Environmental Protection Agency Fuel Economy Label

Phase 2 Focus Groups

United States Environmental Protection Agency

Department of Transportation United States of America

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Office of Transportation and Air Quality
U.S. Environmental Protection Agency

and

National Highway Traffic Safety Administration
United States Department of Transportation

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Introduction

Background

In 2006, EPA updated how the city and highway fuel economy values are calculated to better reflect typical real-world driving patterns and provide more realistic fuel economy estimates. In addition, EPA redesigned the fuel economy label to make it more informative for consumers. The redesigned label more prominently featured annual fuel cost information, provided contemporary and easy-to-use graphics for comparing the fuel economy of different vehicles, used clearer text, and included a Web site reference to www.fueleconomy.gov which provided additional information.

EPA is now initiating a new rule making to ensure that American consumers continue to have the most accurate, meaningful and useful information, as well as an understanding of how the labeled vehicle impacts the environment. In 2006 EPA did not include a consumption-based metric in the new label design, however EPA did recognize at that time that a distance-based metric such as MPG can be misleading and that a fuel consumption metric might be more meaningful to consumers. In this rulemaking, EPA wants to 'gallons per 100 miles' as a potential fuel consumption metric on the label. Additionally, EPA wishes to provide metrics that are relevant and useful for advanced technology vehicles, such as Electric Vehicles, Extended Range Electric Vehicles and Plug-in Hybrid Electric Vehicles.

To help inform the creation of the new label, EPA engaged PRR Inc. to work with them in the design and implementation of several information gathering protocols including:

- Literature review
- Focus groups (in 3 phases, including pre-group online surveys)
- Online survey of new vehicle buyers
- Expert panel

It was decided to use a three-phase approach for the focus groups in order to accommodate the sheer amount of information required to be covered in the focus groups, as well as to use each phase to inform the next phase on overall label design in regard to both content and look. The three phases were designed to address the following issues:

- Phase I – Use of the current label and design of the label for internal combustion engine vehicles
- Phase II – Understandability of metrics for advanced technology vehicle labels
- Phase III – Assessment of full label designs and messaging testing for educational/marketing campaign

This document provides a preliminary overview of the Phase II focus groups and is designed specifically to inform the next phase of focus groups. It is not intended as a comprehensive report of results from the Phase II focus groups; that will come at the end of all three phases of focus groups in the form of a full, comprehensive report. It should be noted that all results reported here refer to the focus group discussions, except when specifically identified as results from the pre-group online survey.

Methodology

Focus groups are the optimum approach to use when the task calls for qualitative, in-depth understanding of consumer's understanding of fuel economy labels. Focus groups allow for probing around such issues as why some label designs are more understandable, how label designs would be used in the vehicle purchase process, and which label metrics are most important to consumers. The focus group discussion can also provide insights about how a label design may nudge consumers toward greater use of the fuel economy label, as well as nudging them toward the purchase of more fuel-efficient vehicles.

Eight focus groups were convened between April 5th and 15th, 2010 in the cities of Seattle, Chicago, Houston and Charlotte. In each city, two groups (one male, one female) were conducted in English and each lasted for two hours. A moderator guide was used to structure the focus group discussions (see Appendix A).

Participants were recruited from databases developed and maintained by the focus group facility used in each city. Twelve persons were recruited for each group, with the assumption that eight to ten would be present for participation. With the exception of the male group in Seattle (which had seven participants), the rest of the groups consisted of eight participants each. In order to screen out 'professional focus group participants,' only those who had not participated in a focus group in the last six months were included. In addition, participants were required to demonstrate evidence that they had purchased a new vehicle (not a used or pre-owned vehicle; not a motorcycle; not a 'Cash for Clunkers' purchase) in the last 12 months and had been the sole or primary decision maker with regard to this new vehicle purchase. Internet accessibility was also a requirement, so that they could complete the pre-group online survey. To ensure a good cross-section, participants were selected that specifically differed in terms of: type of new vehicle, price range of new vehicle, distance typically travelled daily, if they had seriously considered an advanced technology vehicle before purchasing their vehicle, and demographics (see Appendix B for participant profiles).

Participants were asked to complete an online survey before they took part in the focus group discussions. The purpose of the online survey was to obtain additional information regarding their vehicle purchase process, the role of fuel economy in their purchase decision, how they used the current fuel economy label, and motivators and barriers to their purchasing advanced technology vehicles. The pre-group online survey did not present new label designs (these were covered exclusively in the focus groups). It should be noted that the pre-group online surveys are not meant to be representative of new vehicle buyers in general (since focus group participants are in many ways unique), but rather to provide additional information about these specific participants. The online survey was approximately 12 to 15 minutes in length and was completed by 95 of the recruited participants. Of those who had completed the online survey, 31 male recruits and 32 female recruits in total participated in the focus group discussions. While there were some no-show cases for each group, those who participated in the group discussions were selected to ensure a good mix of participants with regard to their age, education, ethnicity, the type of new vehicle they recently purchased, the price range of their new vehicle, the distance they typically travelled daily in their new vehicle, and if they had seriously considered an advanced technology vehicle before making their purchase.

Current Label Use

Factors influencing vehicle choice

Participants across all the groups were asked about the top two factors that influenced their vehicle choice, whether they had considered fuel efficiency during the purchase process, and whether there were other factors that stopped them from buying a vehicle that in all other ways met their needs.

Top factors in vehicle choice

Participants explained that their vehicle choice was primarily governed by the type of vehicle[1] they wanted or needed. Because they had a good idea of the type of vehicle they were looking to purchase, they searched for information that was pertinent to the particular vehicles that fit their needs and used the information to help narrow their choices to the vehicle they subsequently purchased. As detailed below, participants stated they considered very specific criteria when shopping. It is also interesting to note that even if all criteria were satisfied, with rare exceptions, they would not purchase a vehicle that did not meet their aesthetic standards.

The online survey revealed that 88% of those surveyed (N=88) had a specific type of vehicle in mind when they started the purchase process, and the majority (90%) stated that they ended up purchasing the same type of vehicle. Yet, when specifically asked which vehicles they considered before making their final purchase decision, participants did not stick to one particular vehicle type, but selected vehicles across typical EPA vehicle classes that

"I knew I wanted a SUV and a 6-cylinder engine. I knew I was limited to a few choices. From there, it was comfort, then price." – Houston Female

1 Note that when thinking of "type of vehicle" participants thought in relatively broad terms such as SUVs, minivans, sport cars, trucks, economy cars, and midsize cars. Many participants also defined vehicle type as those vehicles that fit my needs, which, for example, could include all vehicle type that carry at least seven passengers. These definitions of vehicle types differ from EPA's definition of vehicle class.

"I haul things for my business. I wanted good gas mileage, but also fold down seats, space." – Seattle Female

"I bought a hybrid. I had good luck with Toyota in the past, and wanted to stick with Toyota." – Seattle Male

suited their particular needs and wants. According to the online survey results, once participants had determined which vehicles they were interested in, comfort to drive the vehicle was the next most important factor. (9.1 on a 1 to 10 scale, where 1 was 'not important at all' and 10 was 'very important'). The next top ten factors (all fairly close in importance) influencing their vehicle purchase decision included safety (mean importance rating = 9), price/affordability (8.8), reliability (8.7), interior and exterior appearance (8.6), performance (8.5), gas mileage/fuel economy (8.4), warranty (8.2), size/interior volume (8.0), brand name (7.6) and seating capacity (7.4).

The focus group discussions reflected this as well. Across all cities, most participants said that when considering the vehicles they were interested in, they next considered factors such as price, fuel economy, comfort, safety, reliability, appearance, and performance, etc. when making their final vehicle purchase decision.

Across all groups, the majority of participants confirmed that they had considered fuel efficiency in the decision of which vehicle they chose to buy. With regard to the factors that would stop them from buying a vehicle that in all other ways met their needs, responses included high vehicle price, bad appearance, unavailability, and negative brand reputation.

b. The part played by fuel economy

In the online survey fuel economy emerged to be the 7th most important factor that respondents considered when making a vehicle purchasing decision and it was rated a '7' or higher (on a 10 point importance scale) by 86% of respondents (n = 88). Close to two-thirds (65% in the online survey) reported that they had searched for fuel economy information before buying their most recent new vehicle. Multiple sources were consulted to gather fuel economy information. Most commonly used sources included manufacturers' websites (69%), fuel economy label on vehicles (62%), Consumer Reports (41%), auto dealers (36%), Edmunds.com (29%), consulted others with similar vehicles (26%), auto magazines (16%), government websites (16%) and television ads (16%). It should be noted that many, if not most, of these sources are consulted prior to visiting a car lot and the fuel economy label.

With few exceptions focus group participants indicated that the environmental impact of the vehicle did not affect the type of vehicle they purchased. Even those who indicated they had considered a hybrid vehicle often discounted it for other factors such as vehicle price and fuel economy when purchasing their new vehicle.

"I used it as a comparison, but not as a deciding factor."
– Houston Female

"The environment was a side benefit [of the hybrid], it was economics mainly."
– Charlotte Male

No major differences were found in the priority of factors that influenced people's vehicle choice based on geographic location or gender.

Based on the above findings, it may be said that participants reported starting with a specific vehicle or vehicle type in mind that fit their individual needs, They then searched for information relevant to those specific vehicles. Assuming the vehicle meets their affordability threshold and aesthetic preference participants looked for information on factors such as comfort, safety, reliability, fuel economy, performance, etc. that they considered important to their final vehicle purchase decision (regardless of gender or geographic location). It should be noted that participants' views of vehicle type varied by their individual needs and preferences and did not match EPA's typical vehicle classes. While fuel economy also figures high on the consideration list, other factors such as safety, reliability, past experience with the brand, etc. also have a strong influence on the purchase decision. At this time, environmental impact does not seem to influence vehicle preference considerably.

Current fuel economy label use

Participants in all the groups were asked if they had used the fuel economy label (see Appendix C) when deciding on their new vehicle purchase. The moderator handed out individual copies of the current fuel economy label to the participants. They were then asked how they had used it, when in the vehicle choice process did they use it, and what information on the label had influenced their purchasing decision.

While the online survey found that two-thirds (66.6%) considered the fuel economy label to be important (rated a '7' or more on a 10-point importance scale) in helping them to choose the make and model of their new vehicle, the focus group discussions revealed that some of these participants had only briefly glanced at the label and did not use it extensively when deciding on their new

"I looked at it, but it wouldn't be a deciding factor. Even if I found a car I liked, even if it was less efficient, I would just deal with it." – Houston Female

"The fuel rating things are worthless for this part of the country. It's different, because of our hills. You'll never get the advertised fuel economy." – Seattle Male

"I usually look at city and highway, and then compare to other vehicles in class." – Seattle Female

"I looked at it when I went to test drive it. I looked at it for reassurance, I guess." – Chicago Male

vehicle purchase. Many of the participants explained that they had researched the vehicles in their consideration set before they visited the dealers, were selective about going to only those dealers who sold these vehicles, and had looked at the fuel economy label only when they viewed vehicles at the dealerships. Further, they mainly used the label to get city and highway gas mileage estimates and used the information to compare among the different vehicles they were considering for purchase.

No major city or gender differences were found with regard to people's use of the fuel economy label.

Based on the above findings, it may be said that participants currently use the fuel economy label after they have selected a specific type of vehicle and done other research. The label is primarily used to compare city and highway gas mileage estimates among different vehicles under consideration for purchase.

Current fuel economy label on hybrid vehicles

In this section, participants were asked to identify hybrid vehicles that they were aware of and whether they had noticed that these hybrid vehicles used the same fuel economy label as a conventional gasoline engine vehicle. The moderator then handed out individual copies of a Toyota Prius fuel economy label and asked them whether they knew why these labels were similar. Following this discussion, the moderator handed out individual copies and read out loud the following statement to explain how the hybrid worked:

"A Gasoline hybrid uses gasoline to propel the vehicle. It can recoup some energy through regenerative braking. It does not plug in to charge the battery."

Across all groups, Toyota Prius was the hybrid vehicle most frequently mentioned. Other hybrid vehicles on the market that were mentioned included those by Lexus, Honda and Ford.

Participants indicated that they had not noticed that hybrid vehicles used the same fuel economy label as the conventional gasoline engine vehicle. When asked about the reason behind the similarity in these labels in spite of the difference in vehicle technologies, a few participants said that it was due to the use of gasoline as fuel in both types of vehicles. Participants appeared to understand the workings of a hybrid with some confusion about when or if they operated on electricity only and when re-charging took place during vehicle operation.

In short, while most participants were aware of hybrids such as the Toyota Prius on the market and had a basic understanding of how they worked, few knew that they used the same fuel economy label as the conventional gasoline engine vehicle.

Electric Vehicles

Awareness about electric vehicles

Gauging participants' awareness about electric vehicles was the first critical step towards designing a fuel economy label for electric vehicles. Awareness played an important role in understanding how knowledgeable they were with regard to electric vehicles and how these functioned. Participants across all the groups were asked if they were aware of any totally electric vehicles (EVs) that were on the market or that were coming on the market.

Chevy Volt, Nissan Leaf and Tesla were the vehicles that participants thought of when asked about their awareness of EVs that were coming onto the market. It should be noted that the Chevy Volt is not an all-electric vehicle, but rather an extended range electric vehicle that also has a gasoline engine.

Male participants in Houston and female participants in Seattle appeared to be more aware of EVs that were on the market (or were coming on the market shortly) as compared to other groups. In both these groups, more participants recalled the names of EVs, as compared to the other groups. Interestingly, female participants in Houston and Chicago stated that they were aware of EVs being released in the market but were not able to recall the names of these vehicles. A few participants thought the Smart Car was an electric vehicle.

With regard to city differences, participants in Chicago appeared to be less aware of EVs coming on the market as compared to other cities. Women participants in Chicago could not recall any EV brand and only one male participant mentioned Tesla.

In short, participants were aware of EVs that (coming) on the market. Further, gender differences were found in Houston where male participants showed greater awareness of EVs (coming) on the market as compared to women participants. In addition, women participants in Seattle also came across as being more aware of the EVs (coming) on the market as compared to men participants in Seattle. With regard to location, Chicago participants appeared to be less aware of EVs (coming) on the market as compared to other cities.

Desirable fuel economy label information for electric vehicles

In this part of the discussion, the moderator read out loud the following description of electric vehicles to participants:

> *"Electric Vehicles use electricity stored in batteries to propel the vehicle. The battery is charged by plugging it into an electrical outlet. This could be a standard electric outlet or a high voltage custom-installed charging station for more rapid charging. Like hybrid vehicles, some energy is recouped through regenerative braking. The vehicle travels until the charge is depleted or it is re-charged. There is no option to run it on gasoline."*

Participants across all groups indicated that they understood the concept of EVs based on the description that was read to them. They were then asked to identify the information that they would want to see on a fuel economy label if they were considering the purchase of an EV.

