



LowCVP Car Buyer Survey: Testing alternative fuel economy labels

**Research conducted by Ecolane Consultancy &
Centre for Sustainable Energy on behalf of the
Low Carbon Vehicle Partnership**

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LowCVP Car Buyer Survey: Testing alternative fuel economy labels

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1. Executive summary

This survey finds that fuel economy expressed as ‘miles-per-gallon’ is of more importance to car buyers than CO₂ emissions and Vehicle Excise Duty (VED). It is for this reason that the headline finding of this survey is that fuel economy (expressed in terms of ‘miles-per-gallon’ or equivalent) is not given sufficient prominence on the current UK Fuel Economy Label. A corollary is that CO₂ emissions are given too much importance in terms of the space and positioning on the existing label.

While the majority of car buyers questioned broadly understood the term ‘combined’ in relation to fuel economy data presented on the UK label, one concern highlighted by the survey is consumers’ lack of trust in the official figures to represent real-world fuel economy. However, this survey provides evidence that car buyers’ have a sufficient level of trust in the official figures when used for comparison purposes, one of the key purposes and rationales for providing vehicle information.

The survey reveals a strong preference for fuel economy expressed in imperial as opposed to metric units. This is very much an issue for UK car buyers, and is unlikely to be applicable elsewhere in the EU where other car labels are in use. However, the central finding – that fuel economy is more important to consumers than CO₂ emissions – may well apply in other EU Member States if fuel economy is expressed in local units (e.g. litres/100km).

Regarding model-specific CO₂ emissions and fuel economy information, this report makes two recommendations which would have the effect of reducing the space given to CO₂ information and increasing the prominence of fuel economy information. Not only would these changes accord with the findings of this and previous surveys, it would also make the title of the current label ‘Fuel Economy Label’ more relevant to the information contained.

Recommendation 1: Tailpipe CO₂ emissions information (expressed as ‘g/km’) should be given less space and importance than it is on the current UK Fuel Economy Label.

Recommendation 2: Fuel economy information (in terms of ‘mpg’) should be made more prominent (through better positioning and larger text-size) than it is on the current UK Fuel Economy Label.

When CO₂ emissions are considered by car buyers, they are most commonly perceived as a cost issue. Given this finding, the survey concludes that the presentation of CO₂ emissions, VED band and VED cost on the existing label should be improved by providing more visual cues as to their link. In addition, the ‘first year’ and ‘standard rates’ need to be more clearly shown than they are on the current new car label due to very low consumer awareness of their introduction.

Focusing on fuel costs, which are currently estimated on an annual basis, the survey finds that many car buyers would find ‘per month’ costs of more interest (due to the tendency for households to budget on a monthly basis), with a majority preferring a ‘per mile’ estimate (due to the simplicity of calculating journey costs by multiplying fuel cost per mile by the journey distance and because the ‘per mile’ metric makes comparison across different vehicle types more transparent). This report recommends therefore that the fuel costs presented on the current label would be improved by the addition of a ‘per mile’ and a ‘per month’ cost estimate.¹

Due to the availability of current data sets, the only practical option for providing comparative data is to compare cars in the same ‘model range’. However, the results show that car buyers have a very poor understanding of what constitutes a ‘model range’. Neither do they have an adequate understanding of ‘vehicle class’, the basis of comparison favoured by the majority of car buyers.

¹ A cost comparison over a period more than a year was not found to be well received by car buyers (3-year period tested).

Regarding the presentation of comparative information, the survey draws three conclusions. Firstly, labels that include comparisons must be clear as to the basis of comparison used, without relying on industry terms – such as ‘model range’. Second, all comparative scales should include clearly marked appropriate numerical scales. Third, where appropriate, actual model names should be included alongside the ‘most efficient’ or ‘best’ as shown on the scale used.

While fuel economy is the consumers preferred metric, comparing ‘mpg’ is inherently problematic due to the need to compare different fuel types, the nonlinear nature of the metric (which is based on the inverse of fuel use per unit distance),² and the negative reaction of car buyers to viewing ranked information when a model range contains a large number of models. This report therefore recommends against the use of providing a comparison of fuel economy *per se* on the label.

In contrast to ‘mpg’, fuel costs do scale linearly with fuel use per unit distance, and are therefore more suited to use as a comparator. Fuel cost is also technology neutral. This report therefore recommends that cost metrics be used for comparisons³ and, based on the popularity of the tested formats, the ‘dial’ style be used to show fuel cost in ‘pence per mile’ (using an absolute or relative scale), and total first-year fuel and VED cost be used within the ‘Buyer’s Guide’ format using a scale ranging from the models with the highest to lowest cost of all models in the same range.

Recommendation 3: The link between vehicle CO₂ emissions and VED cost should be made more explicit (through better visual cues) than it is on the current UK Fuel Economy Label.

Recommendation 4: In addition to annual fuel costs, the UK fuel economy label should include an estimate of fuel costs expressed in terms of ‘pence per mile’ and ‘per month’ (based on the model’s combined fuel economy, an up-to-date average fuel price, and an assumed average mileage).

Recommendation 5: In addition to model specific information, the UK fuel economy label should include a comparison of total first-year fuel and VED tax costs with all models in the same model range. Care should be taken to include numerical values at the end of the scale and text indicating the model with lowest total costs, and technical wording should be avoided (e.g. ‘model range’).

Linked to the ‘trust’ issue regarding the official combined fuel economy, the survey finds a significant level of dissatisfaction (among car buyers) regarding the current label’s fuel cost estimate. As noted by participants, not only is the average mileage not relevant for a large number of drivers, given the inexorable rise in fuel prices, the estimated fuel costs printed on the label are quickly out of date.

One feasible solution to this problem is to ‘hard-link’ the fuel economy label to a website on which more up-to-date and personalised estimates can be calculated. Such a technology is the QR Code, which enables a smart phone equipped with a QR Code application to direct its website browser to a target URL.⁴ This technology is already used in many contexts including the latest US Vehicle Label.⁵

Although not a statistically large sample, almost all focus group participants were impressed by the ability of the QR Code reader to link a printed label to a ‘live’ and personalised fuel cost calculator. Given the rapid adoption of similar technologies across most sectors, this report recommends that the next UK fuel economy labels should include a QR Code (or similar technology). Indeed, the authors are of the opinion that omitting to include such a technology would significantly limit the future options for consumer-focused information provision within the automotive sector.

² Larrick, R. and Soll, J (2008) The MPG Illusion. Policy Forum, Science Vol. 320, pp1593-1594, 20 June 2008

³ With the proviso that fuel and VED costs continue to be closely aligned with carbon emissions.

⁴ For more information, visit: http://en.wikipedia.org/wiki/QR_Code.

⁵ For more information, visit the EPA website. URL: <http://www.epa.gov/carlabel/> [Accessed April 2012].

Recommendation 6: In addition to printed information, the UK fuel economy label should include a 'hard-link' (e.g. QR Code) to link the printed label with online model information. The target URL should include some or all of the following: model specific information, a fuel cost calculator, and comparisons with other cars in the 'model range' or 'vehicle class' (depending on data availability).

Regarding the most effective way to convey information on a label designed for electric vehicles (EVs), the survey finds that car buyers have a very poor understanding of watt-hours (Wh) and kilowatt-hours (kWh). As a result, very few of the test participants adequately understood either 'Wh/km' or 'kWh/100km', two of the electricity consumption units trialled on the EV test labels.

In contrast, when electricity consumption figures are presented in terms of 'mpg equivalent',⁶ this option is well received (and is the most popular option) due to its high level of comprehension by participants who are able to contextualise the figures and compare them with conventional vehicles. A second popular metric is 'miles-per-kilowatt hour' (Miles/kWh) – possibly indicating that 'miles-per litre' for liquid fuels may gain acceptance as a popular metric in the future.

When presented with test EV labels, many of the survey participants voiced their concerns about some of the limitations of EVs which included: short driving range, the length of time to recharge, and the uncertainty about the location of publicly available recharging points. These were also among the issues most requested to be included on a future EV label as additional information.

On a positive note, when test labels showing EV electricity and tax costs are presented to the test sample, the survey finds that car buyers are generally impressed by the low running costs. With the exception of the electricity consumption units, and the inclusion of additional information, this supports the use of a similar label format for both EVs and conventional vehicles.

Recommendation 7: The scope of the UK fuel economy label should be extended to include electric vehicles. The 'EV label' should: adhere to a similar format as for conventional vehicles; present electricity consumption as 'mpg equivalent' (assuming 8.9 kWh/litre petrol) shown alongside official energy data (in Wh/km or kWh/km), and include information specific to electric vehicles (including: driving range, recharge time, and the location of publically accessible charging points).

Plug-in hybrid electric vehicles (PHEVs) and range-extended electric vehicles (REEVs) also present challenges to the presentation of vehicle information for consumers. Not only are the electricity consumption units not readily understood if expressed in Wh/km, there is the problem of how to present fuel economy information when two fuels can be used simultaneously or independently.

The main finding from the testing of PHEV and REEV labels is that when only 'weighted combined' data is presented, few, if any car buyers, are able to understand either the terminology or the data. The two reasons for this lack of comprehension are the use of metric units, together with the difficulty of comprehending two energy sources simultaneously (symbolised in the test labels by the use of a '+' sign). The resulting experience is one of 'information overload'.

While providing an 'mpg equivalent' figure for the liquid fuel element does increase comprehension, presenting a mixture of imperial and metric units (for electricity use) on the same label creates a new problem; namely only the imperial units are 'seen', the metric units being ignored. The effect is to misrepresent the energy information – for example, instead of the label conveying '235 mpg and 130 Wh/km', the label is read as '235 mpg'.⁷ Consequently, this information may not be trusted as car buyers may think it unlikely that such a car would actually cover 235 miles on one gallon of fuel.

⁶ Assuming 8.9 kWh/litre petrol.

⁷ Official NEDC figures applicable to Vauxhall Ampera REEV.

With regard to this key issue for PHEVs and REEVs, this report concludes that an optimum label would be one that presents both the total 'mpg equivalent' figure for the lay-person and the 'weighted combined' published test data as required by ECE Regulation No. 101. (While Condition 'A' and 'B' energy consumption information would be of interest to many car buyers, the authors believe that a choice has to be made between metrics to avoid information overload.)

Recommendation 8: The scope of the UK fuel economy label should be extended to include plug-in hybrid- and range-extended electric vehicles. The 'PHEV/REEV label' should: adhere to a similar format as for conventional vehicles; present fuel/electricity consumption data as total 'mpg equivalent' (assuming 8.9 kWh/litre petrol) and as 'weighted combined' (fuel: litres/100km and electricity: Wh/km or kWh/km), and include information specific to electric vehicles (including: electric driving range, recharge time, and the location of publically accessible charging points).

Focusing on overall design, there is little doubt that most car buyers recognise the current label's A-M coloured bands used to indicate the VED band. It is therefore a key position of this report that any future development of the fuel economy label should retain the current system of coloured bands. However, the survey provides ample evidence that the current label could be significantly improved.

Of the alternative designs tested, the uppermost part of the test label named 'Dashboard' includes by far the most popular label elements according to the focus groups. The reasons given by participants include its simplicity, modularity and the fact that the key CO₂, 'mpg' and fuel cost per mile data and text can be seen from a distance. The comparison element of the 'Buyer's Guide' label was also found to be an effective format in which to compare combine fuel and VED costs, the most popular version using the scale ranging from the highest to lowest first-year total fuel and VED cost.

Considering all the evidence regarding labels tested, this report concludes that the most effective combination of alternative design elements would be a combination of the following:

- Uppermost section: Dashboard design elements (CO₂, 'mpg' and fuel per mile data);
- Central section: Buyer's Guide designs elements (VED, fuel cost, and model range comparison);
- Lower section: Sources of further information and tools (QR Code, website and phone).

This label, termed '**Dashboard Plus**', is designed to be semi-flexible; when a model range comparison is not possible or appropriate, the comparison area can be replaced with 'additional information'. Examples include cases where a new technology is employed (such as an EV, PHEV or REEV) or where there is only one model in a range. As a purely *speculative exercise*, a series of Dashboard Plus labels has been constructed based on the findings of the survey as described – and presented in this report.

In the light of these findings regarding the rationale of the 'Dashboard Plus' fuel economy label, this report makes two recommendations which are designed to more effectively convey vehicle model information to consumers, and outline what would be required for a final round of testing should the Dashboard Plus designs be taken forward towards implementation.

Recommendation 9: Based on the evidence presented, a future UK fuel economy label should incorporate the following design elements (collectively known as the 'Dashboard Plus' design): Uppermost section – Dashboard design elements (CO₂, 'mpg' and fuel per mile data); Central section – Buyer's Guide designs elements (VED, fuel cost, and model range comparison); Lower section – Sources of further information and tools (QR Code, website and phone).

Recommendation 10: Before implementation, a future UK fuel economy label based on the 'Dashboard Plus' design should undergo a final round of testing conducted at the household level to assess the potential impact of the new label on car buyer behaviour.

2. Introduction

2.1 EU Labelling Directive

In 1999, the EU issued a **Labelling Directive** [1999/94/EC] requiring standardised fuel economy and CO₂ emissions information to be made available to buyers of new passenger cars in all EU Member States – effective from January 2001. One of the key information sources covered by the 1999 Directive is a Fuel Economy Label for all new passenger cars⁸ displayed at the point of sale.

As stated in Appendix I of the 1999 Directive, EU Member States must ensure that all car labels:

- Comply to a standardised format in order to allow greater recognition by consumers; and are of a size of 297 mm × 210 mm (A4)⁹; and contain a reference to the model and fuel type of the passenger car to which they are attached;
- Contain the numerical value of the official fuel consumption and the official specific emissions of CO₂. The value of the official fuel consumption is expressed in either litres per 100 kilometres (l/100 km), or an appropriate combination of these and is quoted to one decimal place. The official specific emissions of CO₂ are quoted to the nearest whole number in grams per kilometre (g/km). Such values can be expressed in different units (gallons and miles) to the extent compatible with the provisions of Directive 80/181/EEC;¹⁰
- Contain the following text regarding the availability of the guide on fuel consumption and CO₂ emissions: "A guide on fuel economy and CO₂ emissions which contains data for all new passenger car models is available at any point of sale free of charge"; and "In addition to the fuel efficiency of a car, driving behaviour as well as other non-technical factors play a role in determining a car's fuel consumption and CO₂ emissions. CO₂ is the main greenhouse gas responsible for global warming".

As described in Article 2, the 1999 Directive defines the 'official fuel consumption' and the 'official specific emissions of CO₂' as the figures measured and type-approved by the approval authority in accordance with the provisions of Directive 80/1268/EEC and attached to the EC vehicle type-approval certificate or in the **Certificate of Conformity**.¹¹ The Certificate also includes environmental information related to noise levels, Euro emissions standard, and exhaust emissions for the so-called 'regulated pollutants': CO, NO_x, HC and PM₁₀.

The details of how the 'official' fuel economy and emissions are obtained – and which figures must appear in the Certificate of Conformity – are detailed in **ECE Regulation No. 101**¹² which apply to the *"measurement of the emission of carbon dioxide (CO₂) and fuel consumption, and/or to the measurement of electric energy consumption and electric range of category M1 vehicles powered by an internal combustion engine only or by a hybrid electric power train, and to the measurement of electric energy consumption and electric range of categories M1 and N1 vehicles powered by an electric power train only."*

⁸ Category M1 vehicles as defined in Appendix II to Directive 70/156/EEC(6) and which falls under the scope of Directive 80/1268/EEC. It does not include vehicles falling under the scope of Directive 92/61/EEC(7) and special purpose vehicles as defined in the second indent of Article 4(1)(a) of Directive 70/156/EEC.

⁹ Whether the A4 label is displayed as 'portrait' or 'landscape' layout is not specified.

¹⁰ Council Directive 80/181/EEC of 20 December 1979 on the approximation of the laws of the Member States relating to units of measurement and on the repeal of Directive 71/354/EEC (OJ L 39, 15.2.1980, p. 40).

¹¹ The Certificate referred to in Article 6 of Directive 70/156/EEC.

¹² E/ECE/324, E/ECE/TRANS/505, Rev.2/Add.100/Rev.2, 29 April 2005. URL:

<http://www.unece.org/fileadmin/DAM/trans/main/wp29/wp29regs/r101r2e.pdf>. [Accessed April 2012].

The ECE R101 regulations provide detailed procedures for the measurement of fuel economy and CO₂ emissions of all vehicle types including those: only powered by an internal combustion engine (Appendix 6); electric power-train only (Appendix 7); hybrid-electric power-train, including vehicles that can be externally charged (Appendix 8); and vehicles powered by either an electric power-train or by a hybrid electric power train (Appendix 9).

For each vehicle type, the ECE R101 regulations also specify what data is to appear on the type approval certificate (Appendix 4). With respect to fuel economy, CO₂ emissions and driving range information, Appendix 4 specifies the inclusion of test cycle information (and units in which data must be provided) according to vehicle type as set out in Table 1.

Table 1 Data reporting requirements according to ECE R101

Vehicle type	CO ₂ mass emissions (g/km)	Fuel consumption ^a (litre/100km)	Electricity consumption (Wh/km)
Internal combustion engine; and non-externally chargeable (NOVC) hybrid electric	Urban ^b Extra-urban ^b Combined ^b	Urban ^b Extra-urban ^b Combined ^b	
Pure electric vehicles			Combined: Wh/km ^b Electric range (km)
Externally chargeable (OVC) hybrid electric	Condition A ^c , combined ^b Condition B ^c , combined ^b Weighted ^d , combined ^b	Condition A ^c , combined ^b Condition B ^c , combined ^b Weighted ^d , combined ^b	Condition A ^c , combined ^b Condition B ^c , combined ^b Weighted ^d , combined ^b Electric range (km)

^aRepeat for petrol and gaseous fuel in the case of a vehicle that can run either on petrol or on a gaseous fuel. For vehicles fuelled with natural gas, the unit l/100 km is replaced by m3/km.

^bUrban, Extra-urban, and Combined cycle (representing urban/extra-urban driving) as defined by the NEDC test cycle.¹³

^cCondition A test carried out with a fully charged electrical energy/power storage device. Condition B: test carried out with an electrical energy/power storage device in minimum state of charge.

^dThe weighted CO₂/fuel consumption/electricity consumption are calculated using $X = (De \cdot X_A + Dav \cdot X_B) / (De + Dav)$, where: X = CO₂/fuel consumption/electricity consumption (in g/km or l/100 km or Wh/km), X_A = CO₂/fuel consumption/electricity consumption over Condition A, X_B = CO₂/fuel consumption/electricity consumption over Condition B, De = vehicle's electric range, Dav = 25 km (assumed average distance between two battery recharges).

2.2 UK Fuel Economy Label

In the UK, the EU Labelling Directive is implemented by the *Passenger Car (Fuel Consumption and CO₂ Emissions Information) Regulations 2001*, which came into force in November 2001.¹⁴ The Passenger Car Regulations adhere to the 1999 Directive with minor additions such as the provision of fuel economy in units of ‘miles-per-gallon’ or ‘mpg’.

As stated in Schedule 2, in order to allow for ease of recognition by consumers: (1) The label shall be easily legible and shall contain the wording and the relevant data in the categories specified in [the] figure [Figure 1]; and (2) The label shall be printed on A4 size (210×297 mm) material and shall contain text set out in the format specified in the figure [Figure 1] which shall occupy an area of no less than 180 × 125 mm.

¹³ DieselNet. URL: http://www.dieselnet.com/standards/cycles/ece_eudc.php [Accessed April 2012]

¹⁴ Legislation.gov.uk. URL: <http://www.legislation.gov.uk/ukxi/2001/3523/contents/made> [Accessed April 2012]

Figure 1 Information required to be displayed by Passenger Car Regulations 2001

ENVIRONMENTAL INFORMATION		
A guide on fuel economy and CO ₂ emissions which contains data for all new passenger car models is available at any point of sale free of charge. In addition to the fuel efficiency of a car, driving behaviour as well as other non-technical factors play a role in determining a car's fuel consumption and CO ₂ emissions. CO ₂ is the main greenhouse gas responsible for global warming.		
Make/Model:	Engine Capacity (cc):	
Fuel Type:	Transmission:	
Fuel Consumption:		
Drive cycle	Litres/100km	Mpg
<hr/>		
Urban		
Extra-urban		
Combined		
Carbon dioxide emissions (g/km):		
Important note: some specifications of this make/model may have lower CO ₂ emissions than this. Check with your dealer.		
<hr/>		

To meet the requirements of the Labelling Directive, in 2005, the LowCVP brokered the design and rollout of a UK Fuel Economy Label which included an energy-efficiency style colour coded fuel economy scale linking CO₂ emissions to VED – see Figure 2 for the current label used for new cars.

As Figure 2 shows, the VED bands are colour-coded using a scale similar to the energy-efficiency rating system used for 'white goods' ranging from green for cars with the lowest CO₂ emissions through the colours of the spectrum to red for the most highly polluting vehicles. The CO₂ emissions figures are measured over a single standard test-cycle and are quoted on a per kilometre basis.

Other information on the label includes: annual fuel cost which is estimated assuming a distance of 12,000 miles and based on the 'combined' fuel economy figure and a UK average fuel price for petrol, diesel and liquefied petroleum gas (LPG); and a 12-month Vehicle Excise Duty rate (now extended to include both First Year and Standard VED Rates). Fuel economy information is also displayed in the lower half of the label measured over three cycles: 'urban', 'extra-urban' and 'combined' and is presented in 'mpg' (miles per gallon) and 'litres/100 km' units.

Since 2005, LowCVP has commissioned and conducted a series of surveys to assess the effectiveness of the UK label with regard to its influence on car purchasing decisions, and to build an evidence-base to inform future label design. The surveys focusing on car buyers include:

- *2010 LowCVP Car Buyer Survey: Improved environmental information for consumers.*¹⁵
- *2008 LowCVP Car Buyer Survey: From 'mpg paradox' to 'mpg mirage' – How car purchasers are missing a trick when choosing new cars.*¹⁶

The 2010 Car Buyer Survey made a number of recommendations about how the current label could be improved including:

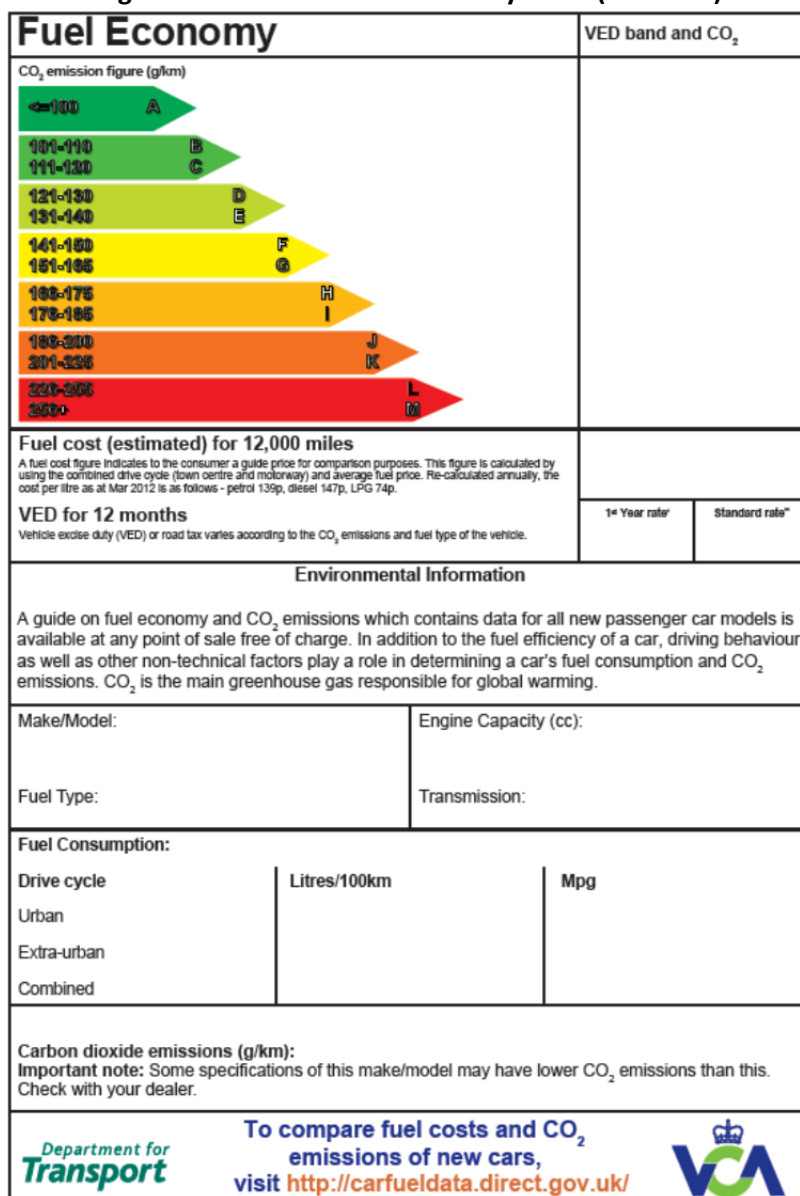
- The fuel economy information (in terms of 'mpg') should be made more prominent (through better positioning and larger text-size) than it is on the current UK Fuel Economy Label;

¹⁵ 2010 LowCVP Car Buyer Survey: Improved environmental information for consumers. Conducted by Ecolane, Sustain, and Robert Gordon University, for LowCVP, 2010.

¹⁶ From 'mpg paradox' to 'mpg mirage': How car purchasers are missing a trick when choosing new cars. Robert Gordon University, Ecolane and Sustain, for LowCVP, 2008.

- Consideration should be given to adding ‘best in class’ information (with a focus on ‘best in class’ fuel economy), while at the same time balancing the possible benefits of doing so with the equally important risk of overloading consumers with too much information;
- Further research should be conducted to assess the future potential of using ‘hard-links’ (e.g. QR Codes) as a consumer tool to link printed with online model information

Figure 2 Current UK Fuel Economy Label (new cars)



In parallel with this ongoing work programme, in the 2011 strategy document, ‘Better Choices: Better Deals’ published by the Department for Business Innovation and Skills (BIS) and the Cabinet Office’s Behavioural Insight Team,¹⁷ the Low Carbon Vehicle Partnership was asked to:

“... bring forward proposals aimed at helping to give consumers much clearer information on how much it will cost them to run a particular car. [The Government] believes that improvements could be made to the current ... fuel economy and emissions label ... so that it gives people much clearer information at the point of sale about ongoing running costs... This could help to shift consumers’ behaviour and deliver environmental benefits, for example by making it clear what cost savings are achievable when running more fuel-efficient vehicles.”

¹⁷ Better Choices: Better Deals. Consumers Powering Growth. BIS & Cabinet Office, 2011.

The strategy identified three potential amendments to the existing label which included:

- Improving the presentation of running cost and financial information to demonstrate the benefits of choosing fuel efficient, low CO₂ vehicles;
- Placing greater emphasis on cost related MPG, and less on the emissions metric of CO₂ g/km;
- Providing comparative information of each model with other vehicles 'in the same model range' using MPG, CO₂ emissions, or financial information or combinations of metrics.

In addition to the project input from BIS and the Cabinet Office's Behavioural Insight Team regarding the importance of running costs, members of the LowCVP's Passenger Car Working Group were also keen to use the latest findings from behavioural science to inform the design of the test labels – based advice from the Department for Transport's Social Research and Evaluation team and also academics at University of West of England.¹⁸ These findings include 'loss aversion' theory which highlights the tendency of people to prefer avoiding losses to acquiring gains.^{19,20}

To achieve these research objectives, in December 2011, the LowCVP commissioned Ecolane Consultancy and the Centre for Sustainable Energy (CSE) supported by the University of Aberdeen to test a series of alternative fuel economy label designs to explore private car buyers' attitudes regarding the information presented. The project was also designed to explore how a future fuel economy label could accommodate new vehicle types including electric and plug-in hybrid vehicles.

