

**Environmental Performance Labels for Vehicles:  
Context and Findings of Market Research  
for the U.S. Environmental Protection Agency**

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## **EXECUTIVE SUMMARY**

There has been a resurgence of interest in environmental ratings and labels for vehicles, due to growing concern about oil dependence and climate change as well as the federal government's failure to address these issues with meaningful transportation-sector initiatives. Both Connecticut and California are currently developing vehicle labels pursuant to state laws, and several non-governmental Web sites display extensive information on comparative environmental performance of new vehicle models.

The U.S. Environmental Protection Agency (EPA) has developed an environmental rating system for vehicles, which now appears on the agency's Green Vehicle Guide Web site. The rating consists of one-to-ten scores on two scales: an air pollution scale and a greenhouse gas scale. Vehicles that score well on both scales are designated SmartWay<sup>SM</sup> vehicles.

In conjunction with the development of this rating scheme, EPA investigated possible redesigns of the existing fuel economy label that would display the environmental ratings as well. This effort occurred in parallel with a separate EPA review of the accuracy and consumer-friendliness of the fuel economy label. Both of these explorations of labeling issues involved market research; EPA contracted with ACEEE to conduct the research on consumers' understanding of vehicles' environmental impacts and their reactions to various label designs that would display environmental information. Stakeholder interviews, consumer focus groups, and an online survey were conducted. Stakeholders included consumer and environmental advocates, academics, auto journalists, state government staff, and representatives of automobile dealers.

### **Market Research Findings**

Several stakeholders suggested a redesign of the label more comprehensive than what EPA had proposed. They commented on the importance of an accompanying consumer education effort and the need to reach consumers early in the vehicle selection process, and they emphasized the importance of ensuring integrity and rigor in the rating scheme. Views differed on the value of the SmartWay designation.

The consumer research found that, while environmental performance was of some concern among a subset of study participants, it was not typically a driver in vehicle purchasing decisions. Fuel economy was of interest to a larger number, but still lagged behind reliability, price, features, and safety as the primary drivers in vehicle purchasing. (Gasoline prices were below \$2.00 per gallon at the time of the research.) While participants were aware that vehicles contribute to air pollution and have a negative impact on the environment, their understanding of the types of pollutants emitted by vehicles and the specific environmental impacts was limited. Participants indicated that they would like to see environmental labels on cars and trucks and were interested in education to help them get a better grasp on the issues and to use the labels effectively. Indeed, they found a high environmental performance score to be highly motivating.

When examining specific label designs and elements, consumers offered a number of suggestions related to the label's visual appearance and ease of use. There was general agreement that the environmental performance scores should provide comparative information for all vehicles and within vehicle class. Consumers found the SmartWay designation to be a useful tool. They are most likely to use the label to help them decide between two otherwise equivalent vehicles, but many would also seek out vehicles with the label or avoid those without.

Results regarding the relative merits of two presentations of environmental scores, a bar graph and a star rating, were mixed. Although survey participants reported a preference for the bar graph and *perceived* it to be easier to understand, this perception was not borne out by actual comprehension results. In fact, when neither label showed the SmartWay logo, participants were more likely to correctly identify the environmentally superior of two vehicles when the star format was used. Bars and stars were equally well understood when used in conjunction with the logo. Consumers were equally likely to read the labels regardless of the format used for the environmental performance scores, but were more likely to use the bar graph.

## **Conclusions and Recommendations**

### *EPA's Rating Scheme*

Certain elements of EPA's vehicle rating scheme should be improved. Representing a vehicle's contribution to air pollution requires some basis, such as a damage cost, for weighing the emissions of the various pollutants. Absent such a basis, EPA at a minimum should take steps to ensure that consumers do not read into the pollution score a meaning that is not there. In particular, EPA should not represent the score in a way that suggests a linear relationship between the score and the cleanness of the vehicle.

When the Tier 2 and LEV II certifications of a given vehicle lead to two different air pollution scores, the better emissions score should be assigned to the vehicle regardless of where it is offered for sale. As full implementation of the Tier 2 program approaches, EPA should tighten the air pollution requirements for SmartWay designation in order to ensure that qualifying vehicles offer superior performance on regulated pollutants.

Especially as fuels other than gasoline become more common for light-duty vehicles, representing a vehicle's greenhouse gas emissions through in-use carbon dioxide (CO<sub>2</sub>) will be misleading. EPA should include full fuel cycle emissions of all greenhouse gases in the greenhouse gas score. For vehicles that can run on more than one fuel, it will be necessary to provide a score for each fuel that is readily available. EPA should also help identify an alternative to SmartWay for those states that have adopted California's greenhouse gas tailpipe standards.

### *Specific Conclusions of the Vehicle Labeling Research*

Based on our market research on vehicle labels, we make the following recommendations:

- Further testing of alternate label designs is warranted and would help to ensure that the final label best communicates fuel economy and environmental performance to consumers.
- A “shopping experiment,” in which response to the label is tested at car dealerships, would be helpful. A larger and more diverse pool of respondents could also clarify some of the outstanding questions about consumer response.
- Changes to the label should be made simultaneously and prominently, in order to maximize consumer attention to and visual recognition of the new label.
- In any labels that are tested with consumers or adopted for the vehicle labeling program, (1) use “Global Warming Score” rather than “Greenhouse Gas Score”; (2) include the SmartWay logo for qualified vehicles; (3) retain city/highway mileage figures and the fuel tank icon; and (4) use both all-vehicle and in-class comparative information.
- An education and promotional campaign on the new label design and the environmental issues related to vehicles will be essential to ensure the ultimate impact of the label on consumer decision-making and its effectiveness as a policy tool.

#### *More General Comments on Vehicle Labeling*

We offer several more general comments on vehicle labeling.

- Previous work on product energy use labeling has concluded that labeling has led to substantially improved average product efficiency, in several cases more than 10% improvement. Consumers’ poor understanding of fundamental environmental relationships such as the correlation between fuel economy and greenhouse gas emissions highlight the potential educational value of a label, including helping to develop consumers’ understanding of actions that would mitigate climate change. Vehicle labels could alter manufacturers’ production decisions as well, as has been shown in the case of appliance labels. At the same time, manufacturers who expect to fare poorly with respect to their competitors under a proposed labeling program may exert their influence to modify or prevent implementation of that program.
- Design can be a major determinant of a label’s efficacy, and consumers’ reactions to design details are hard to predict. Consequently, extensive market research should accompany development or revision of a label. EPA has been too rigid in its approach to new label design and insufficiently receptive to the lessons of earlier research.
- Label executions tested in the research described below, as well as those tested in EPA’s fuel economy focus groups, represent an incremental approach to improving the current fuel economy label. EPA should engage experts in the visual presentation of quantitative information to design the best possible fuel economy and environmental performance label. The existing label should not be taken as a starting point for this design effort. This point is made more generally by those involved in label research.

- The market research described below provided no clear answer on the relative efficacy of a “categorical” rating scheme (i.e., one that places vehicles into discrete levels of environmental performance) and a continuous rating scheme. This may be a reflection of the relatively small sample size used. Other research on consumer labeling has found, however, that categorical labels lead to superior comprehension.
- The air pollution and global warming scores proposed for the vehicle label are a useful service government can provide by identifying key elements of a complicated data set and supplying objective information to the public. EPA’s SmartWay designation is of a somewhat different character, involving subjective judgments about environmental performance. On balance, however, we believe the SmartWay logo should be retained, because it attracts attention and motivates consumers more than labels without the logo. In addition, adding SmartWay to the label will presumably increase manufacturers’ interest in producing high-scoring vehicles.
- With regard to EPA’s investigation of fuel economy labeling, which led to a rulemaking in December 2006, we note that carrying out simultaneous and independent market research efforts related to the fuel economy label was inefficient. Particularly unfortunate was that the fuel economy labeling rule took action on certain labeling issues that had not been adequately investigated in the fuel economy research, resulting in changes that were incompatible with the findings of the environmental information market research. While the final rule acknowledges a role for environmental information on vehicles in the future, a second redesign of the label in a short period of time dilutes the benefits of whatever consumer awareness efforts may accompany the new label and detracts from the reestablishment of the fuel economy label elements as icons for the American public.
- The need to rethink the fuel economy label goes beyond graphical design questions to fundamental issues involving consumer behavior. The market research carried out by EPA in conjunction with improving the accuracy and consumer-friendliness of the fuel economy label seems not to have considered whether the label, together with a consumer outreach program, could tap into the various ways in which consumers might be favorably inclined toward high-efficiency vehicles. The fuel economy label revisions adopted in 2006 represent a missed opportunity to optimize the value of the label. Comprehensive, quantitative consumer research and a complete information design review should precede any future changes to the label.



## BACKGROUND

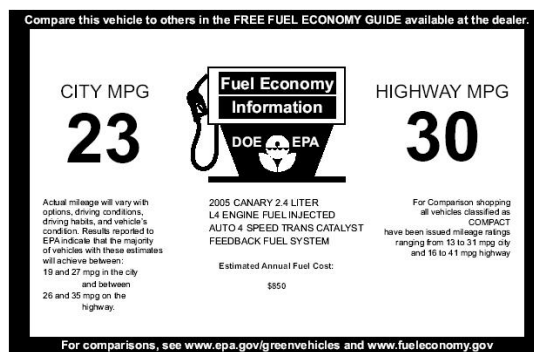
Over the past thirty years, governments around the world have developed labeling programs for energy-using products as a means of promoting sales of more efficient products. The design of the label has come to be appreciated as a complex matter that strongly influences the success of the program.

Light-duty vehicles have been labeled for fuel economy in the U.S. for thirty years. There has been a resurgence of interest in vehicle labeling due to growing concern about oil dependence and climate change as well as the federal government's failure to address these issues with meaningful transportation-sector initiatives. Adding to the perceived importance of labeling is evidence that the public's understanding of vehicles' environmental impacts is limited at present, so labels could serve an important educational purpose.

In this setting, the U.S. Environmental Protection Agency undertook to devise environmental performance ratings for vehicles that reflected emissions of both regulated air pollutants and greenhouse gases. Among federal agencies, EPA was the likeliest candidate to do this, because it administers both the federal motor vehicle air pollution control program and the fuel economy labeling program, and has increasingly acknowledged the need to tackle greenhouse gases from the transportation sector.

EPA's fuel economy labeling program requires that all new passenger vehicles sold in the United States display a label informing consumers about the fuel economy of the vehicle, estimated annual fuel cost, and a comparison to vehicles of the same class. The current U.S. fuel economy label, shown in Figure 1, does not reflect the environmental impacts of fuel consumption.