Across all the groups, the following information was most frequently identified:

- Range/distance on charge ("how far can one go on a fully charged battery"; "how many miles can one travel on a fully charged battery"; "what is the distance one could travel per fully charged battery"; "miles on full charge"; "miles per minutes of charging"; "what is the range of a fully charged battery"; "range of battery for highway and city")

- Cost of charging ("how much does it cost to fully recharge the battery"; "how much will my electricity bill go up to charge the battery"; "what is the impact of charging on the

electricity bill"; "how much does it cost to charge it at charge stations"; "what is the cost to rapidly charge the battery"; "what is the estimated annual cost of charging the battery")

- Time to charge ("how long would it take to recharge the battery")

- Battery cost, life and replacement ("what is the maintenance cost of the batteries"; "what is the battery life"; "how many charges per battery"; "how long will the battery last"; "what is the durability of the battery"; "how soon does one have to replace the battery"; "what is the cost of replacing the battery"; "what is the warranty on the battery")

- Charging system/plug for charging ("how will you charge the battery"; "what is impact on charging based on the type of plug used to charge"; "what is the type of plug one needs to charge the car"; "does one need a special outlet plug"; "where can it be plugged for charging"; "what are the rules for charging the battery?")

Other information that some participants identified included vehicle performance ("how fast can it go from 0 to 60?"; "what is the impact of speed/power on charge?"); safety of EVs; impact of battery on seating capacity, load capacity and accessory use; information on emergency charging and help with breakdown; environmental impact of discarding the battery; and sensitivity to weather and electronic interference.

When asked to select the three factors that were most important, participants indicated distance on charge, cost of charging and time to charge.

No major gender differences were found with regard to the information that participants wanted to see on the fuel economy label for EVs. Interestingly, both male and female participants in Chicago showed more interest in information related to the impact of weather on battery performance as compared to other cities. The Chicago participants were interested in knowing how the temperature differences affected the performance of batteries in summer and winter seasons.

"What happens if you're in the middle of nowhere, will AAA be able to recharge the battery?" – Chicago Female

"With the range, just like the fuel, I'd like to know high and low, and the difference how I drive makes, similar to the difference between city and highway driving." – Houston Male

"I would want to know how much electricity it will use, like how Energy Star appliances tell you how much it will cost per year." – Houston Female

Based on the findings above, it may be said that participants thought the most important information to include on the label for electric vehicles included range, cost of charging, and time to charge. Also of interest was: battery cost, battery life and replacement costs, and plug type for charging. While no gender differences were found across the groups, participants in Chicago were more interested in knowing how temperature differentials affected the performance of EVs.

Fuel economy label metrics for electric vehicles

Participants were provided a list of potential label elements (see Appendix E). They were asked to utilize this list, along with the list they generated as a group during the previous discussion, and individually write or sketch a potential label design using those elements that they thought were most important to them. They were also invited to add any additional elements that they thought were important. A group discussion followed whereby participants worked together to design a single label for an EV using the elements that they had each identified as most important.

The following were the key findings across all groups for EVs (please see Appendix F for tally):

- Charging time

"What happens if I'm driving somewhere and I only have a limited time to recharge? How long will it take to recharge is important." – Chicago Male

Participants across all groups stated that charging time was a crucial piece of information that they wanted to see on the fuel economy label. In essence, they wanted to know whether charging the battery in an EV was a time consuming process.

No major gender or city differences were found with regard to participants' preference for wanting to see charging time information on the fuel economy label for EVs.

The following are design and wording suggestions provided by participants:

- Participants in the Houston female group suggested using 'charging time for a completely depleted battery' instead of 'charging time' as the headline for this section of the label. According to them, 'charging time for a completely depleted battery' sounded more specific and accurate.

- Participants in the Seattle male group suggested using a larger font for the phrase 'Using 220v outlet'. According to them, it was critical that people understood if a particular outlet was required.

- Range

Participants across all groups stated that range was a crucial piece of information that they wanted to see on the fuel economy label for EVs. This was also in line with the previous discussion where they stated that information regarding 'distance on charge' was important for them.

"It's not really like any other car, its miles per charge, not MPG, it's a complete paradigm shift. This range is probably important, how far you go on a charge. There isn't room for error; it has to be awfully accurate." – Chicago Male

In all groups, participants wanted to understand how far they could go on a fully charged battery. They expressed concern about having access to charging when away from home.

Further, with the exception of female participants in Houston and male participants in Charlotte, participants stated that they wanted to see city and highway estimates as well as a combined estimate of range on the fuel economy label for EVs. Participants explained that having all three estimates provided insights for individual differences in city and highway driving while also providing a sense of expectation for combined driving. Participants who only wanted the city and highway range estimates on the label explained that they either drove in the city or on the highway, and hence knowing these estimates was sufficient for them. Some others added that they never paid attention to the combined range estimate on the current label and were less likely to seek such information in the future.

"If I were to plug in at home, how much would my electric bill increase?" – Seattle Female

"You would have to give it a rate per kilowatt hour, because here, energy is very expensive. It may not be as expensive elsewhere." – Houston Female

- Fuel cost

Participants across all groups stated that fuel cost was a crucial piece of information that they wanted to see on the fuel economy label for EVs. This was also in line with the previous discussion in which participants stated that information on the 'cost of charging' was important.

In all the groups, participants enquired about how much it was going to cost them to charge the batteries in an EV. In essence, they wanted to know whether there was going to be a big difference in the amount of money they were currently spending on electricity and the amount that they would spend if they were regularly charging an EV.

"Per mile seems like it would be more manageable to estimate. People drive widely different mileage. " – Seattle Male

"When I got to the grocery store, I always look at the unit cost, cents per mile is the same idea." – Seattle Female

"Everyone's electricity varies depending on how much they use. You need something to figure it out yourself." – Houston Female

"I used monthly, because I pay monthly on my car." – Seattle Male

"If I have a regular car and see this car on the lot, annual cost provides a means to compare." – Houston Male

With regard to preference in expressing fuel cost on the label, 'per mile' emerged to be the preferred fuel cost metric by more of the groups (Chicago male[2] and female group, Charlotte male group, Seattle male and female[2] group). According to participants, a per-mile metric gave them the cost information that they could use to accurately calculate their specific cost estimates based on their driving patterns. Of those who preferred the annual fuel cost metric (Houston groups, Seattle female group, and Chicago male group), they said that they liked it because it was similar to the estimate on the current label and they were comfortable thinking in terms of annual cost. Of those who preferred the monthly metric (Charlotte female group and Seattle male[3] group), they said that it helped them because it was most in sync with how they think of other household costs (such as rent, mortgage, car payments etc.).

A majority of the participants across most groups preferred both city and highway estimates of the fuel cost. They explained that they primarily drove in the city or on highway and did not need a combined estimate for fuel cost. Some added that they had never paid attention to the combined fuel cost estimate on the current label and were not likely to seek such information in the future.

2 Chicago male group also liked the annual city and highway fuel cost metric.

3 Seattle female group also liked the combined annual fuel cost metric.

4 Seattle male group also liked the per mile city and highway fuel cost metrics.

Importantly, participants in most of the groups strongly suggested that instead of the term 'fuel cost', the metric needed to be called 'electricity cost'. According to them, the word fuel does not easily apply to electricity.

In addition, participants across all groups also said that it was important to make clear that "estimated fuel cost based on 15,000 miles per year at 12 cents per kW-hour" to provide information on the basic assumptions on which these numbers were estimated.

Many participants had a strong negative reaction to kWh indicating they would rather it not be used and that they do not think in those terms even when looking at their home electricity usage.

"I think by the time these cars get out we'll be more used to this, but this doesn't mean anything to me right now. Keep it simple." – Charlotte Male

- Fuel consumption

Participants across all the groups indicated an interest in seeing fuel consumption information on the label for EVs.

'MPGe' emerged as the most popular fuel consumption metric (preferred by all the male groups and Charlotte female[5] group) followed by 'kW-hrs per 100 miles' and 'kW-hrs per mile'. According to those who preferred MPGe, they liked it because they were familiar with the concept of MPG and it was easier for them to think of electric energy in equivalent terms. Those who preferred 'kW-hrs per 100 miles' (female participants in Charlotte and Houston) said that the numbers looked similar to the estimates for their current gasoline powered vehicles and that they were familiar with thinking in such terms. Those who preferred 'kW-hrs per mile' (Charlotte male[6] group and Chicago female group) said that they wanted to know how much energy their vehicle consumed per mile and that they could figure out the rest of the math for themselves.

"I feel that would be more beneficial for my use, because I don't understand kilowatt hours." – Chicago Female

"If you really want to know what something costs, what does 'MPGe' tell you?" – Houston Female

"You're getting more miles per gallon, but you're not filling your car with gallons, so I don't really see the value in it." – Houston Male

5 Charlotte female group wanted both MPGe and kW-hrs per 100 miles as the consumption metrics on the label and suggested using smaller font for MPGe metric.

6 Charlotte male group wanted both MPGe and kW-hrs per miles as the consumption metrics on the label and suggested using smaller font for MPGe metric.

It is important to note that in Seattle many individuals thought that MPGe was a cost-equivalence metric. In subsequent groups this was not an issue and a description was added to clarify any misunderstandings.

The Chicago male group wanted combined city/highway estimates only. The Chicago female group and Houston male group wanted all the three estimates – city, highway, and combined. Participants in all the remaining groups said that they wanted only the city and highway estimates of fuel consumption. They explained that they either drove in the city or on the highway and that they did not need a combined estimate for fuel consumption. Some added that they had never paid attention to the combined estimate on the current label and were less likely to seek such information in the future.

Some of the other suggestions included:

- A few participants across different groups suggested adding the definition on MPGe to the label. According to them, not many people were aware of MPGe and needed this information to use the fuel consumption metric correctly.

- Participants in most groups suggested that instead of 'fuel consumption', the metric needed to be called 'electricity consumption'. According to them, the latter sounded more appropriate for electric vehicles.

- Participants in the Chicago male group suggested adding the combined annual and per mile fuel cost in this section along with the qualifier information "estimated fuel cost based on 15,000 miles per year at 12 cents per kW-hour". According to these participants, having all this information under one heading made understanding and comparison easier.

"This car is an environmental statement. Most people who are going to buy this car want something to say it's an eco-car. I guarantee the person who buys this car wants to see this information" – Chicago Female

- Environmental impact

All groups seemed less enthusiastic about the environmental impact metric as compared to the above discussed metrics. Those who supported the idea of including environmental impact information on the label explained that people

who bought EVs were more likely to be motivated by environmental reasons and would want to see this information during the decision-making process.

The slider bar without the CO_2 grams per mile format was the preferred metric for environmental impact as chosen by the Houston groups and the Chicago male group. According to these participants, the slider bar format without the CO_2 grams per mile was simple, informative and visually appealing. Male participants in Charlotte indicated that they did not want an environmental metric on the label.

Those who preferred the 'rating out of 10 'metric (female participants in Charlotte and Chicago and male participants in Chicago[7]), said that it was simple, straightforward and uncluttered. Those who liked the leaf format (male participants in Seattle) said that it was visually appealing and in sync with the environmental impact theme. Further, a few participants in the Seattle female group suggested the label could carry a measure that was indicative of how much the vehicle saved in 100 lbs of CO_2 for each year.

Further, participants in the Seattle groups also wanted information on battery life on the fuel economy label for EVs. They wanted the label to carry information on average battery life and average cost to replace the battery.

With regard to gender differences, women participants appeared to be more interested than males in wanting to see environmental impact information on the fuel economy label for EVs.

In summary, it may be said that participants wanted to see information on charging time, range (city, highway and combined range estimates), 'electricity' cost (city and highway per mile estimates) and qualifier information, and 'electricity' consumption (city and highway MPGe estimates) on the fuel economy label for EVs.

Participants said that charging time was important because it gave them an idea about how time consuming the process was. For range, they wanted to see city, highway and combined range estimates on the fuel economy label for EVs because these estimates gave them a

"From what I'm gathering, an electric car won't have any CO_2 emissions, so why put it on there?" – Houston Female

"The 1-10 scale is more simplistic. I don't understand meaning of '888.' It seems arbitrary." – Houston Male

"I don't need to know the actual grams per mile, I just need to know how it compares with other cars [i.e. the 1-10 scale]." –Houston Male

7 They also wanted to add the sliding bar (1-888 grams of CO_2) in this group.

sense of whether the batteries in EVs held enough charge for them to travel desired distances without worrying about charging the batteries en-route or getting stranded.

For cost, participants wanted to see city and highway per mile 'electricity' cost and qualifier information on the fuel economy label for EVs because they wanted to know how much it was going to cost them to travel a mile, and whether or not these vehicles were cost-effective.

For consumption, participants wanted to see city and highway MPGe estimates of 'electricity' consumption on the fuel economy label for EVs. While fuel economy was one of the top factors that influenced participants' vehicle choice, the equivalency of MPGe with MPG and their familiarity and ease of thinking in terms of MPG made MPGe appealing.

Environmental impact was not as important for many participants. While women participants showed more enthusiasm for environmental information as compared to men, no one metric emerged to be preferred by all groups. However, many preferred the slider bar without the CO_2 grams per mile format because they found it to be more informative and visually appealing than other formats.

Participants agreed that the word "fuel" should be avoided when describing electricity and kWh as a metric should be avoided when possible.

Extended Range Electric Vehicles

Awareness about extended range electric vehicles

Gauging participants' awareness about extended range electric vehicles was the first critical step towards designing a fuel economy label for extended range electric vehicles. Awareness played an important role in understanding how knowledgeable they were with regard to these vehicles and how these vehicles functioned.

In this part of the discussion, the moderator handed out individual copies and read aloud the following description of extended range electric vehicles (EREVs) to participants:

> *"An EREV has 2 modes of operation and can be plugged in to charge the battery.*
>
> 1. *It uses wall electricity to propel the vehicle (like an EV) until the wall electricity is used up.*
>
> 2. *Once the stored wall electricity is used up, it runs like a gasoline hybrid, using gasoline to propel the vehicle with some regenerative braking.*
>
> *Important: daily driving distance can GREATLY affect amount of gasoline used. Can go all the way from zero gasoline (if shorter commutes and plenty of recharging) to entirely gasoline (if longer drives and no recharging)."*

Participants were then asked if they were aware of any EREVs that were on the market or that were coming onto the market.

Participants across different groups had several questions after they read and heard the description of EREVs. Although they understood that EREVs charge the battery by plugging into an electricity source, they required further explanation to understand how these were different from hybrids and EVs, how it would benefit them to purchase an EREV, what was the utility of the EREV, what was the charge storage capacity in EREV batteries, and what did the term "wall electricity" mean. No one was able to name any EREVs that were on the market or that were coming onto the market. The moderator then told that the Chevy Volt was an example of an EREV that would be available shortly.

In short, participants were not aware of any vehicles using this technology and did not readily understand how vehicles using this technology operated. This was true even though limited information about EREVs had been provided in the pre-group online survey.

Desirable fuel economy label information for extended range electric vehicles

In this part of the discussion, participants were asked to suggest terms that could be used to describe an EREV and its two modes of operation in a better way, and to identify the information that they would want to see on the fuel economy label of an EREV. The moderator distributed the teaching tool handout (see Appendix G) to participants to aid their understanding of how the technology worked and to help illustrate how driving distance impacted the operation and fuel cost efficiency of EREVs. They were then asked to confirm their understanding of how EREVs operated.