2.3 Project objectives

The primary objective of this project was to test a series of alternative fuel economy label designs to *explore private car buyers' views and understanding of the information presented on the labels – with particular focus on the inclusion of improved/ comparative fuel cost information.*

By identifying which (if any) of the alternative label designs improved on the existing Fuel Economy Label, the research aimed to identify which key metrics – related to fuel economy, fuel costs, and/or environmental data – are preferred by car buyers and how such data is most clearly presented.

The project brief included a number of key secondary objectives including:

- Improving the presentation of running cost and financial information to demonstrate the benefits of choosing fuel efficient, low CO₂ vehicles;
- Placing greater emphasis on MPG, less on CO₂ g/km, and how this should be displayed;
- Provision of comparative information of the vehicle with other vehicles 'in the model range' using CO₂ emissions, MPG, financial information or a combination of metrics;
- The inclusion of a QR code or similar technology and appropriate links to online tools;
- Future-proofing the label to include new technologies such as battery electric vehicles, and plug-in hybrid vehicles.

The project aimed to answer these research questions for recent buyers of new and used cars. All purchases had to have occurred within the previous 24 months (from the survey date). The target sample was chosen to reflect the national demographic for private car ownership in the UK.

¹⁸ Communications with Erel Avineri and E. Owen Waygood, Centre for Transport & Society, Faculty of Environment and Technology, University of the West of England.

¹⁹ Erel Avineri and E. Owen Waygood. Applying valence framing to enhance the effect of information on transport-related carbon dioxide emissions. Paper submitted to Transportation Research Part A (Psychology of Sustainable Mobility), 2012.

²⁰ Robert Metcalfe and Paul Dolan. Behavioural economics and its implications for transport. Journal of Transport Geography. Article in press.

3. Methodology

The methodology used as its starting point was the approach adopted for the 2010 Car Buyer Survey which proved highly successful in addressing the issues of that study. These included a series of six deliberative focus groups (qualitative),²¹ each of 8-10 persons, and a 15 minute web-based survey (quantitative) which was completed by at least 1,000 respondents.

For all methods of data collection, the target population was private motorists with a relatively recent experience of buying a car. Participants were therefore recruited on the basis of:

- Having a full driving licence and living in a household with at least one privately owned car;
- Having joint/main/sole responsibility for making car purchasing decisions for the household;
- Having bought a car for their household within the last two years (i.e. since January 2010).

The sample surveyed was selected to adequately represent the socio-economic groups, level of education, age, gender and location across England, Scotland and Wales. To reflect the fact that Fuel Economy labels are more often displayed on new cars, at least half of the focus group participants recruited has purchased a new car; for the online survey, the ratio of new to used car purchases was approximately 2:1.

As in the 2010 Car Buyer Survey, the research used a series of prototype test labels and stimulus materials. The test labels were created by an information designer²² working in close two-way co-operation with the survey team. The designer’s main input was determined by the two rounds of fieldwork indicated by the project brief. These were denoted as:

- **Round 1:** Initial series of alternative labels created on the basis of existing research;
- **Round 2:** Revised alternative labels created on the basis of findings from Round 1.

Table 2 Project overview

Project 1 only	Focus groups	Web-based survey
Round 1	✓	✗
Round 2	(6 groups; 58 participants)	✓ (1,005)

3.1 Focus groups

The focus group discussion guide (Round 1) is provided in full in Appendix 1.

Six deliberative workshops, each with 8-10 participants, were conducted, each lasting two and a half hours in length. Six groups were held in six UK cities: Birmingham, London, Exeter, Cardiff, Edinburgh and Leeds. In all cases, group discussions were recorded and transcribed in full for later (anonymous) analysis. In return for taking part in the project, each survey participant received a cash reward of £50 or £60 (depending on venue).

Participants were recruited by local fieldwork recruiters in the target areas (initially identified as London, S-England, N-England, Wales, and Scotland). Recruiters were asked to match the sample profile required, ensuring a representative range across age, gender and social-economic groups. Participants were asked to pre-register online before each workshop to provide basic demographic data and details about their recently purchased car. Participants’ vehicle information was checked with their car’s actual official data sourced using the CarweB database based on a car’s Vehicle Registration Mark (provided on a voluntary basis by over 95% of sample).

²¹ The term ‘deliberative’ is used to convey a particular style focus group; one that while being semi-structured, allows participants to control the discussion in terms of its direction and scope.

²² John Alderson was commissioned by the LowCVP to design alternative labels for this project.

Using a discussion guide, which included visual stimuli, the groups were invited to discuss their attitudes regarding: the most important factors during car purchase; useful information for car buyers; metrics included on the current label and their presentation; alternative ways to present information; the demand for comparative vehicle data; how best to present information for new plug-in vehicles; and the potential for using web-based tools for vehicle comparison.

Adopting the research recommendations of a previous evidence review,²³ the focus group survey design was ‘deliberative’ – which meant that, while the focus group discussions were structured, the conversation was led to a large degree by the participants, allowing open conversation between the participants themselves, and between the group and the researchers.

3.1.1 Alternative test labels (and visual stimuli)

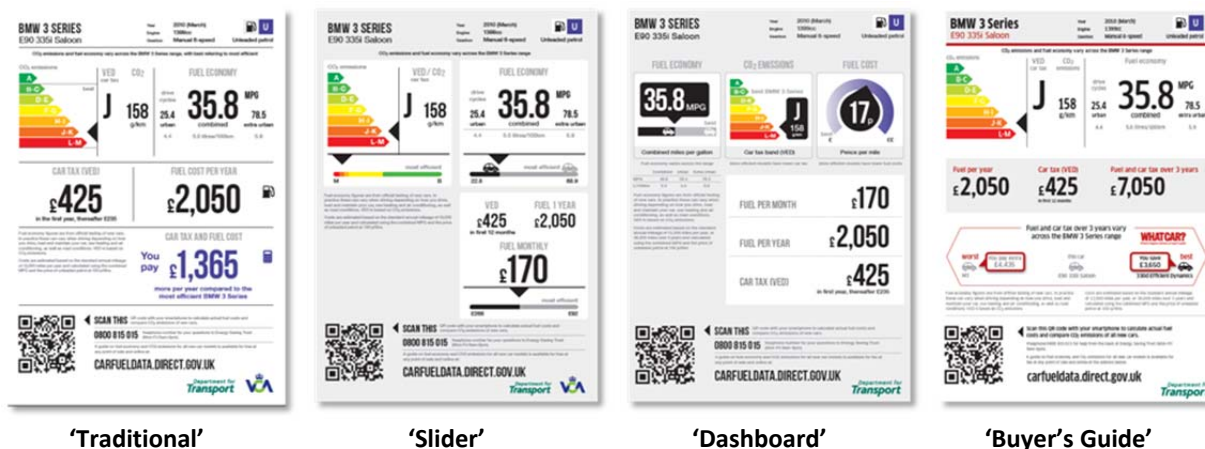
All the test labels (and visual elements) used during Rounds 1 and 2 are provided Appendices 2-3.

For each Round, a series of prototype ‘alternative’ test labels were created by the information designer. The designs used for Round 1 of the survey were informed from previous research including the work conducted on behalf of LowCVP. Round 2 test labels were created on the basis of findings from Round 1. Figures 3 and 4 show a selection of test labels used during the project.

Based on these prototype labels, a set of stimulus materials was then devised for use in the focus groups. In order to more effectively structure the group discussions, the visual stimuli focused on selected elements of the complete prototype test labels, which (in most cases) included one of the following issues: (i) CO₂ and fuel economy (an example of which is shown in Figure 5); (ii) fuel and VED cost information; and (iii) sources of further information. Broadly speaking, the separate visual elements were taken from the upper, middle or lower third of the prototype labels.

As already indicated, a major revision of the test label designs occurred following Round 1 informed by focus group responses to Round 1 visual materials. The key formatting changes made at this stage in the project included giving increased exposure to the more successful label designs (such as the ‘Dashboard’ format). Following significant negative feedback from the focus groups, one key change in content was the removal of labels that highlighted ‘you pay’ or ‘you lose’ messages – see Section 4.4.2 for results of responses to labels utilising ‘loss aversion’ theory.

Figure 3 Examples of test labels used during Round 1



²³ Anable, J, B Lane and T Kelay. Evidence review of attitudes to climate change and travel behaviour. DfT, 2006.

Figure 4 Examples of test labels used during Round 2

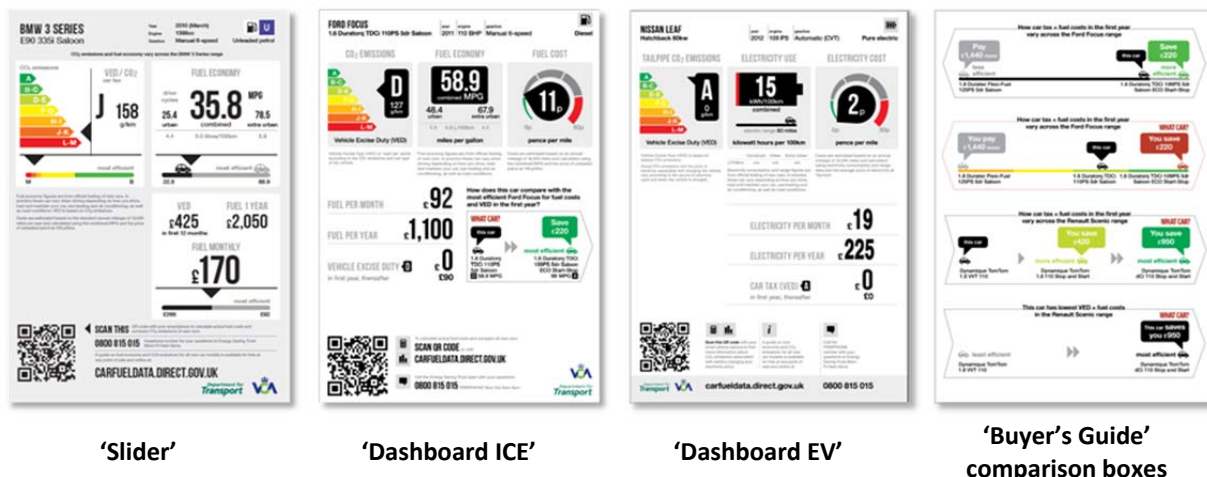
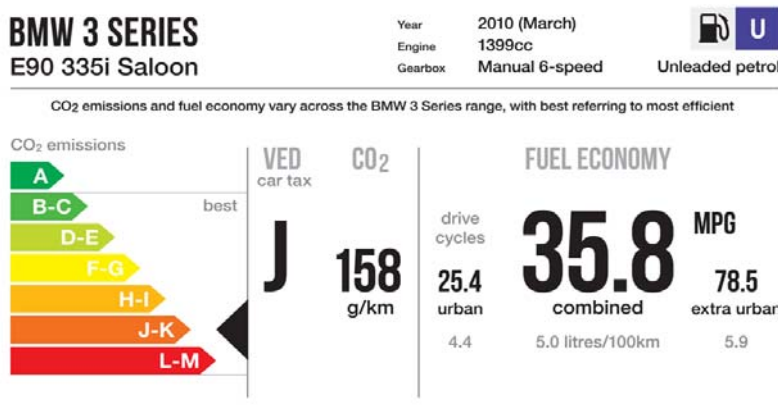


Figure 5 Example of visual stimulus used during Round 1 (A2)



3.1.2 QR Code reader technology

As directed by the LowCVP's project brief, the project investigated the use of 'hard-linking' technology (e.g. QR Code) to deliver additional information to that provided on the printed label.²⁴ The objective was to explore the potential benefits of using the 'web' as an additional resource – either to provide detailed 'flat' glossary type information for new technologies such as plug-in electric vehicles, or online calculators with which to personalise fuel cost and related information.

In the second half of the focus groups, therefore, a QR Code reader was first demonstrated and then tried by the focus groups participants. Using a camera phone equipped with a QR Code application, the reader scanned the image of the QR Code (as pictured in Figure 6) causing the phone's browser to launch and redirect to the programmed URL.

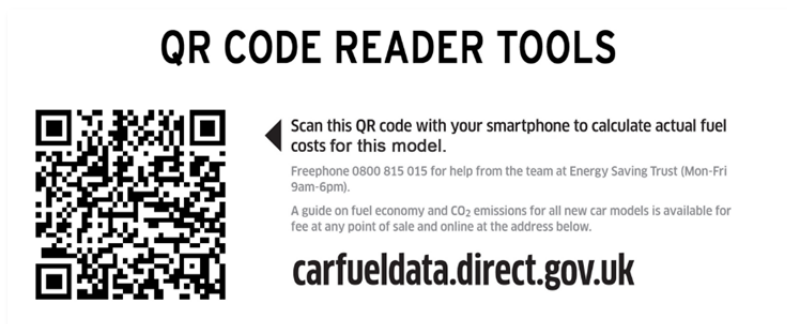
Two target URLs were used for Round 1 of the survey. The first was a web-tool allowing the user to calculate fuel costs for a particular model. In addition to the basis data set as appears on the current fuel economy label (including fuel cost, combined 'mpg' and annual fuel cost for 12,000 miles), the 'fuel cost calculator' tool enabled users to personalise the calculation by inputting their own fuel price and annual mileage, as well as to modify the 'mpg' according to their style of driving – see Figure 7.

²⁴ For more information, visit: http://en.wikipedia.org/wiki/QR_Code.

The second target URL was a much simpler 'glossary' which provided detailed information regarding a number of terms that appear on a fictitious label for an electric vehicle – see Figure 7. Information contained in the glossary included cost of electricity, CO₂ emissions associated with charging and factors influencing electricity consumption under real world driving conditions. The rationale was that this additional information could be accessed by car buyers as required, instead of being included on the printed label where it may have contributed to information overload.

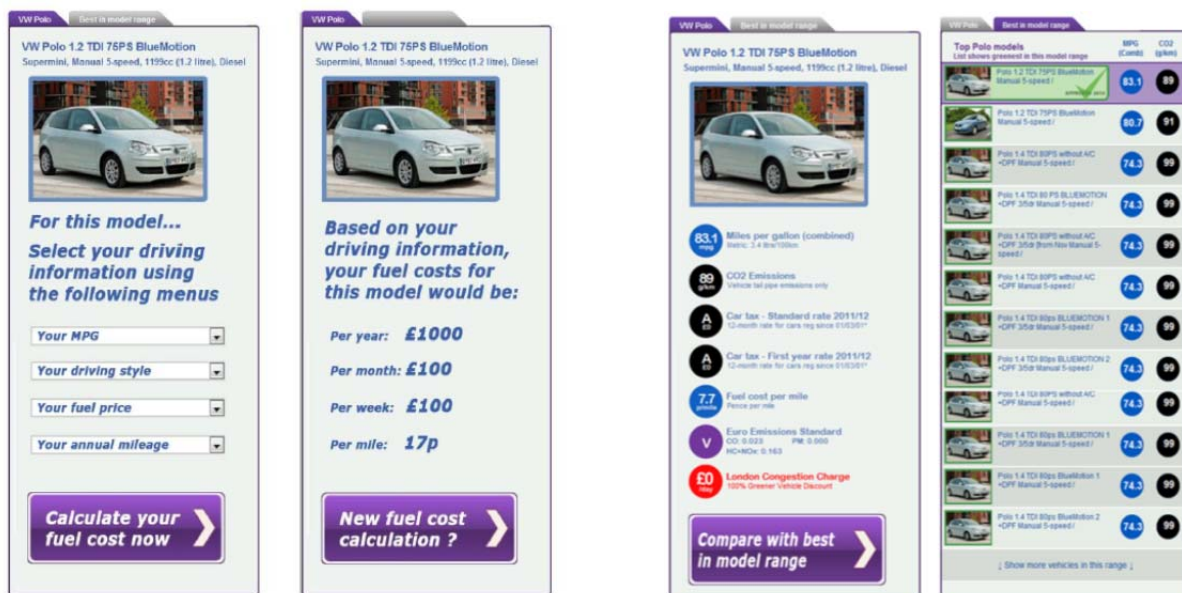
For Round 2, a third tool was tested in a 'mock-up' format rather than as a live test. This was a tool that compared the official combined fuel economy and tailpipe CO₂ emissions of a particular model with other in the same model range. Following a groups' use of the live fuel cost calculator, a visual mock-up of the model range comparator tool was presented to participants for their consideration.

Figure 6 QR Code reader survey test sheet



Hard-link to fuel cost calculator tool (Round 1)

Figure 7 QR Code reader online tools



Fuel cost calculator tool (Round 1)

Model range comparator tool (Round 2)

Live links to the target URLs can be found at:

- <http://www.nextgreencar.com/mobile-calculate/26041/VW-Polo-Diesel-Manual-5-speed/>;
- <http://www.nextgreencar.com/mobile-calculate/26041/VW-Polo-Diesel-Manual-5-speed/>.

3.2 Online survey

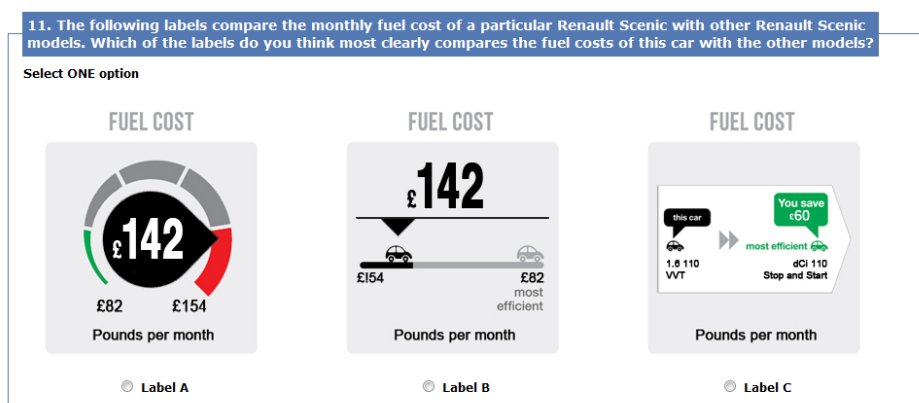
The web-based survey questions are provided in full in Appendix 4.

During Round 2, a web-based survey was conducted of 1,005 car licence holders who had recently purchased a car (using the criteria as already described). Using a web-survey recruitment agency, eligible participants were directed to a dedicated URL to access and respond to the online survey: <http://www.carbuyersurvey.co.uk/2012>. The web-based survey, which took around 15 minutes to complete, was conducted during April 2012.

At the start of the survey, participants were asked to provide basic demographic data and details about their recently purchased car. As with the focus groups, vehicle information was checked with official data sourced using the CarweB database based on a car's Vehicle Registration Mark (provided on a voluntary basis by over 75% of the online sample).

As with the focus groups, the web-based survey participants were presented with a series of visual elements for their comments and responses; in most cases, these visual stimuli were simplified versions of the focus group test materials. While the main content of the web-based survey shared many elements in common with the focus group discussion guide, it was more oriented to the collection of quantitative data through the use of single- and multiple-response questions. However, open-style responses were also used, the responses being categorised during analysis.

Figure 8 Screenshot of online survey single-response question (Q11)



3.3 Data analysis

Transcripts of key focus group discussions are provided in part in Appendix 5 – Note that the quotes highlighted in yellow in Appendix 5 are the one used to illustrate issues in the main text.

All focus group discussions were digitally recorded and the words transcribed. This evidence forms the central data for qualitative analysis and is structured according to the key issues as revealed during the group conversations. During each group, photographs are also taken to record collective activities such as brainstorming using ‘post-it’ notes used to capture thoughts, ideas and opinions.

Given the volume of text generated by the focus groups, research tools are used to efficiently code the issues that emerged during conversations with participants. One was the use of NVivo9, a qualitative software tool that simplified the tracking of ideas within the transcribed texts. For the online survey, all single- and multiple-choice questions, responses were coded and exported using an Excel file for analysis. For open-style questions, responses were first classified using classes as suggested by participants’ comments. All numerical analysis was then conducted in an Excel environment. For the majority of questions, the results are shown in the charts in Section 4.

3.4 Survey sample

For the focus group sample, the number of male and female participants was about the same – see Figure 9. For the web-based survey, the number of male participants exceeded the number of female participants by a ratio of approximately 2:1 – see Figure 10. Participants who had recently bought a new car or a used car were both well represented within both samples – with at least half of those in the focus groups and 66% of the online sample buying new.

Figure 9 Gender profile of focus group

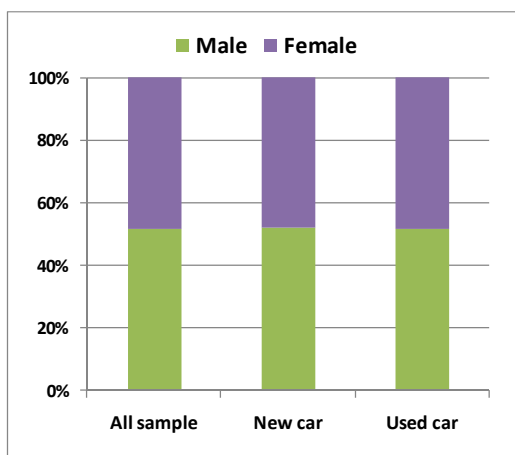
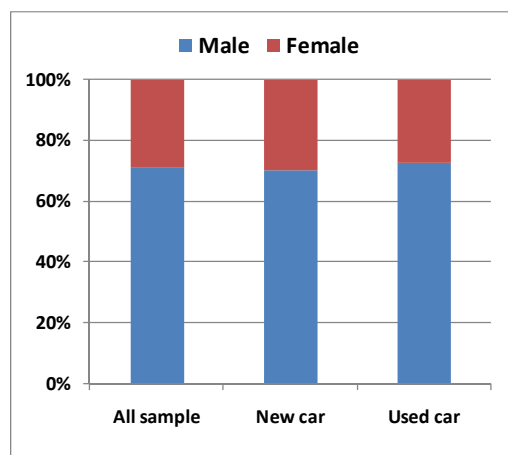
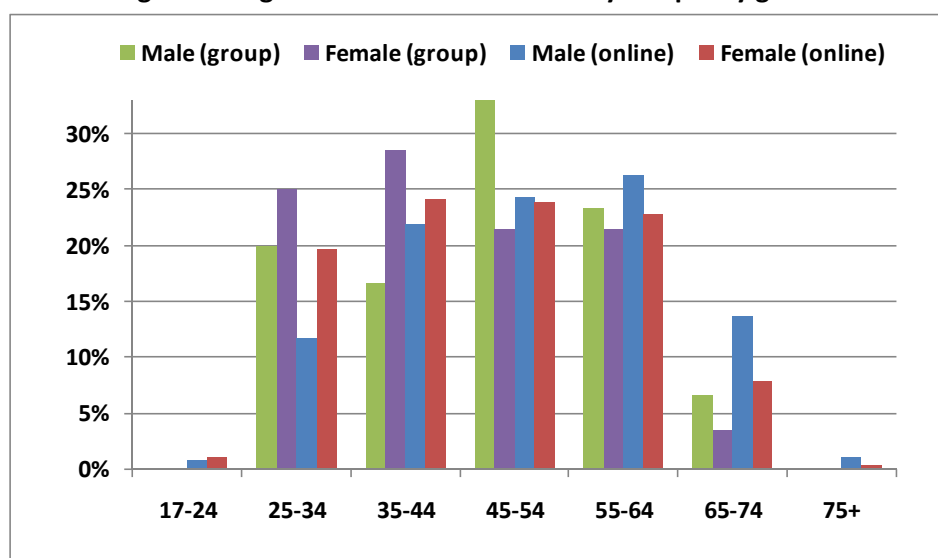


Figure 10 Gender profile of web-sample



Compared with the national age profile of new and used car owning households,²⁵ the 25-64 age categories were reasonably well represented in the focus group and online samples, with the exception of the 17-24, 65+ age groups which were under-represented – see Figure 11.

Figure 11 Age distribution of web-survey sample by gender

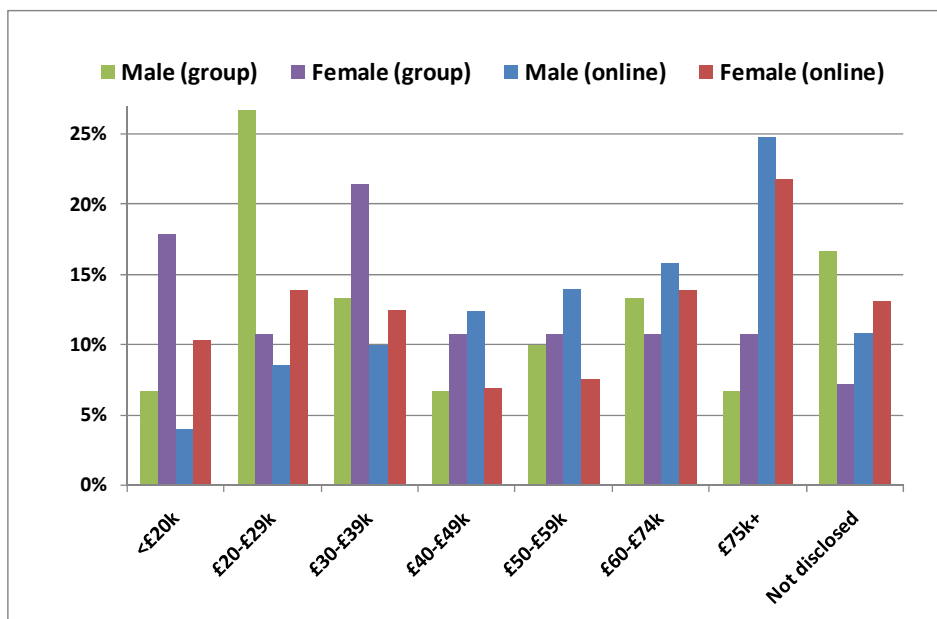


The majority of the web-survey sample were either in full time employment (all: 69%, male: 73%, female: 59%), in part-time work (all: 8%, male: 5%, female: 17%), or retired (all: 18%, male: 18%, female: 16%). The focus groups had a lower proportion of full-time employees (64%), slightly more in part-time work (12%) and a slightly lower proportion in retirement (14%). While all types of employment status groups were well represented in the two samples, the household income profile

²⁵ Climate change and transport choices: segmentation study final report, Department for Transport, July 2011. URL: <http://www.dft.gov.uk/publications/climate-change-transport-choices-segmentation/> [Accessed June 2012].

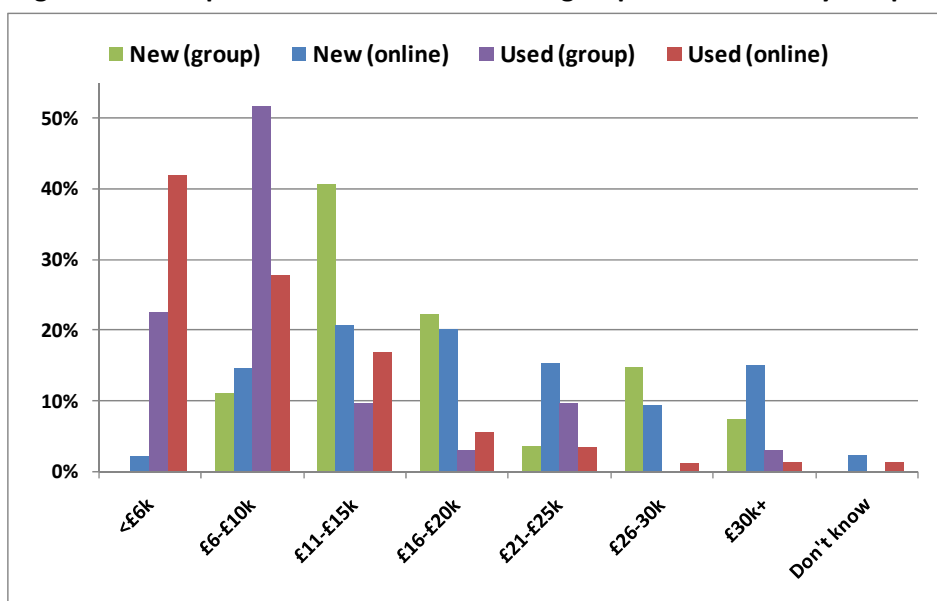
for the online sample was significantly higher than for the focus group participants – for online respondents, the modal income was in the £50,000-£59,000 category; for the focus groups, the modal income was in the £30,000-£39,000 range – see Figure 12.