**Figure 1: Current U.S. Fuel Economy Label**



*NOTE: Larger images of labels shown throughout this report are available in the appendix.*

In 2001, EPA launched the Green Vehicle Guide Web site, listing all new cars and light trucks together with their fuel economies and emissions information. EPA sought input from stakeholders on a proposed environmental rating system based on this information that would be added to the Green Vehicle Guide and potentially to the fuel economy label as well. Manufacturers, environmental and energy efficiency groups, and dealers provided comments,

some quite critical of the proposal, and no consensus was reached on the proper methodology for such a rating system at that time.

EPA subsequently proposed a revised rating system for the Green Vehicle Guide Web site, addressing some of the major criticisms of the earlier system. In particular, EPA shifted from a system in which vehicles competed only with others of the same vehicle class to an absolute rating system, in which scores could be compared across all vehicle offerings. Vehicle ratings were posted on the Green Vehicle Guide in 2004 (see [www.epa.gov/greenvehicles](http://www.epa.gov/greenvehicles)). At that time, EPA began to consider design variations on the existing fuel economy label that would include these environmental ratings. *The market research conducted to test these new labels is the primary subject of this report.*

Two other EPA efforts underway at the same time bear mention here. First, EPA was developing its SmartWay Transport brand to indicate superior environmental performance for a range of transportation products and services, beginning with the shipment of freight. A light-duty SmartWay brand based on the evolving vehicle rating scheme was seen as a desirable complement.

Second, EPA began a rulemaking to respond to complaints about the inaccuracy of the information provided on the existing fuel economy label. EPA undertook to (1) change the methodology for determining label fuel economy values so as to make them more indicative of real world performance and (2) redesign the label to better inform the consumer. The latter effort led to the convening of ten focus groups separate from those described in this report, but with substantial overlap in content.

In December 2006, EPA issued the final rule adopting the new methodology and a new label design for vehicles manufactured after September 1, 2007. The new label does not include environmental ratings, although the rule leaves the door open for a further change to the label, including the voluntary addition of environmental information (EPA 2006). The label now displays a bar graph of the vehicle's combined fuel economy rating, showing how the vehicle compares to others in its class

States are also developing environmental labels for vehicles. Both Connecticut and California are in the process of developing vehicle labels pursuant to state laws (CA Assembly 2005, CT Assembly 2006).

While this report is largely concerned with labeling issues, it begins with a discussion of EPA's environmental rating scheme itself. It then provides a detailed account of the market research done to test presentation of environmental performance information and how such information might be included on the fuel economy label. Finally, the report offers conclusions and recommendations on the rating and labeling effort as a whole.

## **EPA'S GREEN VEHICLE RATING SYSTEM**

The rating system adopted by EPA on its Green Vehicle Guide site consists of two 10-point scales: one for criteria pollutant emissions ("air pollution score") and the other for

greenhouse gas emissions. Higher values mean better environmental performance. Scoring is uniform across all vehicles, i.e., a given score has the same meaning for vehicles of all classes.

A vehicle is assigned an air pollution score from 1 to 10 on the basis of its emission certification, under either the federal Tier 2 system or California's LEV II system. Details of this assignment are available at [www.epa.gov/greenvehicles](http://www.epa.gov/greenvehicles). Due to the structure of these emissions certification systems, achieving a given score requires meeting the corresponding emissions threshold for each pollutant separately. The correspondence between the amount of pollution emitted by a given vehicle and the score it receives is non-linear in each pollutant; in general, differences in emissions between neighboring point values decline at the cleaner end of the spectrum.

The Green Vehicle Guide greenhouse gas score, by contrast, is linear in emissions per mile. The score reflects CO<sub>2</sub> emissions only and is computed from the vehicle's fuel economy and the per-gallon carbon content of the fuel used by the vehicle. This methodology captures only the emissions associated with fuel use, not those arising from production and distribution of the fuel.

The Green Vehicle Guide also shows a "SmartWay" designation for vehicles that achieve scores of at least 6 for air pollution and greenhouse gas emissions separately and have a total score of 13 or more. Vehicles scoring at least 9 points on both scales are designated "SmartWay Elite."

### **Comments on the Rating System**

An absolute rating system such as EPA's is preferable to a class-dependent one. The research described in this report indicates a willingness among consumers to shop in multiple classes, and indeed the growing popularity of "cross-over" vehicles attests to the demand for vehicles that lie outside established classes. Within-class comparisons are also helpful for many consumers, but while absolute ratings allow within-class comparisons, the reverse is not true.

#### *Air Pollution Score*

The fact that the Green Vehicle Guide air pollution score relies entirely on the Tier 2 (or LEV II) certification system raises some concerns. A vehicle is placed in a given "bin" under Tier 2 if, for each of five pollutants, it meets the thresholds that define that bin and not those of any cleaner bin. This means that a vehicle that performs only moderately well with respect to one pollutant and very well with respect to the remaining pollutants will land in the same bin as one performing only moderately well on all pollutants, even though the latter vehicle may have substantially higher environmental impact.

As a practical matter, Tier 2 certification is the only measure of emissions performance available for all new vehicles, so it must play a role in vehicle scores. Other information could be factored in as well, however. For example, particulate matter standards for Tier 2 were set with diesels in mind, and they are unlikely to constrain new gasoline vehicles' attainment of any certification other than bin 1 (zero emissions) (see, for example,

Southwest Research Institute 2003). This suggests that gasoline vehicles' air pollution scores should be higher than those of diesel vehicles of the same bin, especially given current concerns regarding the health impacts of fine particles.

Also, vehicles that achieve the same Tier 2 certification but have different fuel economies will differ in the quantity of pollutants emitted “upstream” in the production and transport of fuel, because upstream emissions are proportional to the vehicle's fuel consumption. Similarly, pollutants emitted in the production and disposal of the vehicle will be related to the vehicle's size, among other properties.<sup>1</sup> Thus, fuel type, fuel economy, and vehicle size all influence a vehicle's emissions in ways that are not detected by its Tier 2 certification or by its air pollution score in the Green Vehicle Guide.

As a final point, a vehicle can be assigned Tier 2 and LEV II certifications that lead to two different Green Vehicle Guide air pollution scores: one in the eleven states that have adopted the California standards and another in the remaining states. This may cause confusion.

### *Greenhouse Gas Score*

The greenhouse gas score in the Green Vehicle Guide is more straightforward, being linear in CO<sub>2</sub> emissions. This score also reflects only in-use emissions, however, ignoring “upstream” emissions (i.e., those related to fuel production and distribution). For gasoline or diesel, roughly one-quarter of carbon emissions occurs upstream. For biofuels such as ethanol or biodiesel, carbon uptake during the growth of feedstocks offsets carbon release during combustion, but production of feedstocks can require a great deal of energy. Thus, a vehicle's emissions of carbon while running can be a poor representation of its actual contribution to greenhouse gas emissions, and upstream emissions should be explicitly included to allow a fair comparison across fuels.

Another element missing from the Green Vehicle Guide greenhouse gas score is that it reflects CO<sub>2</sub> emissions only. The environmental damage associated with non-CO<sub>2</sub> greenhouse gases in a gasoline vehicle accounts for approximately 15 percent of total greenhouse gas damages (Kliesch 2004).

### *SmartWay Designation*

An air pollution score of ‘6,’ or bin 5, allows a vehicle to qualify for SmartWay designation. Given that every manufacturer's vehicles must achieve an average of bin 5, and that 85% of scored model year 2007 vehicles met or exceeded this requirement, the threshold is too lenient for a label designating superior environmental performance. In states that have adopted the California tailpipe standards for greenhouse gases emissions, SmartWay

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<sup>1</sup> See, for example, the methodology for ACEEE's *Green Book*<sup>®</sup>: *The Environmental Guide to Cars and Trucks*. ACEEE rates the environmental performance of new vehicles using a peer-reviewed methodology developed for the *Green Book*. The *Green Book* evaluates all new vehicles annually and assigns each one a Green Score summarizing the environmental impact of the vehicle. *Green Book* methodology combines all criteria pollutant-related impacts using per-mile damage costs and reflects real-world, full fuel-cycle emissions.

thresholds for the greenhouse gas score will also be too low to be helpful in identifying superior performance.

## **MARKET RESEARCH FOR EPA**

In 2004, EPA contracted with ACEEE to conduct primary research with consumers and other stakeholders to test potential modifications to the current fuel economy label to include the environmental scores and SmartWay designation based on the rating system EPA had developed. ACEEE's work was informed by three consumer research projects conducted in the U.S. on environmental labels for vehicles: one undertaken by the Northeast States for Coordinated Air Use Management (NESCAUM 2003), a second by the Oak Ridge National Laboratory (ORNL 2001), and a third then underway at the University of Maine (subsequently described in Teisl, Rubin, and Noblet 2006).

### **Methodology**

ACEEE established a review panel and interviewed interested stakeholders via telephone. Respondents were asked to provide their opinions on the fuel economy label, the addition of environmental performance indicators, the role of consumer education, and the introduction of the SmartWay logo. Stakeholders were also asked how they would use or publicize environmental performance data and/or the redesigned fuel economy label.

Our research with consumers included qualitative (focus groups) and quantitative (survey) research tasks with recent car purchasers and consumers likely to purchase a vehicle in the near future. ACEEE tested graphical design formats that were fully compliant with the current EPA fuel economy label requirements<sup>2</sup> as well as modified designs that are not compliant and would require changes to the labeling rules if adopted. Findings from each research task were used to modify the label designs and develop new executions for further testing. Two rounds of focus groups (consisting of two groups each) were conducted prior to the quantitative consumer survey.

### **Key Findings by Task**

This section summarizes each task in turn and is followed by overall findings from the full research program.

#### *Stakeholder Interviews*

ACEEE conducted a series of interviews with stakeholders from consumer groups, the automobile dealers association, state government, environmental groups, universities, and relevant media outlets. Key comments from the stakeholders are summarized here.<sup>3</sup>

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<sup>2</sup> The EPA fuel economy label format requirements can be found in the *Code of Federal Regulations* at 40 CFR Ch. 1, § 600.307-95.

<sup>3</sup> The comments listed are not intended to suggest consensus views among stakeholders.