"For me, the gas back up instills a sense of security that I'm not going to get stranded somewhere." – Seattle Male

"Keep the word hybrid in there, because everyone knows what that is." – Chicago Male

"Empty battery sounds negative." -- Charlotte Male

Description of EREV modes on the label

Most participants across the different groups liked the terms "electricity" and "gasoline" to describe the EREV's two operational modes. According to them, these terms were simple, straightforward and easy to understand. Other terms suggested by participants to describe the gasoline operation of an EREV included "hybrid", "gasoline back-up", "depleted mode", and "no-charge". Terms suggested to describe the electric operation of an EREV included "reverse hybrid", "full charge", and "electric mode". The terms suggested by participants to describe the merged mode for both (electric and gas) operations in EREVs included "super hybrid",

"dual power", "e before g", and "e 2 g". The term "discharge" was unpopular and was especially not favored by female participants across all groups.

Metrics for the EREV label

When asked about the information that they would want to see on the fuel economy label of an EREV, the participants mentioned the following label elements that they considered to be most important and wanted to see on the EREV label:

- For electric mode of operation:
    - Range/distance on charge ("how far can one go on a fully charged battery"; "how many miles can one travel on a fully charged battery"; "what is the distance one could travel per fully charged battery"; "miles on full charge"; "miles per minutes of charging"; "what is the range of a fully charged battery"; "range of battery for highway and city")
    - Cost of charging ("how much does it cost to fully recharge the battery"; "how much will my electricity bill go up to charge the battery"; "what is the impact of charging on the electricity bill"; "how much does it cost to charge it at charge stations"; "what is the cost to rapidly charge the battery"; "what is the estimated annual cost of charging the battery")
    - Time to charge ("how long would it take to recharge the battery")
    - Battery cost, life and replacement ("what is the maintenance cost of the batteries"; "what is the battery life"; "how many charges per battery"; "how long will the battery last"; "what is the durability of the battery"; "how soon does one have to replace the battery"; "what is the cost of replacing the battery"; "what is the warranty on the battery")
    - Charging system/plug for charging ("how will you charge the battery"; "what is impact on charging based on the type of plug used to charge"; "what is the type of plug one needs to charge the car"; "does one need a special

outlet plug"; "where can it be plugged for charging"; "what are the rules for charging the battery?")

- For gasoline mode of operation:
  - Range/distance on gas ("Miles per gallon"; "range for gas")
  - Gas cost estimate ("annual gas cost")
- For merged electric and gasoline operation:
  - merged range ("what is the merged (electric and gas) metric for distance", "full to empty range"; "what is the city and highway range in merged mode")
  - merged cost ("what is the merged (electric and gas) metric for cost")

Other desirable EREV information suggested by participants included impact of charge on vehicle performance ("how fast can it go from 0 to 60?"; "what is the impact of speed/power on charge?"); safety of EREVs; impact of battery on seating capacity, load capacity and accessory use; information on emergency charging and help with breakdown; environmental impact of discarding the battery; sensitivity to weather and electronic interference; size of the batteries; and size of the gas tank.

Of all the above mentioned items, those that were most important to participants included range, cost and charging time.

No major gender or city differences were found with regard to the information that participants stated (unaided) they wanted to see on the fuel economy label for EREVs.

"Everyone has had gas engines their whole lives. Most people have a feel for what they can do. This is a learning process. You have to have more information for these cars, it's new, and we need information to understand it." – Houston Male

Participants across all the groups found the teaching tool handout to be very useful in understanding the overall functioning of EREVs, the impact of driving distance on an EREV's efficiency, and how driving distance impacted the numbers that would appear on the fuel economy label for EREVs. They understood that driving shorter distances while relying entirely on electricity could be more cost-efficient in an EREV as compared to long distances that require gasoline operation. Many participants across different groups expressed that the EREV (blue) bar chart and the distance-cost matrix used in the handout were very informative and suggested that similar information be made available to educate people about EREVs.

Based on the findings above, it may be said that participants liked the terms "electricity" and "gasoline" to describe the two operational modes in the EREV because these were simple, straightforward and easy to understand. Information identified as the most important for label included distance on electricity-only and the total (electric and gas) range, the cost to charge, cost of gas, and total (electric and gas cost), time to charge, battery cost, battery life and replacement costs, and plug type for charging. Participants understood that driving shorter distances could be more cost-efficient in an EREV as compared to long distances. No gender or city differences were found.

Fuel economy label metrics for extended range electric vehicles

Participants were provided a list of potential label elements (see Appendix H). They were asked to utilize this list, along with the list they generated as a group during the previous discussions, and think of a potential label design using those elements that they thought were most important to them. They were also invited to add any additional elements that they thought were important. A group discussion followed whereby participants worked together to design a single label for an EREV using the elements that they had each identified as most important.

Following are the key findings across all groups (please see Appendix I for tally of label elements chosen):

- Charging time

  Participants across all groups stated that charging time was a crucial piece of information that they wanted to see on the fuel economy label.

  Participants in all groups wanted to know how long it would take to fully charge the battery in an EREV. No major gender or city differences were found with regard to participants' preference for wanting to see charging time information on the fuel economy label for EREVs.

"Range is a big issue for me. I want to know how far I can get on a charge before I'm kind of out there with no place to plug my car in." – Chicago Male

"I like to separate the electric and gas component. Your car is designed to use electricity first. We should know what it can do until that is exhausted. "
—Seattle Male

"Most people are buying this car for the electricity, the gas is insurance." –Charlotte Male

"For the EREV, to me, combined means your combined gas/ electric consumption, not your city highway/consumption, that's what is confusing."
– Charlotte Female

- Range

Participants across all groups stated that range was a crucial piece of information that they wanted to see on the fuel economy label for EREVs. They restated that information regarding 'distance on electricity-only mode, gas-only mode and the merged range (the overall range that could be achieved when the vehicle operated on electric and then on gasoline)' was important for them.

Participants were more interested in range estimates for the electric mode than for the gasoline mode. This was because they wanted to know how far they could go before the gasoline operation kicked in.

For the electric mode of operation, the majority of participants in Charlotte, Houston and the Chicago male group stated that they wanted to see both the city and highway range estimates on the EREV label. They explained that they were used to looking at the city and highway estimates on the current label and would look for these estimates in the new labels.

More male participants (in Seattle, Chicago and Houston) were interested in seeing the combined (city and highway) range estimate for electric mode as compared to the women participants (only Seattle female group showed interest in this metric). The provision to see an estimate without doing the math themselves was considered convenient and helpful to these individuals.

For the gasoline mode of operation, both of the Houston groups, the Seattle male group and the Charlotte female group were interested in seeing the city and highway range estimates on the label as compared to just a combined range estimate. As before, these participants said that they were used to looking at the city and highway estimates on the current label and would look for these same estimates in the new labels as well.

As for the merged range (electric and gasoline) that could be achieved in EREVs, participants in Chicago groups and the Houston male group wanted to see city range estimates, highway range estimates, as well as combined

(city and highway) range estimates on the label. According to them, having all these estimates was useful for everyone irrespective of individual differences in city and highway driving ratios. Male participants in Seattle only wanted to see the combined (city and highway) range estimate. According to them, the opportunity to see an estimate without doing the math themselves was convenient and helpful.

- Fuel cost

Participants across all groups stated that fuel cost was a crucial piece of information that they wanted to see on the fuel economy label for EREVs. This was also in line with the previous discussion where they stated (unaided) that information on cost of charging, gas cost and merged cost (gas + electric) was important to them.

While fuel cost was an important factor in participants' vehicle choice and a fuel cost metric was something that they wanted to see on the EREV label, no consensus was reached with regard to the preference of metrics to express fuel cost on the label. However, the majority of participants across all the groups said that they liked separate cost metrics for the electric mode and the gasoline mode, and would prefer a merged (electric and gas modes) cost metric only as additional information if there was room on the label. According to them, it was helpful to know the electricity cost estimate separately from the merged (electric and gasoline) estimate because they could more easily determine how charging the EREV would affect their electricity bill.

"Need information for long distance drivers to understand what the car is doing so they can calculate costs."
– Charlotte Female

"If you're doing your budget, you need to know how much more your electric bill is and how much less your gas bill is."
– Charlotte Female

The following fuel cost metrics were preferred by the different groups:

- For electric-only operation, a per-mile estimate that combined the city and highway estimates was preferred. Those participants (Seattle groups and Chicago male group) who liked this metric said that they were driving on both city roads and highways and it was useful for them to have combined city and highway estimates. They also said that knowing the combined cost per mile estimate would provide them the base information for doing the math themselves.

- For gasoline operation, a per-mile estimate broken down into the separate city and highway estimates were preferred over others. Those participants (male participants in Seattle and Charlotte) who liked this metric said that they were used to seeing separate city and highway gas cost estimates on the current label. Further, they added that knowing the 'per mile' estimate would provide them the base information for doing the math themselves.

- For those who liked an average of the electric and gasoline cost estimates merged together into one value, the metric 'annual gas + electric cost' was preferred over other metrics. Those participants (male groups in Chicago and Houston) who liked this estimate said that they wanted to see fewer numbers on the label. Further, they added that they wanted a single cost metric that they could use to compare different vehicles irrespective of whether it was based on gasoline, electricity, or both.

Interestingly, some participants (Houston female group[8] and Chicago male group[9]) said that they preferred an annual metric for fuel cost on the EREV label. According to them, they were familiar with an annual cost estimate on the current fuel economy label and wanted a similar metric on the new labels. Additionally, a few participants (Charlotte female group[10]) said that they liked a monthly metric for fuel cost on the EREV label, explaining that the monthly estimate would be useful to include with their other monthly household costs (such as monthly auto loan payment).

In addition, participants across all groups said that it was important to add the qualifier information "estimated fuel cost based on 15,000 miles per year at 12 cents per kW-hour and $3.00 per gallon" for people to know the assumptions on which these numbers were estimated.

- Fuel consumption

Participants across all groups stated that fuel consumption was a crucial piece of information that they wanted to see on the fuel economy label for EREVs. This was also in line

8 These participants preferred the city and highway annual fuel cost estimates for electric-only mode, and the combined annual fuel cost estimate for gas-only mode on the EREV label.

9 These participants preferred the combined annual fuel cost estimate for electric-only mode on the EREV label.

10 These participants preferred combined monthly fuel cost estimates for electric -only mode and gasoline only mode on the EREV label.

with the previous discussion where they stated (unaided) that information on gas mileage and distance per fully charged battery in EREVs was important for them.

As before, the majority of the participants across all the groups stated that they would like to see separate fuel consumption metrics for electric and gas modes and would prefer a merged estimate (electric and gas modes) metric only as an add-on, if there was room on the label.

"Until we all understand what this means, they need to dumb the label down." – Chicago Female

With regard to the metric for the electric mode, 'MPGe' emerged as the most popular fuel consumption metric followed by 'kW-hrs per 100 miles'. According to those who preferred MPGe, they liked it because they were familiar with the concept of MPG and it was easier for them to think of electric energy in equivalent terms. Further, of those who liked the MPGe metric, most said that they wanted to see city and highway MPGe estimates instead of the combined MPGe estimate. They explained that they were used to seeing separate city and highway estimates on current label and wanted the new label for EREVs to resemble it. Those few who preferred 'kW-hrs per 100 miles' (female participants in Houston) said that the numeric values looked similar to the estimates for their current gasoline powered vehicles and that they were used to thinking in such numbers.

As for the preferred metric for the gasoline mode, MPG emerged as the most popular fuel consumption metric across the different groups. Those participants who liked MPG said that they were familiar with the concept of MPG. Here again, most wanted a separate MPG estimate for city and highway and did not seem too enthusiastic about a combined MPG estimate.

For those who liked a merged value of the electric and gasoline consumption estimates together into one value, 'MPGe of gas + electric' combined emerged as the most popular fuel consumption metric in both Chicago groups and the Houston male group. According to these participants, the metric 'MPGe of gas + electric' could be used to compare different vehicles irrespective of the technology.

The following additional suggestions were made by some participants:

- Participants in the Seattle female group and Chicago male group suggested adding the distance-cost matrix and blue bar chart from the teaching tool handout to the label. They said that these graphics could serve as useful aids in explaining the concept of fuel consumption in EREVs.

- Participants in the Chicago female group suggested adding separate city and highway 'MPGe of gas + electric' estimates for the merged (electric and gas) fuel consumption estimate in EREVs. According to them, it was helpful to see the city and highway breakdowns in addition to the combined (city and highway) estimate for merged (electric and gas) fuel consumption in EREVs.

- Environmental impact

Participants across the different groups seemed less enthusiastic about the environmental impact metric as compared to the above discussed metrics. Those who supported the idea of including environmental impact information on the label explained that people who bought EREVs were more likely to be motivated by environmental reasons and would want to see this information during the decision-making process.

"I think CO2 is important, but the number doesn't mean much." – Seattle Male

The slider bar without the CO_2 grams per mile format emerged to be the preferred environmental metric for those in the Houston groups, Seattle female group and Chicago male group. According to these participants, the slider bar format without the CO_2 grams per mile was simple, informative and visually appealing.

"CO2— I don't think the general public will understand it." – Charlotte Female

Those who liked the 'number rating' (out of 10) without the CO_2 grams per mile format (female participants in Chicago), said that it was simple, straightforward and 'uncluttered'. Those who liked the leaf format (male participants in Seattle and female participants in Charlotte) said that it was visually appealing and was consistent with the environmental impact theme.

"You have to read the scale to understand what the numbers mean, but the leaves say environment." – Charlotte Female

Male participants in Charlotte indicated that they did not want an environmental metric on the label while participants in the Seattle groups wanted information on battery life and average cost to replace the battery.

In summary, it may be said that participants wanted to see information on charging time, range, fuel cost and fuel consumption on the fuel economy label for EREVs. They were less enthusiastic about including an environmental impact metric on the label as compared to these metrics.

Participants said battery charging time was important because it let them know if they would have enough time to charge between trips. For range, they wanted to see city and highway estimates for each mode of operation separately. For the merged range (the overall range that could be achieved when the vehicle operated on electric and then on gasoline), participants wanted city and highway as well as combined (city and highway) estimates. According to them, having all these estimates gave them a more complete sense of how far they could travel on the EREV.

For cost, participants wanted to see separate estimates for electric and gasoline modes and preferred a merged cost estimate as an add-on to these estimates only if there was room on the labels. Further, participants indicated that they preferred the 'per mile' estimates for electric and gasoline modes because it more easily allowed them to do the math for their specific driving requirements. They also wanted the total annual gas and electric cost as well as the qualifier information ("estimated fuel cost based on 15,000 miles per year at 12 cents per kW-hour and $3.00 per gallon") on the fuel economy label for EREVs.