Figure 12 Household income of focus groups and web-survey samples by gender



As expected, in the web-survey sample, participants who had recently bought a new car had paid substantially more (median in £16-20k range) than those who had purchased used vehicles (median £6-10k) – see Figure 13. The focus group sample showed a similar but less pronounced variation (modal prices in £11-15k versus £6-10k categories). The difference in prices paid for new/used car between the two samples is thought to reflect the higher household income of the online sample.

Figure 13 Price paid for current car for focus group and web-survey samples



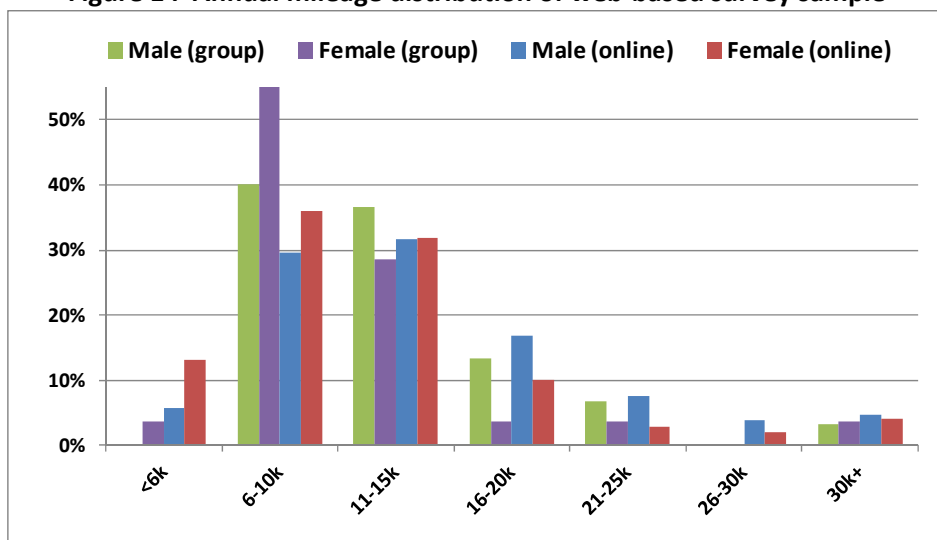
Regarding fuel type of the current cars used by the web-survey sample, petrol cars accounted for 49% (new: 43%, used: 58%) and diesel 50% (new: 55%, used: 40%).²⁶ Alternative fuels and vehicle

²⁶ These figures reasonably reflect the current UK new car market in 2011: Petrol 48%, Diesel 51%, Alternative (inc. hybrid) 1% (approx.), SMMT, 2012.

types only accounted for around 2% of the total sample (comprising 16 hybrids and 1 unknown car type). Within the focus groups, petrol cars accounted for 57% (new: 52%, used: 61%) and diesel 43% (new: 48%, used: 39%) with no participants reporting the purchase of an alternative type.

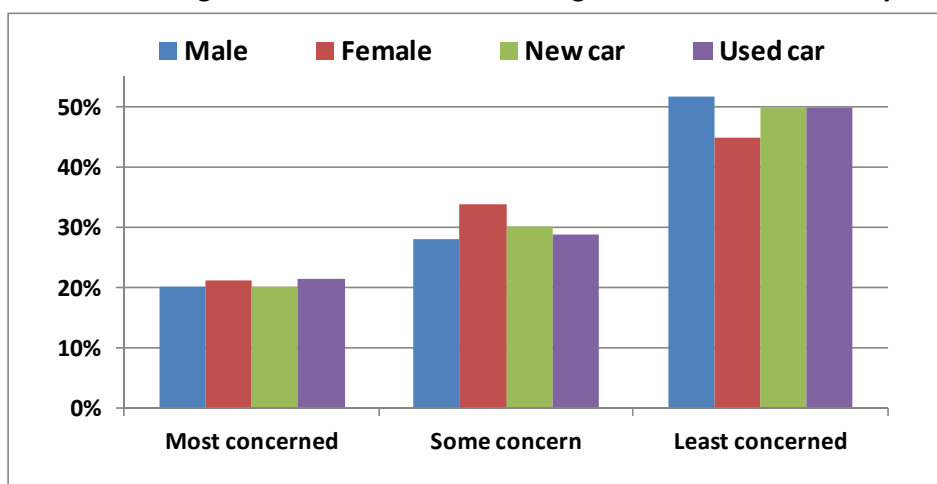
In the web-survey sample, the annual mileage driven by participants varied from below 6k miles per year to over 30k, with a modal annual mileage of 11-15k miles – see Figure 14. While the focus group participants reported a similar range of annual mileages, the average was less than for the online respondents, the group participants having a modal annual mileage in the 6-10k mile range.

Figure 14 Annual mileage distribution of web-based survey sample



In addition to the use of demographic parameters, a simple system of attitudinal segmentation was used to place all participants into one of four attitudinal categories ranging from ‘most concerned’ about environmental issues (and most willing to act to reduce environmental impact), through to the ‘least concerned’ (and least willing to act). This was achieved through scoring participants’ responses to a series of environment-related statements. By adjusting the threshold scores, the web-survey sample was (intentionally) divided into three equal attitudinal groups as shown in Figure 15.

Figure 15 Percentage breakdown of attitudinal segments within web-survey sample



4. Survey results

The following results are based on the analysis of 1,005 web-surveys completed in April 2012 and the transcripts of six focus groups involving 58 participants, which were held during the first quarter of 2012 in Birmingham, London, Exeter (Round 1), Cardiff, Edinburgh, and Leeds (Round 2).

Due to the high variation in household income and price paid for car purchase between the focus groups and online survey samples, all data has been analysed according to gender, new vs. used car purchase, and level of environmental concern (as measured by a set of segmentation questions).

4.1 CO₂ emissions information

4.1.1 Relevance of CO₂ information

When the issue of vehicle CO₂ emissions is raised during the focus-group discussions, the most common responses indicated a low level of interest and understanding of the CO₂ & VED band information as appears on the fuel economy label. This confirmed the well established low priority given to vehicle emissions when choosing a car.²⁷

Simply for the same reason... CO₂ emissions and stuff like that really doesn't come into it when I think about buying a car [Female, Round 1, London]

I have to say, I'm going to be totally honest – it's not that I don't care about the world and the CO₂ – I don't properly understand it [Female, Round 1, London]

Well, I don't know what A to Z is on the vehicle excise duty, but, does anybody else? I mean, there is a J there, what does that indicate? [Male, Round 1, Birmingham]

CO₂ emissions are given more attention when linked with Vehicle Excise Duty, suggesting that, in the context of vehicle purchasing and information, CO₂ is more commonly perceived as a cost issue rather than as an environmental one.

I think 'parking permit costs' and 'road tax' go with 'CO₂' because the CO₂ determines the price of them two attributes [Male, Round 1, London]

I just like to see the category and the cost associated. Once you see that related to your car you know your car tax essentially [Male, Round 2, Cardiff]

F: ...the one thing we said about the emissions was, you're focussed on whether it's a D or an E or an F or a G, but in terms of road tax is that a major difference? Q: ...first you would like to know the cost? F2: Yeah, the D means nothing to us – we don't know how much car tax is... [Conversation, Round 2, Edinburgh]

I think the government would all love us to be interested in green issues but I think in the end we are just more interested in how much it's going to cost us [Male, Round 2, Cardiff]

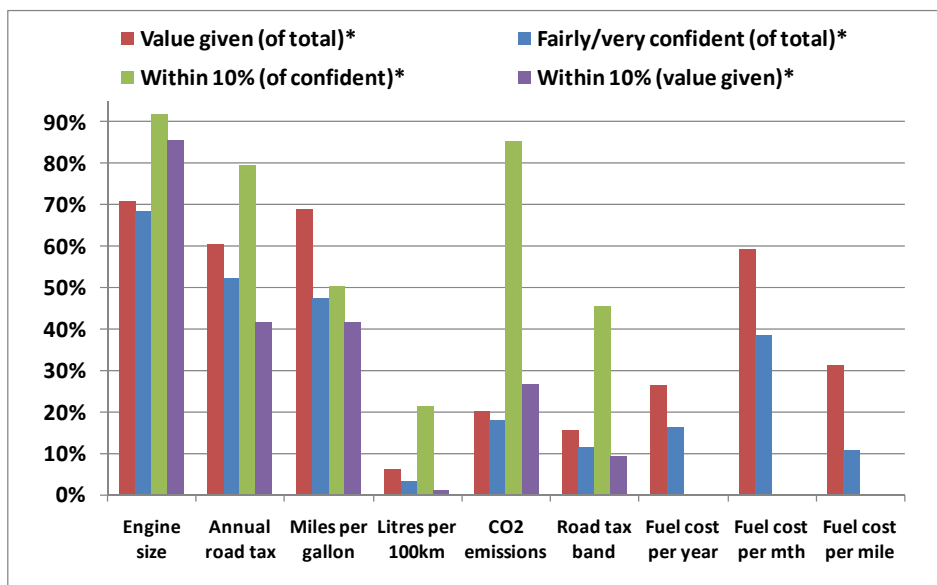
The web-based survey also assessed the level of knowledge of car buyers regarding their car's official performance data (including CO₂ information) by asking participants for 'official figures' for the car recently purchased. The question gave them the opportunity to enter values for the following factors: fuel economy (in 'mpg' and 'litres/100km'), fuel cost (per year, per month and per mile), engine size (litres), CO₂ emissions (g/km) and road tax (VED band and annual cost). Participants' responses were checked with their car's actual official data using the CarweB database based on a car's Vehicle Registration Mark (provided on a voluntary basis by over 75% of the online sample).

The number of responses (correct or otherwise) for each factor, together with the accuracy with which they were answered, was taken to represent the degree to which these factors are 'front of

²⁷ 2010 LowCVP Car Buyer Survey: Improved environmental information for consumers. Conducted by Ecolane, Sustain, and Robert Gordon University, for LowCVP, 2010.

mind' for consumers. It was assumed that, as most car buyers would know the engine size of their car reasonably accurately, the result for 'engine size' was used as a baseline with which to compare the results for the other metrics. The results are shown in Figure 16.

Figure 16 Car buyer's knowledge of their car's official performance data (web-survey)



* With the exception of 'annual road tax', percentages shown are either proportion of total sample or of sample giving values which are correct to within 10% of actual value. For 'annual road tax', percentages express proportion of sub-sample which includes only cars paying VED at standard rate.

Regarding CO₂ information, only 20% of the whole sample was able to volunteer a CO₂ emissions figure for their newly acquired vehicle; a proportion well under the baseline set by knowledge of engine size of around 70%. Of particular significance for this project is the level of CO₂ knowledge as compared to the ability of car buyers to provide a figure for fuel economy (in 'miles-per-gallon') which is around 70% (50% with very or fairly high confidence). The proportion of accurate values given for CO₂ is also significantly less than for 'mpg' – 42% versus 27%. **This question therefore confirms previous findings that CO₂ is a less 'front-of-mind' metric than 'miles-per-gallon'.**

This question shows an interesting second-order result – the minority (18%) of participants who were 'very' or 'fairly' confident about knowing their CO₂ emissions (compared to 48% for 'mpg') were more accurate in their knowledge of CO₂ emissions than 'miles-per-gallon' (86% compared to 50% for 'mpg'). One interpretation is that, whereas more car buyers have an idea of their car's fuel economy (through daily use), the value is likely to be different from the 'official' combined figure. In contrast, unable to test CO₂ themselves, they either know their car's official CO₂ emissions (accurately) or they don't, in which case they are unable to even 'guesstimate' a value.

Other issues raised by the data shown in Figure 16 will be discussed in the relevant sections below.

4.1.2 Importance of CO₂ colour bands

The focus group discussion revealed a high level of recognition among participants regarding the current label's A-M coloured bands used to indicate the VED band. Almost all participants had seen the bands in some context, the most common application being their use on 'white goods'. The level of recognition of the coloured bands suggests that they have become brand or logo for 'efficiency'.

This reminds me of actually when I went to buy a washing machine, and a and you have basically got triple A – its more or less the same sort of thing like this really. I always look at the green marks – so it's going to be triple A, double A or A – so greener means more A's – the greener the bar the more it reflects

more environmentally friendly. So, when I look on here, and it's got A there, it's also got 35.8, which I know is what you get to the gallon. And that's the first thing I notice on here [Male, Round 1, London]

I just thought – that, to me, would be stuck on a fridge... That, to me, is what you see when you're doing your, yeah, on household appliances [Female, Round 2, Leeds]

I've just bought a new fridge freezer, and washing machine – and they're all on them [Female, Round 1, Exeter]

The group conversations also indicated strong support for the coloured bands as an information tool. The coloured bands are readily understood in that green is associated with high efficiency ('good'), and red, low efficiency ('bad').

I just know what it means – you know that red is worse than green basically, you know, at the end of the day... [Male, Round 1, Exeter]

Over here now, this 2 was clearer for me, and I didn't need the numbers in this grid, it was quite easy for me to decipher that green was good and red was bad – and that, as it was orange and close to the red, that CO₂ emissions were quite high. I get that really clearly... [Female, Round 1, London]

Well just to say, when you put that poster up there I was just thinking it would be absolutely great to have this kind of information, you know, like you get for electric appliances... [Male, Round 2, Cardiff]

4.1.3 Improving CO₂ design elements

When presented with a selection of visual elements showing CO₂ and VED band information, the focus-groups participants were generally of the opinion that the *dashboard* style (see Appendices 2 & 3) was clearest and the easiest to understand. Indeed, the *removal* of the information defining the CO₂ limits within each band was noted by some participants as an advantage.

M: For us, this one was more informative [current label A1], but this one's clearer [dashboard style] ... [Q: That's interesting. How is A1 more informative for you?] ... M: Well, it's got the... F: ... the emission thing... M: ... down the middle. [Q: What like the bands?] F: Yeah, that doesn't tell me how many are in each band, although I don't know if you'd even need to know how many are in each band... [Conversation, Round 2, Leeds]

The online survey also asked participants to state their preference of three design elements CO₂ and VED band information – see Figure 17. The results clearly showed a strong preference for the dashboard style design over the format used by the current label and a second alternative (named *traditional*) – see Figure 18. On clarity, the dashboard design for CO₂ emissions was over twice as popular as the current fuel economy label.

Figure 17 Q2 Preference for CO₂ emissions design element

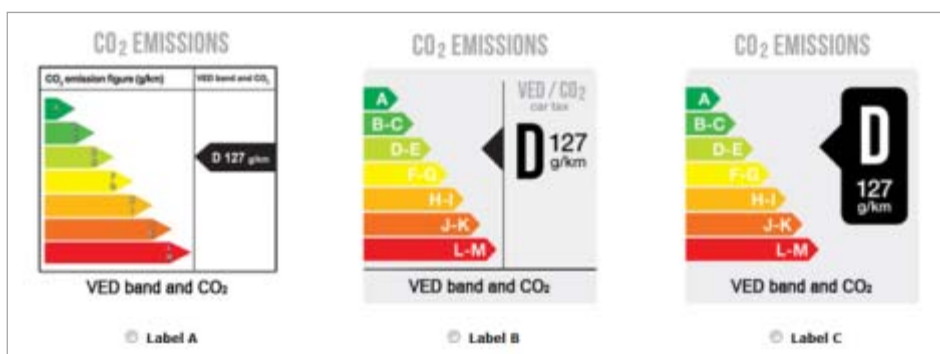
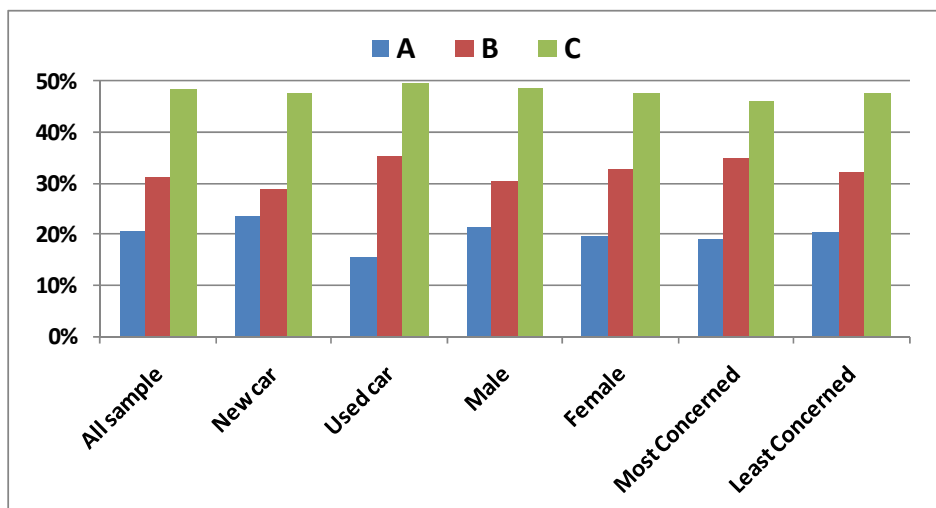


Figure 18 Q2 Preference for CO₂ emissions design element



4.2 Fuel economy information

4.1.1 Importance of fuel economy information

Previous studies have shown that car buyers place great emphasis on fuel economy as a proxy for running costs and environmental impact.²⁸ The focus group discussions in this survey also revealed that fuel economy expressed as ‘miles-per-gallon’ was of more importance to car buyers than CO₂ and VED.

*Q: So is there a consensus that mpg is more important but you are interested in CO₂ as a secondary thing?
F: I would do miles per hour [means miles per gallon], tax band, and then CO₂ [Conversation, Round 1, Exeter]*

I mean just for me, I would go – it’s the miles per gallon which is the key information – this is just additional stuff. What I really want to know is miles per gallon [Male, Round 2, Cardiff]

Well that’s one of the first things I look at, and ask, you know, how many miles per gallon... [Male, Round 1, London]

It all confuses me, all these sort of things really. I look at the 35.8 miles to the gallon – that’s the biggest thing... [Male, Round 1, Exeter]

This is also confirmed by results from the online survey. When testing car buyer’s knowledge of their car’s official data, around 70% of participants were able to provide a figure for fuel economy in ‘miles-per-gallon’ (50% with very or fairly confidence), as compared to only 20% for CO₂ emissions – see Figure 16. **This confirmed that ‘miles-per-gallon’ is a more ‘front-of-mind’ metric than CO₂.**

4.1.2 Terminology used to describe of fuel economy

Of the three fuel economy metrics included on the current fuel economy label, the focus groups highlighted the common confusion created by the use of the terms ‘urban’ and ‘extra-urban’, but also highlighted the high level of acceptance of the term ‘combined’.

F: No, I think urban is fine – that’s just town driving... M: Extra-urban is a bit of an odd one... M2: Yeah, it’s ambiguous isn’t it... M: Yeah [Conversation, Round 1, Exeter]

²⁸ 2010 LowCVP Car Buyer Survey: Improved environmental information for consumers. Conducted by Ecolane, Sustain, and Robert Gordon University, for LowCVP, 2010.

I don't think it will make... well, extra, without a doubt I don't really understand what extra-urban is, but, at the end of the day you've got to have a – for these figures to mean anything – you've got to have a set way of measuring it, and I suppose these are set ways [Male, Round 1, Exeter]

Well, I want to know what extra-urban meant, because I don't think that's particularly clear. Because urban is obviously an urban area, but extra is like – it implies it's a heavily populated area, which would mean that your miles per gallon would actually be significantly down. So, I don't really understand what that means [Male, Round 2, Cardiff]

4.1.3 Consumer trust of official fuel economy data

Of greater significance was the level of consumers' lack of trust in the official combined fuel economy figures. Many of the comments made by focus group participants suggested a widespread mistrust of the accuracy of the official information provided by the fuel economy label, with a realisation that the official figures were unlikely to represent 'real-world' fuel economy performance.

M: ... CO₂ emissions and fuel economy mean diddly squat ... I had a Mazda estate and I changed it to a newer one – the newer one was supposed to be more fuel efficient this that and the other – it used more fuel than the old one. Q: So, you don't believe in the figures? M: Not a great deal no [Conversation, Round 1, Exeter]

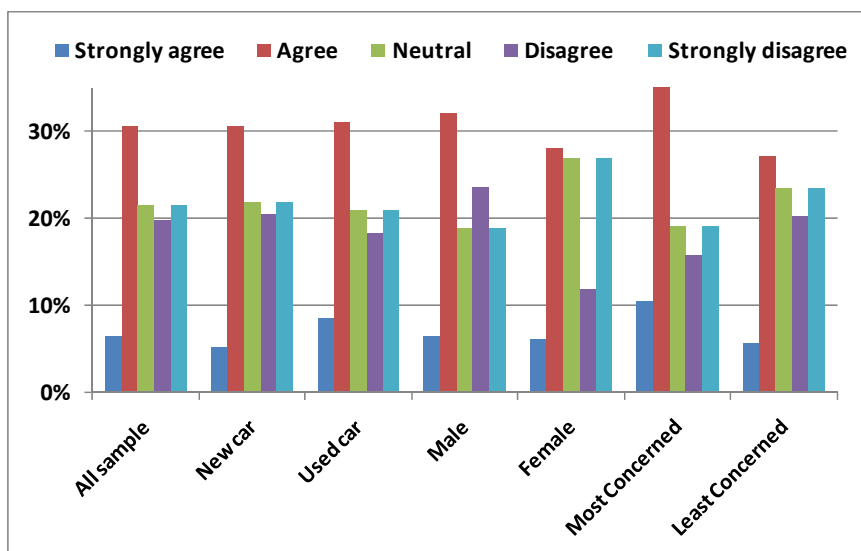
What I will say about the figures is, I think the manufacturers now tune their vehicles to pass these tests, so at a certain point they will do that. But in every day driving, they're not as good [Male, Round 1, Exeter]

Well looking at What Car?, when they test vehicles, what they get out from the average miles per gallon bears no resemblance to the advertisements that you see for that particular car. They are invariably considerably less in real life than what the manufacturer may claim [Male, Round 2, Cardiff]

They usually drive around a test track and we're driving to Tesco's [Male, Round 2, Cardiff]

Given the reported importance of fuel economy information to car buyers, the 'trust' issue was explored in more detail (and quantitatively) in the web-based survey. When asked to agree or otherwise with the statement 'For a particular car, the official 'combined' figure represents the fuel economy achieved by an average UK driver', only around a third of respondents (37%) agreed, with a higher proportion (44%) disagreeing – see Figure 19.

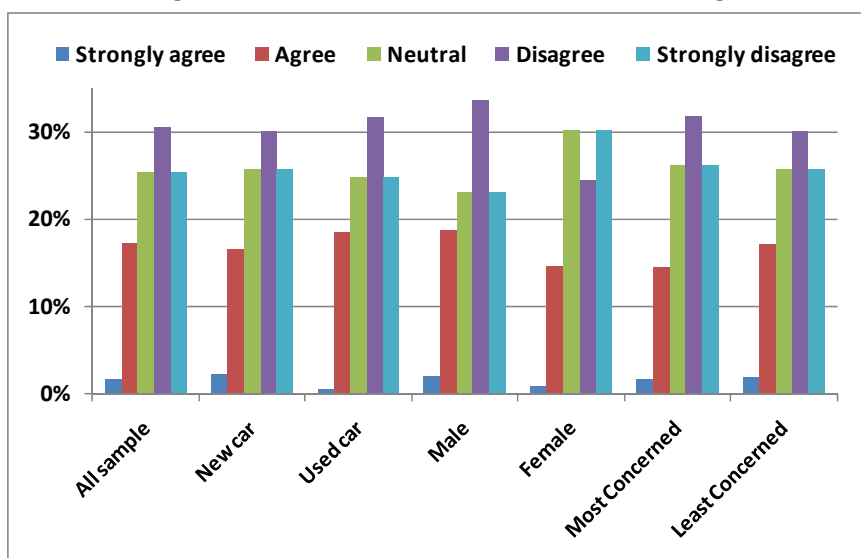
Figure 19 Official MPG achieved by average UK driver



While these results could be of some concern regarding the usability of official fuel economy information, a potentially more negative result relates to the applicability of 'mpg' figures to individual drivers. When asked to agree or otherwise with the statement 'For a particular car, the

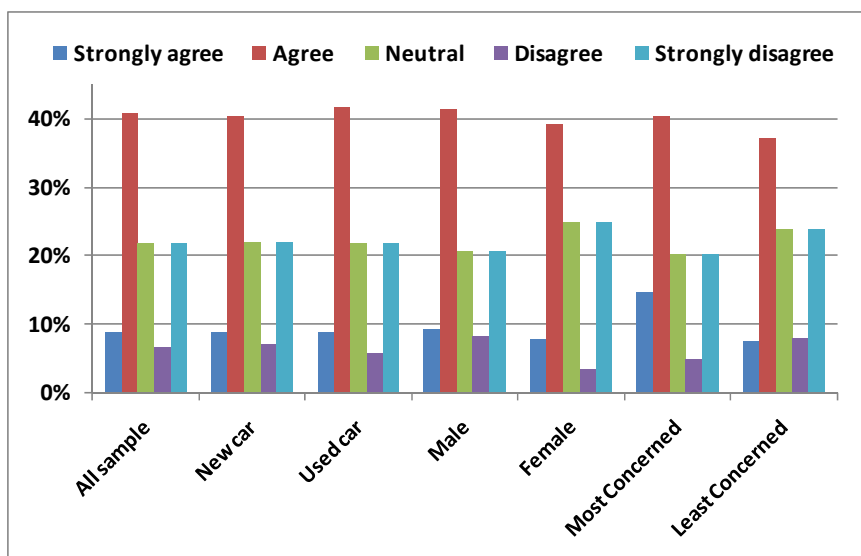
official ‘combined’ figure represents the fuel economy that I would achieve if I was driving’, less than a fifth of respondents (19%) agreed, with over half (55%) disagreeing – see Figure 20.

Figure 20 Official MPG achieved if I was driving



More positively, the online sample showed a greater level of trust in the official figures when used for comparison purposes. When asked to agree or otherwise with the statement ‘The official ‘combined’ figures are a reliable way of comparing the fuel economies of different cars, half of respondents (50%) agreed, with only around a third (29%) disagreeing – see Figure 21. However, it should be noted that, of those disagreeing, few selected ‘disagree’, with almost 20% of the sample choosing to ‘strongly disagree’.

Figure 21 Official MPG is reliable for comparison



4.1.4 Preferred fuel economy units

Confirming the finding from a previous LowCVP Car Buyer Survey, the focus groups revealed a strong preference for fuel economy expressed in imperial as opposed to metric units.²⁹ This is very much an

²⁹ 2010 LowCVP Car Buyer Survey: Improved environmental information for consumers. Conducted by Ecolane, Sustain, and Robert Gordon University, for LowCVP, 2010.

issue for UK (and US) car buyers, and is unlikely to be applicable elsewhere in the EU where other car labels are in use.

The big problem is that we are half in decimal, and we're half out. We are still using miles per gallon, I mean out there, people understand miles per gallon, but very few people know, litres per kilometre [Male, Round 1, Birmingham]

I don't know how much a litre is, I only know, you know, I fill my car up and it costs whatever. I don't know, I never look at the litre. I wouldn't have a clue... [Female, Round 1, Birmingham]

F: It's a term that I use, even though I buy in litres, miles per gallon is the phrase I know... Q: What does it mean to you? F: Um, I presume the higher the number the better it is [Conversation, Round 2, Edinburgh]

While this was very much the majority view, a number of participants did state a preference for metric over imperial units due to the fact that fuel is now priced, sold and dispensed in litres. While this view did highlight a problem, very few of its advocated strongly argued for using 'litres/100km', instead proposing other solutions – some of which will be discussed in later sections.