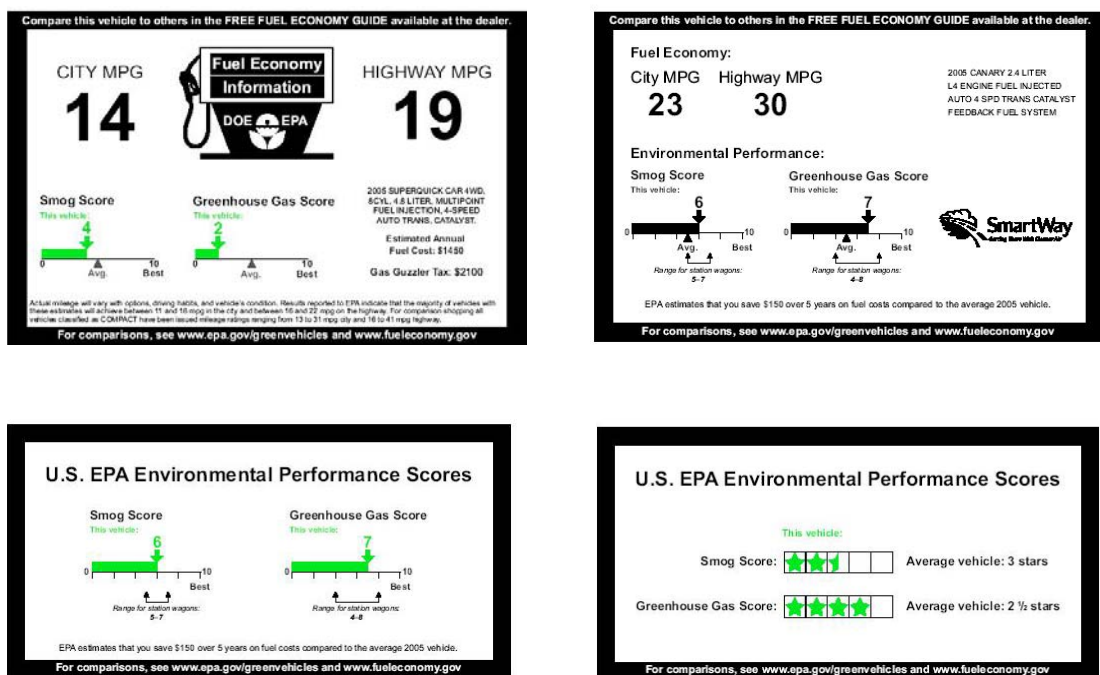
- EPA should create something more visually appealing, eye-catching, informative, and persuasive than the current fuel economy label. There are established principles for best conveying quantitative information graphically; EPA needs a specialist in this area to take a look at the entire label.
- The presentation of fuel economy information needs improvement and emphasis as the environmental performance information is added. Dollar savings from high fuel economy should be underscored, and the connection between fuel economy and greenhouse gas emissions needs to be made explicit.
- Having a SmartWay “seal of approval” would be welcomed by some, but other parties (e.g., dealers) may be less receptive, especially given that SmartWay vehicles will not be distributed evenly among manufacturers or vehicle classes. Consumers will not know what the SmartWay logo indicates without further information on both its general meaning and the eligibility criteria. (Other stakeholders believed that the logo would be correctly interpreted with no further explanation.) Given connotations of the term “elite,” it should not be used to describe the top tier of SmartWay vehicles.
- A major consumer education effort is essential to build an awareness of SmartWay. The label itself won’t do much, given that car selection will typically precede the trip to the showroom. The label should be thought of as part of a larger effort to get the word out.
- Auto writers interested in environmental issues will be enthusiastic and will include the scores in their vehicle reviews and listings.
- If the integrity of the label is maintained through the review process, environmental groups would be supportive. It is very important to have a seal of approval for which the criteria are compatible with the stringent greenhouse gas emissions requirements coming up in California and the Northeast.
- The label should be mandatory.
- There should be an opportunity for public comment during label development.

### *Consumer Focus Groups*

ACEEE contracted for two rounds of consumer focus groups to examine vehicle shopping experiences, attitudes toward the current fuel economy label, interest in environmental labels for vehicles (including an endorsement label), and responses to various label designs. Thirty-eight participants were recruited for the groups: 19 participated in two groups held in Bethesda, Maryland; the other half joined two groups in Chicago, Illinois. Participants had shopped for or bought a new car or truck in the past three years or were planning to do so in the next year and were directly involved in the vehicle purchase decision.

For the first round of focus groups, the current fuel economy label was tested along with three alternative labels and three variations of the environmental performance scores. Examples of the alternative labels and environmental performance scores tested are shown in Figure 2. The groups were not expected to come up with final designs; rather they were intended to uncover trends and general directions for additional qualitative and quantitative analysis. Thus, this round of focus groups was intended as an initial step toward developing a fuel economy label with environmental performance information that consumers found easy to understand and motivating.

**Figure 2: Sample Labels and Environmental Performance Scores Tested in First Round of Focus Groups**

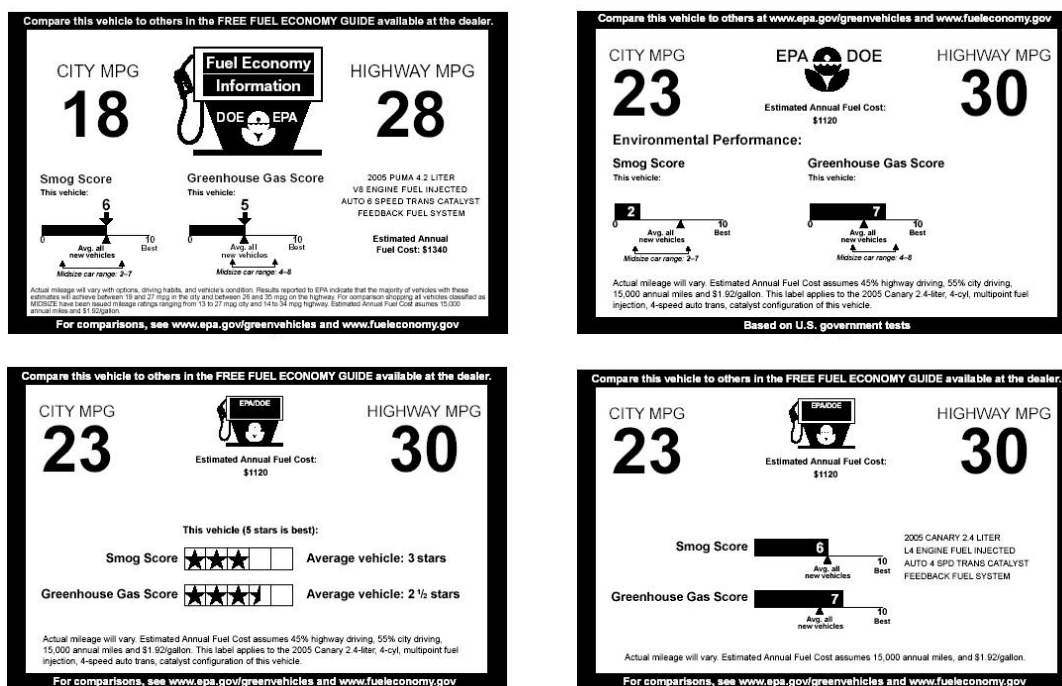


In the second round of focus groups, participants were presented with the current fuel economy label and nine alternative labels that had slight modifications to address issues raised in the first round. Examples of the labels tested in the second round of focus groups are shown in Figure 3.

The focus groups began with an introductory conversation to elicit information on the consumers' vehicle shopping experiences and the role of fuel economy and environmental performance in their purchase decisions. The results were similar to other studies that have found that fuel economy is a secondary consideration for most consumers, although it is of higher importance to those with a long commute. It should be noted that gas prices averaged under \$2.00 per gallon at the time of the focus groups; results might be quite different today.

Environmental performance was unlikely to be a consideration for car buyers, even though many expressed concern about the impact that vehicles have on the environment. The results indicate that: (1) consumers put their personal needs and preferences above environmental concerns when selecting a car; and (2) they can and do make other choices to offset the negative impact of their vehicle (e.g., walking or biking for shorter trips, using public transit). While participants generally reported that they tend to shop within class to compare vehicles of similar size and style, a few reported that they had recently shopped across classes or changed their mind at the dealership and switched classes.

Figure 3: Sample Labels Tested in Second Round of Focus Groups



Next, participants were asked for their opinions of the current fuel economy label. Few of them recognized the label or were familiar with any aspects of the label beyond the large city and highway MPG numbers. Participants agreed that the label is not visually appealing—many found it boring, hard to read, and cluttered with too much text. According to participants, an improved label would: (1) keep the MPG numbers in large text; (2) keep the familiar fuel tank icon with the words “Fuel Economy Information,” but reduce its size somewhat; (3) keep the URL for the fuel economy guide; (4) add information on how annual fuel cost is estimated (i.e., annual miles driven and average fuel cost used); (5) delete or clarify the range information provided, which is unclear and of little or no use as currently presented; and (6) move disclaimers and MPG range data to a footnote or smaller text at the bottom of the label. Participants were confused about the MPG range information presented and had mixed views about the type of range information they wanted to see. Some felt that only the class-based average was needed, while others were interested in seeing the range for the class of vehicles and all vehicles. Very few participants understood what the range data for vehicles with the same mileage estimates meant or how it was derived.

Participants were interested in seeing environmental performance information on the fuel economy label, but stressed that the information had to be presented in a clear and concise fashion. A simple, visual presentation was preferred to technical details and terms. Respondents were interested in getting information on vehicle emissions even if they did not expect it to impact their own personal purchasing decisions. Participants also suggested that a promotional campaign would be critical to introduce the new label and educate consumers on how to interpret the information on vehicle emissions. Rather than further cluttering up the fuel economy label with detailed explanations, participants suggested that additional



point-of-sale materials could be made available through car dealers and/or that sales staff should be able to explain it in greater detail.

The groups had mixed views on the alternate label designs presented to them. The use of the term “Environmental Performance” as a title for the emissions scores was well-received; customers found it eye-catching and informative. Participants also liked to see the smog and greenhouse gas scores on the label, but needed more information to understand the meanings of these terms (particularly greenhouse gas) and the differences between the two. Learning more about the differences between the two scores reinforced their belief that both should be included on the label. A number of participants felt that the “Greenhouse Gas Score” should be changed to “Global Warming Score,” as this seemed a clearer description. No clear preference emerged for the bar graph or the star rating format for environmental performance scores—each had its proponents and detractors.

Participants also agreed on their preferences for the use of color (particularly green) on the labels and inclusion of information for both in-class and all vehicle comparisons. To clean up the appearance of the label, participants thought the MPG range information and fuel cost assumptions should be put in a footnote (small text) at the bottom of the label. They also felt this would keep the extra text from detracting from the label’s key information. Furthermore, participants wanted to see a hierarchical presentation of the information that placed the fuel economy information at the top (MPG numbers, the fuel tank icon, and estimated annual fuel cost), environmental performance scores in the middle, and supporting text at the bottom.