For fuel consumption, participants wanted separate estimates for electric and gasoline modes on the fuel economy label for EREVs and preferred a merged consumption estimate as an add-on to these estimate if there was room on the labels. Participants also indicated that they preferred the city and highway MPG estimate for gasoline mode, city and highway MPGe estimate for electric mode, and the 'MPGe for electric + gas consumption' for merged fuel consumption on the label for EREVs. The equivalency of MPGe with MPG and their familiarity and ease of thinking in terms of MPG, made MPGe appealing to the participants.

With regard to the environmental impact, participants were less enthusiastic about this metric as compared to the other metrics. With regard to format preference, many preferred the slider bar without the CO_2 grams per mile format because they found it to be more informative and visually appealing over others.

Participants agreed that the word "fuel" should be avoided when describing electricity.

Plug-In Hybrid Electric Vehicles*

Awareness about plug-in hybrid electric vehicles

Gauging participants' awareness about plug-in hybrid electric vehicles was the first critical step towards designing a fuel economy label for plug-in hybrid electric vehicles. Awareness played an important role in understanding how knowledgeable they were with regard to these vehicles and how these vehicles functioned.

In this part of the discussion, the moderator handed out individual copies and read out loud the following description of plug-in hybrid electric vehicles (PHEVs) to participants:

> "A PHEV has 2 modes of operation and can be plugged in to charge the battery.
>
> 1. It uses wall electricity intermingled with some gasoline to propel the vehicle until the wall electricity is used up.
> 2. Once the stored wall electricity is used up, it runs like a gasoline hybrid, using gasoline to propel the vehicle with some regenerative braking.
>
> Important: daily driving distance can GREATLY affect amount of gasoline used. "

Participants were asked to refer to the PHEV mode in the teaching tool handout (refer back to Appendix G) and then asked if they were aware of PHEVs that were on the market or that were coming on the market.

* By PHEVs, we are specifically referring to blended PHEVs.

Participants across different groups had several questions when they read and heard the description of blended PHEVs. Although they understood that PHEVs charge by plugging into an electricity source, they required additional discussion to understand how these were different from hybrids and EREVs, how it would benefit them to purchase PHEVs, and how the batteries operated in PHEVs. No one in any of the groups was aware of any PHEVs that were on the market or that were coming onto the market. When the moderator mentioned Prius PHEV as an example of the PHEVs that was coming onto the market, participants said that they were not aware of it.

In short, participants were not really aware of the concept of blended PHEVs and had limited information about blended PHEVs based on what they had learned about them in the pre-group online survey. As a result, participants had several questions regarding how PHEVs operate and how they differed from hybrid vehicles.

Desirable fuel economy label information for plug-in hybrid electric vehicles[11]

In this part of the discussion, participants were asked to suggest alternative terms that could be used to describe the PHEV's two modes of operation and identify the information that they wanted to see on the fuel economy label of a PHEV.

Description of PHEV modes on the label

Participants across the different groups liked the terms "hybrid" and "gasoline" to describe the two PHEV operational modes. According to them, the term "hybrid" explained the blended mode of operation and the term "gasoline" explained the gasoline-only mode of operation.[12] Other terms that were suggested to describe the overall operations included "gas assisted phase 1 mode and battery assisted phase 2 mode" and "continuous dual mode".

Metrics for the PHEV label

The following information was most frequently identified as important and desirable to include on the fuel economy label:

11 Note that only 'blended' (electric with gas) and 'gasoline' (after battery power is depleted) modes of operation was discussed for PHEVs. In regards to 'merged' metrics (where numbers for operation under 'blended' and 'gasoline' modes are combined), this issue was not discussed in the PHEV section of the discussion as this issue had been addressed under the EREV discussion. Participants repeatedly stated that no matter what ended up being included on the fuel economy labels, it should be consistent across vehicle types so to ease comparisons across vehicle technologies.

12 Note that such use of the term "hybrid" to describe the blended mode of operation in PHEVs would not be the same as used in the context of a conventional hybrid vehicle. In fact, the gasoline mode in PHEVs is the operational mode that is technologically similar to how conventional hybrids function.

- For blended (electric and gasoline) mode of operation:
  - Range ("what is the distance on charge and gas"; "miles on full charge and full tank"; "gasoline and battery range")
  - Cost ("what is the combined (electric and gas) metric for cost")
- For gasoline-only mode of operation:
  - Range/distance on gas ("Miles per gallon"; "range for gas")
  - Gas cost estimate ("annual gas cost")

Participants wanted similar information for PHEVs as they did for the EVs and EREVs. Most important to participants were range, cost and charging time. Additionally, participants requested the label for PHEVs include the size of the gas tank.

"It sounds like we're talking about the same things [as EREV]"
– Chicago Male

No major gender or city differences were found with regard to the information that participants stated (unaided) they wanted to see on the fuel economy label for PHEVs.

"We're still using separate electric and gas, it's just the vehicle is running it differently. I would still want to know the same stuff."
– Charlotte Female

Based on the findings above, it may be said that participants liked the terms "hybrid" and "gasoline" to describe the two operational modes of PHEVs because these were simple and descriptive of how the PHEVs function in the blended mode and the gasoline-only mode. Further, the information that they thought was most important and needed to be on the label for plug-in hybrid electric vehicles included distance [in blended (electric and gas) mode and gas only mode], cost (of charging for blended mode and gas mode functioning), and time to charge. No gender or city differences were found.

Fuel economy label metrics for plug-in hybrid electric vehicles

Participants were provided a list of potential label elements (see Appendix J). Using the distributed list and the list generated by the group they worked as a team to design a label for PHEVs.

Across all groups the following key elements were most desired: (see Appendix K for tally):

- Charging time

  Participants felt it was critical to know how long it would take to fully charge the battery in a PHEV. They wanted to know whether charging the battery in the PHEV would meet their driving needs.

  No major gender or city differences were found with regard to participants' preference for wanting to see charging time information on the fuel economy label for PHEVs.

- Range

  Participants wanted the label to show the PHEV's blended (electric and gasoline) range for a fully charged battery, and to show how far the PHEV could go in gasoline-only mode.

"You can pretty much calculate from below half full when you need to get gas with your own experience with the car. Now you have two things…when do I need to charge, when do I fill the tank? Are you just going to do it more than you need to, or be stressed about it, lose confidence in the car?" – Seattle Male

  Interestingly, more participants were interested in learning about the PHEV range estimates for the blended mode. This was because they wanted to know how fuel efficient a PHEV was as compared to a traditional gasoline powered vehicle.

  For the blended (electric and gasoline) mode of operation, the Chicago female group and Houston male group wanted to see city range, highway range, as well as combined (city and highway) range estimates on the PHEV label. According to them, having all these estimates was useful for everyone irrespective of individual differences in city and highway driving ratios. Participants in the Seattle male group and the Chicago male group wanted to see only the combined (city and highway) range estimate on the label. According to them, the opportunity to see an estimate without doing the math themselves was convenient and helpful. Seattle male group further explained that they wanted the PHEV label to resemble the EREV label for consistency in label design and hence wanted the same metrics that they chose for EREV label to be on the PHEV label. The female participants in Charlotte wanted separate city and highway range estimates as opposed to combined (city and highway) range estimates for blended mode of operation on the label. According to them, they were used to seeing these two estimates separately on the current label and would look for the same on newer labels.

As for the gasoline mode of operation, participants in the Houston male and female groups were interested in seeing the city and highway range estimates on the label for PHEVs. As before, these participants said that they were used to looking at the city and highway estimates on the current label and would look for these estimates in the new labels as well.

- Fuel cost

Participants across all groups stated that fuel cost was a crucial piece of information that they wanted to see on the fuel economy label for PHEVs. This was consistent with the previous discussion where they stated (unaided) that information on cost of charging, blended operation (gas + electric) cost, and gas operation cost and cost for merged (gas + electric) was important for them.

Many participants said they preferred a metric for blended mode on the fuel cost section of the PHEV label. They explained that because the PHEV was a "super-hybrid" that functioned in the blended mode for the first 50 miles and then used gasoline as its main fuel source for the remaining miles, it was more important to know the fuel cost for the blended mode in PHEVs.

With regard to the preferred fuel cost metric for blended mode, many liked the combined (city and highway) per mile estimate. Those participants (Seattle groups and Chicago male group) who liked this metric said that they were driving on both city roads and highways and it was useful for them to have combined city and highway estimates. Moreover, many of these participants added that they wanted the PHEV label to resemble the EREV label for consistency in label design and hence wanted the same metrics that they chose for EREV label to be on the PHEV label.

"Just the combined, so there's not so much information."
– Chicago Male

"You want the same information for all the labels."
– Chicago Female

This was followed by combined (city and highway) annual estimate for the blended mode as indicated by some in the Seattle female group and in the Houston male group. According to these participants, they were used to seeing an annual fuel cost estimate on the current label and wanted something similar on the newer labels. Moreover, they

wanted a combined estimate because it was simple and easier to compare different vehicles using one consolidated fuel metric.

Interestingly, some participants (Houston female group[13]) said that they preferred separate city and highway metrics for annual fuel cost on the PHEV label. According to them, they were driving either on city roads or on highways, and it was useful for them to have separate city and highway breakdowns of their fuel cost. A few participants (Charlotte female group[14]) said that they liked a monthly metric for fuel cost on the PHEV label because monthly estimates were useful in budgeting with their other monthly household costs (such as monthly auto loan payment).

Participants across all groups also said that it was important to add the qualifier information "estimated fuel cost based on 15,000 miles per year at 12 cents per kW-hour and $3.00 per gallon" for people to know the basic assumptions on which these numbers were estimated.

- Fuel consumption

"Need combined fuel consumption, because the car won't work without gasoline."
– Charlotte Female

Participants said that they preferred a fuel consumption metric for the blended mode over the gasoline only mode on the PHEV label. They explained that because the PHEV was a "super-hybrid" that functioned in the blended mode for the first 50 miles and then used gasoline as its main fuel source for the remaining miles, it was most important to know the fuel consumption for the blended mode as well as the consumption metric for gasoline-only mode.

With regard to the metric for blended mode in PHEVs, city and highway 'MPGe of gas + electric' estimate emerged to be the most popular fuel consumption metric across all groups, closely followed by combined 'MPGe of gas + electric' estimate. According to those who liked the city and highway 'MPGe of gas + electric' estimate, they were used to seeing separate city and highway estimates on the current label and wanted the new label for PHEVs to resemble it. Those who liked the combined 'MPGe of gas + electric' estimate said that they wanted a single estimate that could be used to compare fuel consumption across different PHEVs.

13 These participants preferred the city and highway annual fuel cost estimates for the gas-only mode and the blended (electric and gas) mode on the PHEV label.

14 These participants preferred combined (city and highway) monthly fuel cost estimates for blended mode and gasoline only mode on the PHEV label.

Most participants preferred MPG for the gasoline mode because they were familiar with the concept of MPG. Here again, most wanted a separate MPG estimate for city and highway and seemed less enthusiastic about a combined MPG estimate.

Participants in the Seattle female group suggested adding the orange bar chart (see Appendix G) from the teaching tool handout to the label. They said that these graphics could serve as useful aids in explaining the concept of fuel consumption in PHEVs.

- Environmental impact

  Participants across the different groups seemed less enthusiastic about the environmental impact metric as compared to the above discussed metrics.

  The 'number rating' (out of 10) without the CO_2 grams per mile count format emerged to be the preferred metric for environmental impact chosen by female participants in Charlotte and Chicago, and male participants in Houston. According to these participants, this rating was simple, straightforward and uncluttered.

  Those who liked the slider bar without the CO_2 grams per mile format (female participants in Seattle and Houston), said that it was simple and visually appealing. Those who liked the leaf format with the CO_2 grams per mile count (male participants in Seattle and female participants in Charlotte) said that it was visually appealing and was consistent with the environmental impact theme. Male participants in Charlotte indicated that they did not want an environmental metric on the label.

In summary, it may be said that participants wanted to see information on charging time, range, fuel cost and fuel consumption on the fuel economy label for PHEVs. They were less enthusiastic about the inclusion of the environmental impact metric on the label as compared these metrics. This was similar to what was seen in the EV and EREV label design preference.

"As we work through the transition, it's really important for the agencies to educate us and give the tools so that when we walk on the lot and we are trying to be more environmentally aware of what we are doing, the labels need to help us understand why they are a better option, but it needs to be in a metric that we understand." – Chicago Female

Participants indicated that battery charge time was important because it gave them information on how to accommodate their driving requirements. To illustrate range, they wanted to see combined (city and highway) estimates for the blended (electric and gas) mode of operation. For the gasoline only mode, participants wanted city and highway estimates of range. According to them, all these estimates gave them a more complete sense of how far they could drive the PHEV.

For both fuel cost and consumption, participants wanted to see combined (city and highway) estimates for the blended mode of operation. They explained that because the PHEV was a "super-hybrid" that functioned in the blended mode for the first 50 miles and then used gasoline as its main fuel source for the remaining miles, it was more important to know the fuel consumption and cost while in blended mode. While a combined (city and highway) per mile estimate for the mode emerged as the most popular fuel cost estimate, separate city and highway 'MPGe of gas + electric' estimates for blended mode emerged to be the most popular fuel consumption metrics across most groups. The equivalency of MPGe with MPG and their familiarity and ease of thinking in terms of MPG made MPGe appealing to the participants.

Participants were less enthusiastic about an environmental metric as compared to the other metrics. With regard to format preference, many preferred the number rating (out of 10) without the CO_2 grams per mile count format because they found it to be simple, straightforward and visually appealing over others.

Comparison Across Vehicle Types

When asked if it was important to be able to compare across different types of vehicle technologies (conventional gasoline powered vehicles, EVs, EREVs and PHEVs), virtually every participant said yes[15]. They indicated that they wanted to use the information to compare different vehicles across technologies in their consideration and therefore be able to make an informed decision. They added that they wanted labels that were easy to read and understand and consistent in content and design across different vehicle technologies. This meant using same/similar label elements for describing fuel economy in a vehicle irrespective of whether it was a conventional gasoline powered vehicle, EV, EREV or PHEV. The majority of participants thought that fuel cost and fuel consumption were the two critical elements on the labels that would allow them to compare all the different types of vehicles as part of their decision process.

"What you put on the sticker needs to be simple, basic, because it's going to scare a lot people away from the car if there are too many figures."
– Chicago Male

With regard to participants' preference for expressing metrics using bookend approach (i.e. separate estimates for each mode of operation) versus merged approach (i.e. one estimate for all modes of operation) for purposes of comparison, most wanted the merged estimate as an add-on to bookend estimates only if there was room on the labels.

When asked if it was important to have a label that explained in more detail how a particular type of vehicle worked, most participants said that they would not want this type of information on the fuel economy label. Instead, they would look for it on websites or on informational brochures.

15 Participants in the Houston female group were not asked this question because the group ran out of time.

Overall Summary

Gender and Location Affects

Based on the results of these Phase 2 focus groups, no systematic gender or city location differences were found. Those reported here appear to be random, but will be further tracked and reviewed as Phase 3 of the focus groups is completed.

Vehicle Choice Process and Current Label Use

The findings in the Phase 2 focus group supported the vehicle choice process identified in Phase 1.