One thing that gets really confusing is, we changed, we went from pence per gallon to pence per litre, but yet, when you look at all the figures, they're all based on per gallon. Why? When we work in litres now [Female, Round 1, London]

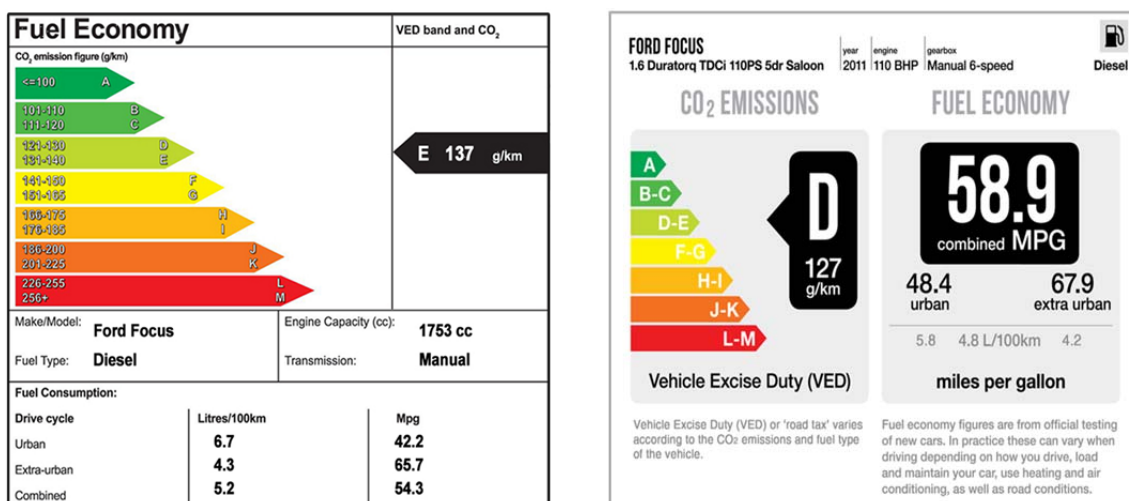
It just annoys me because, it says 58.9 miles per gallon – nobody knows what a gallon is. You buy your fuel in litres. I've no idea – I mean I know it's more than a litre, but for me it would be so much easier if it said, 30p a mile on the road, you know, 25p a mile. Then you would actually know what it meant [Female, Round 2, Edinburgh]

4.1.5 Improving MPG design elements

Car buyers' preference for 'miles-per-gallon' as the key fuel economy metric is accompanied by a strong demand for 'mpg' to be given greater prominence on the fuel economy label; this was one of the recommendations of the LowCVP Car Buyer Survey completed in 2010.

When presented with visual elements based on the current label and on an alternative mock-up – see Figure 22 – the majority of participants prefer alternative versions that present 'mpg' information using a large, clear font, placed alongside the CO₂ emissions figures.

Figure 22 Visual elements of survey test labels (Round 2)



Of the alternatives tested in the focus groups, the dashboard design was particularly well received by all groups – due to the prominence of the 'mpg' information, and also its overall design – see a portion pictured in Figure 22 (right).

F: Yeah, and that's the miles per gallon standing out more... it has actually got just as much information as the big one, which, you've got to – that looks too complicated to read... Q: So for you, A2 [dashboard] is simpler and clearer? F: Yeah [Conversation, Round 2, Leeds]

F It just says it as it is doesn't it. I mean it's... CO₂. It's got a box for CO₂ emissions, and it just tells you that it's J, which isn't very good, and then fuel economy. It just stands out a bit more than... there's too much information here [Female, Round 1, Birmingham]

Q: Which of those do you... just thinking of impact, strength, preference? F: I still like A3 [dashboard]. F2: It just stands out doesn't it. F: Because you've got these boxes [Conversation, Round 1, Birmingham]

Yeah that's fine – that's not anything to do with it. I think that [A3] [dashboard] is loads clearer – because that's something you walk past and notice and I can see the two main things to me... Visually – that's much clearer. And that's just telling you everything, where they start getting; it just gets a little bit confusing on the rest of it [Female, Round 1, Exeter]

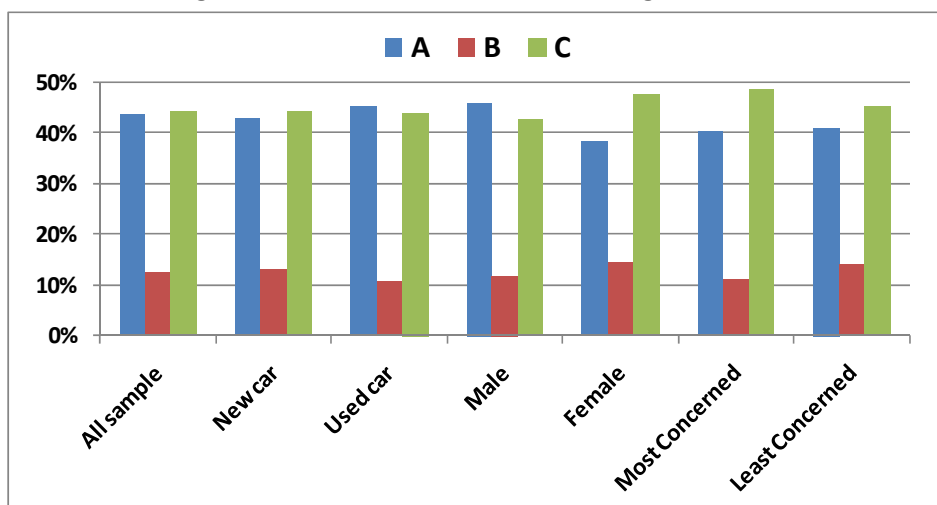
Knowing that the dashboard design was the most popular alternative label for presenting 'mpg' information among focus group participants, the online survey tested three variants of the dashboard layout to more fully understand the strongest visual elements – see Figure 23.

The results show a strong preference for two dashboard designs that present the data using a white-on-black format. While both score equally overall, the results suggest a slight preference based on gender; men preferring the rounded square background, and women the 'oil drop' which is used to represent a liquid fuel – see Figure 24.

Figure 23 Q4 Preference for MPG design element



Figure 24 R4 Preference for MPG design element



4.3 Fuel and tax costs

4.3.1 Relevance of current fuel cost information

Linked to the ‘trust’ issue regarding fuel economy information are car buyer’s attitudes about the assumptions used to calculate annual fuel cost (as presented on the current label), or monthly fuel costs (as presented on some alternative labels). These assume an annual mileage of 10,000 or 12,000 miles, depending on the label tested. Some of the focus group comments suggest a level of dissatisfaction with this approach.

Well that was confusing for me, because, I mean, looking at it I think, well how do they know what I’m going to do? How many miles? The print on the bottom is not clear [Female, Round 2, Leeds]

That’s the bit that’s clearer on this, that’s not clear really on that. We were really asking ourselves, like, £133 more month if you do what – then we read this tiny little bit at the bottom that said if you do 10,000 – I think that needs to be clearer [Male, Round 2, Leeds]

The only good thing is that you can compare it with another car, a completely different car, but really, who does exactly 12,000 a year? [Female, Round 1, Birmingham]

It’s... completely irrelevant to me. I don’t drive 10,000 miles a year, I mean, I would rather know what the fuel cost is, how efficient it is and how many miles per gallon [Male, Round 2, Cardiff]

Another and perhaps more significant complaint about the existing and alternative labels was the assumptions made about fuel price; together with the observation that, given the inexorable rise in fuel prices, these, together with the estimated fuel costs, are quickly out of date.

I think it’s really good, but I don’t understand how they base the one year, when, our petrol changes – the prices change so much through 12 months, and, it’s working out what they work that out on, where I can’t see how realistic that can be [Female, Round 1, Exeter]

Oh that’s good, it tells you what... 12,000 miles – the price of what your fuel would be. I’d like to know... is that with fuel not changing in price in the next year [laughing] [Female, Round 1, Exeter]

M: The issue, for this car would be out of date as soon as it’s public, because the cost of petrol changes so much that no-body is going to be able to, everyone is going to have to re-work out the cost of this car ... Q: Is it helpful that it says in the text underneath what the assumption is? M: It does help, but it does point out the fact of how wrong it is [Conversation, Round 2, Cardiff]

It’s going to be out of date as soon as you print it really isn’t it [Male, Round 2, Leeds]

4.3.2 Relevance of current VED tax information

Again supporting findings from previous LowCVP surveys, many focus group participants had a poor understanding of ‘Vehicle Excise Duty’; its meaning, its relation to ‘road tax’ or ‘car tax’, and its link with CO₂ emissions.

F: I was saying – what does VED mean?... F2: That’s car tax – I learnt that on the last one [Conversation, Round 1, Exeter]

Sorry, all I was going to say is, it’s obviously the VED band, but who knows what a VED band is? Or they can work it out? Why don’t they just say car tax band? [Male, Round 1, London]

Q: What’s the general thought about... do we as a group understand vehicle excise duty? It’s got 127 g/km – do we know what that’s going on about? F: I don’t [Conversation, Round 2, Edinburgh]

Related to this low level of understanding is the tendency of car buyers to conceptualise VED in terms of costs rather than in terms of band. This preference seems to be prevalent even when the link between VED band and costs is appreciated.

Coming back to what I said earlier on about the J code, it didn’t mean anything to a lot of people, but once you put money around it, then people can relate to that [Male, Round 1, London]

You need to put the road fund licence – the VED pricing in there. There's no point in me telling you it's a D [Male, Round 2, Cardiff]

One thing, is, that even though the road tax is associated with the emissions, I think it should probably display how much road tax it, you know [Male, Round 2, Leeds]

This was also confirmed by results from the online survey. When testing knowledge of their car's official data, car buyers were over four times more able to volunteer a value for annual VED cost than they were VED *band*.³⁰ Over the whole sample, 42% were able to accurately quote their annual tax (within 10%) compared to only 9% who correctly gave their road tax band.

Despite buyers of new car being well represented in the focus groups, very few participants were able to confidently explain the difference between 'first year' and 'standard rates' of VED.

That's the tax you have to pay on the first, first payment, and when you buy a new car you have to pay that extra on top for, perhaps buying a big cc car. But I don't think you pay that on a smaller, economical car would you? [Male, Round 1, Exeter]

Can I ask, why is the car tax more expensive in year one and then it's going to go down? [Female, Round 1, London]

I wouldn't as, if I was drawing this, writing this – I wouldn't put the car tax as 425, I would put it as 235. It's only the first year and they normally give you that free anyway. Because I would see that – if I read that, I would say that the car tax was 425 every year [Female, Round 1, Exeter]

M: With your road tax, it's saying it £250 first year, then every year after that it goes down to £180. What does that mean? So now I've got two road tax... M: Standard rate – what does standard rate mean? M: I don't understand why, after the first year it goes down. Why would it do that? If it's the same car nothing's going to change is it? [Conversation, Round 2, Leeds]

4.3.3 Alternative cost metrics

One of the central cost issues discussed in the focus groups was the period over which costs are estimated. While fuel and VED costs are currently quoted on an annual basis, the survey team wanted to establish whether other costing periods, in addition to 'per year', would be useful to car buyers. The results stimulated much positive debate, with many participants offering support for one or other of the alternatives discussed.

Q: Is that a reasonable... an estimate of a yearly cost of running a car? F: Yeah, because you know that it is estimates on the 12,000 miles per year – you know if you only do 6,000 miles a year, just to half that cost. But it also on the A2, it also gives you your monthly cost of fuel, per month – which is good because most people will know what they spend a month as opposed to a year, on fuel [Conversation, Round 1, London]

F: I think it could be monthly or weekly, not annual. I mean I would love for my car just to take £170 per month – that would be great. But I think monthly and weekly would be better than annually and monthly...

Q: Is that because weekly – that's how you think about your finances, your household finances is it? F: Weekly and monthly more than annually, yeah [Conversation, Round 1 London]

I think it's better to have a shorter period rather than the annual, because as you say, you can relate it to your filling up every two weeks, or whatever. It's easier to relate the figures isn't it [Male, Round 1, London]

F: Change the 'per year' to 'per month' and I'll be happy... F2: Why don't you put them all? Per mile, per month and per year – then everybody's happy [Conversation, Round 2, Edinburgh]

The majority of participants fell into one of two camps – those that supported an additional estimate presented on a 'per month' basis, and those who supported a 'per mile' cost. The main reason cited

³⁰ While it should be noted that the online survey was completed independently by participants, completion times were monitored to check that participants were not conducting online searches to check official vehicle CO₂ data. Given also the low level of success in the results, there is no evidence that this occurred.

by the 'per month' group was the fact that individual and households tend to budget on a monthly basis. Quoting a monthly fuel cost would therefore work well within this context.

Monthly, because I know that it's roughly monthly that I fill the car, and I know that it's roughly monthly, whatever I fill the tank up, it's gone up from say, £65 up to 80 – in the last few months [Female, Round 2, Cardiff]

I think, yeah, I think we all kind of think monthly now. We're paid monthly, we've got our monthly, you know, we've got our lump sum each month [Female, Round 1, Exeter]

I think it is useful, yeah, I mean you think, if you think in monthly salary, you think in monthly outlay, you think in direct debit – whatever. It brings out a kind of focus for you, or for me anyway [Male, Round 2, Edinburgh]

I deal in months, when I'm thinking about petrol, how much is it going to be in a month – I like that... [Male, Round 2, Leeds]

The main reason given by those supporting 'per mile' costs was the fact that this figure could very easily be linked with particular journeys as distances were often known or could be estimated. The proponents indicated that it would be fairly simple to calculate journey fuel costs by multiplying fuel cost per mile by the journey distance to be covered.

I prefer to know the per mile – I know what mileage I do [Female, Round 1, Birmingham]

Well I would actually, because I think, annually it just varies and so I would like to know when I popping down, out on a visit or on a shop, it's going to cost me roughly so much... [Female, Round 1, Birmingham]

I like mile, because when my daughter says to me, mum can you take me somewhere, I can say yes, it's 5 miles so... petrol money. It relates a little bit more, per mile [Female, Round 1, London]

If you look at, if you pull up a journey on Google Maps, it will give you your destination from A to B, and it will tell you how many miles you're covering – so you can then work it out [Female, Round 1, London]

Well I take trips to Manchester on a regular basis, then the pence per mile can help me work out how much my trip would cost, and then, it just gives you a better idea of where you're actually spending your money, essentially for me, because it's in trips, rather than doing, because I was a contractor it could be anywhere, so the cost of the trip is more important to me [Male, Round 1, London]

An unexpected consequence of being able to more easily estimate the fuel costs for actual car journeys was the increased motivation to switch travel mode. On several occasions during the series of focus groups, participants reported that if they knew what a particular car journey would cost in terms of fuel, they would be more likely to consider other travel options for that particular trip – possibly using public transport or even not travelling at all.

M: I think it's [per mile costs] trying to tell the women that are picking the kids up, that's how much it is costing you to pick up, to do the school run F: That you need to walk F2: Yeah [laughing] [Conversation, Round 1, Birmingham]

... you might think well, is it cheaper to go in the car, or cheaper to go on the train. If it was per mile you would know – you could work it out roughly [Female, Round 1, Birmingham]

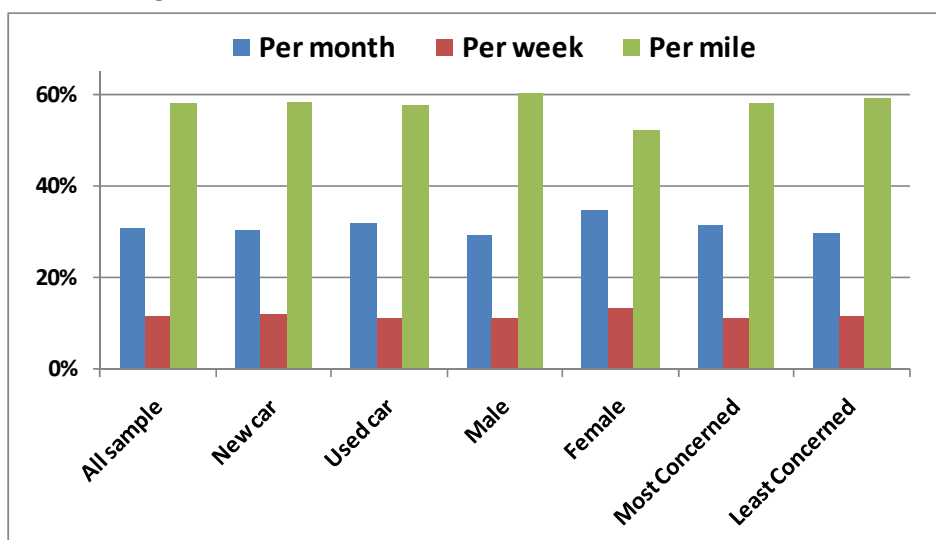
I mean if that's to scare somebody to not use their car so much, 17 pence per mile is brilliant for that [Female, Round 1, Exeter]

F2: If it was someone that wanted me to use my car less that probably would work... The fact that it tells you the price per mile. Q: That would incentivise you to use your car less? F2: Yes, possibly... Q: Because it's so shocking? F2: Yes [Conversation, Round 2, Leeds]

Given the popularity of both monthly and per mile costs, the online survey addressed this issue to more fully understand the most useful costing period in *addition* to the annual one already provided. In response to a multiple-option question, the results show the highest preference is for 'per mile'

with almost 60% of the total sample selecting this option. While very popular, the online survey indicates that the ‘per month’ option is only of preferred by around 30% – see Figure 25.

Figure 25 Q10 Preference for additional fuel cost metric



It is interesting to note that, when testing car buyer’s knowledge of their car’s official data, most participants were able to provide a figure for ‘per month’ fuel costs (59%), followed by ‘per mile’ costs in second place (31%), and annual fuel costs last (26%) – see Figure 16. Confidence was also highest for monthly estimates (39%) and lowest for ‘per mile’ estimates (11%). The apparent discrepancy between the results reported above may suggest that while monthly cost may be better known from experience (and may resonate with monthly pay and bill cycles), car buyers would find ‘per mile’ fuel costs more useful for decision making if the data was available (on the fuel economy label or from other sources).

One last issue to be raised in the context is the ‘cost to fill up a tank’. While not a majority, a large number of focus group participants reported thinking of fuel costs in terms of how much they spent when filling their car with fuel rather than in terms of cost per unit of time or distance driven. This observation was also a key finding of previous LowCVP Car Buyer Surveys.³¹

The scary thing is that, I mean a lot of people would just go into the garage and put say, £20 worth in, and you’ve got it in your mind, oh £20 – that’s probably so many gallons, but when you do the comparison back you think – god, it’s only that. And of course, because it’s gone up so much, based on your original thinking, you are thinking, I’m getting so and so to the gallon, but when you work it out you’re not getting so many gallons to that £20 – obviously [Male, Round 1, Birmingham]

I just go by the cost of filling the tank up basically [Female, Round 2, Cardiff]

Q: Do you know what your car is [mpg]? F: Not got a clue – I just know how much it costs to fill it up [Conversation, Round 2, Edinburgh]

4.4 Comparison issues

4.4.1 Demand for on-label comparisons

Central to all of the focus group discussions – whether they were about fuel economy, CO₂ or costs – was the issue of comparison. Given the potential for providing comparative information on the fuel

³¹ From ‘mpg paradox’ to ‘mpg mirage’: How car purchasers are missing a trick when choosing new cars. Robert Gordon University, Ecolane and Sustain, for LowCVP, 2008. 2010 LowCVP Car Buyer Survey: Improved environmental information for consumers. Conducted by Ecolane, Sustain, and Robert Gordon University, for LowCVP, 2010.

economy label, the project aimed to identify the consumer demand for comparative data and the most effective way that comparative data could be provided.

The first issue explored was the degree to which car buyers would find comparative information useful. In the context of fuel economy expressed in terms of 'mpg', a significant number of participants supported the provision of comparative data on the label.

But it does actually give you something to compare other models with, at a glance. So say if I was there looking at an Audi and I could see what their mpg is, at a glance, I've got something to compare with... [Female, Round 1, Exeter]

If you walked into a showroom with loads of different cars, and each car had that in their window, and they were all different sized cars with different sized engines – it would be a quick thing to look at. I'm not saying you know what the comparison is, but it's a good thing to look at, to be able to say, oh, god, well that one's average, that one, god – that's really efficient and that one's not [Female, Round 1, Exeter]

*Q: Yeah? Anyone want to say a little bit more? Would it change your mind if you knew that there was a more efficient model – not the one that you were just about to buy – would it make any difference to you?
M: Yeah F: Yes. It probably would [Conversation, Round 2, Leeds]*

However, a sizable minority did express some misgivings about seeing comparisons on the label, stating that they could do this themselves by comparing different labels.

You know when you go into a car dealership, you've got things like this, on the screen or on a stand next to it now. Yeah, so putting that, about another car, could be confusing. I mean, that should only relate to the car that you are looking at [Male, Round 1, Birmingham]

My answer is I think that comparison is absolutely useless. Credit us with some intelligence and we will compare them ourselves [Male, Round 1, Exeter]

I just don't see the relevance of it. You know it's £133 per month, so it doesn't matter if it's, on that scale – why's that bad and why's that good – I don't know, it's like, you decide for yourself [Male, Round 2, Edinburgh]

More importantly, many participants were confused by the comparative labels that were discussed, the most common complaint being the lack of clarity regarding the basis of the comparison. This highlighted the importance of more full understanding how best to convey comparative data and which basis of comparison would be most effective for the majority of car buyers.

...I would say that it's meaning that this car is about, on A4, on the efficiency, that it's in the worst third of the... but it's taking me some reading to work that out [Male, Round 1, Exeter]

Well is that in comparison with other BMW models? If it is, BMW might be rubbish – so what's the good of them being the best of the rubbish? If it's comparing, you know, is that just comparing between BMW, or is it comparing between every vehicle that's on sale? So then if you've got 4WD's lumped in with super-minis – it just doesn't mean anything [Male, Round 1, Exeter]

No but why, it isn't clear. I mean, because they've got the bold thing there, and you're given all this 48.4, the 67 – they've got 58.9 standing there, I mean then they've got a little picture with a little line – it doesn't mean anything to me. I don't know what it means [Female, Round 2, Leeds]

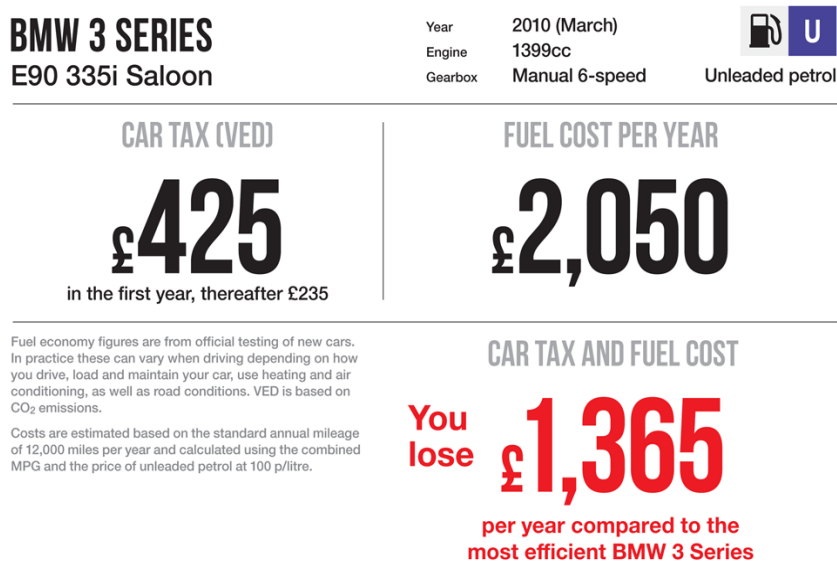
4.4.2 Emotional response to 'loss aversion'

As indicated in Section 2.2, one of the project aims was to apply findings from behavioural science to inform the design of the test labels. In particular, the research team considered how 'loss aversion' theory (which highlights the tendency of people to prefer avoiding losses to acquiring gains) could be applied to increasing the efficacy of label design.

To include this aspect of behavioural science, the Round 1 focus groups were presented with two labels each with a message comparing the annual fuel and tax costs of a particular model with others

in the same model range; one leading with the phrase ‘You lose’ and the other ‘You pay’ [more] – see Figure 26 (and also Appendix 2: B1, B2, Traditional 1 ICE, Traditional 2 ICE).

Figure 26 Q7 ‘You lose’ visual test element (Round 1, B1)



Without exception, all three of the Round 1 focus groups collectively reacted very strongly to the ‘You lose’ label, so much so that its merits particular note in this results section. Almost without exception among the participants involved, the label evoked a strong negative emotional response. When considering the two test labels, many participants were very clear that they wanted the process of buying a car to be a positive experience, albeit an expensive one. Introducing a ‘lose’ message at this stage was, therefore, not welcomed, even if the message was aimed at saving them money in the longer term.

While not hugely popular in itself, the ‘You pay’ message was considered more sober and factual, and resonated with their expectation that buying a car would involve a significant level of expenditure. This contrasted with the sentiment of ‘losing’, which was not considered to be an appropriate way to convey the same information.

Given the strength of this reaction, transcriptions of conversations from each of the three Round 1 focus groups are reproduced at length below.

I don't like the way it's saying 'you lose'... Q: Oh, expand on that... Because I don't think that's a good selling point to somebody, if you want to go and buy something, and you're told you are going to lose something already – you understand you've got to pay, because of course, when you buy a car you've got something to pay. But I don't want to be told that I'm going to 'lose'... Q: I appreciate that point... does it explain it clearly what you are going to lose? ... Yeah, well that I'm going to lose car tax and fuel costs, that's what I'm going to lose. ... to me that's also telling me that this car is crap, that some of our other 3 Series are much better than this one... Q: And basically, it sounds like you don't like that... No [laughing] [Female 1, Round 1, London]

Q: ... so you're happy for it to say 'you pay'... Yeah you pay more, that's clearer in my head than 'I lose', and it being in red, and just looking like danger, and just steer clear and I would walk straight past and not take any notice of it... Q: So that would be a turn off basically... Yeah, and this clearly tells me that I am paying more, which would then prompt me to think, Ok, let me look at something that would cost less. [Female 2, Round 1, London]

Q: [Holding up the test label B1] What information is it conveying to you? F: It's negative... Q: Negative in a good way or negative in a bad way? F: In a bad way... You're losing money, it's almost like saying – don't

buy this, to me... M: Yeah... Q: Is it a warning that might be useful to you, or is it just a warning? M: Well you look at it and you think, oh, forget that. You'd go the other way wouldn't you... Q: It's just a turn off? M: Yeah, it's a turn right off... F: It's appalling isn't it... M: You lose... M2: Yeah, I don't think you would look twice at that. [Conversation, Round 1, Exeter]

Q: [Holding up the test label B1] What does that tell you? F: I just think it is a negative comment, and I can't, I can't see the point of advertising that... M: It's supposed to be a negative comment.. Q: So, you feel, I sense there is an emotional reaction to that..? F2 Well... you lose 1,365... I don't think I would even read anymore... F: But you are going into pay something, when you go into buy a car you are going into pay, so... F2: Well you paying 1,365 more, is still the same as... F: I know, it's just a different way of presenting it, but if I read that, straight away, I'm not going into lose anything, I'm going in to pay something, so that to me is worded better... [Conversation, Round 1, Birmingham]

[Later to confirm] Q: ...obviously the whole framing of the 'you lose' as opposed to 'you pay' is very unpopular with people? F: Yes... F2: Yeah... Q: Can we just re-cap why that was? F: It's negative... F2: If you lose anything, you don't really want to be seeing that do you... Q: So, buying a car is a kind of positive experience? F: Yes... F2: Yeah...Q: Something that you look forward to – and then to be confronted with this information is... F: You expect to pay. But you don't expect to lose... F2: Yeah... F3: Because you're already losing money by driving off the forecourt aren't you. [Conversation, Round 1, Birmingham]

The outcome of these very clear and strong negative signals, was that the 'You lose' messaging was not taken forward for further exploration using the test labels in Round 2. As a result, Round 1 labels known as 'Traditional 1 ICE', 'Traditional 2 ICE' as well as visual elements B1 and B2 were not used in Round 2.