Preferences were split on the use of averages or ranges to express the environmental performance scores and on the use of the bar graph or stars rating. Several respondents (and one advisory committee member) had difficulty discerning whether a “1” or a “10” indicated the best environmental performance on the bar graph, even when the word “best” was included under the “10” on the graph. Other aspects of the label drew mixed reactions, but were generally considered of less importance—placement of numbers on the bar graph, stacking the scores versus placing them side by side, and inclusion of the phrase “based on U.S. government tests.”

Looking at the labels, participants reiterated the need for education on the environmental performance scores. In addition to a public promotion campaign, participants suggested more information be provided through the Web site listed on the label, sales staff at dealerships and auto shows, and the “Free Fuel Economy Guide” referenced on the label.

Specific areas of confusion include: (1) the meaning of the “smog” and “greenhouse gas” scores in terms of the pollutants measured and their environmental impacts; and (2) instances where a single vehicle’s air pollution and greenhouse gas scores differ greatly (e.g., smog score below average, greenhouse gas score above average). Participants also felt that all vehicles should be required to display the label with environmental performance scores. They would be suspicious of those without the label and think that the manufacturer had something to hide. While participants understood that dealers and manufacturers may not want to display the information on vehicles with poor environmental performance since that would impact purchasing decisions, they believed consumers should have access to this information.

Finally, participants were asked about the SmartWay logo developed by EPA as an endorsement label for greener vehicles. Reactions to the SmartWay were very positive; participants understood its purpose as an endorsement or seal of approval, appreciated it as an easy and simple way to identify vehicles, and felt it would influence their purchase decisions. Participants liked the use of color in the logo—they found the colors attention-grabbing and reinforcing of the environmental message. The groups did express a caution that the logo must include EPA’s name or clearly be associated with EPA or the government to be credible and trustworthy. Otherwise, consumers are likely to believe the logo was developed by the manufacturer and disregard it as biased.

### Consumer Survey

Following the consumer focus groups, ACEEE contracted for a survey of recent and prospective vehicle purchasers and shoppers. The main survey of 214 respondents was conducted online in December 2004. Due to data corruption issues affecting responses to two questions, those questions were re-tested with a second sample of 200 respondents in March 2005. The survey was designed to determine which of the label formats best communicates information about a vehicle’s environmental performance (i.e., comprehension, likelihood of reading, and motivating ability) and which performance data should be included on the label. In addition, respondents were asked about the role of environmental performance in their vehicle purchasing decisions and their knowledge and attitudes about the environmental impact of vehicles.

Based on the results of the consumer focus groups, two label designs were tested—one presenting the environmental performance scores with a bar graph, the other with a star rating (see Figure 4). Survey respondents also evaluated mock-ups of the environmental performance scores as shown in Figure 5. The labels incorporated many of the features that tested well in the focus groups. In addition, the term “Global Warming Score” was used in place of “Greenhouse Gas Score.”

**Figure 4: Sample Label Designs Tested in Consumer Survey**



After answering some screening questions, respondents were asked a series of questions about the vehicle purchase decision process and their knowledge of and attitudes about the environmental impact of vehicles. More than half of the respondents considered reliability, safety, price, and performance among the most important considerations when shopping for a

new vehicle. Fuel economy was considered among the most important considerations by close to half of the respondents (49%) and moderately important by most of the remainder (50%). Environmental performance was among the most important considerations for a much smaller group of the respondents (21%) and was cited as least important more than any other consideration listed (18%). The majority of respondents considered it of moderate importance (61%). Contrary to the findings of the consumer focus groups, respondents were more likely to shop across vehicle class than within a single class. Of recent car purchasers, 45% reported having shopped across class, while 42% said they had shopped within class.

**Figure 5: Sample Environmental Performance Scores Tested in Consumer Survey**



In general, respondents were aware that vehicles have a negative impact on the environment and that the environmental performance of vehicles can be improved. Approximately two-thirds of respondents realized that pollution from cars is of concern just as it is from industry and other sources (66%). However, there were gaps in their understanding and confusion over the specific issues involved. None of the questions about vehicle environmental impacts were answered correctly by more than two-thirds of respondents. For example, less than one-third (32%) knew that a vehicle's contribution to global warming is directly related to the amount of fuel it consumes. Just over half (54%) realized that some new vehicles pollute at two to three times the level of others. A majority (70%) of respondents believed that manufacturers would make more environmentally friendly vehicles if consumers could easily evaluate a vehicle's environmental performance.

To test label comprehension, respondents were shown two versions of the same label execution (i.e., two labels with bar graphs or two with star ratings), each with different environmental performance scores.<sup>4</sup> Half of the respondents also saw the SmartWay logo on the higher-performing vehicle label. Figure 6 shows an example of the label executions evaluated by survey respondents. They were asked to identify which of the two vehicles is more environmentally friendly based on the information on the label. In the first survey conducted in December 2004, over half (59%) of respondents correctly identified the better-performing vehicle. In the second survey, conducted in March 2005, a higher percentage of respondents (69%) correctly identified the more environmentally friendly vehicle on their first attempt. Respondents were then shown the other label execution (i.e., either stars or bars, depending on which they had seen in the first question) and again asked to identify the more environmentally friendly vehicle. The order of presentation was rotated to account for

<sup>4</sup> The city and highway mileage estimates were held constant across all labels shown, thus the global warming score was the same on all labels. The smog score on each label in the pair was different, reflecting a likely real-world scenario where two vehicles with the same mileage/global warming score have different smog scores because of differences in emissions-control technology.

any learning effect and order bias. Data on the second exposure to the labels for the December survey was corrupted, so results cannot be reported. For the March survey, comprehension improved to 78% for the second exposure. The reasons for the marked difference in label comprehension between the December and March surveys are unclear.

**Figure 6: Label Execution with Different Environmental Performance Scores Tested in Consumer Survey**



Overall, there were no significant differences in comprehension between the bar and star label executions *except* when the bar label was shown without the SmartWay logo. This execution was least likely to lead to the correct identification of the greener of two vehicles presented by respondents in both the December and March surveys—only 61% of respondents identified this label correctly, whereas 76% to 78% correctly identified the greener vehicle when the bar graph with SmartWay, star rating with SmartWay, and/or star rating without SmartWay were used. Interestingly, respondents *perceived* the bar graph as easier to understand even though this perception was not borne out by actual comprehension.

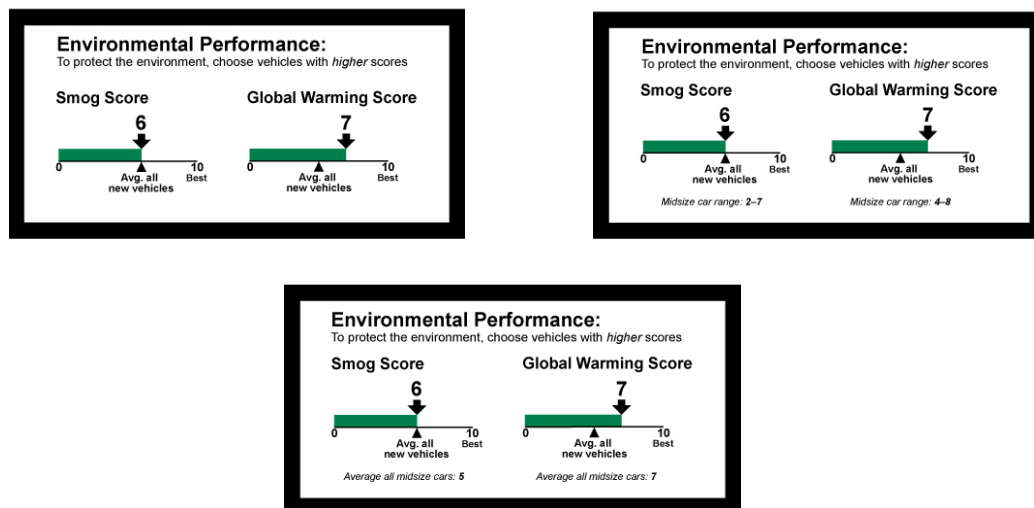
Respondents clearly understood that the bar graphs and star ratings on the labels were meant to indicate environmental performance (well over 90% correct), whereas very few respondents (1% or less) mistakenly thought the scores indicated other qualities such as value, quality, or safety. There was far less clarity about the quantitative meaning of the ratings, with 36% incorrectly assuming that a vehicle with a rating twice the level of another vehicle's rating is twice as good for the environment and another 30% reporting uncertainty about whether this conclusion is correct or not.

Respondents to the December survey also rated each label execution on attention-grabbing ability, likelihood of reading, and ability to motivate the respondent to purchase a given vehicle. There were no significant differences between the labels with bar graphs and those with star ratings on any of these traits. However, respondents found labels with the SmartWay logo, whether bar graph or star rating, to be more attention-grabbing. High environmental performance was more likely than low performance to motivate respondents to purchase a vehicle regardless of the format of the environmental performance scores or the presence of the SmartWay logo. Respondents understood the meaning of the SmartWay logo although many were unclear whether or how they would use it. When asked about their preferred label format, a larger portion of respondents stated that they were more likely to use

the label with the bar graph (47%) than the star rating (36%), while some (18%) would use either format equally.

Another purpose of the survey was to determine the type and amount of comparative information to include in the environmental performance scores. To that end, respondents were asked to evaluate several versions of the environmental performance scores showing all-vehicle comparisons only versus all-vehicle and in-class comparisons, and reporting comparisons using averages or range information as shown in Figure 7. Approximately two-thirds of respondents (65%) were interested in seeing in-class scores in addition to all-vehicle scores for comparison. The use of average scores for all vehicles and for vehicles within class was slightly preferred to the use of an average score for all vehicles together with a range of scores for vehicles within class (69% versus 62%), because this appeared to present the right level of information. There were no significant differences in visual appeal or ease of understanding for any executions of the environmental performance shown.

**Figure 7: Sample Environmental Performance Scores with Average and/or Class-Based Range Information**



## Overall Findings of Market Research

A common theme emerging from each research task is that, while environmental performance is of some concern among a subset of study participants, it is not typically a driver in vehicle purchasing decisions. Fuel economy is of interest to a larger number, but still lags behind reliability, price, features, and safety as the primary drivers in vehicle purchasing.<sup>5</sup> In addition, while most consumers are aware that vehicles contribute to air pollution and have a negative impact on the environment, their understanding of the types of pollutants emitted by vehicles and the specific environmental impacts is limited. Consumers

<sup>5</sup> Since this research was conducted, there has been a sustained period of high gasoline prices, during which fuel economy allegedly became one of buyers' highest priorities. Sales of larger vehicles declined markedly during this period. Preliminary reports on purchase habits since the decline of gasoline prices to \$2.20 per gallon indicate at least some reversion to vehicle preferences prior to the onset of high prices.

would like to see environmental labels on cars and trucks and are interested in education to help them get a better grasp on the issues and to use the labels effectively. Indeed, consumers stated that they found a high environmental performance score to be highly motivating.