Buyers actively began the vehicle purchasing process with specific vehicles or vehicle type in mind that fit their individual needs. They then searched for information relevant to those particular vehicles. Assuming the vehicle met their affordability threshold and aesthetic preference, and had positive brand reputation and was available on the market, information on factors such as comfort, safety, reliability, fuel economy, performance, warranty, size, seating capacity, etc. became critical in influencing one's vehicle choice regardless of one's gender or location. It should be noted that participants' views of vehicle type varied by their individual needs and preferences and did not match EPA's typical vehicle classes.

Participants used the current fuel economy label to compare different vehicles within the same type, primarily relying on city and highway gas mileage estimates. While fuel economy figured high on the consideration list, it was considered along with other factors (such as comfort, safety, reliability, size, performance, brand name, past experience with the brand, etc.) in comparing different vehicles in the consideration set. Environmental impact did not seem to significantly impact vehicle choice.

Participants were well-aware of hybrid technology and brands such as the Toyota Prius that are currently on the market. They had a basic understanding of the technology, but also did not understand how the battery and gasoline work together to power the vehicle. They were not aware that hybrids currently use the same fuel economy label as conventional gasoline engine vehicles.

Electric Vehicles

Some participants were able to recall a few electric vehicles (EVs) that are coming onto the market. The focus group discussions included basic information on the technology which provided a foundation for participants to know more about EVs.

With regard to the fuel economy label for EVs, information on range, charging time, electricity cost and consumption were important to participants. They wanted to see each of these elements on the fuel economy label.

Range gives them a sense of how far they can go on a fully charged battery. They wanted to see this information broken out for city, highway, and combined. Charging time tells them how it long it takes to charge the EV battery and if they can accommodate it within their schedules. All three of these estimates gave participants a sense of whether the batteries in EVs will hold enough charge for them to travel desired distances.

With regard to fuel cost in EVs, participants strongly recommended calling it 'electricity cost' on the label because they did not readily associate the word 'fuel' with electricity. Participants wanted to see city and highway cost per mile information in addition to the qualifier information "estimated fuel cost based on 15,000 miles per year at 12 cents per kW-hour" on the label. Knowing the cost to travel a mile will allows them to calculate whether these vehicles are cost-effective or not in regard to their personal annual miles traveled and local cost for electricity. To understand consumption estimates, participants wanted to see city and highway MPGe estimates. While fuel economy was one of the important factors that influenced participants' vehicle choice, the equivalency of MPGe with MPG and their familiarity and ease of thinking in terms of MPG made MPGe appealing.

Environmental information was currently not sought after for many participants as their vehicle choice was not largely influenced by environmental impact. Although participants did not feel strongly about including such an environmental metric, many preferred the slider bar without the CO_2 grams per mile format. They found this format to be more informative and visually appealing over other formats. Further, women participants were more enthusiastic about including an environmental impact metric as compared to men.

Extended Range Electric Vehicles

Participants were not aware of the concept of extended range electric vehicles (EREVs) and had limited information about EREVs based on what they had learned in the pre-group online survey. As a result, they had several questions regarding how EREVs operate and how they differ from hybrid vehicles.

As participants learned how EREVs worked in the focus groups, they preferred the terms "electricity" and "gasoline" to describe the two operational modes. According to them, these terms are simple, straightforward and easily understood. It was clear to participants that driving shorter distances can be more cost-efficient in an EREV as compared to long distances.

For EREVs, participants thought that range, charging time, fuel cost and fuel consumption were most important and needed to be included on the EREV label. Environmental impact was less important and they were less enthusiastic about including an environmental impact metric on the EREV label compared to these other metrics.

For range, they wanted to see city and highway estimates for electric-only and gasoline-only modes of operation. Charging time was important because it gives them information about how time consuming the battery charging process will be and if they can accommodate it within their schedules. For the merged range estimate (an average of the electric and gasoline range estimates combined together into one value), they wanted city, highway, and combined (city and highway) estimates on the fuel economy label. According to them, all these estimates give them a more complete sense of how far they can travel in an EREV.

Participants wanted to see separate fuel cost estimates for electric and gasoline modes on the fuel economy label and preferred a merged) cost estimate (an average of the electric and gasoline cost estimates combined together into one value) as an add-on only if there was room on the label. Participants preferred 'per mile' estimates for electric-only mode and gasoline-only mode because these metrics are indicative of how much it is going to cost them to travel a mile and are useful in figuring out their own personal costs based their typical mileage. They also wanted the qualifier information ("estimated fuel cost based on 15,000 miles per year at 12 cents per kW-hour and $3.00 per gallon") on the fuel economy label.

With regard to fuel consumption, participants wanted separate estimates for electric and gasoline modes and preferred a merged consumption estimate (an average of the electric and gasoline consumption estimates combined together into one value) as an add-on if there is room on the label. As for the metric for fuel consumption, participants preferred the city and highway MPG estimate for gasoline mode, city and highway MPGe estimate for electric mode, and the 'MPGe for electric + gas consumption' for total fuel consumption. The equivalency of MPGe with MPG and their familiarity and ease of thinking in terms of MPG made MPGe appealing to them.

Participants were less enthusiastic about the environmental metric as compared to the other metrics. However, with regard to format, many preferred the slider bar without the CO_2 grams per mile format as they found it to be informative and visually appealing over others.

Plug-In Hybrid Electric Vehicles

Participants were not aware of plug-in hybrid electric vehicles (PHEVs) and had limited information about PHEVs based on what they had learned about them in the pre-group online survey. As a result, participants had several questions regarding how PHEVs operate and how they differ from hybrid vehicles and EREVs.

As participants learned how PHEVs worked in the focus groups, they preferred the terms "hybrid" and "gasoline" to describe the two operational modes because these are simple and descriptive of how PHEVs function in the blended and gasoline-only modes.

As for the fuel economy label for PHEVs, participants thought that charging time, range, fuel cost and fuel consumption were most important. Environmental impact was less important and they were less enthusiastic about including an environmental impact metric on the EREV label compared these other metrics.

According to participants, charging time was important because it gives them information about how time consuming the charging process is and if they can accommodate it within their schedules. For range, they wanted to see combined (city and highway) estimates for blended (electric and gas) mode of operation. With regard to the metrics for range, participants wanted city and highway estimates for the gasoline-only modes of operation on the fuel economy label. According to them, all these estimates give them a more complete sense of how far they can travel in a PHEV.

For both fuel cost and consumption, participants wanted to see combined (city and highway) estimates for the blended mode of operation. Participants described the PHEV as a "super-hybrid" that functions in the blended mode for the first 50 miles and then uses gasoline as its fuel source for the remaining miles, it was more important to participants to know the fuel consumption and cost for the blended mode in PHEVs. Combined (city and highway) cost per mile for the blended mode was the most preferred fuel cost estimate. With regard to fuel consumption, city and highway 'MPGe of gas + electric' estimates for blended mode was the most preferred metric. The equivalency of MPGe with MPG and their familiarity and ease of thinking in terms of MPG made MPGe appealing to the participants.

Participants were less enthusiastic about the environmental metric as compared to the other metrics. However, with regard to format preference, many preferred the 'rating out of 10' without the CO_2 grams per mile format as they found it to be simple, straightforward and visually appealing over other formats.

Comparison Across Vehicle Types

Participants thought that it was important to be able to compare across different types of vehicle technologies (conventional gasoline powered vehicles, EVs, EREVs and PHEVs). They wanted labels that are easy to read and understand and consistent in content and design across different vehicle technologies.

Participants thought that fuel cost and fuel consumption were the two critical elements on the labels that will allow them to compare all the different types of vehicles. When it comes to explaining in more detail how a particular type of vehicle works, participants want this type of information on websites or on informational brochures instead of the fuel economy label.

Preferred Metrics by Vehicle Type

When looking at the preferred metrics by vehicle type it was found that[16]: (To see this information in a table format see Appendix L.)

- Charging time: All the groups wanted charging time across all the labels.
- Range:
  - For 'electric only' mode: More groups wanted city, highway and combined (city and highway) range estimates for EVs than EREVs. This may be explained by the fact that EVs run on electricity only and hence participants attached sole importance to these estimates. On the other hand, EREVs use both electricity and gasoline to propel the vehicle, and hence each mode received distributed attention from participants.
  - For 'gas only' mode: More groups wanted separate city and highway range estimates for EREVs than PHEVs.
- Fuel cost:
  - For 'electric only' mode: More groups wanted city, highway and/or combined (city and highway) fuel cost estimates[17] for EVs than EREVs. This may be explained by the fact that EVs run on electricity only and hence participants attached sole importance to electric only estimates. On the other hand, EREVs use both electricity and gasoline to propel the vehicle, and hence each mode received distributed attention from participants.

16 This section does not include a discussion on comparison of blended mode in PHEVs (because no such corresponding mode exists for EVs or EREVs), or comparison of merging of operations in EREVs and PHEVs (because the PHEV section did not involve a discussion around the merging of the blended and the gas operations)

17 Most preferred per mile estimates for EVs and EREVs.

    - For 'gas only' mode: More groups wanted separate city and highway cost estimates for EREVs than PHEVs.

- Fuel consumption:
    - For 'electric only' mode: More groups wanted city, highway and/or combined (city and highway) fuel consumption estimates[18] for EVs than EREVs. This may be explained by the fact that EVs run on electricity only and hence participants attached sole importance to these estimates. On the other hand, EREVs use both electricity and gasoline to propel the vehicle, and hence each mode received distributed attention from participants.
    - For 'gas only' mode: More groups wanted separate city and highway MPG estimates for EREVs than PHEVs.
- Environmental impact:
    - The slider bar format was preferred by a comparable number of groups for the EV and EREV labels,
    - For PHEVs, most groups preferred rating number out of 10
    - For all vehicle types, the majority of groups preferred an environmental measure that did not include a CO_2 grams per mile metric.

18 Most preferred MPGe estimates for EVs and EREVs.

Appendices

Appendix A: Moderator Guide

Introduction (8 minutes)

- Moderator introduces herself/himself.
- [Explain:] A focus group is a group discussion where we can learn more in-depth about peoples' ideas and opinions (compared to telephone or written surveys).
- My job is to facilitate the discussion and make sure that everyone has an opportunity to speak and to make sure that no one dominates the conversation.
- Mention observers in separate room. Our discussion today is being recorded. These recordings allow us to write a more complete report, and to make sure we accurately reflect your opinions.
- Housekeeping – Toilets and refreshments.
- Mention ground rules:
    - There is no right or wrong answer; we're interested in your honest and candid opinions and ideas.
    - Our discussion is totally confidential. We will not use your name or contact information in any report.
    - Please only speak one at a time, so that the recorder can pick up all your comments.
    - It is important to tell YOUR thoughts, not what you think others will think, or what you think others want to hear.
    - Please turn off cell phones
    - Your stipend will be provided as you leave.
    - Relax and enjoy

Thank you all for participating in the survey we sent to you in advance. Today we will continue the discussion talking about new car purchases. Any questions before we begin?

- Let's start off by getting to know a little more about each other. I'd like us to go around the room with each person answering the following questions (Listed on poster chart):
  - Your first name
  - When did you buy your last new vehicle?
  - What make and model did you buy?
  - Did you consider buying a hybrid, or clean diesel, or some other alternative fuel vehicle?

Current Label Use (10 minutes)

1. What were the top two things that influenced your vehicle choice? Could I see a show of hands of those who considered fuel efficiency in the decision of which vehicle you chose to buy?

   Are there other things that you haven't mentioned that would stop you from buying this vehicle that in all other ways meets your needs? (Listen for and probe on things like performance, attractiveness, 'cool factor', impact on the environment, etc.)

2. Did you use the fuel economy label when deciding on your new vehicle purchase? Why or why not? How did you use it? When in the vehicle choice process did you use it? (Handout copies of the existing fuel economy label) and ask what information on the label most influenced their purchasing decision.

3. What are some of the hybrid vehicles that are on the market today? If you look at these vehicles on a new car lot you will see that hybrid vehicles use the same fuel economy label as a conventional gasoline engine vehicle. (Handout copies of a Prius fuel economy label Why is that? (Listen for their understanding of how hybrids work and then explain that:

(Handout copies and read the following statement)

A Gasoline hybrid uses gasoline to propel the vehicle. It can recoup some energy through regenerative braking. Does not plug in to charge the battery. Validate that they understand this.

Electric Vehicles (27 minutes)

Now we're going to talk about Electric Vehicles.

4. Are you aware of any totally electric vehicles that are on the market or that will be coming on the market? (Listen for Nissan Leaf.)

Read the following (Handout copies and read the following statement):

> Electric Vehicles use electricity stored in batteries to propel the vehicle. The battery is charged by plugging it into an electrical outlet. This could be a standard electric outlet or a high voltage custom-installed charging station for more rapid charging. Like hybrid vehicles, some energy is recouped through regenerative braking. The vehicle travels until the charge is depleted or it is re-charged. There is no option to run it on gasoline.

5. If you were considering the purchase of an Electric Vehicle, what information do you want to see on the Fuel Economy Label? (Capture list on poster chart) Now let's identify the top two most important. (Listen for items such as range, fuel efficiency, fuel cost, and environmental impact.) If battery life comes up and its related replacement cost – ask why that is important relative to the entire lifetime cost of gasoline they pay for in a conventional gasoline vehicle.

6. (Pass out a blank label template and puzzle pieces for EV) For the next couple minutes I'd like you to look at the list of elements on the poster chart that we discussed as well as these potential label elements (puzzle pieces). Using only those that are important to you sketch or write down how you might design the label (Have the participants individually work on this for 3 minutes. If they are struggling with this move to the group discussion exercise).

   Now let's work together to design a label for Electric Vehicles using the elements you each identified. (Utilize a large board that is a blank label with pre-created elements (the puzzle pieces) that can be stuck on the board – blank pieces will also be created for additional elements that the group identifies). Probe on use of City and Highway for some of the metrics, e.g., consumption, MPGe, range. There is likely to be a difference in these values across the two conditions.

   a. kwhr/100 miles (or another consumption measure)
   b. miles per gallon equivalent - MPGe
      - If not mentioned, ask about a vehicle that gets 300 MPGe. Probe on:
        - What does MPGe mean to you? After they answer, moderator to explain that MPGe is an energy efficiency measure, with 34 kW-hr of energy = 1 gallon of gas.
        - Do you think this is useful considering an electric vehicle does not consume gallons? Why or Why not?
        - Should MPGe be on the label? Why or why not?

c. Fuel cost (Probe on annual, per month, weekly, cents per mile, cents per 100 miles.)

d. Range

e. Charging time

f. Info on how to charge

g. Environmental impact

7. Once label elements have been added, probe on the following:

- Does this give them the information they need?
- Do they need all of this info?
- Do they need additional info?
- Do you want a technology description on the label?

Ask client if they have any additional questions regarding Electric Vehicle discussion.

Extended Range Electric Vehicle (30 minutes)

Now we're going to talk about another type of vehicle that some refer to as an Extended Range Electric Vehicle.