There was also evidence that the group participants were not at all clear as to the basis of the comparison used to make the 'You pay' and 'You lose' figures. This issue, which involves an understanding of how models are compared with others in the 'range', is explored more fully in the next section 4.4.2. A related issue, that of ranking models (which also led to strong emotional reactions in the focus groups) will be discussed in 4.4.4.

4.4.2 Bases for comparisons

Due to the availability of current data sets, the only practical option for providing comparative data is to compare cars in the same 'model range'. Practicalities aside, it became apparent from the group conversations that participants were in two minds about whether 'vehicle class' or 'model range' comparison were preferable; some participants changing their opinions after talking through the issues with others.

Well, if you have decided on the type of car, and you want a 3 Series, then you would be more interested in a comparison of the same series wouldn't you, because that's what you have decided you wanted is 3 Series... [Female, Round 1, Birmingham]

In most cases you would perhaps be comparing a Focus and a Golf for instance, something like that. That's the information and the comparison you want to see, not cars in the same range [Male, Round 2, Cardiff]

Q: Would you like similar cars of the same model, would you like all cars or would you like cars of similar size across different models? F: Similar cars, different models. Because when I was looking for my car, I looked at Renault, Volkswagens, Vauxhalls... Q: And how would you define a similar car in your mind? F: Umm, size, engine size... [Conversation, Round 2, Edinburgh]

Going back to Ford – if I'm looking at a Focus, I'm not going to want to compare it to a Fiesta, or a Mondeo because they're the cars are completely – three completely different cars [Male, Round 2, Leeds]

It also became apparent that, while the term 'vehicle class' was understood by the majority of participants, there was much confusion about the meaning of the term 'model range'.

Well you could say that there's a range in manufacturers – they do their 3 Series range that is the 3 Series, but then they would say, you could say a range as in that category of cars, if you bring in other manufacturers – which range of theirs? So would that be compared to a Mondeo, would it be compared to a Audi A4, or what? You know, who knows... [Male, Round 1, Exeter]

Q: Can I just open that issue about what model range means to you...? F: Maybe it might be some extras on the car? Q: Extras. Yeah, could be extras

I think it's generic. Ford, you know, if you were looking at a Ford Focus it would be that particular size of car across the, you know, not just Ford, other cars [Female, Round 2, Edinburgh]

The model range is, what other cars are similar to this model – not necessarily the manufactures... because the Mondeo isn't the same sort of model range as what I would consider a Focus to be – I would consider other cars, like an Audi A3 or something, to be in the same as a Ford Focus, because it's a similar shape, similar engine sizes... [later] You know what, I don't even agree with what I've just said [Laughing]... I think it's – yeah, Ford Focus ST, Ford Focus.... whatever, all Ford Focus [Male, Round 2, Leeds]

Given that no overall conclusion could be drawn from the focus group discussions regarding the most popular basis for comparison, a series of questions on this issue were included in the online survey. One of these simply asked respondents to selection which option their preferred, 'vehicle class' or 'model range', care being taken to explain the meaning of each term (the response type allowed both options to be selected, and invited suggestion for 'other' options). The results showed an overwhelming majority in favour of comparisons made on the basis of 'vehicle class' – see Figure 27.

Figure 27 Q7 Preference for basis of comparison



The online survey was used to further test car buyer's understanding of comparison terminology by providing a list of vehicles (specifying manufacturer, model, engine size, fuel type and body shape) and asking respondents to place them into the same 'vehicle class' and 'model range' as a Ford Focus, 1.6 litre, petrol, family hatchback. The results are shown in Figure 28. (Note the 'correct' responses for 'vehicle class' are: A, possibly C, D; for 'model range': A, C).

The results show that the respondents had very little understanding of what constitutes a 'vehicle class', despite this being the most popular basis for comparison by far; fewer than 10% of the sample were able to answer this question correctly. The responses shown in Figure 28 suggest that manufacturer and engine size are the key factors being used by respondents to group vehicles into a class, fuel type and vehicle shape being less important. A different manufacturer seems to disqualify a vehicle from being the same class according to these results.

Figure 28 Q6a Same 'vehicle class' as Ford Focus 1.6 petrol family hatch

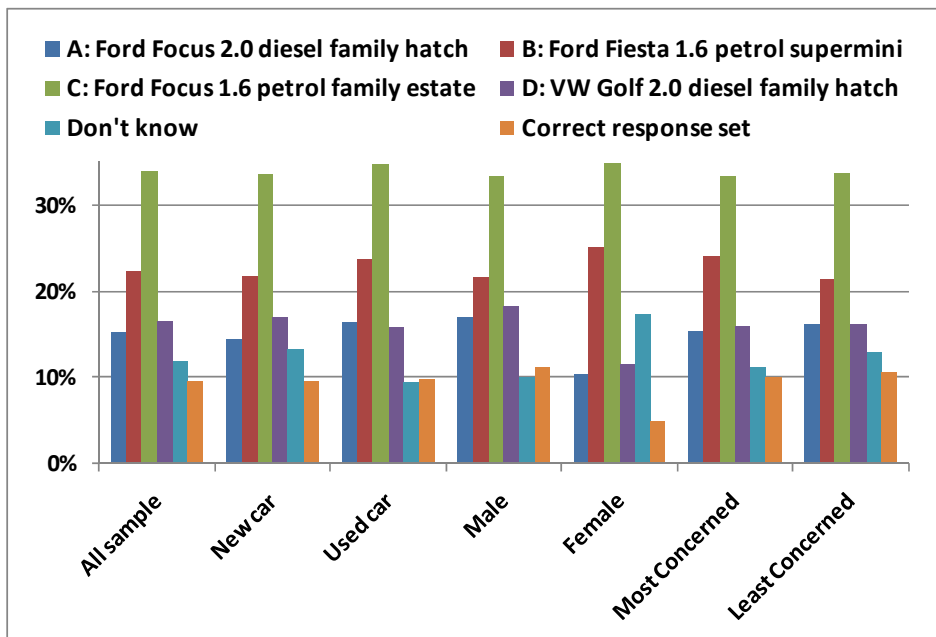
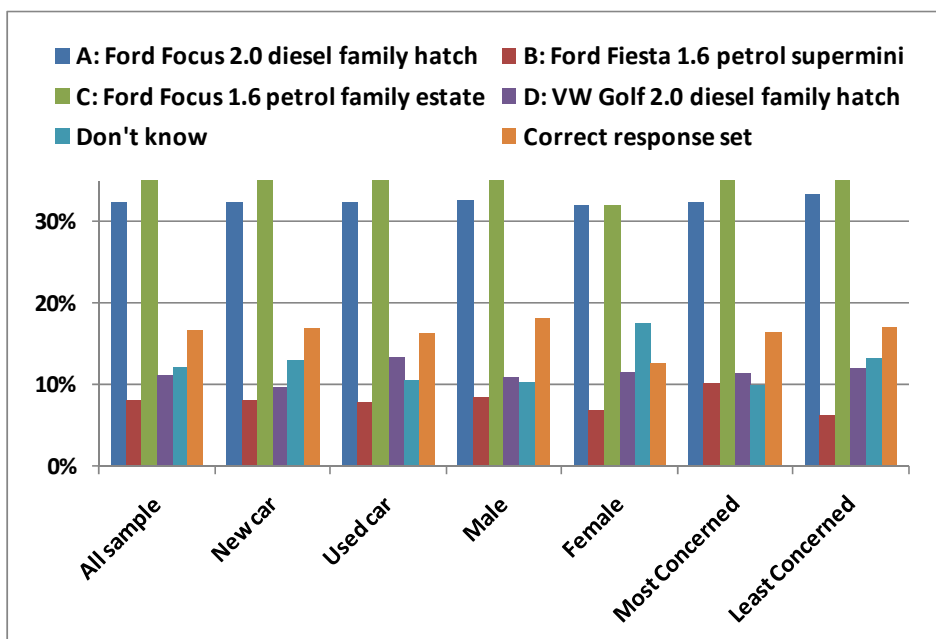


Figure 29 Q6b Same 'model range' as Ford Focus 1.6 petrol family hatch



For 'model range', the results shown in Figure 29 initially look more encouraging with over 30% of respondents selecting the other two Ford Focus models from the vehicle list provided. However, around 20% also selected other models in the list with the result that only 17% of the online sample selected the correct set of models; although a higher proportion than selected the correct set for the question regarding 'vehicle class'.

4.4.3 Timescale for comparisons

One last issue discussed in the context of the basis of comparison was the timescale over which fuel and tax costs are compared. Some of the alternative labels presented cost comparisons over a three year period in contrast to the more usual and current one year time frame. Of the two options, the

majority of focus group participants were in favour of an annual comparison, the main resistance to three year period being the long-term uncertainties in fuel price and VED rates.

I would like the three year comparison, because I get cars every three years, I just get my whatever, like I've just done in 2010, and then at the end of three years I will get another one basically – so for me it's actually quite handy [Male, Round 1, London]

It's not so much bad news – it's just I can't think three years ahead. You know, I'm here and now – who knows what's going to happen, you know I can't, it's not going to be the be all and end all that I buy this car because over three years it's going to save me this or cost me this [Female, Round 1, London]

And also we don't know what will happen to the fuel prices in three years time [Female, Round 1, London]

F: I don't like this! I don't want to know that I am going to be paying £7,000 over three years. I don't want to know that. I'd rather not think about that. You just do it without thinking about it. Q: Is it useful even though you don't want to know? F: No. It's not useful. It's a deterrent. Q: What would you do with that information? F: I'd rather just not see it – I'd rather not know that I was going to be forking out £7,000 Over the next three years, it's easier to do it just doing it without thinking about it! [Laughing] [Conversation, Round 1, London]

4.4.4 Design options for presenting comparisons

The visual elements used to test model comparisons are shown in Appendices 2-3.

At several points during each focus group, alternative labels showing comparative information were presented to participants for discussion. These included comparisons of 'mpg', fuel cost, VED cost and annual fuel and tax costs combined. Across all these issues, a number of key observations can be made regarding the presentation of comparative information.

The first is the demand for clear explanation of the basis of comparison (which ever basis is used) and for all comparative scales (in whatever form) to include clearly marked appropriate numerical scales. Where appropriate, many in the focus groups also welcomed the addition of the actual model name alongside the 'most efficient' or 'best' as shown on the scale.

M: Yeah, there's the... it's the 43rd in the BMW 3 Series range – that's the first time we've seen saying what that bar graph is comparing it with... Q: So that's important? M: Well whether it's any better or not – the layout isn't as good as the speedometer one – but there is actually some writing underneath to tell you what, where or why it's... Q: So B4 is clearer on the basis of comparison? M: Yeah

F: B2 graph is definitely clearer than B4 graph Q: Why is it clearer? F: Because it puts the 170, it shows you on the graph with two figures either end, at the bottom [Conversation, Round 1, Birmingham]

M: I think B3 [dial] is better, but the one thing that it does do, it just says 'best', whereas that one [slider]... it gives you a figure, it says £92, so you can't see like, where 170 is... F: We didn't like the 'best' F: So, if that had 92 and 268 there, it should have the figures either end F2: Yes, I see what you mean Q: Oh Ok, so you would prefer to actually have the numbers F: Yeah [Conversation, Round 1, Birmingham]

F: It does tell you that it's just over half way to being one of the most efficient cars, and then there's also a little bit about the eco stop-start – where it stops when, you're at traffic lights and things like that... Q: ... and is it clear that that eco stop-start is the most efficient model? F: I think it's only clear if you happen to have a stop-start car, or read it – you may not know anything about them [Conversation, Round 2, Leeds]

One of the three main approaches used to visually present comparative information during the label testing was the so-called 'slider' design – two examples of which are shown in Figure 30 (applied to monthly fuel cost comparisons). Although the evidence is qualitative in nature, the focus groups expressed a significant level of support for this design style.

Q: Did you say bar graph? Yeah it's got that bar graph F: And when it says best BMW 3 Series, that's much more clear. But say if you were going to, if you were interested in emissions, or bothered by them, then you would know that the 3 Series would be the better one out of the two to go to [Conversation, Round 1, Birmingham]

Q: What do you think about the scale? Is it useful having it there, because it wasn't on the other ones M: Yeah, I mean it's just a visual representation isn't it. So, you know, it's all about picking stuff up quickly, and yeah you can see, on a general scale of economy, this car is just under half way as to what it could be if, I presume, you went for a greener car [Conversation, Round 1, London]

Figure 30 Examples of 'slider' style visual comparison labels (Round 1)

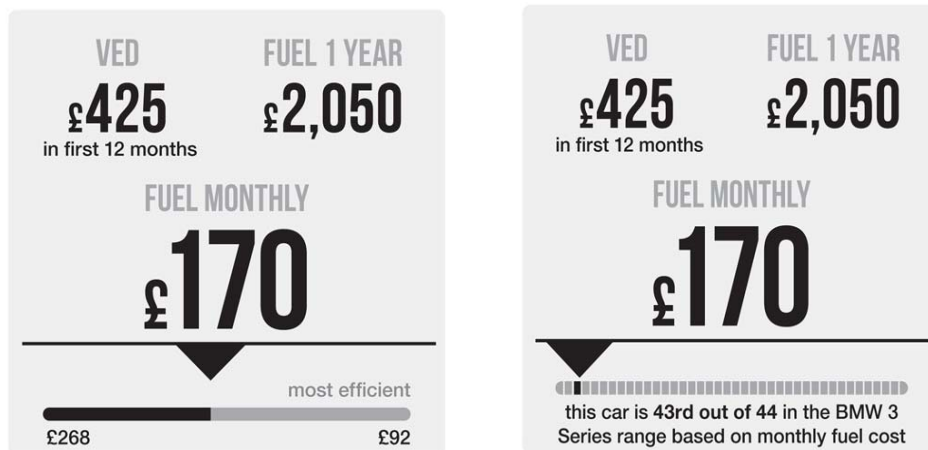
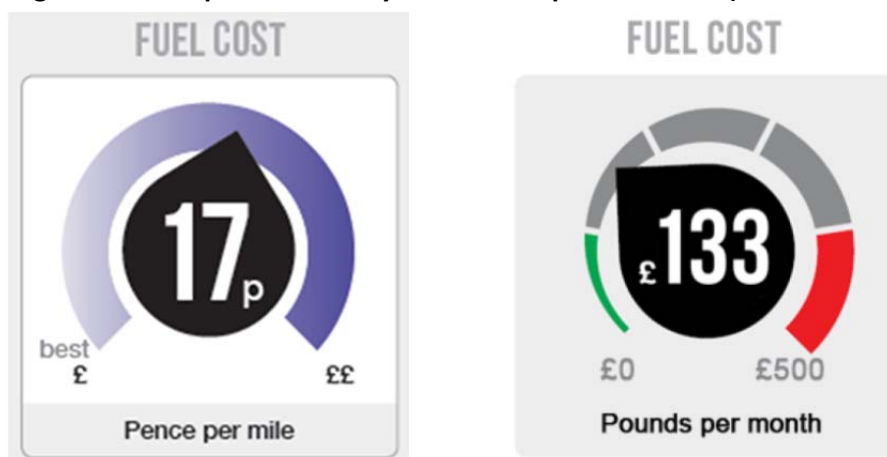


Figure 31 Examples of 'dial' style visual comparison labels (Rounds 1 & 2)



One notable observation made during the Round 1 focus groups was a very strong and negative reaction to the 'slider' showing information in ranked format (Figure 30, right) as opposed to the use of a linear scale. The reaction was quite emotional in most cases with participants expressing incredulity that there could be so many models within the BMW 3-Series range.

F: There can't be 44 different types of BMW 3 Series, can there? There can't be 44 different cars... Q: There are, apparently... F: 44? In one series? In a 3 Series?... M: Different shapes, power to weight ratios... F: I thought, I can't have read that right... F2: We didn't get that either [Conversation, Round 1, Birmingham]

F: Well, they are telling you something different in as much as with this one they are telling you that there are 44 cars in that series, which just seems unbelievable, doesn't it? And really, in a way, you don't need to know that – I don't want to know that I'm second to last, whereas that one shows it more sort of in the middle with a figure either end, on B4 [Female, Round 1, Birmingham]

I wouldn't have thought there were 44 different models in one series – that astounds me. How can you make 44 different types of one car [Male, Round 1, London]

In the context of fuel economy, the display of comparative information using a slider style scale was explored more fully in the web-based survey. Presented with the three visual elements shown in

Figure 32, respondents were asked to select the option that most clearly compared the fuel economy of a particular model with others in the same range (terms explained).

While the result of this question confirms one of the previous findings from the focus groups (the preference for the clarity of the ‘white-on-black’ ‘mpg’ design), it is also at odds with the negative reaction to the ranking design reported earlier, the online sample showing equal support for the ranking and linear scale options. (One possible reason for this discrepancy is the fewer number of models ranked on the online survey label as compared to the 44 models of the focus group label.)

Figure 32 Q8 Preference for MPG comparison design (Round 2)

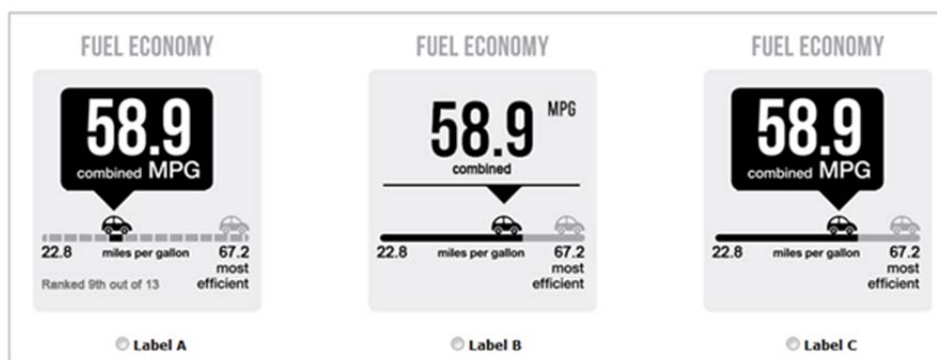
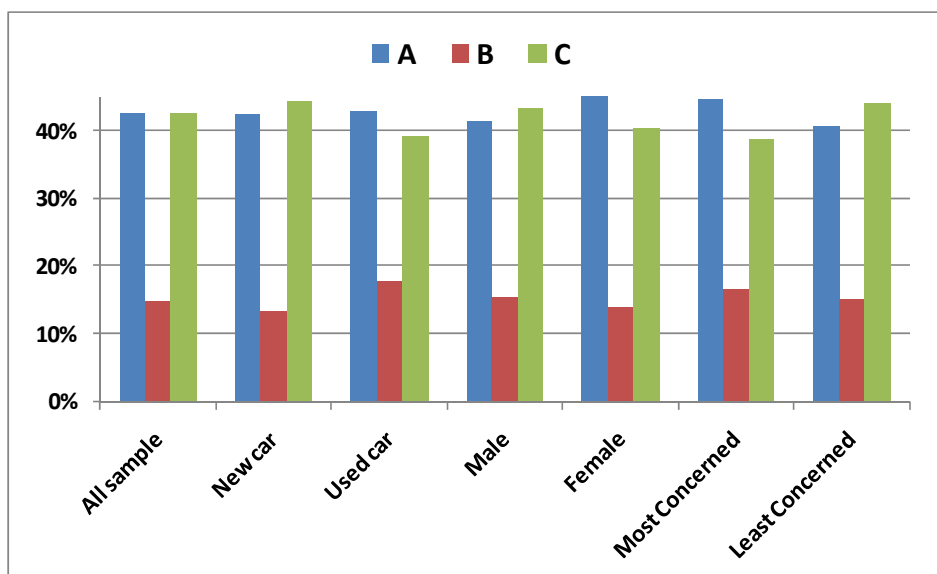


Figure 33 Q8 Preference for MPG comparison design



Second of the three main methods used to presenting comparative information was the so-called ‘dial’ design – two examples of which are shown in Figure 31 (applied to ‘per mile’ and ‘per month’ fuel cost comparisons). As was the case for the ‘slider’, the focus groups expressed a significant level of support for the ‘dial’ comparison design style.

Q: Why do you prefer B3? F: Because it stands out better doesn't it... Yeah it's a bit more clear information for us Q: Why is it clearer? F: I think this graph is a bit clearer... because of the use of the... F2: It's like a milometer... F: That's it [Conversation, Round 1, Birmingham]

I prefer the speedo, but one thing that I think is missing is the figures, you know on these ones they have £92 and most efficient, so maybe having those figures down there as well [Male, Round 1, London]

Rita and I prefer D1, again it's very clear and plain to see. We quite like the speedo thingy, although we discussed it and thought that we would prefer it if best and worst if had a little monetary value next against it – that would make it a bit better [Male, Round 1, London]

In an attempt to better understand the relative popularity of the ‘slider’ and ‘dial’ comparison designs, the online survey presented the same information using three label options and asked respondents to select the option that most clearly compared the fuel costs of a particular model with others in the same range (terms explained) – see Figure 34.

Figure 34 Q11 Preference for fuel cost comparison design

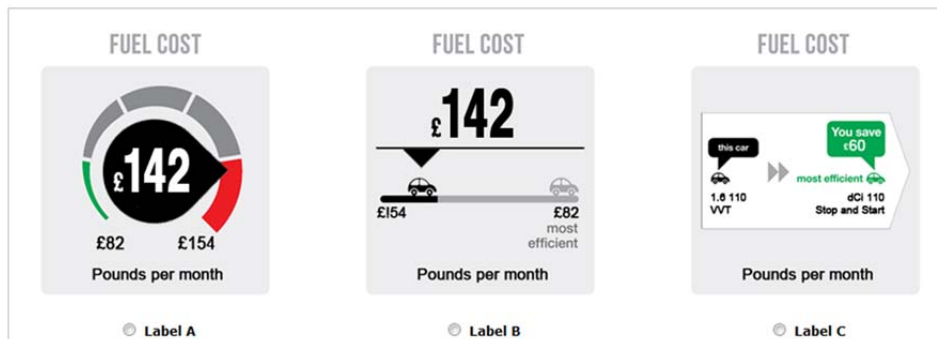
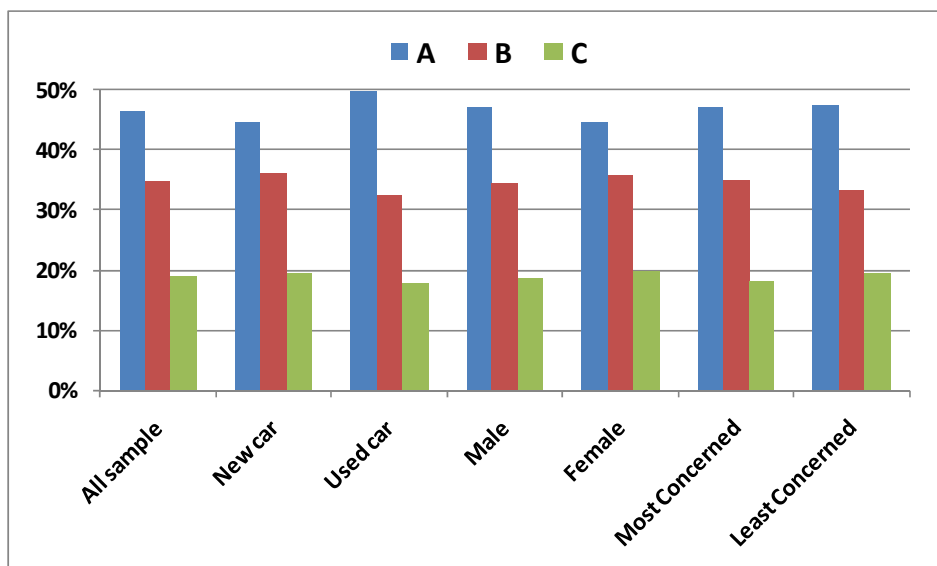


Figure 35 Q11 Preference for fuel cost comparison design



The results show that, when used to compare fuel costs over a monthly timeframe, respondents have a preference for the ‘dial’ comparative design. However, two issues should be noted: first, the strong second preference expressed for the ‘slider’ design; and second, the fact that the result may be context dependent and may not be the case when comparing other metrics.

Third of the three main options tested to visually present comparative information was the so-called ‘Buyer’s Guide’ – two examples of which are shown in Figure 36 (from Round 2). As shown in the top image, some of the labels tested included logos from well known and less well known organisations including WhatCar?, VCA and DfT. Although a mixed reaction overall, the focus groups expressed some support for at least one version of the ‘Buyer’s Guide’ format.

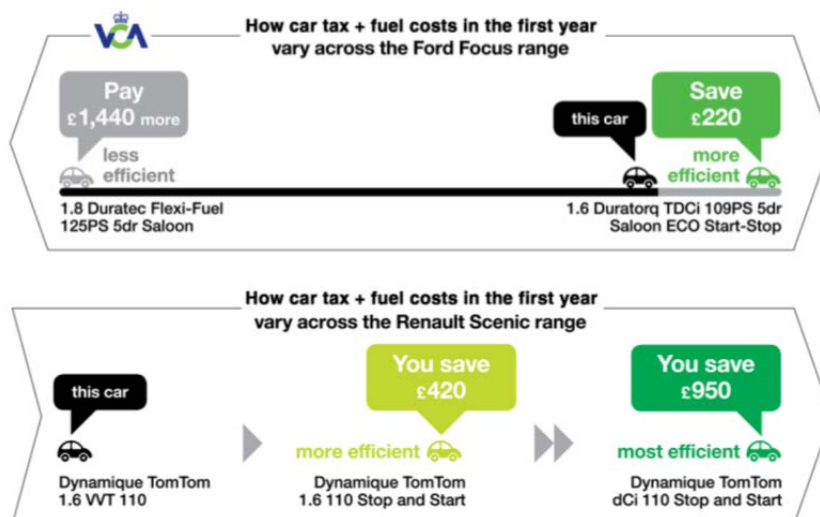
Yeah... the moment I looked at it I wasn't confused or having to work things out as much as I have done on the other ones, so, it's very clear. I think the very fact that it says 'worst' and 'best', and with What Car? there, because that's going to have an indication of how they have things in their magazine, it's not, 'the worst' doesn't have the negative connotations as, 'you lose' – which is a lot worse I think. So, I thought it was really good, very easy to work out and quite explanatory [Female, Round 1, London]

In a way it's quite good, because it's telling you about a different type of car, and it's telling you that that one is going to cost you £1,440 more, so it's actually... telling you that there's £1,440 difference... when I

first looked at it I thought it was to do with the price of the car, but it's not, it's actually that the car tax and fuel [Male, Round 2, Edinburgh]

Its saying don't buy the car you're thinking about, buy the greener one! [Male, Round 2, Leeds]

Figure 36 Examples of 'Buyer's Guide' style visual comparison labels (Round 2)



Two main variants of the 'Buyer's Guide' were tested; one showing the 'best' and 'worst' in a model range (Figure 36, top image), the other 'better' and 'best' models (Figure 36, bottom image). Overall in the focus groups, opinions were divided as to which was the preferred option.

Q: ...is it better to see something that is a bit better, rather than just the best, on this definition? Is that a general...? F: It is on this scale, because you've got an option then haven't you F2: Yeah, yeah F: You've got the option of what you want to do, and which model you want to... it's giving you a bit more of an option on that, I believe [Conversation, Round 2, Leeds]

Q: Ok, but, why do you want to see both ends? Because you're not going to go and buy the worse efficient car ... why would you want to see it there? F: People have got to have the option – everyone has a budget. And they should be allowed to – they can't say what a person's going to buy and what they aren't going to buy – that person's is on, in some way, a budget, let them decide what they want to buy. They might not be able to afford that, but they can afford that [Conversation, Round 2, Leeds]

I was going to say basically what Linda said earlier, that, what's to the back of this – to the left hand side? There's nothing – if you're going to show what's better than this car, why don't you show, to be fair, what's worse than this car? [Male, Round 2, Leeds]

While there was broad support for one of the 'Buyer's Guide' options, there was also a significant level of criticism about the comparisons which focus solely on fuel and VED costs over one year. The main issue raised was the omission of other costs – such as purchase cost and/or depreciation rates – which were thought by some to be more significant than the fuel and tax costs presented. (This also links to the perceived 'trade-offs' of buying a more fuel efficient car – see Section 4.8.)