When examining specific label designs and elements, consumers offered a number of suggestions related to the label's visual appearance and ease of use. For example, consumers preferred to have similar information or elements grouped together within the same section of the label and to have the key information presented in large text (i.e., fuel economy numbers and environmental performance scores). Moving supporting information and disclaimers to smaller text at the bottom of the label made the label easier to read and less cluttered while maintaining all the necessary information. Consumers also liked the use of color on the label, finding it eye-catching and meaningful within the context of the label.

There was general agreement among consumers and stakeholders that the environmental performance scores should provide comparative information for all vehicles and within vehicle class. Consumers were split, however, in their preferences for the use of averages or ranges for the comparative data, with a slight preference for use of averages only. Overall, consumers found the SmartWay designation to be a useful tool to help them compare vehicle environmental performance. It was clear to most consumers that the logo is an endorsement that would only be given to better-performing vehicles.<sup>6</sup> Consumers believe they are most likely to use the label to help them decide between two otherwise equivalent vehicles, but many would also seek out vehicles with the label or avoid those without.

Throughout the research, results regarding the merits of the bar graph versus the stars rating were mixed. Although survey participants reported a preference for the bar graph and *perceived* it to be easier to understand, this perception was not borne out by actual comprehension results. In fact, when neither label showed the SmartWay logo, participants were more likely to correctly identify the environmentally superior of two vehicles when the star format was used. Bars and stars were equally well understood when used in conjunction with the logo. Consumers were equally likely to read the labels regardless of the format used for the environmental performance scores, but were more likely to use the label with the bar graph than the one with stars.

## **CONCLUSIONS AND RECOMMENDATIONS**

### **EPA's Rating Scheme**

#### *Linearity of Pollution Score*

Representing a vehicle's contribution to air pollution requires some basis, such as a damage cost, for weighing the emissions of the various pollutants. Absent such a basis, EPA at a minimum should take steps to ensure that consumers do not read into the pollution score a meaning that is not there. In particular, EPA should not represent the score in a form, such as

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<sup>6</sup> This finding was contrary to the expectations of several stakeholders who asserted that the logo would convey nothing absent further explanation. It should be noted that consumers in this research saw various labels before they were asked to interpret the logo, which may have increased their understanding.

a bar graph, that suggests a linear relationship between the score and the cleanness of the vehicle.

#### *Consistency of Air Pollution Score*

When the Tier 2 and LEV II certifications of a given vehicle lead to two different air pollution scores, the better emissions score should be assigned to the vehicle regardless of where it is offered for sale.

#### *Greenhouse Gas Score*

Especially as fuels other than gasoline become more common for light-duty vehicles, representing a vehicle's greenhouse gas emissions through in-use CO<sub>2</sub> alone will be misleading. EPA should include full fuel cycle emissions of all greenhouse gases in the greenhouse gas score. For vehicles that can run on more than one fuel, it will be necessary to provide a score for each fuel that is readily available.

#### *Stringency of SmartWay Criteria*

As full implementation of the Tier 2 program approaches, EPA should tighten the air pollution requirements for SmartWay designation in order to ensure that qualifying vehicles offer superior performance on regulated pollutants. EPA should also work with states following California's greenhouse gas tailpipe standards to identify an alternative to SmartWay to avoid undermining those standards.

### **Specific Conclusions of Vehicle Labeling Research**

Based on the limited sample used for the survey, we arrived at the conclusions below. Having a larger sample probably would have allowed us to draw further conclusions of importance to the labeling effort.

*High-profile education and outreach are crucial to an effective labeling program.* Consumers are interested in seeing environmental labels on vehicles. They also want help to understand what the labels mean (i.e., what the "Smog" and "Greenhouse Gas" or "Global Warming" scores measure and the environmental problems they are associated with) and how to use them. Our research revealed limited understanding of these issues, indicating the need for an extensive education campaign to accompany the program. Such a campaign would be essential, not only to ensuring that consumers properly interpret the label content, but also to raising the public's level of awareness and understanding of the environmental consequences of vehicle choice. Visual familiarity of the label would also be very helpful to increasing its use, so the appearance of label elements in vehicle reviews, car Web sites, and advertising should be vigorously promoted. This is all the more important in view of the fact that buyers today often do extensive research on vehicles of interest to them prior to entering a showroom, which may reduce the importance of the label at the point of sale.

*The bar graph and star ratings perform equally well in many respects; stars are better understood in some circumstances, while bars are perceived as easier to read.* Consumers rated the label formats the same for attention-grabbing ability, likelihood of reading, and motivating ability. The bar graph was perceived as easier to read, but this perception was not borne out by actual label comprehension. While this may seem an anomalous result, it is apparently common. Egan and Waide (2005), reviewing the findings of labeling research in the EU, the US, and seven other countries, observed: "...international research has often shown a discrepancy between what people perceive as understandable and what they actually interpret as correct." The star rating system had higher levels of comprehension than the bar system when the SmartWay logo was not present. Since some cars will not have the SmartWay designation—some will not qualify, while others may be from manufacturers that choose not to participate, assuming the program is voluntary—it is important that consumers understand labels with and without the logo. Consumers choosing among vehicles that do not have the logo may still be interested in purchasing the most environmentally benign of the group, and it appears that a stars-based rating would facilitate that decision.

*"Global Warming Score" is a preferable term for the carbon emissions score.* During our focus group testing, the term "Greenhouse Gas Score" was used. Participants found this confusing, as they did not understand what greenhouse gases were or what environmental problem they were associated with. When the issue was explained, participants suggested that "Global Warming Score" would be more meaningful to them. Global warming gave a clearer indication of the environmental problem related to vehicle performance and was not associated with other notions of what a greenhouse is or what greenhouse gases might be. The term "Smog Score" was used to designate criteria emissions throughout the research project. It may be useful to test the terms "Global Warming Score," "Smog Score," and other alternatives further.

*The SmartWay logo is an effective tool for conveying superior environmental performance.* Consumers appeared to correctly interpret the meaning of the SmartWay logo intuitively, particularly once the logo was identified with the EPA. Although the SmartWay logo was not shown to improve comprehension of the label, consumers found it eye-catching and appreciated that it provides a quick and easy way to identify the most environmentally friendly vehicles.<sup>7</sup>

*Consumers should be offered information to allow comparisons of the labeled vehicle to all new vehicles and to vehicles of the same class.* Our findings indicate that close to half of car buyers shop across two or more vehicle classes, suggesting that it is important to include comparison data for all new vehicles in environmental performance scores, rather than providing comparative data only for vehicles within the same class.<sup>8</sup> Most consumers expressed an interest in having within-class information as well, however.

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<sup>7</sup> It should be noted that in no part of this research were consumers asked to comment on the criteria used to designate a vehicle as SmartWay.

<sup>8</sup>That consumers shop across vehicle class does not prove that environmental labels would be used to choose among classes, however. Indeed, other research has led to the conclusion that labels would be relevant only to choices within a class (Noblet, Teisl, and Rubin 2006).



*Further testing and consideration of alternate designs is warranted.* Comprehension of the label executions tested was not particularly high, with 59% and 73% of respondents correctly identifying the more environmentally friendly of a pair of vehicles in the first and second surveys, respectively. Assuming that those not understanding the labels chose at random, the data indicate that only slightly more than half of respondents could consistently identify the preferable vehicle and could therefore be said to have even the most basic understanding of the label. In addition, many consumers report that they are unlikely to use any of the label executions presented despite a general interest in the information presented. These findings indicate the need for education but also for further thought on label design.

*Improvements to the fuel economy label would enhance its appeal and use among consumers.* Beyond the specifics of the environmental performance scores, consumers suggested numerous other improvements to the fuel economy label that would enhance its visual appeal, clarify the information it conveys, and increase its use. Some of these changes can be made within the current regulatory guidelines for the label; others will require modifications to the regulations.

In summary, further testing of alternate label designs is warranted and would help to ensure that the final label best communicates fuel economy and environmental performance to consumers. The results of our research suggest a number of key elements that should be included in any labels that are tested with consumers or adopted for the vehicle labeling program:

1. Use “Global Warming Score” rather than “Greenhouse Gas Score”
2. Include the SmartWay logo for qualified vehicles
3. Retain city/highway mileage figures and the fuel tank icon
4. Use all-vehicle and in-class comparative information

Any changes to the label should be made simultaneously and be accompanied by extensive public outreach to the public in order to maximize consumer attention to and visual recognition of the new label.

Finally, the success of an education and promotional campaign on the new label design and the environmental issues related to vehicles will determine the ultimate impact of the label on consumer decision-making and its effectiveness as a policy tool.

Resources for the market research limited the scope of the research. A “shopping experiment,” in which response to the label is tested at car dealerships, would be helpful. A larger and more diverse pool of respondents could also clarify some of the outstanding questions about consumer response.

### **More General Comments on Vehicle Labeling**

Previous work on product energy use labeling has concluded that labeling has led to substantially improved average product efficiency, in several cases more than 10% improvement (Thorne and Egan 2002). The label elements discussed in this report relate

primarily to environmental performance rather than operating costs, however, and may not produce results of this magnitude. On the other hand, consumers' poor understanding of fundamental environmental relationships such as the correlation between fuel economy and greenhouse gas emissions highlight the potential educational value of a label, including helping to develop consumers' understanding of actions that would mitigate climate change.

Vehicle labels could alter manufacturers' production decisions as well, as has been shown in the case of appliance labels (Egan and Waide 2005, citing Waide). When a labeling program includes an element highlighting certain vehicles as especially good (or bad) in some important regard, manufacturers will to some degree compete to maximize the "halo" they gain under the program. At the same time, manufacturers who expect to fare poorly with respect to their competitors under a proposed labeling program may exert their influence to modify or prevent implementation of that program.

### *Design Does Matter*

Car-buying undoubtedly has features distinct from purchasing behavior for other products, given the cost and importance of vehicles to consumers. Nonetheless, there are lessons from years of market research on appliance labeling that should be taken into account in designing a vehicle label. Design can be a major determinant of a label's efficacy, and consumers' reactions to design details are hard to predict. Consequently, extensive market research, early in the process, should accompany development or revision of a label. EPA's approach to changing the vehicle label, for purposes of both improving the content and presentation of fuel economy information and adding environmental information, has been too rigid with regard to design and insufficiently receptive to the lessons of earlier research.