(Handout copies and read the following statement. Leave the conventional vehicle label and just designed EV label showing for reference.)

An EREV has 2 modes of operation and can be plugged in to charge the battery.

1. It uses wall electricity to propel the vehicle (like an EV) until the wall electricity is used up.

2. Once the stored wall electricity is used up, it runs like a gasoline hybrid, using gasoline to propel the vehicle with some regenerative braking.

Important: daily driving distance can GREATLY affect amount of gasoline used. Can go all the way from zero gasoline (if shorter commutes and plenty of recharging) to entirely gasoline (if longer drives and no recharging) Validate that they understand this.

8. Are you aware of any Extended Range Electric Vehicles that are on the market or that will be coming on the market? (Listen for Chevy Volt.)

9. Use EREV teaching tool here to point directly to the two modes .

10. How can we better describe this? If the label has electric mode information on one side and gasoline mode on the other, how should the two sides of the label be labeled? What should we call the two modes? (Write suggestions on poster chart. Listen and suggest the following if not mentioned – then get a show of hands vote on the most preferred from just the list below and probe on why.)

    Full Battery and Empty Battery

    Electricity and Gasoline

    All Electric and Gasoline

    Charged and Discharged

    Other?

11. If you were considering the purchase of an Extended Range Electric Vehicle, what information would you want to include on the Fuel Economy Label? (Refer back to list created for EV and ask them which of these they would want and to add others needed.) Now let's identify the top two most important. (Listen for items such as range, fuel efficiency, fuel cost, and environmental impact.)

12. Is it important to you to understand that some of these things will be different depending on the mode of operation? Why or why not? (Use 'EREV Mode Teaching Tool' (blue example) as a handout to get them to see the impact of different mode configurations.)

13. (Pass out copies of the EREV puzzle pieces) Now let's work together to design a label for Extended Range Electric Vehicle using the elements you identified as well as the elements on the "puzzle pieces". (Utilize a large board that is a blank label with pre-created elements as listed below, that can be stuck on the board – blank pieces will also be created for additional elements that the group identifies).

    a. Range

    b. Fuel efficiency

    c. Fuel cost

    d. Environmental impact.

MODERATOR NOTE: . Additionally, EVERY time an MPGe value is chosen ask the following questions:

-Why did you chose MPGe?

-What will you use it for?

-Remind them of why (if this is true) they did not like it/trust it/ found it confusing in the initial conversation of MPGe in the EV section, then ask again/confirm whether they still want to chose MPGe now.

14. Once label elements have been added, probe on the following:

    - Does this give them the information they need?
    - Do they need all of this info?
    - Do they need additional info?
    - Do they need City and Highway, even if values are close? (Recognize impact of wanting City and Highway on quantity of information.)
    - Do you want a technology description on the label?

15. Driving distance has huge impact on most of the numbers you placed on the label—does that matter in your vehicle choice or in understanding the label?

    (Look at EREV Mode Teaching Tool with merged info) Is this helpful? Why or why not?

16. In order to compare across vehicle types would it help to merge some of this information for vehicles that have two modes of operation? Or is it better to keep these separate?

    For total cost:

    - Do the "bookends" of all-electric and all-gasoline numbers give enough info? Why or why not? Or do you want us to make some assumptions about what percentage of time you will drive in each mode of operation and merge that to come up with a blended number? (show examples here of actual bookend and blended numbers)
        - Electric mode annual cost - $618
        - Gasoline mode annual cost - $1,194
        - Merged annual cost - $889

    For energy/fuel consumption:

    - Do the "bookends" of all-electric and all-gasoline numbers give enough info? Why or why not? Or, do you want us to make some assumptions about what percentage of time you will drive in each mode of operation and merge that to come up with a

blended number? (show examples here of actual bookend and blended numbers)

- Electric mode – 98 MPGe
- Gasoline mode – 38 MPG
- Merged – 56 MPGe

Ask client if they have any additional questions about Extended Range Electric Vehicles.

PHEV Vehicles (25 minutes)

Now we're going to talk about a label for what is known as a Plug In Hybrid Electric Vehicle, also referred to as PHEVs.

(Handout copies and read the following statement).

A PHEV has 2 modes of operation and can be plugged in to charge the battery.

1. It uses wall electricity intermingled with some gasoline to propel the vehicle until the wall electricity is used up.
2. Once the stored wall electricity is used up, it runs like a gasoline hybrid, using gasoline to propel the vehicle with some regenerative braking.

Important: daily driving distance can GREATLY affect amount of gasoline used. Validate that they understand this. (Refer to PHEV Mode Teaching Tool for example)

17. Are you aware of any Plug In Hybrid Electric Vehicles that are on the market or that will be coming on the market? (Listen for Prius PHEV.)

18. How can we better describe this? If the label has electric mode information on one side and gasoline mode on the other, how should the two sides of the label be labeled? What should we call the two modes of operation in a PHEV? (Write the following on poster chart and add others that they suggest – then get a show of hands vote on the most preferred from just the list below and probe on why.)

    - Full Battery and Empty Battery
    - Electricity and Gasoline
    - Mostly Electric (with some gasoline) and Gasoline
    - Charged and Discharged

19. If you were looking considering the purchase of a Plug-In Hybrid Electric Vehicle, what information do you want to include on the Fuel Economy Label? (Refer back to list created for EV and EREV and ask them which of these they would want and to add others needed to either add others needed.) Now let's identify the top two most important. (Listen for items such as range, fuel efficiency, fuel cost, and environmental impact.)

20. (Pass out copies of the PHEV puzzle pieces) Now let's work together to design a label for just the electric mode (since gas operation is identical to EREV) of a Blended Plug in Hybrid Electric Vehicle using the elements you identified as well as the elements on the "puzzle pieces" (Utilize a large board that is a blank label with pre-created elements as listed below, that can be stuck on the board – blank pieces will also be created for additional elements that the group identifies).

    a. Range

    b. Fuel efficiency

    c. Fuel cost

    d. Environmental impact

MODERATOR NOTE: . Additionally, EVERY time an MPGe value is chosen ask the following questions:

-Why did you chose MPGe?

-What will you use it for?

-Remind them of why (if this is true) they did not like it/trust it/ found it confusing in the initial conversation of MPGe in the EV section, then ask again/confirm whether they still want to chose MPGe

21. Once label elements have been added, probe on the following:

    - If the full battery mode of the PHEV had a small all-electric range (a few miles), would you want that on the label even if the all electric range is not guaranteed. (Example, if you step on the accelerator really hard during this small electric range, you would probably start to use some gasoline.)
    - Does this give them the information they need?
    - Do they need all of this info?
    - Do they need additional info?
    - Do you want a technology description on the label?

    (Note: this section is particularly tricky and where we most need to get input—the balance between providing enough info so that people can make the right choice for their driving needs and making

it understandable is our greatest challenge. It will be important to make sure they know, if they tend toward simple, what they are giving up—and probe on whether that matters to them or not. Refer to their list of potential elements as a discussion guide in probing this area)

Ask client if they have any additional questions about PHEVs.

Comparison Across Vehicle Types (15 minutes)

22. Show all three labels that were developed. For each, ask what are the two most important pieces of information? (moderator to identify these by circling these or crossing out the others.

23. Is it important to be able to compare across these different types of vehicles, meaning conventional, electric, extended range electric, plug-in hybrid electric vehicles? Why or why not? Or is it more important to have a label that explains in more detail how a particular type of vehicle works?

24. Is there a particular element of these labels that would allow you to compare all the different types of vehicles as part of your decision process? What would that be? (Probe on fuel cost and fuel consumption.)

25. Do you care what is behind the ratings (4 out of 5 stars, or 9 out 10, etc.) or do you just want a rating to use as you compare vehicle to vehicle? Why?

26. Should the current label for gasoline vehicles be revised to make it easier to compare with the labels for these other kinds of vehicles? Why or why not?

Wrap-Up (5 minutes)

27. Is there information that we have not discussed today that would influence you to choose a fuel efficient vehicle?

28. Anything else you would like our clients to know about your thoughts about fuel economy labels?

Appendix B: Participants' Profile

Seattle Male Group

	Q9. Type of vehicle purchased	Q10. How is this vehicle powered?	Q11. Distance in miles of typical daily travel in the vehicle	Q12. Price range of new vehicle	Q13. Age range	Q14. Education	Q15. Ethnicity
1	Passenger Car	Gasoline Powered Vehicle	10-19 Miles	$20,000-$30,000	65+	Some College or College Graduate	Caucasian
2	Passenger Car	Gasoline powered vehicle	20-29 Miles	$20,000-$30,000	65+	Some College or College Graduate	Caucasian
3	Passenger Car	Hybrid	10-19 Miles	$20,000-$30,000	65+	Some College or College Graduate	Caucasian
4	Passenger car	Hybrid	40+ miles	$20,000-$30,000	65+	Some College or College Graduate	Caucasian
5	Passenger car	Gasoline Powered Vehicle	Less than 10 miles	$20,000-$30,000	20-34	Some College or College Graduate	Hispanic
6	Passenger Car	Hybrid	30-39 Miles	$40,000-$50,000	50-64	Some College or College Graduate	Caucasian
7	Passenger Car	Hybrid	30-39 miles	$20,000--$30,000	35-49	Some College or College Graduate	Asian
8	SUV	Gasoline Powered Vehicle	40+ Miles	$20,000-$30,000	35-49	Some College or College Graduate	Caucasian

Seattle Female Group

	Q9. Type of vehicle purchased	Q10. How is this vehicle powered?	Q11. Distance in miles of typical daily travel in the vehicle	Q12. Price range of new vehicle	Q13. Age range	Q14. Education	Q15. Ethnicity
1	Passenger Car	Gasoline Powered Vehicle	40+ Miles	$30,000-$40,000	20-34	Some College or College Graduate	Caucasian
2	Passenger Car	Gasoline Powered Vehicle	20-29 Miles	$20,000-$30,000	20-34	Some College or College Graduate	Mixed Race
3	Passenger Car	Gasoline Powered Vehicle	10-19 Miles	$20,000-$30,000	35-49	Some College or College Graduate	Caucasian
4	Passenger Car	Gasoline Powered Vehicle	20-29 miles	$20,000-$30,000	20-34	Some College or College Graduate	Caucasian
5	Passenger Car	Gasoline Powered Vehicle	10-19 Miles	Less than $15,000	20-34	Some College or College Graduate	Asian
6	Passenger Car	Gasoline Powered Vehicle	20-29 Miles	$40,000-$50,000	35-49	Some College or College Graduate	Asian
7	Passenger Car	Gasoline Powered Vehicle	20-29 Miles	$40,000-$50,000	50-64	Some College or College Graduate	Caucasian
8	SUV	Gasoline Powered Vehicle	40+ Miles	$20,000-$30,000	35-49	Some College or College Graduate	Caucasian

Chicago Female Group

	Q9. What type of vehicle did you purchase?	Q10. How is this vehicle powered?	Q11. What is the distance in miles of your typical daily travel in this vehicle?	Q12. Price range of new vehicle	Q13. Age	Q14. Education	Q15. Ethnicity
1	Passenger car	Gasoline powered	20-29 miles	$30-40k	35-49	Some college or college graduate	African American
2	SUV	Gasoline powered	20-29 miles	$20-30k	20-34	Some college or college graduate	Caucasian
3	SUV	Gasoline powered	10-19 miles	$20-30k	35-49	Some college or college graduate	African American
4	Passenger car	Gasoline powered	20-29 miles	$15-20k	50-64	Some college or college graduate	Caucasian
5	Passenger car	Gasoline powered	10-19 miles	$15-20k	35-49	Some high school or high school graduate or GED	Caucasian
6	Passenger car	Gasoline powered	10-19 miles	$20-30k	50-64	Some college or college graduate	Caucasian
7	Station wagon or minivan	Gasoline powered	30-39 miles	$20-30k	35-49	Some college or college graduate	Caucasian
8	Passenger car	Gasoline powered	Less than 10 miles	$20-30k	35-49	Some high school or high school graduate or GED	African American

Seattle Male Group

	Q9. What type of vehicle did you purchase?	Q10. How is this vehicle powered?	Q11. What is the distance in miles of your typical daily travel in this vehicle?	Q12. Price range of new vehicle	Q13. Age	Q14. Education	Q15. Ethnicity
1	Passenger car	Gasoline powered	30-39 miles	$30-40k	20-34	Some college or college graduate	Asian
2	SUV	Gasoline powered	10-19 miles	$30-40k	35-49	Some college or college graduate	African American
3	Passenger car	Gasoline powered	10-19 miles	$50k+	20-34	Some college or college graduate	African American
4	Passenger car	Hybrid	30-39 miles	$30-40k	20-34	Graduate degree	Caucasian
5	Passenger car	Gasoline powered	40 or more miles	$20-30k	20-34	Graduate degree	Caucasian
6	Passenger car	Hybrid	20-29 miles	$20-30k	50-64	Graduate degree	Caucasian
7	Passenger car	Gasoline powered	Less than 10 miles	$15-20k	35-49	Some high school or high school graduate or GED	Caucasian
8	Passenger car	Gasoline powered	30-39 miles	Less than $15k	50-64	Some college or college graduate	Hispanic

Houston Femaie Group

	Q9. What type of vehicle did you purchase?	Q10. How is this vehicle powered?	Q11. What is the distance in miles of your typical daily travel in this vehicle?	Q12. Price range of new vehicle	Q13. Age	Q14. Education	Q15. Ethnicity
1	Passenger Car	Gasoline	Less than 10 Miles	$25k	50-64	Some College or College Graduate	Caucasian
2	Passenger Car	Gasoline	40 or more miles	$25k	35-49	Some College or College Graduate	African American
3	SUV	Gasoline	20-29 Miles	$32k	35-49	Some College or College Graduate	Caucasian
4	SUV	Gasoline	40 or more miles	$35k	35-49	Some College or College Graduate	Hispanic
5	SUV	Gasoline	20-29 Miles	$30-40k	35-49	Some College or College Graduate	Caucasian
6	SUV	Gasoline	40 or more miles	$40-50k	20-34	Some College or College Graduate	Caucasian
7	SUV	Gasoline	20-29 Miles	$20-30k	35-49	Graduate Degree	Asian
8	Passenger Car	Gasoline	30-39 miles	$30-40k	50-64	Some College or College Graduate	Caucasian

Houston Male Group

	Q9. What type of vehicle did you purchase?	Q10. How is this vehicle powered?	Q11. What is the distance in miles of your typical daily travel in this vehicle?	Q12. Price range of new vehicle	Q13. Age	Q14. Education	Q15. Ethnicity
1	SUV	Gasoline powered	20-29 miles	$40-50k	20-34	Some college or college graduate	Asian
2	Passenger Car	Gasoline powered	30-39 miles	$15-20k	50-64	Some college or college graduate	Caucasian
3	SUV	Gasoline powered	20-29 miles	$40-50k	65+	Some college or college graduate	Caucasian
4	SUV	Diesel powered	30-39 miles	$20-30k	50-64	Some college or college graduate	Caucasian
5	Passenger Car	Gasoline powered	10-19 miles	$21k	20-34	Some college or college graduate	Hispanic
6	Passenger Car	Gasoline powered	20-29 miles	$14k	35-49	Some college or college graduate	African American
7	Pickup Truck	Gasoline powered	30-39 miles	$30k	20-34	Some college or college graduate	Caucasian
8	SUV	Gasoline powered	40 or more miles	$20k	20-34	Some college or college graduate	Caucasian

