog check required

Economy: models come with AM/FM radio, pre-cooled and heated seats.

Standard: models come with AM/FM and cassette, anti-lock brakes, drivers air-bag, power windows and cruise control .

Luxury: models come also with CD Stereo system, heat pump climate control, dual airbags, all power accessories, sunroof, keyless entry

Regional electric vehicle

Increased Range. The regional electric offers longer range and battery life.

Recharging: Do most of your refueling at home; no gasoline on your hands or fumes.

Slow charge 110 volt wall socket (8-10 hours if batteries fully discharged). Or
Normal charge Install a 220 volt (2-4 hours if batteries fully discharged) circuit and outlet in your garage, carport or driveway of your home, condominium or apartment. Utility rebates available for installing new circuit.

Optional Fast charging: Recharge up to 80% of your battery in around 20 minutes at special fast charge stations.

Optional Solar: panels for roof and hood provide 10 extra miles on sunny days or can extend range by offsetting air-conditioning load.

Electricity Costs: 1-2 cents per mile, when charged at night,
6 cents per mile for daytime charging.

Battery Options

Type 1: 120-130 miles per charge. Warranteed to 50,000 miles or 5 years (replacement cost $3,000 - financing available).

Type 2: 140-150 miles per charge, Warranteed to 50,000 miles or 5 years (replacement cost $4,000- financing available).

New range instrumentation: Tells precisely how many miles are left on the vehicle

Drive train: 130 horsepower, three phase, alternating current motor (There is no transmission in electric vehicles)

Body: aluminum space frame construction.

Top speed: 85 mph (speed is governed to reduce drain to batteries).

Accelerates: 0-60 in 8-9 seconds (some sports models faster).

Standard air conditioning: Interior pre-cooled or pre-heated while recharging

Optional air conditioning: High performance heat-pump, high efficiency air conditioning (for use while driving)

Maintenance: battery and check-up service each 10,000 miles.

Warranty: 3 years or 36,000 miles warranty on electronics, 8 year or 100,000 mile warranty on motor and drive train, 50,000 mile warranty on batteries.

Meets Zero Emissions Vehicle requirements for State of California ($4,000 tax credits)

No smog check required

Economy: models come with AM/FM radio, pre-cooled and heated seats.

Standard: models come with AM/FM and Cassette, anti-lock brakes, drivers air-bag, power windows and cruise control.

Luxury: models come also with CD Stereo system, heat pump climate control, dual airbags, all power accessories, sunroof, keyless entry

Neighborhood electric vehicle

Neighborhood electric vehicle: is designed for around the town driving. Easy parking, handling and use. Comes as two passenger version or with small rear seat for two additional passengers. Cargo room for four bags of groceries.

Vehicle length: is 11 ft, width is 5 ft, can park in small places, turning radius 15 ft.

Top speed: 40 mph.

Accelerates: 0-40 in 15 seconds.

Range: 40 miles.

Curb weight: of the vehicle is 1200 lbs.

Composite structure: is fully crash tested and passes all federal crash safety.

Optional airbags:

Electricity Costs: less than 1 cent per mile for electricity.

Recharges: 2-4 hours on 110 volt **slow charge** depending on the charge level of the battery. 1.2 hours on 220 volts **normal charge.** Replacement cost of battery back is just $500.

Fast charge: not available for neighborhood electric.

Optional solar: panels, offers 7 miles extra of range on sunny day.

Standard air conditioning: Interior pre-cooled or heated while recharging

Optional air conditioning: High performance heat-pump, high efficiency air conditioning (for driving)

Service is minimal

Warranty: Motor and drive train warranteed for ten years or 100,000 miles. Batteries are guaranteed for 20,000 miles.

***The neighborhood electric is not intended for highway driving.**

Meets California Zero Emissions vehicle standards for non-freeway vehicles. Qualifies for $2000 tax credits.

Standard: comes with AM/FM radio, pre-cooled and heated seats.

Luxury: models come also with CD Stereo system, heat pump climate control, dual airbags, all power accessories, sunroof, keyless entry

APPENDIX B

References to the articles on electric and natural gas vehicles included in Part Three of the survey instrument.

—*A cleaner way to drive*. San Jose Mercury News. p. 11E. Monday, November 25, 1991.

—*BART: Electric connection*. Bay Area League of Women Voters Bay Area Monitor. p.3. May/June 1993.

—*The big three's current examples*. Autoweek. p. 18. December 13, 1993. (This is a sidebar to a longer article on electric vehicles.)

Cogan, R. *Electric vehicles: Powerplay on the auto circuit*. Motor Trend. October 1993.

Gromer, C. *New age of the electric car*. Popular Mechanics. February 1994

Levander, M. *Jump-starting an industry*. San Jose Mercury News. p. 1D. Monday, April 26, 1993.