Label executions tested in the research described above, as well as those tested in EPA's fuel economy focus groups, represent an incremental approach to improving the current fuel economy label rather than a wholesale effort to design a new label to best meet consumer needs. Several experts from the fields of information design and energy efficiency program design suggested that a more thorough research effort exploring a broader range of labeling concepts could greatly enhance the impact of the vehicle label. EPA should engage experts in the visual presentation of quantitative information to design the best possible fuel economy and environmental performance label. The existing label should not be taken as a starting point for this design effort. Indeed, this point has been made more generally by those involved in label research: "Label design by committee or technical stakeholders rarely matches the needs of consumers as found in market research. As consumers are the intended end-users, new energy labels should always be designed through consumer-based market research." (Egan and Waide 2005).

### *Categorical vs. Continuous Label*

The market research described above provided no clear answer on the relative efficacy of a "categorical" rating scheme (i.e., one that places vehicles into discrete levels of environmental performance) and a continuous rating scheme. This may be a reflection of the relatively small sample size used. Other research on consumer labeling has found that categorical labels lead to superior comprehension:

Labels which present the comparative efficiency via discrete categories such as stars, letters or numbers are vastly more preferred and seem to be more effective than those which use a continuous scale. In part, this is because they are easier to remember when shopping for an appliance. In addition, the thresholds used in these labels can be highly motivating for both manufacturers and retailers. (Egan and Waide 2005)

In reality, the “stars vs. bars” question raised in this research is of a more subtle nature. The bar format tested here was continuous in presentation only; possible scores were integer values, and the same thresholds defined scores in both formats.

### *The Role of Government*

Government has long played a key role in providing consumer information on a range of products. The air pollution and global warming scores as proposed for the vehicle label are good examples of a useful service government can provide by identifying key elements of a complicated data set and providing objective information to the public.

EPA’s SmartWay designation is of a somewhat different character, involving judgments on how two major aspects of environmental performance, namely air pollution emissions and greenhouse gas emissions, should be combined to create a single measure, as well as what constitutes superior performance by that measure. This element of EPA’s rating scheme has been criticized, not only by some vehicle manufacturers and dealers, but also by some in the environmental community. In particular, they have commented that this kind of designation is best left to non-governmental entities, especially given the subjectivity of the choices of how low a vehicle’s impact must be to qualify and what the relative importance is of criteria pollutant and greenhouse gas emissions (DeCicco 2005).

These concerns do not seem to us to outweigh a consideration that the survey results discussed here highlight: the SmartWay logo attracts attention more than labels without the logo. In addition, adding SmartWay to the label will presumably increase manufacturers’ interest in producing high-scoring vehicles.

### **EPA’s December 2006 Rule on Fuel Economy Labeling**

As mentioned in the Background section above, EPA conducted market research in connection with its rulemaking to address shortcomings of the current fuel economy label. Carrying out simultaneous and independent market research efforts related to the fuel economy label was inefficient. Particularly unfortunate was that the fuel economy labeling rule took action on certain labeling issues that had not been adequately investigated in the fuel economy research, resulting in changes that were incompatible with the findings of our environmental information market research. For example, the addition of a fuel economy scale that reflects only within-class performance is not compatible with the findings of the latter research effort showing that well under half of all vehicle buyers consider only vehicles within a single class. The preamble to the fuel economy labeling rule even comments on the fact that some participants in the fuel economy focus groups did not shop within a specific vehicle class, and that others believed that a scale showing absolute fuel economy

performance “could influence some people to reconsider vehicles with higher fuel economy.” There was no quantitative testing on this issue in the fuel economy market research, however (EPA 2006).

While the final rule acknowledges a role for environmental information on vehicles in the future, a second redesign of the label in a short period of time dilutes the benefits of whatever consumer awareness efforts may accompany the new label and detracts from the reestablishment of the fuel economy label elements as icons for the American public.

The need to rethink the fuel economy label goes beyond graphical design questions to fundamental issues involving consumer behavior. Recent research suggests that consumers may interpret the term “fuel economy” in a way that is quite contrary to what is implicit in the current label (Kurani and Turrentine 2004). It appears that for some consumers, “fuel economy” carries a residual implication of poor quality, dating from the 1970s and 1980s, in which numerous small, poorly constructed vehicles appeared on the market. While this notion may be changing with the advent of high-efficiency, high-tech vehicles such as hybrids, the EPA would do well to recognize this kind of association in its labeling program. Unfortunately, the market research carried out by EPA in conjunction with improving the accuracy and consumer-friendliness of the fuel economy label seems not to have considered whether the label, together with a consumer outreach program, could tap into the various ways in which consumers might be favorably inclined toward high-efficiency vehicles.

Expenditures on fuel have declined as a percentage of personal income in recent decades, making annual fuel cost a less compelling piece of information in car-purchasing than the EPA label implicitly assumes. Whether current high gasoline prices are sufficient to restore the importance of this consideration is unclear. With sustained high prices for gasoline, one might expect interest in fuel savings would increase, reducing the weight of the other elements of the proposed label. At the same time, interest in global warming is certainly increasing as well. Furthermore, it should be recognized that a well-designed label will inform and motivate multiple audiences. Among them will be those with higher discretionary income, who may continue to be unmotivated by gasoline costs in their vehicle selection. This is a key group to reach, both because they purchase a high percentage of the most environmentally damaging vehicles and because they have greater ability to purchase advanced technology vehicles, and thereby help to bring down the cost of those vehicles.

The fuel economy label revisions adopted in 2006 therefore represent a missed opportunity to optimize the value of the label. Comprehensive, quantitative consumer research and a complete information design review should precede any future changes to the label.

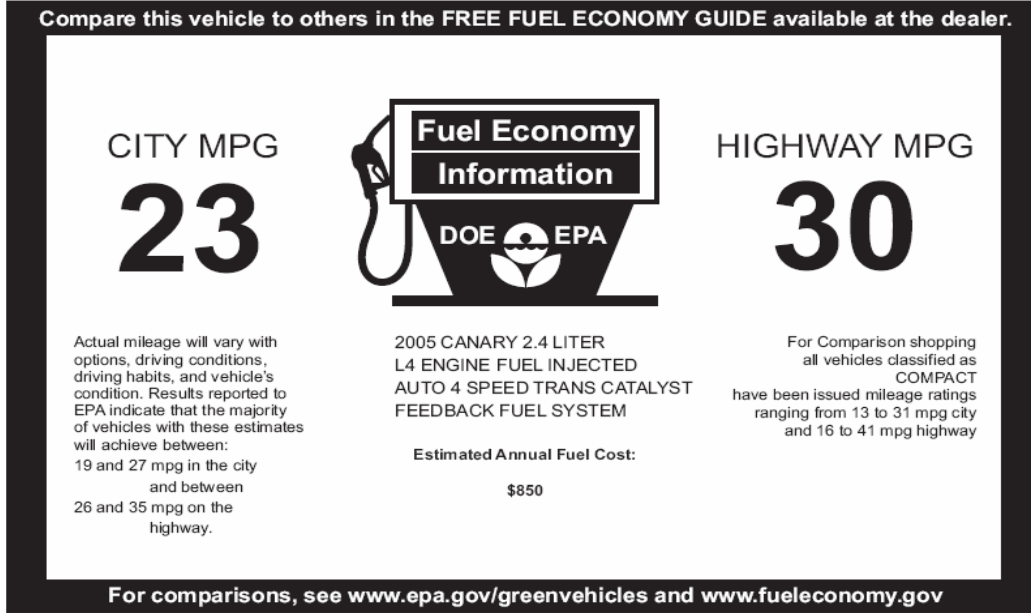
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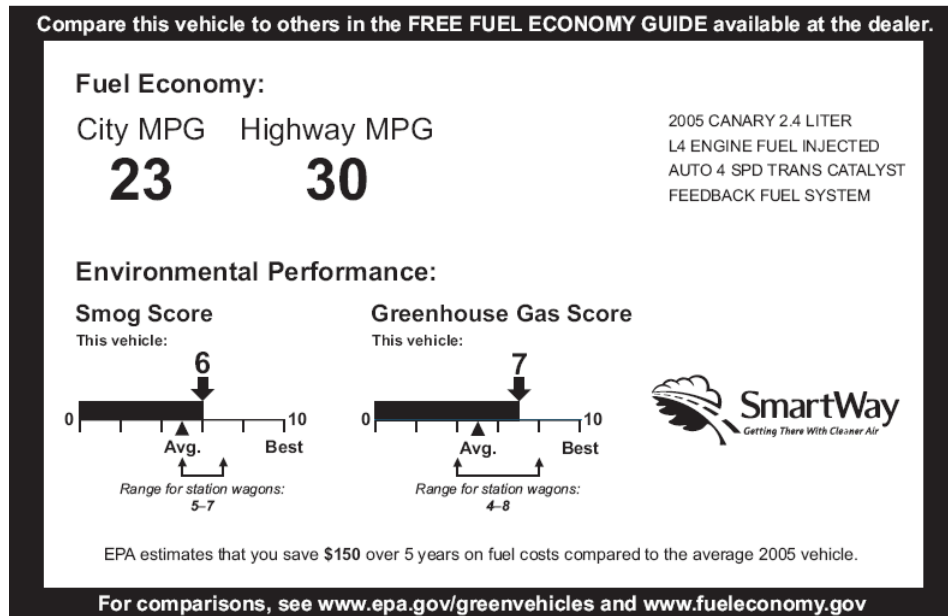
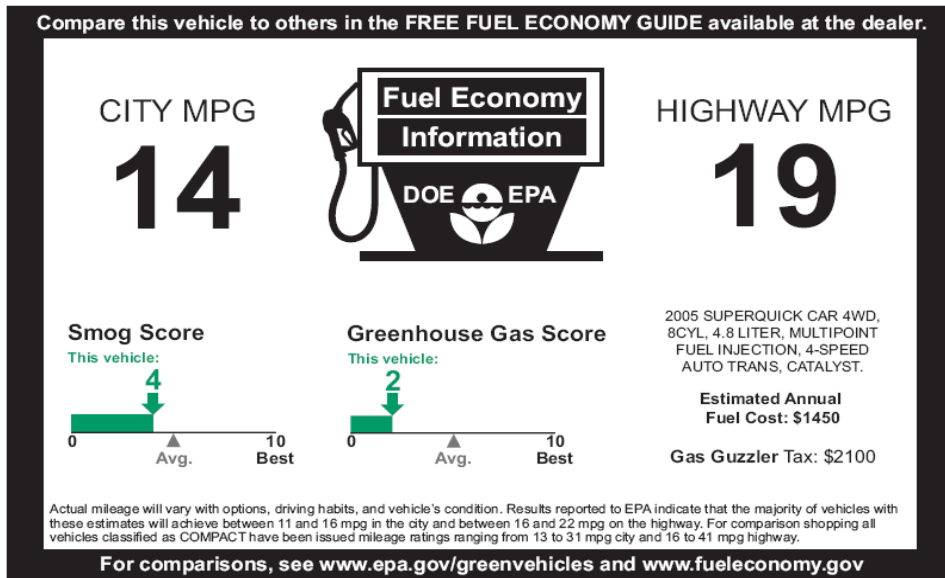
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**APPENDIX: LARGER IMAGES OF LABELS**