Charlotte Femaie Group

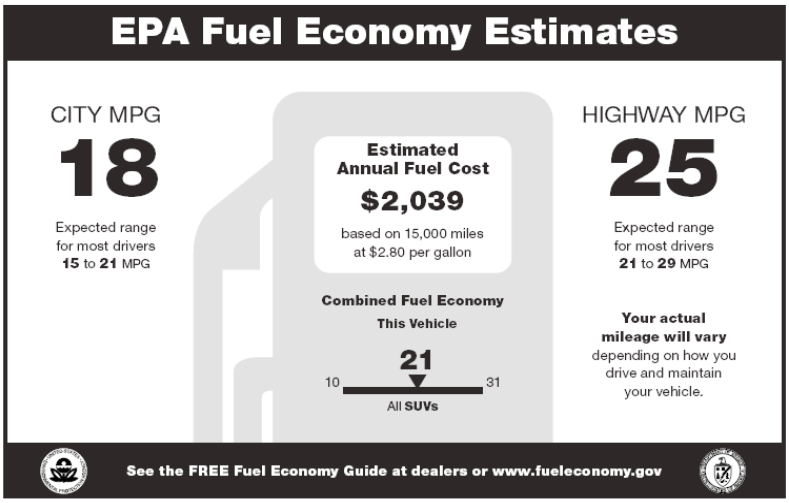
	Q9. What type of vehicle did you purchase?	Q10. How is this vehicle powered?	Q11. What is the distance in miles of your typical daily travel in this vehicle?	Q12. Price range of new vehicle	Q13. Age	Q14. Education	Q15. Ethnicity
1	Passenger Car	Gasoline powered	20-29 miles	Less than $15k	35-49	Some college or college graduate	Caucasian
2	Passenger Car	Gasoline powered	40 or more miles	Less than $15k	50-64	Some college or college graduate	Caucasian
3	Passenger Car	Gasoline powered	10-19 miles	$20-$30k	50-64	Some high school or high school graduate or GED	Caucasian
4	SUV	Gasoline powered	10-19 miles	$20-$30k	35-49	Graduate degree	Caucasian
5	Passenger Car	Gasoline powered	20-29 miles	$20-$30k	35-49	Some college or college graduate	Caucasian
6	Passenger Car	Gasoline powered	40 or more miles	$15-$20k	20-34	Some college or college graduate	African American
7	Passenger Car	Hybrid	20-29 miles	$20-$30k	35-49	Some college or college graduate	Asian
8	Passenger Car	Hybrid	40 or more miles	$20-$30k	35-49	Some college or college graduate	Caucasian

Charlotte Male Group

	Q9. What type of vehicle did you purchase?	Q10. How is this vehicle powered?	Q11. What is the distance in miles of your typical daily travel in this vehicle?	Q12. Price range of new vehicle	Q13. Age	Q14. Education	Q15. Ethnicity
1	Passenger Car	Hybrid	40 or more miles	$20-$30k	50-64	Some college or college graduate	Caucasian
2	Passenger Car	Hybrid	40 or more miles	$20-$30k	35-49	Some college or college graduate	Caucasian
3	SUV	Gasoline powered	40 or more miles	$30-$40k	35-49	Some college or college graduate	Caucasian
4	Passenger Car	Gasoline powered	20-29 miles	$15-$20k	20-34	Some college or college graduate	Caucasian
5	SUV	Gasoline powered	10-19 miles	$30-$40k	35-49	Some college or college graduate	Caucasian
6	Passenger Car	Gasoline powered	40 or more miles	Less than $15k	50-64	Some college or college graduate	Caucasian
7	Passenger Car	Gasoline powered	10-19 miles	$15-$20k	20-34	Some college or college graduate	Caucasian
8	SUV	Gasoline powered	40 or more miles	$20-$30k	50-64	Some college or college graduate	Caucasian

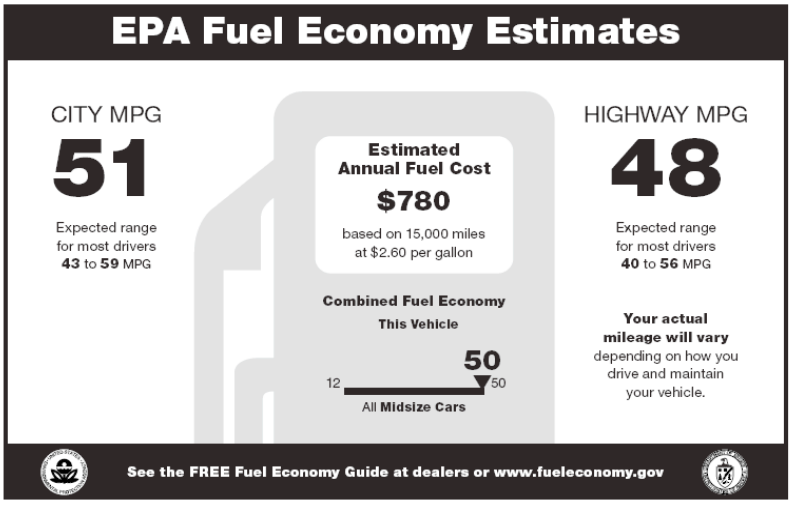
Appendix C: Current Label

Current Label



Appendix D: Prius Label

Current Label



Appendix E: EV Label Elements

1a EV Label: Categories & Metrics

Charging Time

Battery charge time
12 hours (Using 220v outlet)

Range

On a full charge, vehicle can travel approximately:

City	Highway	Combined
110 Miles	88 Miles	100 Miles

Fuel Consumption

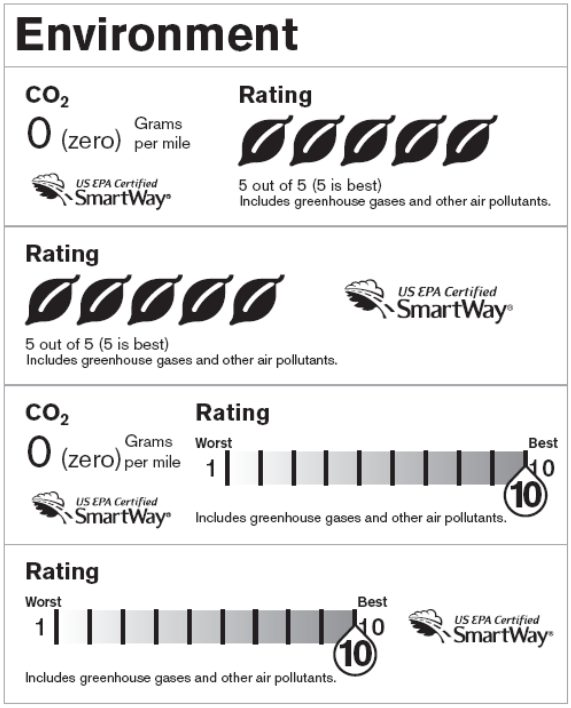
City	Highway	Combined
33 kW-hrs per 100 miles	36 kW-hrs per 100 miles	34 kW-hrs per 100 miles
.33 kW-hrs per mile	.36 kW-hrs per mile	.34 kW-hrs per mile
3.0 miles per kW-hr	2.8 miles per kW-hr	2.9 miles per kW-hr
102 MPGe	94 MPGe	98 MPGe
4950 kW-hrs per year	5400 kW-hrs per year	5153 kW-hrs per year

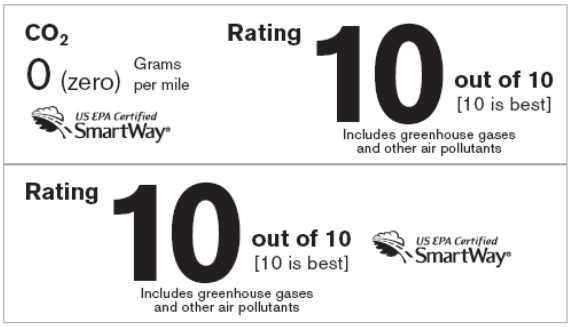
Fuel Cost

City	Highway	Combined
$594 Annual	$648 Annual	$618 Annual
$.04 per Mile	$.04 per Mile	$.04 per Mile
$50 per Month	$54 per Month	$52 per Month

Estimated fuel cost based on 15,000 miles per year at 12 cents per kW-hour.

1b EV Label: Environment Metrics





Appendix F: EV Label Elements Tally

EV: Charging Time and Range

	Seattle		Chicago		Charlotte		Houston		
	Female	Male	Female	Male	Female	Male	Female	Male	Total
Charging time	X	X	X	X	X	X	X	X	8
Range: "On a full charge, until the battery is exhausted, vehicle can travel"									
Separate City & Highway	X	X	X	X	X	X	X	X	8
Combined (city and highway)	X	X	X	X	X			X	6

EV: Fuel Cost

		Seattle		Chicago		Charlotte		Houston		
		Female	Male	Female	Male	Female	Male	Female	Male	Total
Separate City & Highway	Annual				X			X		2
	Per mile		X	X			X			3
	Monthly		X			X				2
Combined City & Highway	Annual	X			X				X	3
	Per mile	X		X	X					3
	Monthly					X				1

EV: Fuel Consumption

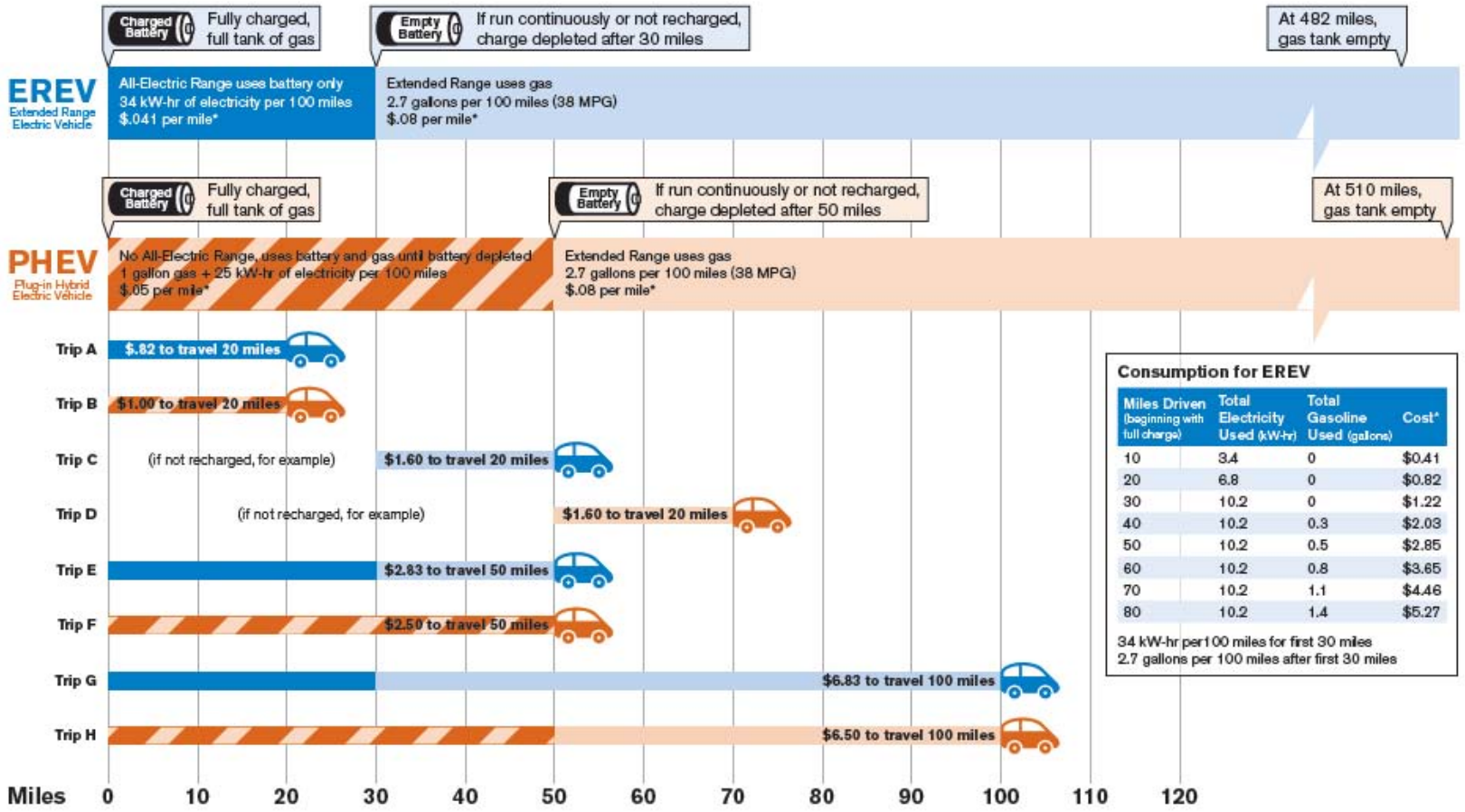
		Seattle		Chicago		Charlotte		Houston		
		Female	Male	Female	Male	Female	Male	Female	Male	Total
ELECTRIC ONLY										
kW-hrs per 100 miles	City and highway					X		X		2
	Combined									
kW-hrs per mile	City and highway			X			X			2
	Combined			X						1
miles per kW-hrs	City and highway									
	Combined									
MPGe	City and highway					X	X		X	3
	Combined				X				X	2
kW-hrs per year	City and highway									
	Combined									

EV: Environmental Impact

		Seattle		Chicago		Charlotte		Houston		
		Female	Male	Female	Male	Female	Male	Female	Male	Total
Leaves	With CO_2 grams per mile count		X							1
	Without CO_2 grams per mile count									
Slider Bar	With CO_2 grams per mile count									
	Without CO_2 grams per mile count				X			X	X	3
Rating Number out of 10	With CO_2 grams per mile count				X					1
	Without CO_2 grams per mile count			X		X				2

Appendix G: Teaching Tool Handout

Understanding Modes of Operation



Consumption for EREV

Miles Driven (beginning with full charge)	Total Electricity Used (kW-hr)	Total Gasoline Used (gallons)	Cost*
10	3.4	0	$0.41
20	6.8	0	$0.82
30	10.2	0	$1.22
40	10.2	0.3	$2.03
50	10.2	0.5	$2.85
60	10.2	0.8	$3.65
70	10.2	1.1	$4.46
80	10.2	1.4	$5.27

34 kW-hr per 100 miles for first 30 miles
2.7 gallons per 100 miles after first 30 miles

*All mileage cost estimates assume $.12 per kW-hr and $3.00 per gallon.