I'm just thinking, that it would also help me if I knew the cost of the cars, because that would be a major factor. You may be telling me that I'd only pay £1,480 less with an M3, but then how much is an M3? And how does that relate to me – would that even be a factor? [Female, Round 1, London]

F: It's like a sales pitch isn't it ... Q: More like a sales pitch? By buying that you can save that, and by buying that you can save that. But at the end of the day, costs are involved [Conversation, Round 2, Leeds]

Just one point – that should say in that last box, that should say 'you save on running costs'. The reason why we want running costs, are the fact that a diesel car will cost you more money than a petrol, initially, so you lose on the purchase price [Male, Round 1, London]

In order to get quantitative evidence regarding the popularity of the different ‘Buyer’s Guide’ options, the online survey presented the same information using two labels and asked respondents to select the option that most clearly compared the fuel and tax costs of a particular model with others in the same range (terms explained) – see Figure 37. While a sizable proportion were in favour of the ‘better/best’ version of the ‘Buyer’s Guide’ (around 40%), a larger proportion (60%) stated their preference for the ‘best/worst’ version.

Figure 37 Q12 Preference for fuel and tax cost comparison

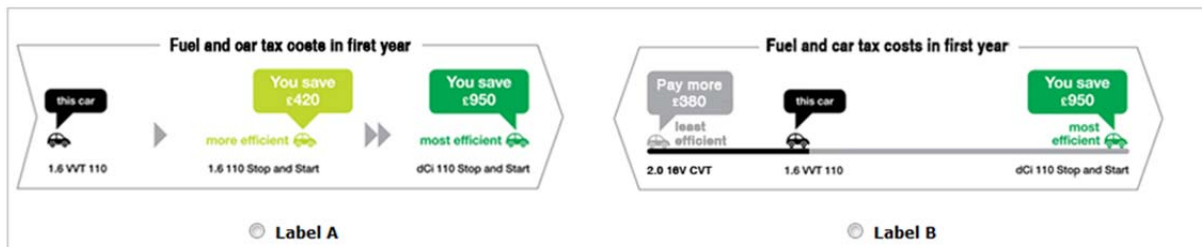
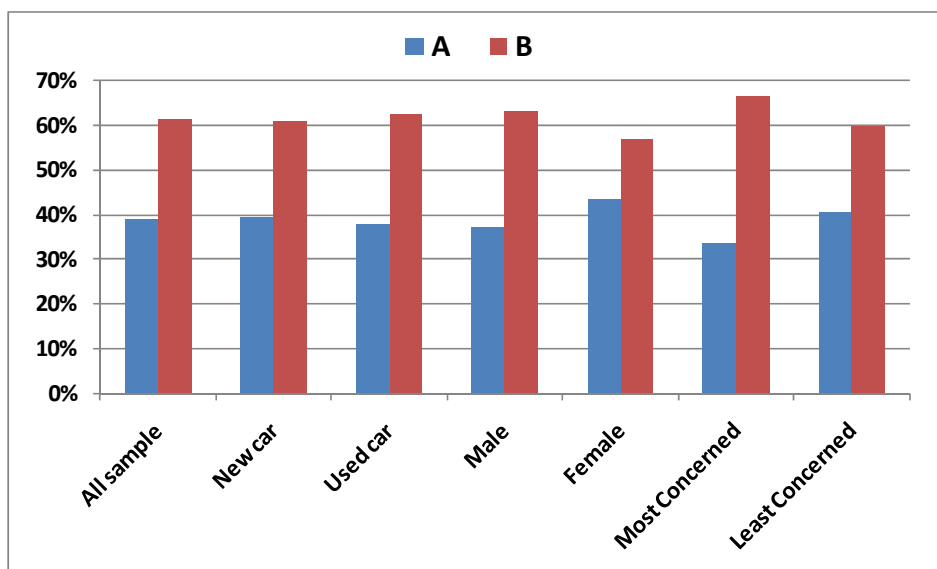


Figure 38 Q12 Preference for fuel and tax cost comparison



As part of the focus group discussion of the ‘Buyer’s Guide’ labels, the issue of the information source was raised. As shown in Figure 36, several of the alternative labels tested included logos from well known and less well known brands including WhatCar?, VCA and DfT. While only a limited number of brands were discussed in order to test the principle of whether Government or other sources would be better received, the focus group comments suggest that citing well respected and independent organisations adds credibility and authority to the way the cost comparisons are perceived. This issue links with the ‘trust’ issue discussed in Section 4.1.3.

M: I think that, for something to look at, I think that do a comparison online or otherwise, What Car? give their credibility to this vehicle, by the various rigorous tests that they carry out on that car. It supports what this is all about. It is informative because people trust What Car? M2: Actually Which? would be better [Conversation, Round 1, Birmingham]

It’s quite clever they’ve put What Car? in, because we live in a world of comparisons now, and the fact that they’ve put the What Car? in, people would look at that and trust that... the What Car? buying guide – [one] might sort of take that away from the fact that, Ok, they’ve done the research and they’ve got the answers. I think it’s quite clever that they’ve put that on there [Female, Round 1, Exeter]

I think because you’ve got What Car? on there you immediately think, someone’s looked at it already for me – I don’t have to think about it. So therefore it’s a good thing – if someone else has rated it already. Someone’s done the leg work; it’s got a rating of X – even though that might be... [Male, Round 1, Exeter]

I think people know, Which? magazine or What Car? magazine, or most people know that they're independent. So, you can trust them more, because they're not influenced by anybody [Male, Round 2, Edinburgh]

Although WhatCar? was the main non-Government organisation proposed to the focus groups by the survey team, participants were quick to suggest other organisations they considered authoritative. These included Which?, the AA, the RAC. They also indicated that, should Government agencies make themselves better known, official Government figures were also to be welcomed. Underlying these opinions was the suspicion that manufacturers were in control of the data being presented.

Q: And apart from What Car? are there any other independent sources that you would trust? About cars... M: Which?... Q: Ok, What Car? or Which? Any third? M: RAC? Or The AA? Possibly [Conversation, Round 2, Cardiff]

Q: Can I just add one quick thing – so, we have said that What Car? lends some credibility, what about if it was some sort of Government agency's logo here, would that be credible? F: Yes M: The VOA or someone like that... M3: I don't think it is actually right to promote a third party which is a commercial organisation [Conversation, Round 1, Birmingham]

One other issue is also worthy of mention with regard to the use of independent information sources. Research shows that consumers tend to 'satisfice' when sourcing product information, only searching to a threshold level of 'adequacy' at which obtaining further information (in order to make an optimum choice) is considered too costly in terms of time and resources.³² Where information sources are trusted, car buyers may therefore rely on this information to reduce the (perceived) need for further time-intensive research.

4.5 QR Code Reader

In the second half of the focus groups, new technologies were introduced to the participants for their consideration. These included a relatively recent IT technology, the QR Code reader, which was first demonstrated and then tried by the focus groups participants. As detailed in Section 3.1.2, two live tools were tested: a personalised fuel costs calculator, and a 'glossary' providing detailed information regarding a terms used for electric vehicles. In Round 2, a third model comparator tool was also presented in a 'mock-up' format rather than as a live test.

Although not a statistically large sample, many of the focus group participants indicated a general recognition of the QR Code and how they were intended to be used.

Q: So you don't know what they are called but you know what you do with them? What do you do with them? F: You point your iPhone or you smart phone whatever you've got to it, and it downloads the information onto your phone [Conversation, Round 1, Birmingham]

I see them all over the place – literally, on ads, in magazines, on bill boards... [Female, Round 1, London]

Q: Ok... you obviously recognise them... do you know what they do? F: Yeah, they take you straight through to a website [Conversation, Round 1, London]

4.5.2 Attitudes to QR Code reader

Across all six focus groups, the vast majority of participants were impressed by the ability of the QR Code reader to automatically link the printed label to live online information. Even those who had never seen a QR Code before voiced positive opinions about the technology.

Q: What are your impressions about the technology? Six of you had seen the QR code... F: Brilliant F2: I thought it was amazing [Conversation, Round 1, Birmingham]

³² Prabha, Chandra, Lynn Silipigni Connaway, Lawrence Olszewski, and Lillie R. Jenkins. "What is enough? Satisficing information needs." *Journal of Documentation*, 63,1: 74-89, 2007.

I think it's accessibility – it's having the information available if you want to use it, depending on your technical knowledge, your need to know. It's as simple as that [Male, Round 1, Birmingham]

Great. I was really impressed – I've never really used one of these before, and when we did the calculator I thought that was brilliant [Male, Round 1, London]

A minority however did express a lack of interest or reservation about using such a device, with most negative comments highlighting the fact that the tools were only as good as the target website, or raising privacy concerns associate with stored data.

I've seen them but I don't use them, because for me, it's too technical. I'm just not interested [Female, Round 2, Cardiff]

... all the QR code does is take you back to an internet site ... You know, it's the website behind it – how you access the website, whether it's through a QR code or with your finger typing into the keyboard, I think is less important [Male, Round 2, Cardiff]

To be quite honest... I was just thinking, if you were involved in a traffic accident and you had killed somebody, for arguments sake, your iPhone is available for evidence in that inquiry – and you have recorded yourself as a boy racer – I mean... [Male, Round 1, Birmingham]

Of the majority who expressed support for including a QR Code on the label, many were quick to imagine how such a tool might be used (when researching models or in a showroom), and to highlight the advantages of having fast access to information under one's own control.

I suppose it's accessibility as well – the fact that you have got the information to hand when you are going out looking for vehicles, whereas normally when you're researching it you are at home on the computer [Male, Round 1, Birmingham]

M: I've seen these but I didn't realise that you could use them like this – I think it would be a really good feature. If you're in the showroom and you want to know a little bit more – rather than ask the dealer, you can just go, bang, and you've got the information to hand – so it's great F: Yeah, it puts you a little bit more in control doesn't it [Conversation, Round 1, London]

Yeah I do think it's good because you don't have to stand around in the showroom reading things, you can take it home. Once you've zapped it you can then store it on your phone [Female, Round 1, London]

4.5.3 Options for QR Code reader tools

Of the two QR Code reader tools tested, all focus groups³³ were clear that the 'fuel cost calculator' was by far the most useful, preferring it to the less interactive information glossary. The main reason for this view was the ability to *personalise* the calculation resulting in a more relevant, and more trusted, estimate of fuel costs.

Q: What did you think about the tool? Was it useful? F: I'm going to get the app as soon as I get home [Conversation, Round 1, Birmingham]

I thought that calculator – to be able to put in your miles, the sort of driver you are, the cost of fuel – and to calculate was a brilliant idea [Female, Round 1, Exeter]

Everybody's different, mileage is different, type of driving is different – everything is different so you can personalise it [Female, Round 1, Exeter]

M: I've seen these but I didn't realise that you could use them like this – I think it would be a really good feature. If you're in the showroom and you want to know a little bit more – rather than ask the dealer, you can just go, bang, and you've got the information to hand – so it's great F: Yeah, it puts you a little bit more in control doesn't it [Conversation, Round 1, London]

F: It's brilliant – I think it's brilliant [cost calculator]. Whereas the other one that we used is too much information, too much print and like, you know just standing in the showroom you have to read it all – it

³³ The QR Code was tested in five of the six focus groups. Given the evident high level of support for the tool, the time used to test the QR Code was reallocated in the sixth workshop to allow more time to test plug-in hybrid labels.

wouldn't interest me... Q: So you would prefer some calculator rather than flat information F: Yeah [Conversation, Round 1, London]

In addition to indicating support for the 'fuel cost calculator', several participants in the focus groups also offered suggestion as to how the tool could be improved, including the addition of a save function to enable access to the information at a later date.

Is there like, on that software that you can save your details, your mileage whatever, and then swap across – is that what you're saying you could do? ... Once you've saved it, put your stuff in then just move it across, on those cars [Male, Round 1, Exeter]

... it would be better if you had a single app on your phone and you go round to a dealership, and scan the code and it would add the information into your application so you could go round scan them all, and then you could compare in the app on your phone [Male, Round 2, Cardiff]

4.6 Electric cars

4.6.1 Issues specific to electric vehicles

During the second part of the 'new technology' session, electric vehicles (EVs) were introduced to the participants for discussion. First a short presentation was made to the groups to explain the basic capabilities of the latest commercially available EVs including the Nissan LEAF. Participants were also given a short time for a question-and-answer session so that all members of the group could become acquainted with the technology.

Both during the introductions, and when first presented with test labels designed for electric vehicles (two example of which are shown in Figure 39), many of the focus group participants (who had no direct experience for owning or driving EVs) voiced their initial concerns about some of the limitations of electric vehicle technology. One of these limitations concerned the maximum driving range on one charge.

... the fact that it goes 80 miles, you know the practicality of it would make me go, yeah, what is the point of this car? I can't even get to Bristol and back [Male, Round 2, Cardiff]

You can only drive 100 kilometres before your battery runs out – it's the first thing I would see [Female, Round 1, Exeter]

Or the distance is it? You can't just say, oh, we'll drive to Manchester this weekend, because the car... they don't go very far [Female, Round 2, Edinburgh]

Another common concern was the length of time to charge an EV and the uncertainty about the location of publicly available recharging points.

Yeah you charge it while you're asleep I suppose, but, it wouldn't be much good if you go away on a journey and you want to go out again, and you haven't charged it up [Male, Round 1, Exeter]

But, if you were buying an electric car, with a limited range, I'd want to feel confident that there are sufficient places that I could go and actually plug in [Male, Round 2, Edinburgh]

While not included on any of the test labels, a third issue that focus groups gave significant attention to was the high purchase price of vehicles and battery packs. This issue is linked to, and is an extreme example of, the perceived 'trade-offs' of buying a more environmentally friendly vehicle – discussed on more detail in Section 4.8.

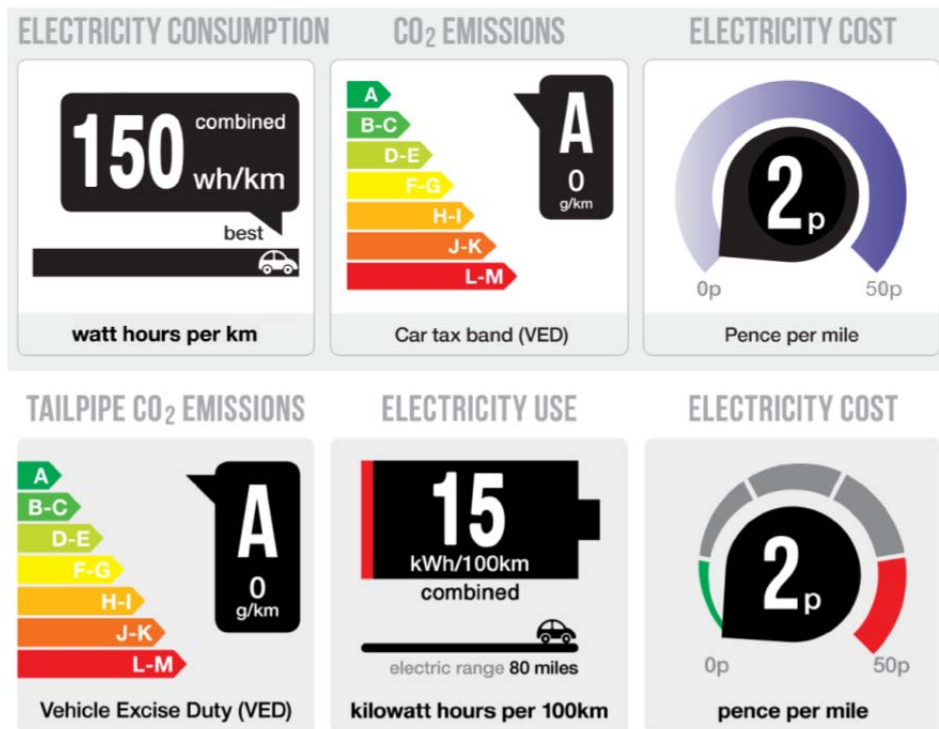
F: Oh you will have a massive outlay, on the price comparison I reckon that's a massive outlay to buy one of those. M: Or you could have a massive outlay to replace the battery [Conversation, Round 1, Exeter]

The cost of them – they're very expensive, so they're actually not economical at all, because you will pay so much for an electric car normally, that the saving that you're making doesn't equate to the cost of the car

and the running of it. Yeah, it will be cheaper to run, but you could buy a simpler diesel car, which is, over 5 years, actually cheaper to run than buying an electric car... [Male, Round 2, Edinburgh]

Well it's double the price and you can't even go more than 80 miles on it – who can afford to do that? [Male, Round 2, Leeds]

Figure 39 Examples of test labels for electric vehicles (Rounds 1+2)



4.6.2 Presenting electric vehicle information

One of the key objectives of the survey was to ascertain the most effective way to convey electricity consumption as opposed to fuel economy information. In contrast to the popularity ‘mile-per-gallon’ (as evidenced by this and other surveys), little prior knowledge was available regarding car buyers understanding of electric energy units including watt-hours (Wh) and kilowatt hours (kWh).

The evidence from the focus groups suggests a very low understanding of both ‘Wh/km’ and ‘kWh/100km’, two of the electricity consumption units trialled on the EV test labels.

Q: Ok, alright, and in terms of the units – we’ve got 10 watt hours per kilometre, 10wh... F: That means nothing to me F2: Nor me Q: ... Does a Wh per kilometre mean anything to anybody? F: Absolutely nothing [Conversation, Round 1, Exeter]

Q: Ok, does that mean anything to anybody? Wh/km? M: No, no F: Where’s that? F2: Is that wattage? Kilometres M: Not really F: Wattage M: Yeah it’s something to do with your electrical usage M2: What the ‘h’ then? [Conversation, Round 1, London]

Q: Do you understand what a kWh is? F: Kilowatt M: Kilowatts Q: Kilowatts? F: Isn’t it kilowatt-hours Q: Kilowatt-hours? F: I wouldn’t know what it is M: It’s a measure of electricity [Conv., Round 2, Cardiff]

Several focus group participants also commented on the use of kilometres in this context, preferring distance to be expressed in miles. (This issue is linked with the general preference for fuel economy to be presented in imperial rather than metric units – see Section 4.1.2.)

Couldn’t they do it in miles? Why did they do it in kilometre? [Female, Round 1, Birmingham]

There's also a mix up with kilometres and miles, then, you know, why don't you stick to one or the other? Everybody drives in miles, nobody drives in kilometres – well I don't drive in kilometres, I wouldn't know how far... [Female, Round 1, Birmingham]

Kilowatt hours per... they should have changed kilometres to miles, obviously, because we're in England [Male, Round 2, Leeds]

Given the preference for petrol and diesel fuel economy to be presented in 'mpg', some of the EV test labels were used to test focus group reaction to presenting electricity consumption in terms of its petrol 'mpg equivalent' (assuming 8.9 kWh/litre petrol). In general, this option was well received due to its comprehension by participants who were able to contextualise the figures and compare them with conventional vehicles.

The ones that say 'mpg equivalent' is more meaningful than the other ones [Male, Round 2, Edinburgh]

The point I'm trying to sneak in, is that we all measure engine power as horsepower, and no one actually knows how much one horse is anymore. But it's a relative thing – you can say that I've got a certain number of horsepower, the others are bigger, or smaller, and it's a case of what people recognise really. I think, theoretically, the new technology should move to the new measuring system. But like horsepower, it is probably better that you stick to something that you remember. Or it's an option anyway, so that's just confusing it now [Male, Round 2, Edinburgh]

I think what would be more informative, would be to keep that 168 miles per gallon, but somewhere on the side say how you got to that figure in the first place [Male, Round 2, Leeds]

However, several potential issues of using a 'mpg equivalent' figure were raised by participants. These were linked to the maximum EV driving range and (as is the case with conventional vehicles) the credibility of the test data.

That would attract me more, because I was thinking – wow, 168 miles per gallon. And then you read the small print – you're not going to be going 168 miles [Female, Round 2, Leeds]

Q: Miles per gallon equivalent – what does that mean to people? M: It explains it better than the kilowatts, but it's not going to be that all the time. If you put your lights on it will decrease [Conversation, Round 2, Leeds]

In order to quantify the relative popularity of the different options for presenting electricity consumption information, the online survey presented a list of six possible metrics and asked respondents to select the option(s) that they would prefer to appear on a future EV label. As shown in Figure 40, the most popular metric selected was 'mpg equivalent' (MPG-e: 41%) followed by 'miles-per-kilowatt hour' (Miles/kWh: 29%). All other options (including those suggested by respondents) were selected by fewer than 12% of the sample.

This survey question was posed in connection with a second graphical question that offered three options within a design element – see Figure 41. A similar response was found with 'mpg equivalent' (MPG-e) accounting for 63% of all responses, and 'miles-per-kilowatt hours' (Miles/kWh) in second place at 30%.

Test labels showing electricity and tax costs for electric vehicles were also presented to the focus groups for consideration. Apart from the issues of high capital cost (reported above), participants were generally impressed by the low running costs.

Q: Ok, so what are your reactions to these labels? F: Electric cars are a lot cheaper to run, than fuel cars [Conversation, Round 1, Exeter]

No car tax – that's a perk. That's a selling point [Female, Round 1, London]

F: I'm sold [laughing]... Because it's cheap... It's cheap cheap Q: And is this label making it clear quite how cheap they are? F: Very much so, yeah. It's the best for electricity costs – it's most efficient basically. Per month – pittance, per year – pittance. No tax – yay! [Conversation, Round 1, London]

Figure 40 Q13 Preference for electricity consumption units

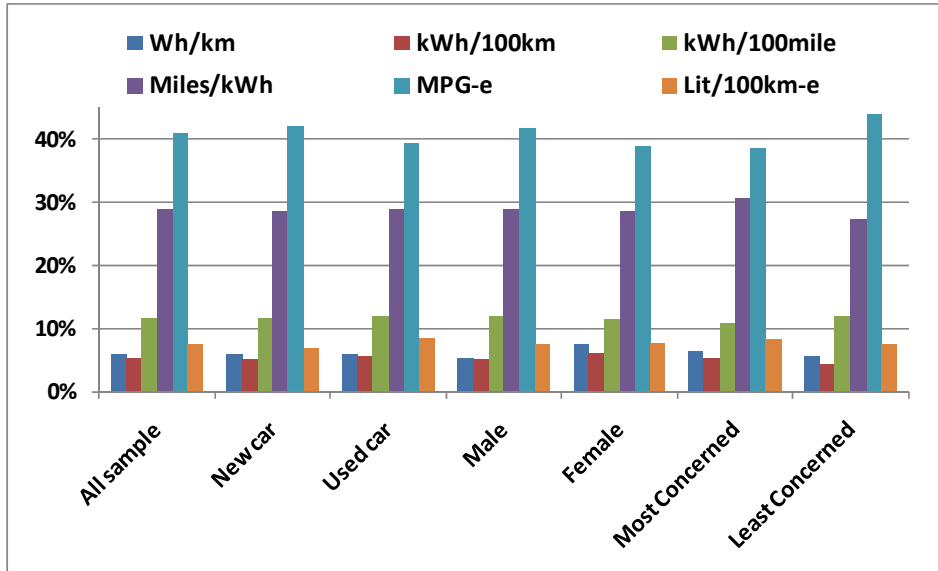


Figure 41 Q14 Preference for electricity consumption units

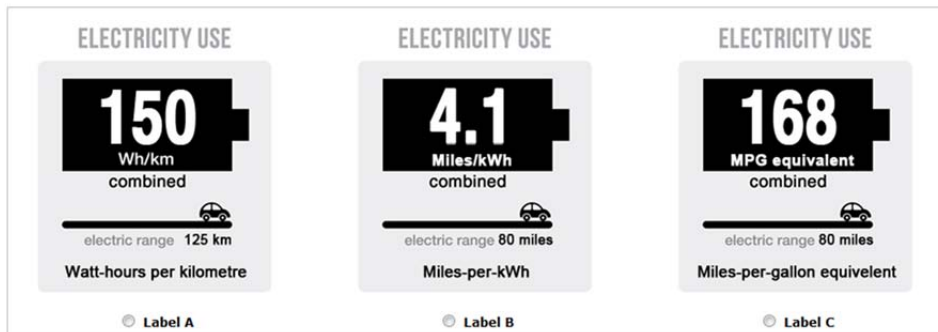
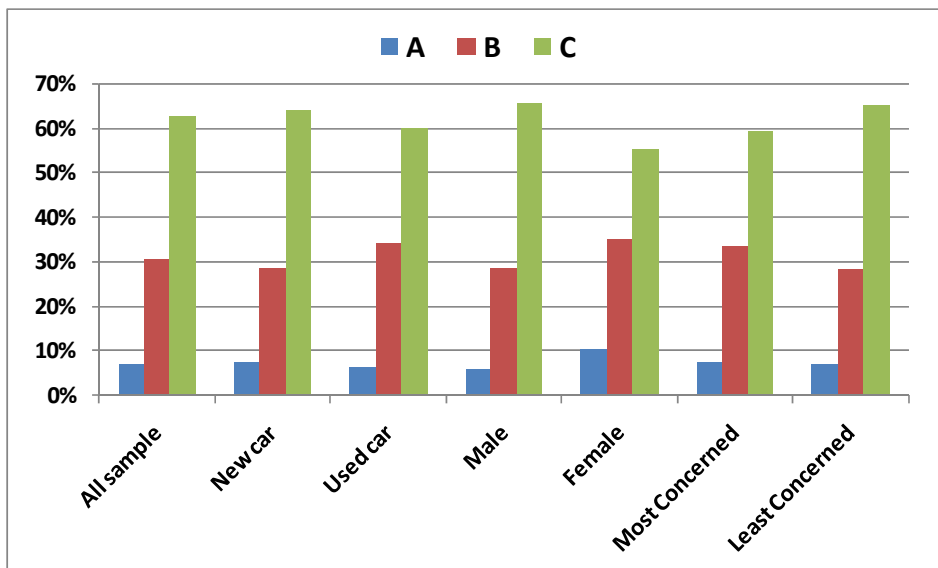


Figure 42 Q14 Preference for electricity consumption units



As was the case for conventional vehicles, several participants stated a preference for seeing VED tax costs over VED tax bands, many not at first linking the zero CO₂ emissions with zero-rated tax.

Well it's an A – but I don't know what the significance of well-to-well is, so I don't want to know all the emissions that need to be for that to be a red. All I want to know is what the letter is, and how much it's going to cost me [Male, Round 2, Cardiff]

Well it says zero g/km, but that doesn't necessarily tell you there's no cost [Male, Round 2, Edinburgh]

Yes. But we don't know whether zero emissions equals zero tax, or whether zero emissions equals £70 tax [Male, Round 2, Edinburgh]

4.6.3 Additional information and comparison with ICEs

Given the novelty of EVs for most consumers, focus group conversations included a discussion as to whether car buyers would find it useful to have additional EV information included on the label. This information would only appear on labels for new vehicle types (including EVs and PHEVs).

In general, the group comments suggested a strong demand for additional EV information, the most popular suggestions including driving range (raised at the outset of the EV session), charging time and the locations of public charging points. Vehicle and battery costs were also mentioned.

... if you want to buy a Nissan LEAF on cost, but as soon as you realised that it only went 80 miles before it had to be, have an 8 hour charge, you'd then start to think, I shall go for the Renault Scenic [laughing]. It's not enough information – it is misleading information [Male, Round 2, Edinburgh]

Q: Ok, is there any other information about electric vehicles that you would like to know that isn't shown on this label? F: How much does it cost to buy one? F2: How long does it take to charge it up [Conversation, Round 1, Exeter]

And the other thing I think would be useful is if you had, you've got a QR code here, but something with like – find a link, that gives you a map of where the locations are for charge points [Male, Round 2, Cardiff]

The cost of the battery, overall running cost over 10 years, but battery and servicing and that sort of thing. I would want to know a bit more about that [Female, Round 1, Birmingham]

To better quantify the demand for additional EV information, an optional open-response style question was included on the web-based survey; a question answered by 41% of the total sample. Broadly confirming the focus group findings, the most popular issues as rated by online respondents were driving range and the time for full charge – see Figure 43. Unlike the focus group participants, the online sample ranked charging locations as less important, preferring vehicle/battery costs and lifetimes in third to fifth place.