**Figure A-1: Current U.S. Fuel Economy Label**



**Figure A-2: Sample Labels and Environmental Performance Scores Tested in First Round of Focus Groups**





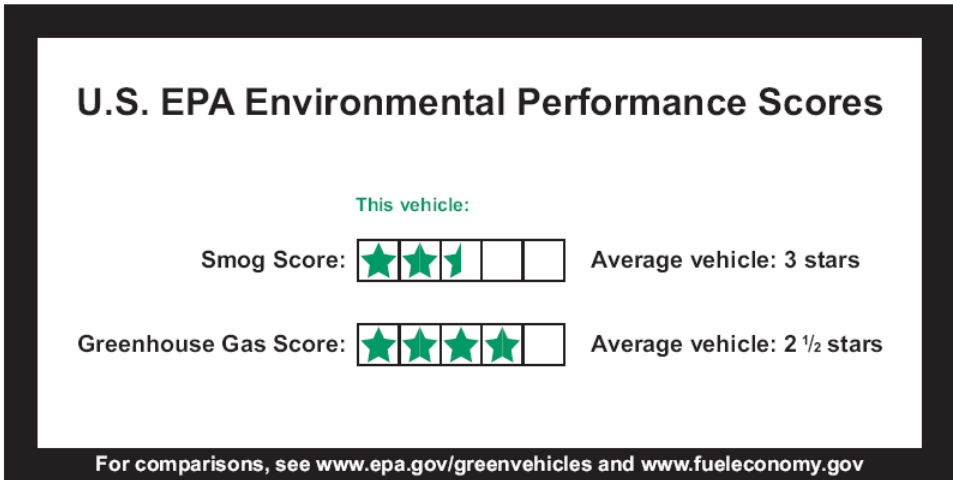
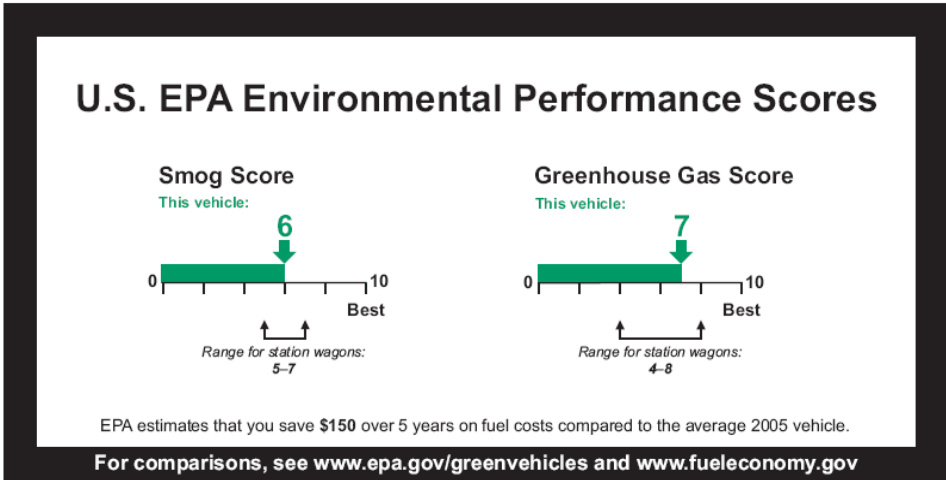
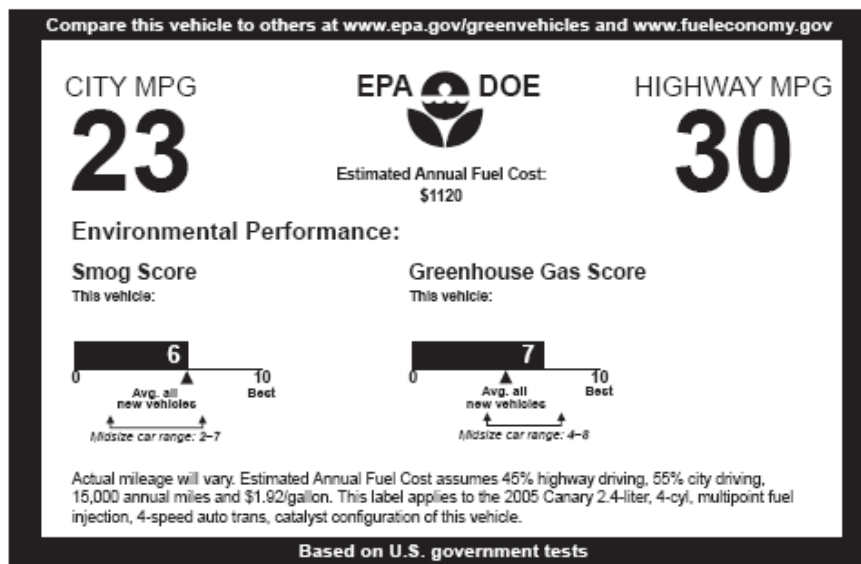
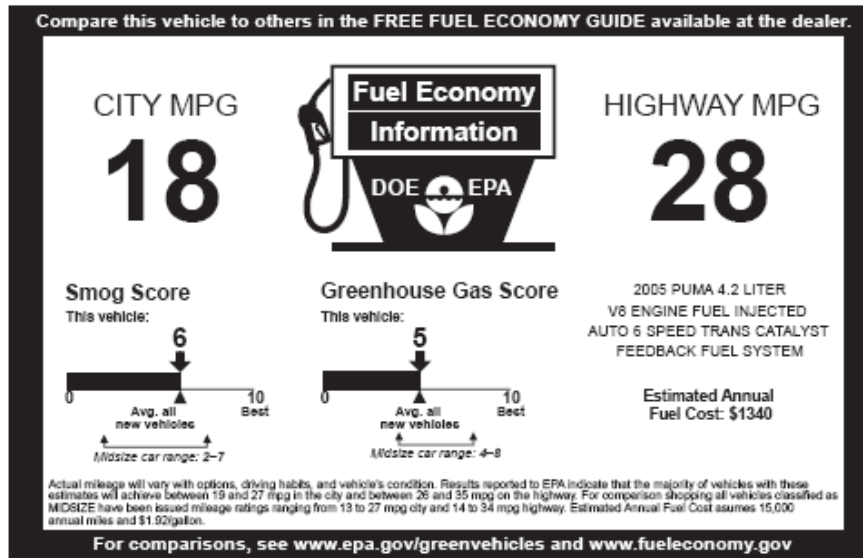
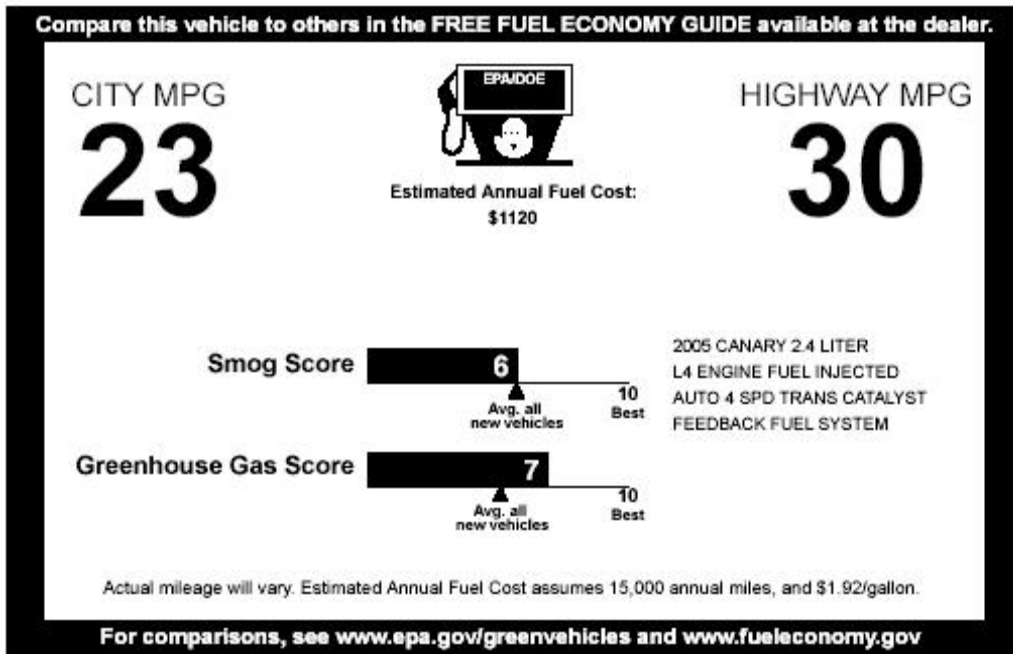
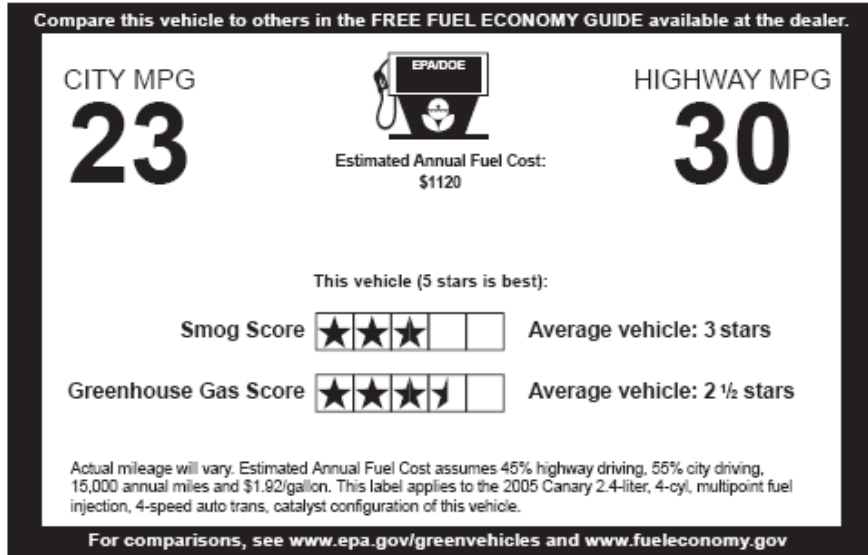