Appendix H: EREV Label Elements

2a EREV Label: Electric Categories & Metrics

Charging Time

Battery charge time
4 hours (Using 220v outlet)

Fuel Consumption Electricity:

City 33 kW-hrs per 100 miles	**Highway** 36 kW-hrs per 100 miles	**Combined** 34 kW-hrs per 100 miles
City .33 kW-hrs per mile	**Highway** .36 kW-hrs per mile	**Combined** .34 kW-hrs per mile
City 3.0 miles per kW-hr	**Highway** 2.8 miles per kW-hr	**Combined** 2.9 miles per kW-hr
City 102 MPGe	**Highway** 94 MPGe	**Combined** 98 MPGe
City 4950 kW-hrs per year	**Highway** 5400 kW-hrs per year	**Combined** 5153 kW-hrs per year

Range

On a full charge, until battery is exhausted, vehicle can travel:

City 32 Miles	**Highway** 27 Miles	**Combined** 30 Miles

From a full charge, until all fuel is exhausted, vehicle can travel:

City 432 Miles	**Highway** 480 Miles	**Combined** 452 Miles

Fuel Cost Electricity:

City $594 Annual	**Highway** $648 Annual	**Combined** $618 Annual
City $.04 per Mile	**Highway** $.04 per Mile	**Combined** $.04 per Mile
City $50 per Month	**Highway** $54 per Month	**Combined** $52 per Month

Estimated fuel cost based on 15,000 miles per year at 12 cents per kW-hour and $3.00 per gallon.

2b EREV Label: Gasoline Categories & Metrics

Fuel Consumption Gasoline:

City	Highway	Combined
36 MPG	40 MPG	38 MPG
2.8 gallons per 100 miles	2.5 gallons per 100 miles	2.7 gallons per 100 miles
.028 gallons per mile	.025 gallons per mile	.027 gallons per mile
417 gallons per year	375 gallons per year	398 gallons per year

Fuel Consumption Electric + Gasoline:

Combined	
18 kW-hrs + 1.2 gallons per 100 miles	
18 kW-hrs per 100 miles + 80 MPG	56 MPGe of gas + electric

Fuel Cost Gasoline:

City	Highway	Combined
$1,250 Annual	$1,125 Annual	$1,194 Annual
$.08 per Mile	$.08 per Mile	$.08 per Mile
$104 per Month	$94 per Month	$99 per Month

Fuel Cost Electric + Gasoline:

Combined
$889 Annual gas + electric

2c EREV Label: Environment Metrics

Environment

CO_2 150 Grams per mile
US EPA Certified SmartWay

Rating
4.5 out of 5 (5 is best)
Includes greenhouse gases and other air pollutants.

Rating
4.5 out of 5 (5 is best)
Includes greenhouse gases and other air pollutants.
US EPA Certified SmartWay

CO_2 150 Grams per mile
US EPA Certified SmartWay

Rating
Worst 1 — 9 — 10 Best
Includes greenhouse gases and other air pollutants.

Rating
Worst 1 — 9 — 10 Best
US EPA Certified SmartWay
Includes greenhouse gases and other air pollutants.

CO_2 150 Grams per mile
US EPA Certified SmartWay

Rating
9 out of 10 [10 is best]
Includes greenhouse gases and other air pollutants

Rating
9 out of 10 [10 is best]
US EPA Certified SmartWay
Includes greenhouse gases and other air pollutants

Appendix I: EREV Label Elements Tally

EREV: Charging Time And Range

			Seattle		Chicago		Charlotte		Houston		
			Female	Male	Female	Male	Female	Male	Female	Male	Total
Charging time			X	X	X	X	X	X	X	X	8
Range	ELECTRIC ONLY :"On a full charge, until the battery is exhausted, vehicle can travel"	Separate City & Highway				X	X	X	X	X	5
		Combined (city and highway)	X	X		X				X	4
	GASOLINE ONLY: "Without a charge, until all fuel is exhausted, vehicle can travel"	Separate City & Highway		X			X		X	X	4
		Combined (city and highway)								X	1
	MERGED ESTIMATE FOR BOTH MODES: "From full charge, until all fuel is exhausted, vehicle can travel"	Separate City & Highway			X	X				X	3
		Combined (city and highway)		X	X	X				X	4

EREV: Fuel Cost

		Seattle		Chicago		Charlotte		Houston		
		Female	Male	Female	Male	Female	Male	Female	Male	Total
ELECTRIC ONLY										
Separate City & Highway	Annual							X		1
	Per mile						X			1
	Monthly									
Combined City & Highway	Annual				X					1
	Per mile	X	X		X					3
	Monthly					X				1
GASOLINE ONLY										
Separate City & Highway	Annual									
	Per mile		X				X			2
	Monthly									
Combined City & Highway	Annual							X		1
	Per mile									
	Monthly					X				1
MERGED COST FOR BOTH MODES										
Combined					X				X	2

EREV: Fuel Consumption

		Seattle		Chicago		Charlotte		Houston		
		Female	Male	Female	Male	Female	Male	Female	Male	Total
ELECTRIC ONLY										
kW-hrs per 100 miles	City and highway							X		1
	Combined									
kW-hrs per mile	City and highway									
	Combined									
miles per kW-hrs	City and highway									
	Combined									
MPGe	City and highway					X	X			2
	Combined				X					1
kW-hrs per year	City and highway									
	Combined									
GASOLINE ONLY										
MPG	City and highway	X	X		X	X	X	X		6
	Combined				X					1
gallons per 100 miles	City and highway									
	Combined									
gallons per mile	City and highway									
	Combined									
gallons per year	City and highway									
	Combined									
MERGED CONSUMPTION FOR BOTH MODES										
kW-hrs + gallons per 100 miles										
kW-hrs per 100 miles + MPG										
MPGe of gas + electric				X	X				X	3

EREV: Environmental Impact

		Seattle		Chicago		Charlotte		Houston		Total
		Female	Male	Female	Male	Female	Male	Female	Male	
Leaves	With CO_2 grams per mile count		X							1
	Without CO_2 grams per mile count					X				1
Slider Bar	With CO_2 grams per mile count									
	Without CO_2 grams per mile count	X			X			X	X	4
Rating Number out of 10	With CO_2 grams per mile count									
	Without CO_2 grams per mile count			X						1

Appendix J: PHEV Label Elements

3a PHEV Label: Charged Battery Electric Categories & Metrics

Charging Time

Battery charge time
4 hours (Using 220v outlet)

Range

On a full charge, until battery is exhausted, vehicle can travel:

City	Highway	Combined
52 Miles	47 Miles	50 Miles

Fuel Consumption Electricity:

City	Highway	Combined
24 kW-hrs per 100 miles	27 kW-hrs per 100 miles	25 kW-hrs per 100 miles
.24 kW-hrs per mile	.27 kW-hrs per mile	.25 kW-hrs per mile
4.2 miles per kW-hr	3.7 miles per kW-hr	3.9 miles per kW-hr
101 MPGe	125 MPGe	133 MPGe
3600 kW-hrs per year	4050 kW-hrs per year	3803 kW-hrs per year

Fuel Cost Electricity:

City	Highway	Combined
$432 Annual	$486 Annual	$456 Annual
$.029 per Mile	$.032 per Mile	$.030 per Mile
$36 per Month	$41 per Month	$38 per Month

Estimated fuel cost based on 15,000 miles per year at 12 cents per kW-hour and $3.00 per gallon.

3b PHEV Label: Charged Battery Gasoline Categories & Metrics

Fuel Consumption Gasoline:

City	Highway	Combined
97 MPG	101 MPG	99 MPG
1.0 gallons per 100 miles	1.0 gallons per 100 miles	1.0 gallons per 100 miles
.010 gallons per mile	.010 gallons per mile	.010 gallons per mile
155 gallons per year	149 gallons per year	152 gallons per year

Fuel Consumption Electric + Gasoline:

City	Highway	Combined
49 MPGe of gas + electric	56 MPGe of gas + electric	57 MPGe of gas + electric

Fuel Cost Gasoline:

City	Highway	Combined
$291 Annual	$303 Annual	$296 Annual
$.019 per Mile	$.020 per Mile	$.020 per Mile
$24 per Month	$25 per Month	$25 per Month

Fuel Cost Electric + Gasoline:

City	Highway	Combined
$723 Annual	$789 Annual	$753 Annual
$.05 per Mile	$.05 per Mile	$.05 per Mile
$60 per Month	$66 per Month	$63 per Month

3c PHEV Label: Depleted Battery Gasoline Categories & Metrics

Range

From a full charge, until all fuel is exhausted, vehicle can travel:

City	Highway	Combined
432 Miles	480 Miles	452 Miles

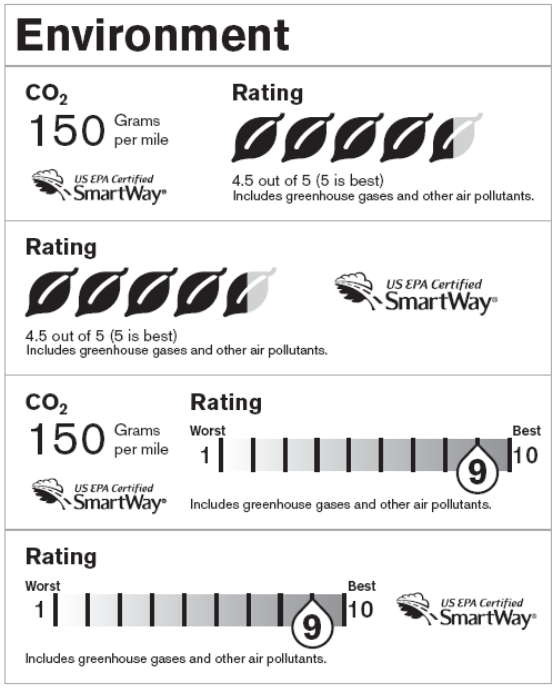
Fuel Consumption Empty battery, gas only:

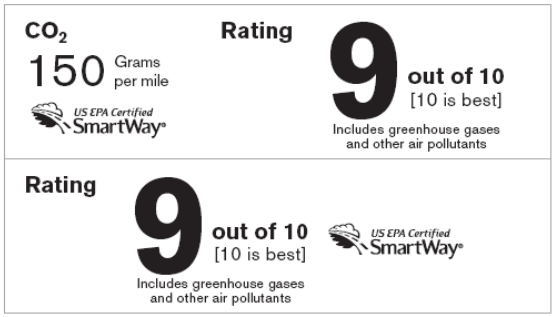
City	Highway	Combined
36 MPG	40 MPG	38 MPG
2.8 gallons per 100 miles	2.5 gallons per 100 miles	2.7 gallons per 100 miles
.028 gallons per mile	.025 gallons per mile	.027 gallons per mile
417 gallons per year	375 gallons per year	398 gallons per year

Fuel Cost Empty battery, gas only:

City	Highway	Combined
$1,250 Annual	$1,125 Annual	$1,194 Annual
$.08 per Mile	$.08 per Mile	$.08 per Mile
$104 per Month	$94 per Month	$99 per Month

3d PHEV Label: Environment Metrics





Appendix K: PHEV Label Elements Tally

PHEV: Charging Time and Range

			Seattle		Chicago		Charlotte		Houston		Total
			Female	Male	Female	Male	Female	Male	Female	Male	
Charging time			X	X	X	X	X	X	X	X	8
Range	BLENDED (GAS/ ELECTRIC) MODE: On a full charge, until the battery is exhausted, vehicle can travel "	Separate City & Highway			X		X			X	3
		Combined (city and highway)		X	X	X				X	4
	GASOLINE ONLY: "Without a charge, until all fuel is exhausted, vehicle can travel"	Separate City & Highway							X	X	2
		Combined (city and highway)								X	1

PHEV: Fuel Cost

		Seattle		Chicago		Charlotte		Houston		Total
		Female	Male	Female	Male	Female	Male	Female	Male	
BLENDED MODE										
Separate City & Highway	Annual							X		1
	Per mile						X			1
	Monthly									
Combined City & Highway	Annual	X							X	2
	Per mile	X	X		X					3
	Monthly									
GASOLINE ONLY										
Separate City & Highway	Annual							X		1
	Per mile						X			1
	Monthly									
Combined City & Highway	Annual									
	Per mile									
	Monthly					X				1

PHEV: Fuel Consumption

		Seattle		Chicago		Charlotte		Houston		Total
		Female	Male	Female	Male	Female	Male	Female	Male	
BLENDED MODE										
MPGe of gas + electric	City and highway			X	X	X	X	X		5
	Combined		X	X	X				X	4
GASOLINE ONLY										
MPG	City and highway			X			X	X		3
	Combined			X						1
gallons per 100 miles	City and highway									
	Combined									
gallons per mile	City and highway									
	Combined									
gallons per year	City and highway									
	Combined									

PHEV: Environmental Impact

		Seattle		Chicago		Charlotte		Houston		Total
		Female	Male	Female	Male	Female	Male	Female	Male	
Leaves	With CO_2 grams per mile count		X			X				2
	Without CO_2 grams per mile count									
Slider Bar	With CO_2 grams per mile count									
	Without CO_2 grams per mile count	X						X		2
Rating Number out of 10	With CO_2 grams per mile count									
	Without CO_2 grams per mile count			X		X			X	3

Appendix L: At-A-Glance Comparison Across Technologies

			EV (# of groups)	EREV (# of groups)	PHEV (# of groups)
Charging time			8	8	8
Range					
Electric only		Separate City and Highway	8	5	n/a
		Combined City and Highway	6	4	n/a
Gas Only		Separate City and Highway	n/a	4	2
		Combined City and Highway	n/a	1	1
Fuel Cost					
Electric only	Separate City & Highway	Annual	2	1	n/a
		Per mile	3	1	n/a
		Monthly	2		n/a
	Combined City & Highway	Annual	3	1	n/a
		Per mile	3	3	n/a
		Monthly	1	1	n/a
Gas only	Separate City & Highway	Annual	n/a		1
		Per mile	n/a	2	1
		Monthly	n/a		
	Combined City & Highway	Annual	n/a	1	
		Per mile	n/a		
		Monthly	n/a	1	1

			EV (# of groups)	EREV (# of groups)	PHEV (# of groups)
Fuel Consumption					
Electric only	kW-hrs per 100 miles	City and highway	2	1	n/a
		Combined			n/a
	kW-hrs per mile	City and highway	2		n/a
		Combined	1		n/a
	miles per kW-hrs	City and highway			n/a
		Combined			n/a
	MPGe	City and highway	3	2	n/a
		Combined	2	1	n/a
	kW-hrs per year	City and highway			n/a
		Combined			n/a
Gas only	MPG	City and highway		6	3
		Combined		1	1
	Gallons per 100 miles	City and highway			
		Combined			
	Gallons per mile	City and highway			
		Combined			
	Gallons per year	City and highway			
		Combined			
Environmental impact					
Leaves		With CO_2 grams per mile count	1	1	2
		Without CO_2 grams per mile count		1	
Slider Bar		With CO_2 grams per mile count			
		Without CO_2 grams per mile count	3	4	2
Rating Number out of 10		With CO_2 grams per mile count	1		
		Without CO_2 grams per mile count	2	1	3