A final issue raised in the focus groups was whether there was a demand for the EV labels to present comparisons with all vehicle types (including petrol and diesel cars) or only with other EV models. On the whole opinion was divided with both cases being argued.

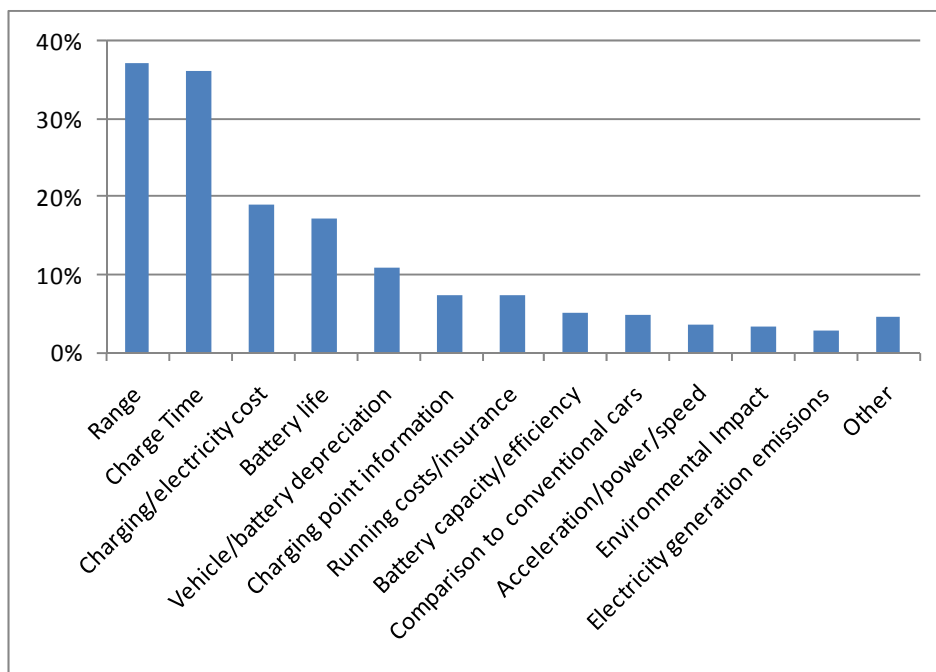
I don't think you are going to go out to look at an electric car, a petrol car and a diesel car. I think you've made the decision... you're going to buy a diesel or electric or whatever, before you step out of the door. So, I don't really see the point in having a comparison in the running costs [Male, Round 1, Birmingham]

I think it's important to link the Nissan with other electrical cars, because if you put it with the petrol or diesel – it confuses everybody. I think if you're looking to buy an electric car it's better to make a comparison with the other electric cars [Male, Round 1, London]

... the great advantage of electric – or what they are trying to sell you as the advantage of an electric over a petrol or diesel – ...look what you get with that, with your petrol and your tax and look what you get with the electric – and you can still see the advantages can't you [Male, Round 1, London]

Well again, I think it's suggesting one thing – that it's going to be cheaper, and everything. It's not is it? [Female, Round 2, Leeds]

Figure 43 Q14 Preference for electricity consumption units



One particularly pertinent comment offered a potential solution. If a ‘per mile’ fuel cost were to adopted on future labels for all vehicle types, this would become a *de facto* comparator as all energy and fuel data would be converted to technology independent cost information.

The only way to compare them really – when you’ve got two different fuel sources – is on pence per miles isn’t it, because you can’t compare miles per gallon with kilowatts, kilowatt hours per kilometre can you. There’s no way to compare it [Male, Round 1, Exeter]

4.7 Plug-in hybrids

4.7.1 Issues specific to PHEVs and REEVs

Plug-in hybrid electric vehicles (PHEVs) and range-extended electric vehicles (REEVs) present particular challenges to the presentation of information to car buyers. Not only do the electricity consumption units present a difficulty to consumers (as was shown for EVs in the preceding section), there is the additional problem of how to present fuel economy information when two fuels can be used simultaneously or independently to propel the vehicle.

As described in Section 2.1, the ECE R101 regulations specify what data is to appear on the type approval certificate (Appendix 4). For PHEVs and REEVs which can be externally charged, the regulations determine the method for measurement and recording of CO₂ emissions (in g/km), fuel economy (in litres/100km); and electricity consumption (in Wh/km) over the following test conditions and cycles:

- Combined³⁴ cycle; ‘Condition A’ conducted with fully charged electrical energy/power storage device;
- Combined cycle; ‘Condition B’ conducted with an electrical energy/power storage device in minimum state of charge.

³⁴ Combined cycle (representing urban/extra-urban driving) as defined by the NEDC test cycle. DieselNet. URL: http://www.dieselnet.com/standards/cycles/ece_eudc.php [Accessed April 2012]

- Combined cycle; so called ‘weighted combined’ which weights Conditions ‘A’ and ‘B’ according to the vehicle’s electric-only range and the assumed average distance between battery recharges.³⁵

At present, only the weighted combined figures appear on the Certificate of Conformity (CoC), but in principle, due to the requirements of Regulation No. 101, all the above data, including Condition ‘A’ and ‘B’ figures, are available for presenting on a future PHEV/REEV label.

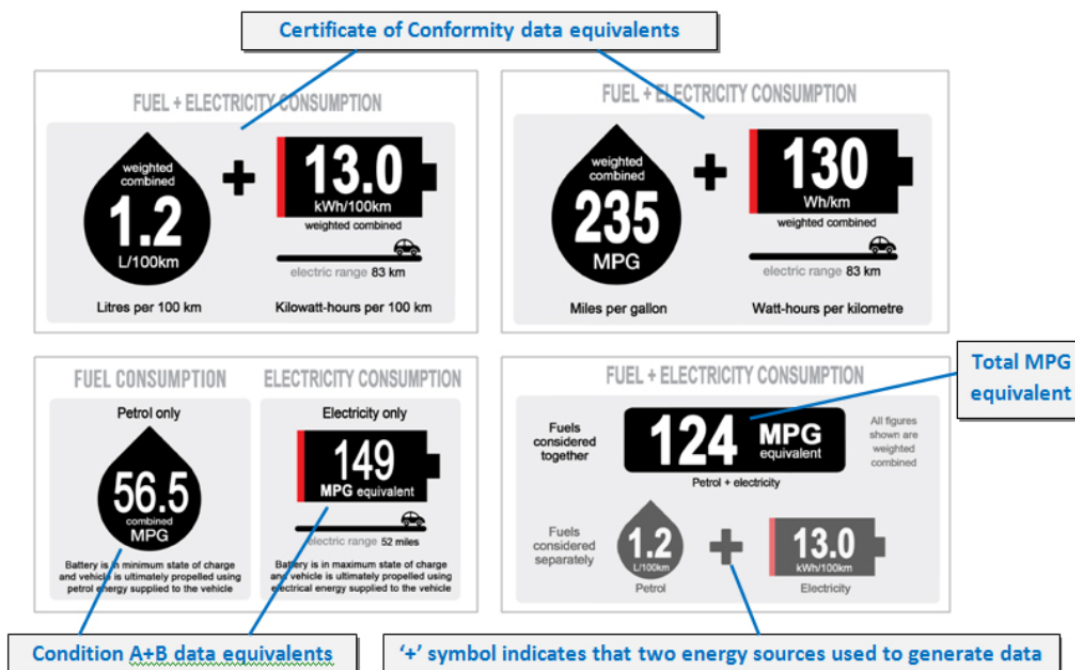
Given the large number of data permutations and possible forms that could be adopted by a future PHEV/ REEV label, a series of test labels was devised that used the CoC data as its starting point. However, in the light of the low level of understanding of both ‘litre/100km’ (fuel consumption) and ‘Wh/km’ (electricity consumption), the use of alternative units was explored to aid consumer understanding.

Figure 44 gives a schematic overview of the test labels presentation of fuel economy and electricity consumption information. The data is based on the Vauxhall Ampera/Chevrolet Volt REEV as quoted in the CoC and as required by ECE R101. In summary the four test labels shown in Figure 44 display the following data:

- Top left: ‘weighted combined’ data with 130 Wh/km converted to 13 kWh/100km;
- Top right: ‘weighted combined’ data with 1.2 lit/100km converted to 235 ‘mpg’;
- Bottom left: Conditions ‘A’ data with 169 Wh/km converted to 56.5 ‘mpg-equivalent’; and Condition ‘B’ data with 5.0 lit/100km converted to 56.5 ‘mpg’;
- Bottom right: ‘weighted combined’ data with 130 Wh/km converted to 13 kWh/100km and total energy consumption of approx 73.3 MJ/100km converted to 124 ‘mpg-equivalent’;

The actual PHEV and REEV labels tested (in their entirety) can be viewed in Appendix 3.

Figure 44 PHEV/REEV labels elements test during survey



³⁵ The weighted CO2/fuel consumption/electricity consumption are calculated using $X = (De \cdot X_A + Dav \cdot X_B) / (De + Dav)$, where: X = CO2/fuel consumption/electricity consumption (in g/km or l/100 km or Wh/km), X_A = CO2/ fuel consumption/ electricity consumption over Condition A, X_B = CO2/ fuel consumption/ electricity consumption over Condition B, De = vehicle’s electric range, Dav = 25 km (assumed average distance between two battery recharges).

4.7.2 Presenting PHEV and REEV information

The headline finding from the testing of PHEV and REEV labels is that when only the CoC data is used (Figure 44, top two images), no participants were able to understand the information presented. The two reasons for this lack of comprehension were the use of metric units (already discussed in connection with electric vehicles), and the difficulty of comprehending two energy metrics simultaneously. The resulting experience was one of ‘information overload’.

I haven't got a clue – it doesn't really mean anything to me. I don't know – I mean we were saying that we were understanding it a little in miles per gallon, in the other ones – but, that's about it [Female, Round 2, Edinburgh]

F: That is it – it's too complicated, and I don't think you go and buy a car to do all that F2 [Figure 44, top right]: That F1 [Figure 44, top left] is just a nightmare, sorry [Conversation, Round 2, Leeds]

The only positive comments from focus group participants related to the use of ‘mpg equivalent’, as this metric was more readily understood and was able to give some context to the data.

Q: There is an alternative unit for electricity, we can turn it into mpg equivalent. F: Yeah, because it's more standardised then and that's what people are used to isn't it M: Yeah, that would be good [Conversation, Round 2, Cardiff]

Q: Just going on to F2, what I've done is turn one of the numbers into units that have gone down well so far – mpg. So is that a step in the right direction? F: Yes... M: Its better, but I still don't understand the 130?... M: Is it, I don't understand it. F: We need to be educated on this [Conversation, Round 2, Leeds]

However, while ‘mpg equivalent’ figures are able to increase comprehension, presenting a mixture of imperial and metric units on the same label creates a new problem; namely only the imperial units are ‘seen’, the metric units being ignored. The effect is to misrepresent the energy information – instead of the label conveying ‘235 mpg and 130 Wh/km’, the label is read as ‘235 mpg’. Consequently, participants treated this partial information with some incredulity commenting that it was unlikely (they thought) that you could drive such a PHEV for 235 miles on one gallon of fuel. (This links to the ‘trust’ issue discussed in Section 4.1.1.)

Well 235 mile per gallon – if I buy one of these, if I go and buy a Vauxhall Ampera today, with the type of driving I do I would not get 235 miles per gallon. I go to Bristol every day, Ok, so assume I go to Bristol every day, which is a round trip of roughly 80 miles, and I do a couple of business trips a week – so let's say I do roughly 500 miles per week – I'm not going to do that on 2 gallons of petrol [Male, Round 2, Cardiff]

The concept of ‘weighted combined’ was raised with the Round 2 focus groups. Without explanation, and with only the label text for guidance, participants had no real understanding of what the term meant or implied. More positively, understanding did increase somewhat following explanation by a group facilitator.

And also, what I was querying – weighted combined – what's weighted combined? Does that mean how many passengers, or... luggage? [Female, Round 2, Leeds]

[Referring to 80:20 electric: petrol split in weighted combined] I'm thinking if it's always an 80/20 – what that means is that you are actually using less petrol than you are electricity, so presumably you would have to keep on topping up the electricity to get the 124 miles per gallon [see Figure 44, bottom right]. Because if you don't you're going to get less than 124 – like 80 or something [Male, Round 2, Leeds]

Another approach, and one already adopted in the US by the Environmental Protection Agency (EPA) for the US Vehicle Label,³⁶ is to present Condition A and B fuel/electricity consumption information in place of the ‘weighted combined’ figures. When tested in the focus groups, while there was a degree of support for this approach, many participants also wanted to see the ‘weighted combined’ figures.

³⁶ For more information, visit the EPA website. URL: <http://www.epa.gov/carlabel/> [Accessed April 2012].

Q: Do you have any preference about whether you want – you just want to know how it works on average, or would you like to know the petrol and electric separately? F: Yeah, like this bit has got a bit for electric and a bit for petrol – I think it is clear to me when it split's it up [Conversation, Round 2, Edinburgh]

Well if there were miles per gallon on petrol, miles per gallon equivalent electricity and you knew how that was done. What I'm not sure about and don't know about, if you had those, would you then need a sort of combined one? [Male, Round 2, Cardiff]

I would probably want both, just because of the kind of driving I was doing. Because saying electric range is 40 miles... that would get me to work and back... that would be great. But then, if I went further, I would want to know what the combined mileage I would get out of it – so, if it gets me from A to B, to a charging point, then onto C. So I would want both [Female, Round 2, Edinburgh]

A final PHEV/REEV label tested was based on CoC data with the addition of a total measure of energy used (petrol and electricity combined) as shown in Figure 44 (bottom right). While the sample size was too small to draw firm conclusions, there was some evidence from participants' comments that this label offered the most usable combination of numerical information – an overall 'mpg equivalent' figure for the lay-person, with CoC published test data as required by ECE R101.

If you're buying a car you want to know miles per gallon – you're not bothered about kilowatts per kilometre or watt hours – I want to know how many miles I get out of my car, whether it's combined or single – I want one figure [Male, Round 2, Leeds]

F: [Looking at F5] That doesn't look as frightening, because to me, my car will do 124 miles per gallon. M: That's it – I'm happy with that [Conversation, Round 2, Leeds]

M: It doesn't matter what it is as long as you know what you're getting, in miles per gallon, again, combined – you know that you can go 124 miles on a gallon, from what you put in that car – that's all that matters. M2: Mpg, we're not talking, its gallons, and we know it's not gallons because it's electric – it's just a title... maybe you could change it to miles per unit, or whatever you want to call it. It's just a title, mpg, but everybody knows mpg. M: It's universal isn't it [Conversation, Round 2, Leeds]

In order to get more quantitative evidence regarding the most popular format and information that could be used for a future PHEV and REEV label, a question was included in the web-based survey. Given the established difficulty experienced by consumers in understanding the metric units required (by ECE R101) to express electricity consumption, the question was posed using only fuel economy data, the electricity use data being expressed in words – see Figure 45. The intention was to clarify the central issue posed by the question; namely to ask respondents which *data format* was most preferable for inclusion on a future PHEV/REEV label.

As shown in Figure 46, the most popular option selected was total 'weighted combined' energy use expressed in terms of 'mpg equivalent' (44%) followed by the separate 'Condition A' and 'Condition B' data (37%). The third option (closest to the CoC determined 'weighted combined' figures) was selected by fewer than 20% of the sample.

As part of the discussions about how best to convey fuel and electricity economy for plug-in hybrids and range-extended EVs, focus group participants were asked for their opinion on the use of the fuel and battery symbols that appear on the test labels shown in Figure 44. While for conventional vehicle labels, the online sample were equally favourable to a plain rectangle and 'oil drop' symbol format (see Figure 23), in the context of plug-in vehicles, there was some indication that the symbols were helpful to at least some car buyers.

Q: [Referring to the test PHEV and REEV labels] ...do these labels mean anything? F: That means petrol and that means electric, because of the symbols – that is it [Conversation, Round 2, Leeds]

Figure 45 Q16 Preference for plug-in hybrid label design

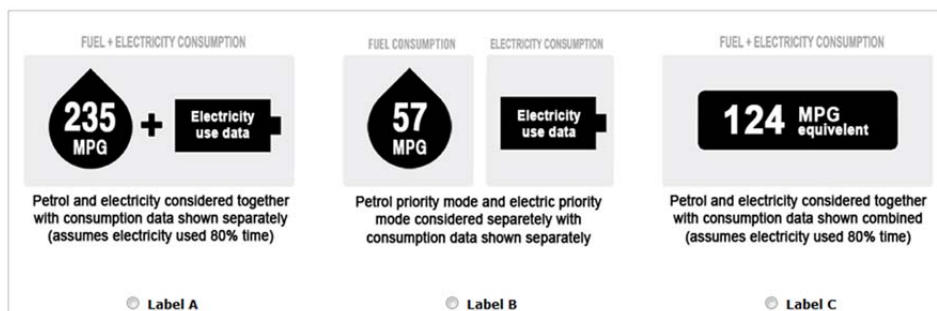
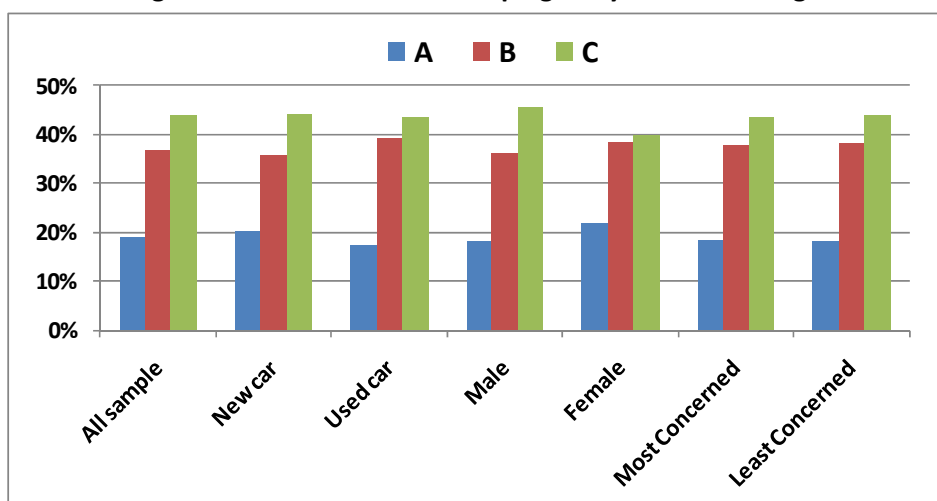


Figure 46 Q16 Preference for plug-in hybrid label design



As was the case for EVs, focus group participants were asked whether there additional information for PHEVs and REEVs should be included on the label. While only a few comments refer to this question, one suggestion was the addition of the electric range; particularly as this is model specific.

M: The big one is the 40 miles on electric range – we need to know that. Q: ... even though it can go further on petrol, you want to know what it can do on electric only? M: I think you need to know [Conversation, Round 2, Edinburgh]

4.8 Use of words and colour

While many issues relating to label design and word choice have already been discussed, this section describes design issues (as raised by focus group participants) that have not been covered in previous sections.

While only one focus group participant commented on the actual title of the label, the comment noted that the current title is at odds with the main visual focus of the label which gives most prominence to CO₂ emissions.

I think it is emissions. But actually, I must admit, I have looked at these more and on this one, it is obvious that that bit is emissions, it's not so obvious with that because the first word that comes up is fuel economy [Female, Round 1, Birmingham]

Of all the main designs tested in part and their entirety, the alternative label named 'dashboard' (see Appendices 2-3) was by far the most popular alternative labels according to the focus groups. The reasons given included its simplicity, modular design and the fact that the key numbers and text could be seen from a distance.

M2: A picture speaks a thousand words. If you're stood there and I'm back here, the first thing I look at, is what you're holding – I go straight to there... Q: When I walk into the showroom... M: I can see 58.9 rather than anything in your left hand [Conversation, Round 2, Leeds]

The use of colour also generated several comments. In addition to confirming that green is closely associated with 'good' and red 'bad', a few participants spoke favourably about the blue used in the 'dial' design (Round 1), and some unfavourably noted the use of grey which they found hard to read.

M: Why did they choose blue there instead of green? M: Actually, that's a good idea... F: Yeah. M: ...like go from green to red. M: I mean it all down to a green theme, so I'm confused as to why they chose blue [Conversation, Round 1, Birmingham]

Q: Is it showing you that the car is more expensive to run in a slightly clearer way than B2? F: Yes. Yeah because it's the first thing I noticed – it's got it with the dark blue. Q: How did it manage to make this amazing thing happen? F: Because it's gone to the dark, the dark blue. Q: The dark blue – so you've got a kind of visual clue there, that straight away tells you..? F: Yeah, so that is telling me, it's clearer, yeah, visually straight away by going to the darker colour, yep [Conversation, Round 1, Exeter]

Firstly I looked at it and thought, firstly I thought, what does 99 mean, on there. And I hate anything that's grey, because you're hiding something – why's it grey? If you want me to read it, make it black [Male, Round 2, Leeds]

4.9 Role of label in car selection

While the fact that the fuel economy label only plays a minor role when buying a car was discussed at the start of the focus groups during one of the warm up exercises, a few participants did voice their opinion that all the information displayed on the labels was, for them, irrelevant.

What is the point in it, because, what I don't get is, I'll be honest, I don't look at none of these figures, I look at the car and think, I want that car – and I will pay what I can afford. If I can afford it then I can afford it, if I can't then I can't. It don't look into all this rubbish [Female, Round 2, Birmingham]

Q: What is important to you? F: Honestly? None of it Q: None of it? F: No, because that's not why I bought my car – I bought my car because I wanted it [Conversation, Round 1, London]

Another minority view, but one important to note, is that several of the alternative labels tested led to 'information overload', which had the result of disengaging the participants involved from the conversations (to varying extents).

F: Well it just all confuses me, it would just put me off – I'd just end up walking out and not buying one. Q: Is the information just a put off? F: Yeah [Conversation, Round 1, Birmingham]

Q: You like A1? F: Yes, it's straight to the point and not too much information clouding the issue. That's just me, but it is, yes Q: Too much information on A4 F: Yes [Conversation, Round 2, Cardiff]

I just feel that it's too much information and I can't make my mind up going into the garage which car I was looking for – I'd have done research before I went in there, and that to me would have been too much information, basically [Female, Round 2, Cardiff]

As observed in previous studies, the focus group discussions generated much evidence regarding perceived 'trade-offs' in which improving fuel efficiency is thought necessarily to be accompanied by a loss in vehicle performance or an increase in costs. That fuel efficient cars cost more is the most common 'trade-off' reported.

F: Yeah, like if you went to the best one, which is this What Car? one, you would save £1,220, but it would probably cost you another £8,000 Q: So what do you feel about that figure that they have given you? F: I know that we have to be informed, but I think everybody knows that if you have got the money to buy the best car, you are going to get the best emissions, you are going to get the best fuel – you are going to get everything the best. Q: Do you actually think that it is necessarily going to cost more? F: Yeah [Conversation, Round 1, Birmingham]

F: We would all like to be able to drive those cars, and have those cars, but we can't all afford to purchase them Q: So the more efficient cars, or the cars with the lowest miles per gallon... F: Are out of our price range Q: ...are more expensive initially? F: Yes [Conversation, Round 1, Exeter]

If the price was better I would, yeah. They hike cars up based on the fact that it's eco friendly [Male, Round 2, Leeds]

The reverse 'trade-off' was also noted – that cars tended to get more expensive as they became more sporty and less fuel efficient.

M: Less efficient is probably more expensive. Q: You don't think it would necessarily be more expensive?

M: No. If you got for like a Porsche 3-litre V8, whatever it is – that's not efficient at all [Conversation, Round 2, Leeds]

A second common perceived 'trade-off' is that newer cars are necessarily more fuel efficient and have lower emissions. This is linked with the high cost for new cars, and also the assumption that as technology improves over time, so does fuel economy and emissions control.

Yeah, what's it mean? Also, the fact that the B to C on the best BMW could relate to a brand new one, but if you are buying a second hand vehicle you wouldn't expect it to be in the lower exhaust emissions, sorry, the higher exhaust emissions, because the technology wasn't there... [Male, Round 1, Birmingham]

But you know, to avoid paying high taxes, and having cars that are more economical, you've got to initially pay out for a new vehicle, to get those issues with... so that your running costs are cheaper, your tax is cheaper. But initially you've got to purchase that car [Female, Round 1, Exeter]

5. Discussion of results

5.1 CO₂ emissions and fuel economy information

This survey finds that fuel economy expressed as ‘miles-per-gallon’ is of more importance to car buyers than CO₂ emissions and VED. ‘Mpg’ is also a more ‘front-of-mind’ metric than CO₂; around 70% of the sample tested is able to provide a figure for their car’s fuel economy in ‘miles-per-gallon’ as compared to only 20% for CO₂ emissions. This conclusion accords with the findings of previous studies which have shown that UK car buyers place great emphasis on fuel economy as a proxy for running costs, a key concern of motorists.³⁷

It is for these reasons that the headline finding of this survey is that fuel economy (most commonly expressed by car buyers in terms of ‘miles-per-gallon’) is not given sufficient prominence on the current UK Fuel Economy Label. A corollary is that CO₂ emissions are given too much importance in terms of the space and positioning on the existing label.

While the majority of car buyers questioned broadly understood the term ‘combined’ in relation to fuel economy data presented on the UK label, one concern highlighted by the survey is consumers’ lack of trust in the official figures, many having the opinion that the official figures were unlikely to represent ‘real-world’ fuel economy performance. However, more positively, this survey provides evidence that car buyers’ have a sufficient level of trust in the official figures when used for comparison purposes, one of the key purposes and rationales for providing vehicle information.

The survey reveals a strong preference for fuel economy expressed in imperial as opposed to metric units. This is very much an issue for UK car buyers, and is unlikely to be applicable elsewhere in the EU where other car labels are in use. However, the central finding – that fuel economy is more important to consumers than CO₂ emissions – may well apply in other EU Member States if fuel economy expressed in local units.

When vehicle CO₂ emissions are considered by car buyers, they are most commonly linked with Vehicle Excise Duty, suggesting that, in the context of vehicle purchasing and information, CO₂ is more commonly linked with and perceived as a cost issue rather than as an environmental one. Given this association, the survey concludes that the visual links between CO₂ and VED on the existing label could be improved (as discussed in the next section).

In the light of these findings regarding model-specific CO₂ emissions and fuel economy information, this report makes two recommendations which would have the effect of reducing the space given to CO₂ information and increasing the prominence of fuel economy information. Not only would these changes accord with the findings of this and previous surveys, it would also make the title of the current label ‘Fuel Economy Label’ more relevant to the information contained.

Recommendation 1: Tailpipe CO₂ emissions information (expressed as ‘g/km’) should be given less space and importance than it is on the current UK Fuel Economy Label.

Recommendation 2: Fuel economy information (in terms of ‘mpg’) should be made more prominent (through better positioning and larger text-size) than it is on the current UK Fuel Economy Label.

³⁷ 2010 LowCVP Car Buyer Survey: Improved environmental information for consumers. Conducted by Ecolane, Sustain, and Robert Gordon University, for LowCVP, 2010.

5.2 Fuel and VED costs and comparative information

As noted above, where CO₂ emissions are considered by car buyers, they are most commonly perceived as a cost issue through the link with graduated Vehicle Excise Duty. VED is also more likely to be thought of in terms of cost than VED *band*; this preference seems to be prevalent even when the link between VED band and costs is appreciated. Of the sample tested, car buyers were over four times more able to volunteer a value for their car's annual VED cost than they were its VED band.