Figure A-3: Sample Labels Tested in Second Round of Focus Groups





**Figure A-4: Sample Label Designs Tested in Consumer Survey**

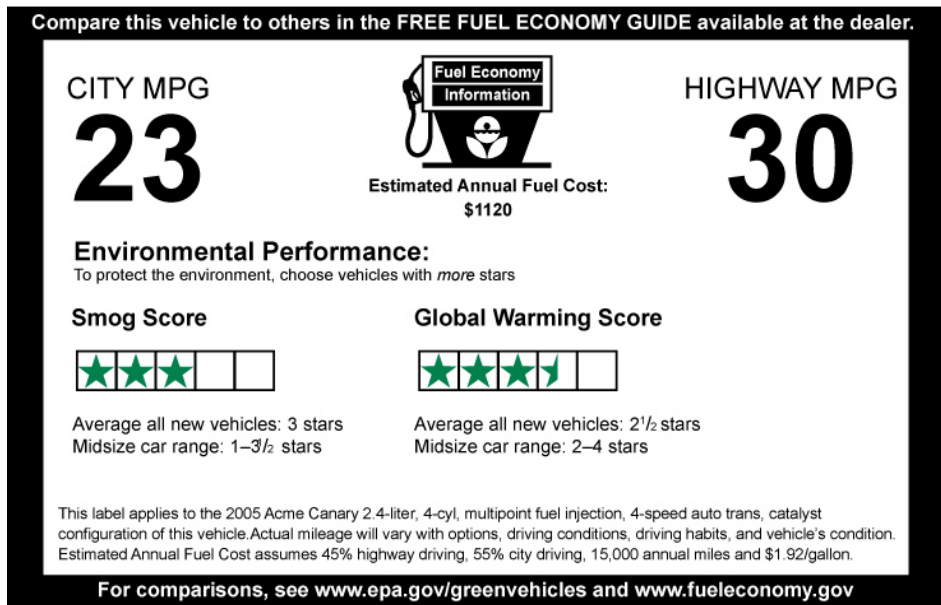
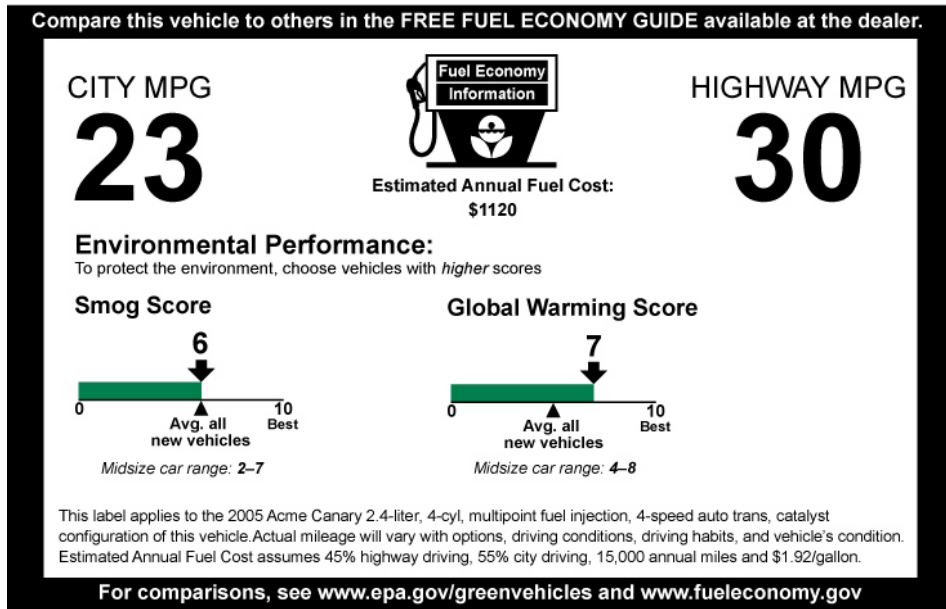
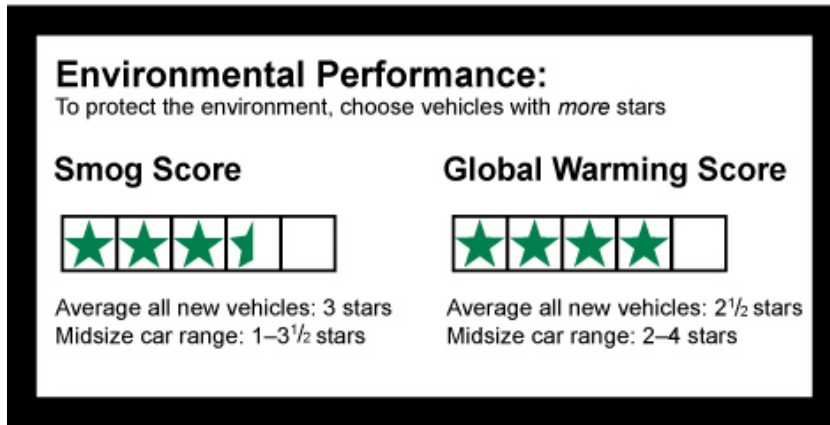
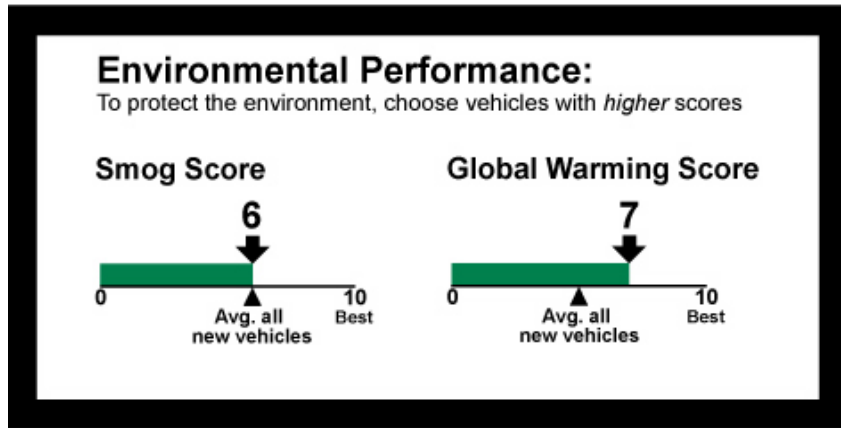
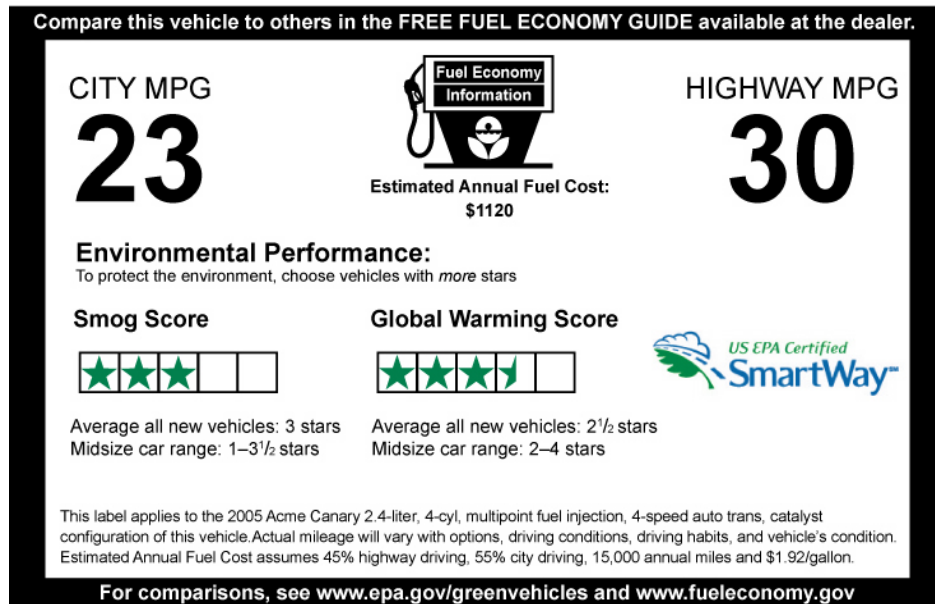
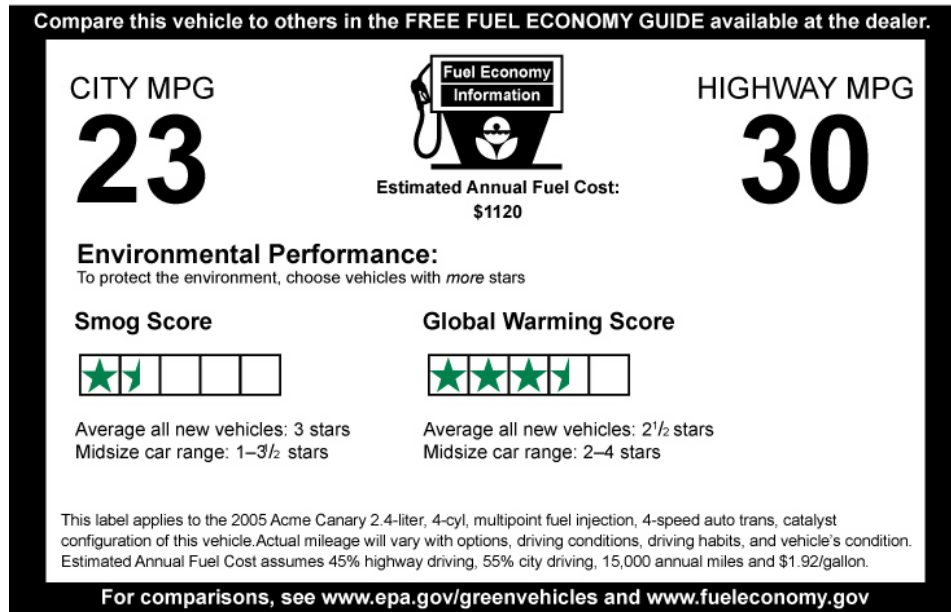


Figure A-5: Sample Environmental Performance Scores Tested in Consumer Survey



**Figure A-6: Label Execution with Different Environmental Performance Scores Tested in Consumer Survey**



**Figure A-7: Sample Environmental Performance Scores with Average and/or Class-Based Range Information**