Despite buyers of new cars being well represented in the survey, few participants were able to confidently explain the difference between 'first year' and 'standard rates' of VED. This suggests that the relatively recent introduction of the two rates had yet to be appreciated by most motorists.

Given these findings, the survey concludes that the presentation of CO₂ emissions, VED band and VED cost on the existing label should be improved by providing more visual cues as to their link (through graduated VED). In addition, the 'first year' and 'standard rates' need to be more clearly shown than they are on the current new car label.

Focusing on fuel and VED costs, which are currently quoted on an annual basis, the survey aimed to establish whether other costing periods would be useful to car buyers. While the findings show that many car buyers would find 'per month' costs of interest (due to the tendency for households to budget on a monthly basis), the majority would prefer a 'per mile' estimate (due to the simplicity of calculating journey costs by multiplying fuel cost per mile by the journey distance to be covered).

In addition to the ease of fuel cost calculation, many focus group participants noted that the 'per mile' metric makes comparison across different vehicle fuels and technologies (such as electric vehicles) more transparent. Despite the fact that fuel and tax comparisons for different vehicle types can be made using an average annual mileage, the comments suggest that the comparison is made more concrete using a 'per mile' unit.

The 'informational power' of providing 'per mile' fuel cost information is demonstrated by evidence suggesting this metric may even increase drivers' motivation to switch travel mode. On several occasions during the survey, participants reported that if they knew what a particular car journey would cost in terms of fuel, they would be more likely to consider other travel options for that particular trip – possibly using non-car modes.

Given that VED is purchased on a 12-month or 6-monthly basis, the findings relating to 'per mile' information are relevant to the presentation of fuel costs. This report concludes therefore that the fuel cost information presented on the current label would be improved by the use of a 'per mile' and a 'per month' cost, in addition to the current annual estimate over 12,000 miles.

One of the objectives of the survey was to identify the consumer demand for comparative data and the most effective way that a comparison could be provided. While a significant proportion of the survey participants support the provision of comparative data on the label, one key finding is that, if not executed with care, comparisons can create confusion so reducing the effectiveness of the label as a whole.

Due to the availability of current data sets, the only practical option for providing comparative data is to compare cars in the same 'model range'. However, the results show that car buyers have very little understanding of what constitutes a 'model range'. Neither do they have an adequate understanding of 'vehicle class', the basis of comparison favoured by the majority of car buyers.

Regarding the presentation of comparative information, a number of key observations can be made. First is that labels that include comparisons must be clear as to the basis of comparison used, without relying on industry terms – such as ‘model range’ – as these terms are not understood by the average car buyer. Second, all comparative scales (in whatever form) should include clearly marked appropriate numerical scales. Third, where appropriate, actual model names should be included alongside the ‘most efficient’ or ‘best’ as shown on the scale.

At least three comparison formats were tested in the survey including: linear ‘slider’ design scale applied to ‘mpg’ and fuel costs; ranked ‘slider’ scale applied to ‘mpg’ and fuel costs; linear ‘dial’ design scale applied to ‘mpg’ and fuel costs; numerical ‘you lose/save’ style comparisons; and linear ‘Buyers’ Guide’ scale applied to fuel costs (alone) and combined one-year fuel and VED costs – see Appendices 2-3 for label elements tested.

From this complex testing of formats, the survey draws the following observations. While fuel economy is the consumers preferred metric overall, comparing ‘mpg’ is inherently problematic due to the need to compare different fuel types, the nonlinear nature of the metric (which is based on the inverse of fuel use per unit distance),³⁸ and the strong, negative reaction of car buyers to viewing ranked information when a model range contains a large number of models. This report therefore recommends against the use of providing a comparison of fuel economy *per se* on the label.

In contrast to ‘mpg’, fuel costs do scale linearly with fuel use per unit distance, and are therefore more suited use as a comparator. Fuel cost is also technology neutral, and can be calculated for all conventional and electric vehicle types. This report therefore concludes that cost metrics be used for comparisons and, based on the popularity of the tested formats, the ‘dial’ style be used to show fuel cost in ‘pence per mile’ (using an absolute or relative scale), and total first-year fuel and VED cost be used within the ‘Buyer’s Guide’ format using a scale ranging from the highest to lowest cost models in the range.

In the light of these findings regarding fuel and VED costs and comparative information, this report makes three recommendations which are designed to make clearer the link between CO₂ emissions and VED costs, improve the provision of fuel costs information through the introduction of ‘per mile’ and ‘per month’ fuel costs, and introduce (for the first time) comparative fuel and VED cost information across all models in the range.

Recommendation 3: The link between vehicle CO₂ emissions and VED cost should be made more explicit (through better visual cues) than it is on the current UK Fuel Economy Label.

Recommendation 4: In addition to annual fuel costs, the UK fuel economy label should include an estimate of fuel costs expressed in terms of ‘pence per mile’ and ‘per month’ (based on the model’s combined fuel economy, an up-to-date average fuel price, and an assumed average mileage).

Recommendation 5: In addition to model specific information, the UK fuel economy label should include a comparison of total first-year fuel and VED tax costs with all models in the same model range. Care should be taken to include numerical values at the end of the scale and text indicating the model with lowest total costs, and technical wording should be avoided (e.g. ‘model range’).

³⁸ Larrick, R. and Soll, J (2008) The MPG Illusion. Policy Forum, Science Vol. 320, pp1593-1594, 20 June 2008

5.3 The fuel economy label in a digital context

Linked to the ‘trust’ issue regarding the official combined fuel economy (see above), many focus group comments suggest a level of dissatisfaction with the current label’s fuel cost estimates which assume an annual mileage of 12,000 miles and a stated fuel price. As noted by participants, not only is the average mileage not relevant for a large number of drivers, given the inexorable rise in fuel prices, the estimated fuel costs printed on the label are quickly out of date.

One possible solution to this problem suggested in a previous LowCVP survey³⁹ is to ‘hard-link’ the fuel economy label to a website on which more up-to-date and personalised estimates can be calculated. Such a technology is QR Code, one of several industry ‘hard-linking’ standards, which enables a smart phone equipped with a QR Code application to direct its website browser to a target URL.⁴⁰ This technology is already used in many contexts including the latest US Vehicle Label.⁴¹

Although not a statistically large sample, the vast majority of focus group participants were impressed by the ability of the QR Code reader to link the printed label to a fuel cost calculator which allowed a degree of personalisation of input data (through the control of fuel price, driving style and annual mileage).⁴² Even those who were using a QR Code for the first time voiced positive opinions about the technology. Indeed, many were quick to imagine how such a tool might be used, and to highlight the advantages of having immediate access to information under one’s own control.

While it was never the intention of this survey to develop an actual QR Code reader tool, one of the objectives was to assess the level of demand for, and a potential application of, a QR Code located on the fuel economy label. In this context, and given the rapid adoption of similar technologies across most sectors, this report recommends that the next UK fuel economy labels should include a QR Code (or similar ‘hard-linking’ technology). Indeed, the authors are of the opinion that omitting to include such a technology would significantly limit the future options for consumer-focused information provision within the automotive sector.

Recommendation 6: In addition to printed information, the UK fuel economy label should include a ‘hard-link’ (e.g. QR Code) to link the printed label with online model information. The target URL should include some or all of the following: model specific information, a fuel cost calculator, and comparisons with other cars in the ‘model range’ or ‘vehicle class’ (depending on data availability).

5.4 Designing labels for new vehicle technologies

One of the key objectives of the survey was to consider the design of a label for new technologies such as the electric vehicles (EVs). In particular, the survey aimed to identify the most effective way to convey electricity consumption as opposed to fuel economy information.

The survey findings clearly show that car buyers have a very poor understanding of watt-hours (Wh) and kilowatt-hours (kWh). As a result, very few of the test participants adequately understood either ‘Wh/km’ or ‘kWh/100km’, two of the electricity consumption units trialled on the EV test labels.

In contrast, when electricity consumption figures are presented in terms of ‘mpg equivalent’ (assuming 8.9 kWh/litre petrol), this option is well received (and is the most popular option) due to

³⁹ 2010 LowCVP Car Buyer Survey: Improved environmental information for consumers. Conducted by Ecolane, Sustain, and Robert Gordon University, for LowCVP, 2010.

⁴⁰ For more information, visit: http://en.wikipedia.org/wiki/QR_Code.

⁴¹ For more information, visit the EPA website. URL: <http://www.epa.gov/carlabel/> [Accessed April 2012].

⁴² One target URL tested is: <http://www.nextgreencar.com/mobile-calculate/26041/VW-Polo-Diesel-Manual-5-speed>.

its high level of comprehension by participants who are able to contextualise the figures and compare them with conventional vehicles. Of six possible metrics tested, the second popular metric is 'miles-per- kilowatt hours' (Miles/kWh), with all other options receiving little support.

When first presented with test labels designed for electric vehicles, many of the focus groups participants (who had no direct experience for owning or driving EVs) voiced their initial concerns about some of the limitations of EVs which included: short driving range on one charge, the length of time to recharge, and the uncertainty about the location of publicly available recharging points. Together with vehicle and battery costs, these were also the issues that car buyers most requested be included on a future EV label as additional information.

On a positive note, when test labels showing EV electricity and tax costs are presented to the test sample, the survey finds that car buyers are generally impressed by the low running costs. With the exception of the electricity consumption units, and the inclusion of additional information, this supports the use of a similar label format for both EVs and conventional vehicles. This would allow the direct comparison of 'per mile' and 'total first year fuel and VED costs' between vehicles with electric and conventional drive-trains.

Given these findings regarding the design of a label for electric vehicles, this report makes three recommendations which are intended to enable the comparison of EVs with all other vehicle types, maximise the comprehension of electricity consumption data, and provide an educational role regarding the capabilities of particular EV models.

Recommendation 7: The scope of the UK fuel economy label should be extended to include electric vehicles. The 'EV label' should: adhere to a similar format as for conventional vehicles; present electricity consumption as 'mpg equivalent' (assuming 8.9 kWh/litre petrol) shown alongside official energy data (in Wh/km or kWh/km), and include information specific to electric vehicles (including: driving range, recharge time, and the location of publically accessible charging points).

Plug-in hybrid electric vehicles (PHEVs) and range-extended electric vehicles (REEVs) also present challenges to the presentation of vehicle information for consumers.⁴³ Not only are the electricity consumption units not readily understood if expressed in Wh/km (as already described), there is the additional problem of how to present fuel economy information when two fuels can be used simultaneously or independently to propel the vehicle.

The main finding from the testing of PHEV and REEV labels is that when only 'weighted combined'⁴⁴ data is presented, few, if any car buyers, are able to understand either the terminology or the data. The two reasons for this lack of comprehension are the use of metric units, together with the difficulty of comprehending two energy sources simultaneously (symbolised in the test labels by the use of a '+' sign). The resulting experience is one of 'information overload'.

While providing an 'mpg equivalent' figure for the liquid fuel is able to increase comprehension, presenting a mixture of imperial and metric units (for electricity use) on the same label creates a new problem; namely only the imperial units are 'seen', the metric units being ignored. The effect is to misrepresent the energy information – instead of the label conveying '235 mpg and 130 Wh/km', the

⁴³ With the exception of the vehicle type description at the top of the label, PHEVs and REEVs are treated in a similar manner with respect to the provision of label based information.

⁴⁴ The weighted CO₂/fuel consumption/electricity consumption are calculated using $X = (De \cdot XA + Dav \cdot XB) / (De + Dav)$, where: X = CO₂/fuel consumption/electricity consumption (in g/km or l/100 km or Wh/km), XA = CO₂/ fuel consumption/ electricity consumption over Condition A, XB = CO₂/ fuel consumption/ electricity consumption over Condition B, De = vehicle's electric range, Dav = 25 km (assumed average distance between two battery recharges).

label is read as '235 mpg'.⁴⁵ Consequently, this information may not be trusted as car buyers may think it unlikely that such a car would actually cover 235 miles on one gallon of fuel.

Two alternative PHEV/REEV test labels were also tested: (1) showing a total measure of energy used (petrol and electricity combined) expressed in terms of 'mpg equivalent'; and (2) presenting Condition 'A' and 'B' energy consumption information in place of the 'weighted combined' figures (the approach adopted by the US Vehicle Label).⁴⁶ The survey provides quantitative evidence that the first (including only the total MPG-equivalent) is the most popular option, offering as it does the most comprehensible information, with the second alternative (Conditions A and B shown separately) being the next most popular option among web-survey sample.

With regard to these key issues for PHEVs and REEVs, this report concludes that an optimum label would be one that presents both the total 'mpg equivalent' figure for the lay-person and the 'weighted combined' published test data as required by ECE Regulation No. 101. (While Condition 'A' and 'B' energy consumption information would be of interest to many car buyers, the authors believe that a choice has to be made between metrics to avoid information overload.)

Recommendation 8: The scope of the UK fuel economy label should be extended to include plug-in hybrid- and range-extended electric vehicles. The 'PHEV/REEV label' should: adhere to a similar format as for conventional vehicles; present fuel/electricity consumption data as total 'mpg equivalent' (assuming 8.9 kWh/litre petrol) and as 'weighted combined' (fuel: litres/100km and electricity: Wh/km or kWh/km), and include information specific to electric vehicles (including: electric driving range, recharge time, and the location of publically accessible charging points).

5.5 The 'Dashboard Plus' fuel economy label

The main test alternative designs are shown in full in Appendices 2-3.

Focusing on overall design, there is little doubt that most car buyers recognise the current label's A-M coloured bands used to indicate the VED band, with most having seen the bands in other contexts such as on 'white goods'.

The high level of recognition of the bands suggests that they have become a symbol for 'efficiency'. It is therefore a key position of this report that any future development of the fuel economy label should retain the current system of coloured bands. However, regarding other aspects of design and format, the survey provides ample evidence that the current label could be improved to more effectively convey the information it contains to car buyers.

Of all the alternative designs tested in part and in their entirety, the uppermost part of the test label named Dashboard (shown in Figures 47 and 48) includes by far the most popular label elements according to the focus groups. The reasons given by participants include their simplicity, modularity and the fact that the key CO₂, 'mpg' and fuel cost per mile data and text can be seen from a distance.

Within the most popular Dashboard label (Round 2 version), the CO₂ panel (top left) is reduced as compared to the space it occupies on the current label. The VED band is clearly written using a large font size, and in the most popular version is 'white-on-black'. This increases the prominence of the band over the CO₂ emissions, while at the same time links the two within a single box; an arrow locating the level of emission within the well-recognised coloured A-M band format.

⁴⁵ Official NEDC figures applicable to Vauxhall Ampera REEV.

⁴⁶ For more information, visit the EPA website. URL: <http://www.epa.gov/carlabel/> [Accessed April 2012].

In the next panel (top centre), fuel economy or electricity consumption is presented alongside the CO₂ information. The main fuel economy figure shown is ‘combined mpg’ with metric units also displayed. As with CO₂, the fuel economy data is written using a large font size, and in the most popular version is ‘white-on-black’ (metric units are presented in a smaller font in grey). The overall effect is that the combined ‘mpg’ figure can be seen at some distance from the label.

The third panel (top right) included in the Dashboard design is the ‘dial’ design element, which is used to present fuel cost information in terms of ‘pence per mile’, the scale being an absolute scale to match the absolute scale adopted by the CO₂ bands. This element is suitable for all technology types and there is evidence from the survey that this would be used by car buyers as a quick cost comparator, comparing one label with another.

Within the central portion of the Dashboard design, fuel costs (in ‘per month’ and ‘per year’ units) and VED (first-year and standard rates) are displayed in a vertical format. While the vertical layout allows a block of space for additional information, the VED cost are somewhat disconnected from the CO₂ emissions information. Therefore, and given the finding that these issues should be visually linked, the horizontal arrangement of costs used on the Buyer’s Guide design has the better potential to display CO₂ and VED information in close proximity.

Figure 47 Alternative label designs tested during Round 1 (selection)

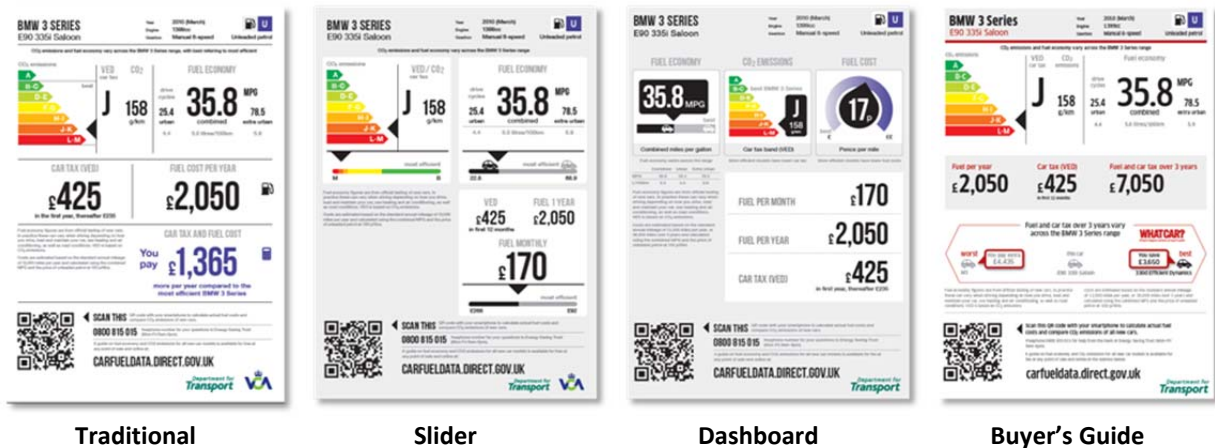
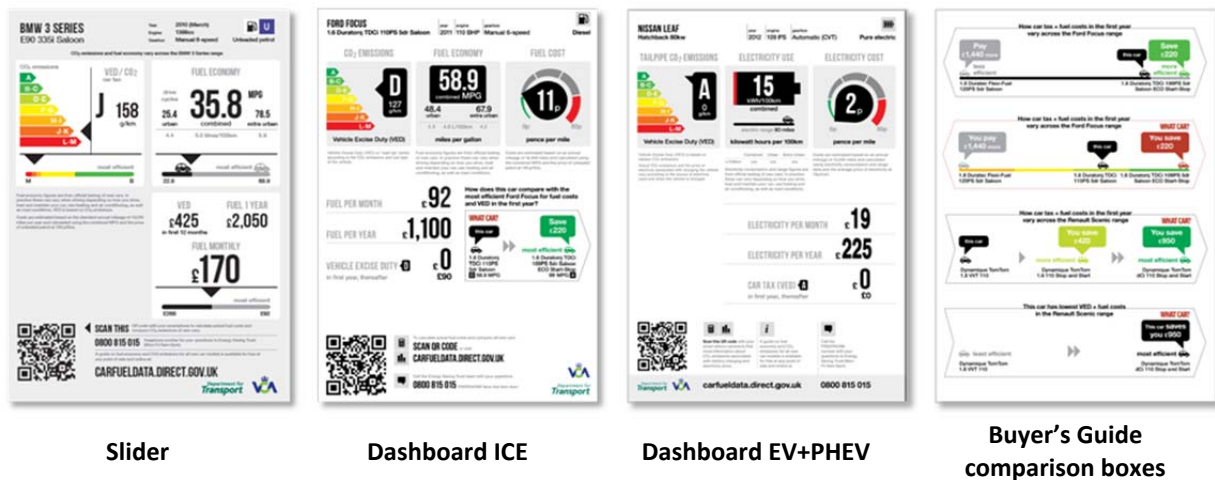


Figure 48 Alternative label designs tested during Round 2 (selection)



The comparison element of the Buyer’s Guide label was also found by the survey to be an effective format in which to compare combine fuel and VED costs, the most popular version using the scale ranging from the highest to lowest first-year fuel and VED cost – Figure 48 (Buyer’s Guide, top

image). In fact, this is a large version of the comparison bars found on the Slider label which received a significant level of support from focus group participants.

Considering all the evidence regarding labels tested, this report concludes that the most effective combination of alternative design elements would be a combination of the following:

- Uppermost third: Dashboard design elements (CO₂, 'mpg' and fuel per mile data);
- Central third: Buyer's Guide designs elements (VED, fuel cost, and model range comparison);
- Lower third: Sources of further information and tools (QR Code, website and phone).

For two reasons this optimum label is termed the '**Dashboard Plus**' label; first, most of its key design elements are taken from the original Dashboard design; and second, when a model range comparison is not possible or appropriate, the comparison area can be replaced with 'additional information'. Examples include cases where a new technology is employed (such as an EV, PHEV or REEV) or where there is only one model in a range.

As a purely *speculative exercise*, a series of four possible Dashboard Plus labels has been constructed based on the findings of the survey as described in this report. These are shown in Figures 49-52. It is important to note, however, that these speculative labels are only one interpretation of the survey's findings. The labels are not intended as a final design but are intended to be used as the basis for a final testing cycle (at the household level) which this report recommends be performed before a final design is selected.

While the authors are of the opinion that this report provides ample evidence that the speculative designs would be more effective in conveying vehicle information to car buyers, further work is required to address a number of remaining presentational and data issues.

For example, the 'least efficient' model in a range may not have the highest total fuel and VED costs as different fuel types can exist with a model range (such as petrol and bioethanol). Also more research is required to finalise the most effective metrics with which to display PHEV and REEV energy use information. Other issues include agreeing how to calculate recharge times for plug-in models as multiple charge rates can be used on many models.

In the light of these findings regarding the rationale of the 'Dashboard Plus' fuel economy label, this report makes two recommendations which are designed to more effectively convey vehicle model information to consumers, and outline what would be required for a final round of testing should the Dashboard Plus designs be taken forward towards implementation.

Recommendation 9: Based on the evidence presented, a future UK fuel economy label should incorporate the following design elements (collectively known as the 'Dashboard Plus' design): Uppermost section – Dashboard design elements (CO₂, 'mpg' and fuel per mile data); Central section – Buyer's Guide designs elements (VED, fuel cost, and model range comparison); Lower section – Sources of further information and tools (QR Code, website and phone).

Recommendation 10: Before implementation, a future UK fuel economy label based on the 'Dashboard Plus' design should undergo a final round of testing conducted at the household level to assess the potential impact of the new label on car buyer behaviour.

Finally, as part of the focus group discussions regarding the Buyer Guide comparison designs, the issue of the information source was raised. The majority of comments suggest that citing well respected organisations can add credibility to the way the cost comparisons are perceived. While participants agreed that *WhatCar?* and *Which?* were the two organisations most likely to be

considered authoritative, they also indicated that Government figures would be better accepted if the official issuing agencies (such as the Vehicle Certification Agency) were to make themselves better known. This report supports this latter option, and concludes that any marketing of a new label should also highlight the source and authority of the official data supplier.

Figure 49 Dashboard Plus ICE

FORD FOCUS
1.6 Duratorq TDCi 110PS 5dr Saloon

year	engine	gearbox
2011	110 BHP	Manual 6-speed

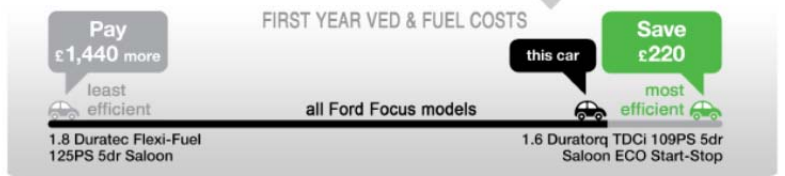
Diesel



Vehicle Excise Duty (VED) or 'road tax' varies according to the CO₂ emissions and fuel type of the vehicle.

Fuel economy figures are from official testing of new cars. In practice these can vary when driving depending on how you drive, load and maintain your car, use heating and air conditioning, as well as road conditions.

Costs are estimated based on an annual mileage of 10,000 miles and calculated using the combined MPG and the price of diesel at 145 p/litre.



Scan this QR Code with your smart phone to calculate your fuel costs using this model based on your annual mileage and driving style.

A guide on fuel economy and CO₂ emissions for all new car models is available for free at any point of sale and online at

Call the FREEPHONE number with your questions to Energy Saving Trust (Mon-Fri 9am-6pm).

Figure 50 Dashboard Plus EV

NISSAN LEAF
Hatchback 80kw

year	engine	gearbox
2012	109 PS	Automatic (CVT)

Pure electric



Vehicle Excise Duty (VED) is based on tailpipe CO₂ emissions. Actual CO₂ emissions and the price of electricity associated with charging the vehicle vary according to the source of electricity used and when the vehicle is charged.

Electricity consumption and range figures are from official testing of new cars. In practice these can vary depending on how you drive, load and maintain your car, use heating and air conditioning, as well as road conditions.

Costs are estimated based on an annual mileage of 10,000 miles and calculated using electricity consumption and range data and the average price of electricity at 15p/kWh.



Scan this QR code with your smart phone camera to find more information about CO₂ emissions associated with battery charging and electricity price.

A guide on fuel economy and CO₂ emissions for all new car models is available for free at any point of sale and online at

Call the FREEPHONE number with your questions to Energy Saving Trust (Mon-Fri 9am-6pm).

Figure 51 Dashboard Plus REEV #1

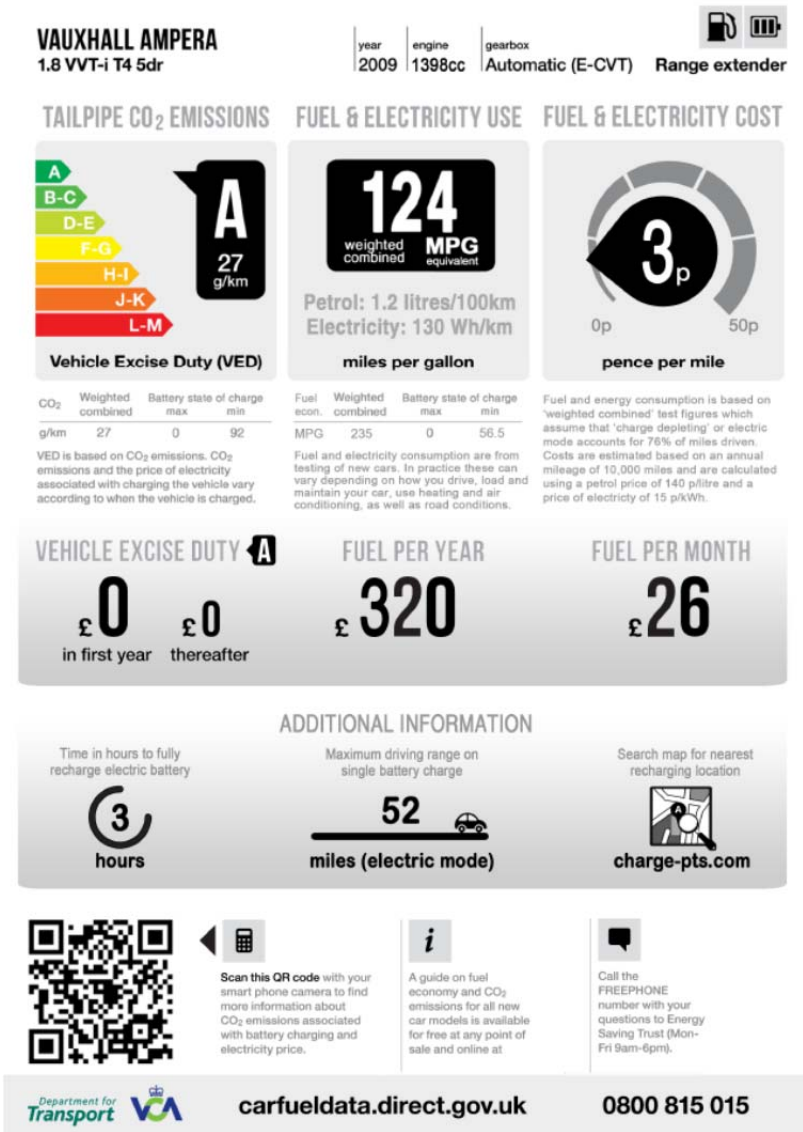


Figure 52 Dashboard Plus REEV #2

