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## Programme Area: Light Duty Vehicles

### Project: Consumers and Vehicles

#### Title: Executive Summary

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#### Abstract:

This project was undertaken and delivered prior to 2012, the results of this project were correct at the time of publication and may contain, or be based on, information or assumptions which have subsequently changed. The Consumers and Vehicles project is comprised of five Work Packages. This Executive Summary covers Work Packages 1.3 and 1.4. The purpose of Work Package 1.3 was to develop and deliver a segmentation model of the consumer vehicle market (representing both ownership and usage) segmented by the factors affecting purchase and use of plug-in vehicles. The purpose of Work Package 1.4 was to develop a model, representing consumer attitudes to purchasing, and behaviours when using, plug-in vehicles as a function of the key factors affecting the consumer response.

#### Context:

The Consumer and Vehicles project looked at the potential long-term performance and cost of plug-in vehicles. It examined consumer reactions and behaviours in buying and using them. It explored supporting infrastructure, and included in-depth surveys with 3,000 consumers and real-world testing with 40 drivers.

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## ETI Executive Summary

**Programme:** Transport – Plug-in Vehicle Economics and Infrastructure

**Project:** Consumers and Vehicles (TR1001)

**Work Package(s):** 1.3 and 1.4 (consumer research)

*Final Deliverable(s): TR1001/1.3-6, TR1001/1.4-8 and TR1001/1.4-9*

**Version:** 1.0

### Introduction

The Consumers and Vehicles project is comprised of five Work Packages. This Executive Summary covers Work Packages 1.3 and 1.4.

1.1	Future capability and performance of vehicles
1.2	Vehicle cost driver analysis
1.3	Identifying the relevant consumer segments
1.4	Modelling the consumer response
1.5	Consumer testing framework.

The purpose of Work Package 1.3 was to develop and deliver a segmentation model of the consumer vehicle market (representing both ownership and usage) segmented by the factors affecting purchase and use of plug-in vehicles.

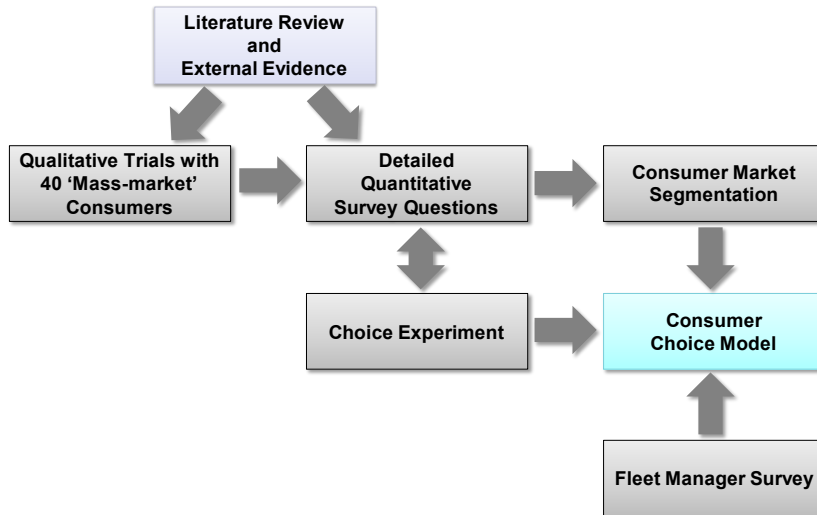
The purpose of Work Package 1.4 was to develop a model, representing consumer attitudes to purchasing, and behaviours when using, plug-in vehicles as a function of the key factors affecting the consumer response.

The scope of this work started with a very comprehensive literature review. This was followed by qualitative research with 40 consumers specifically selected to be representative of the mass market. Half were given a PHEV and the other half a BEV. Detailed interviews were undertaken both before and after use. The output informed the question set for quantitative surveys.

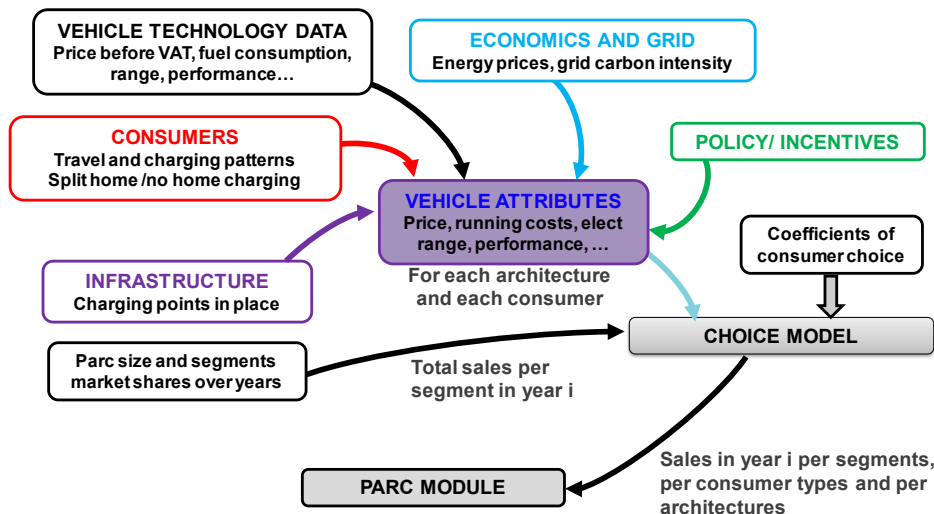
Building on the data from the trials, detailed quantitative surveys were undertaken (with 2,729 full responses). Three separate aspects were covered:

- Demographics, including travel, car ownership and car buying attitudes;
- Attitude questions to different aspects of the plug-in vehicle ecosystem, including attitudes towards incentives, infrastructure availability, etc; and
- A choice experiment, testing the complex trade-offs consumers make between factors (e.g. price, range, infrastructure availability, etc). The overall workflow is shown in the diagram below.

The overall workflow for this consumer research is shown in the chart below. The majority of this work is reported in deliverable .../1.3-6. The exceptions are the 'Choice Experiment' and the 'Consumer Choice Model', which are covered in deliverables .../1.4-8 (reports) and .../1.4-9 (the model itself).



The consumer choice model (deliverable ....1.4-9) encapsulates the breadth of this consumer research, and assimilates data from elsewhere as shown in the diagram below.

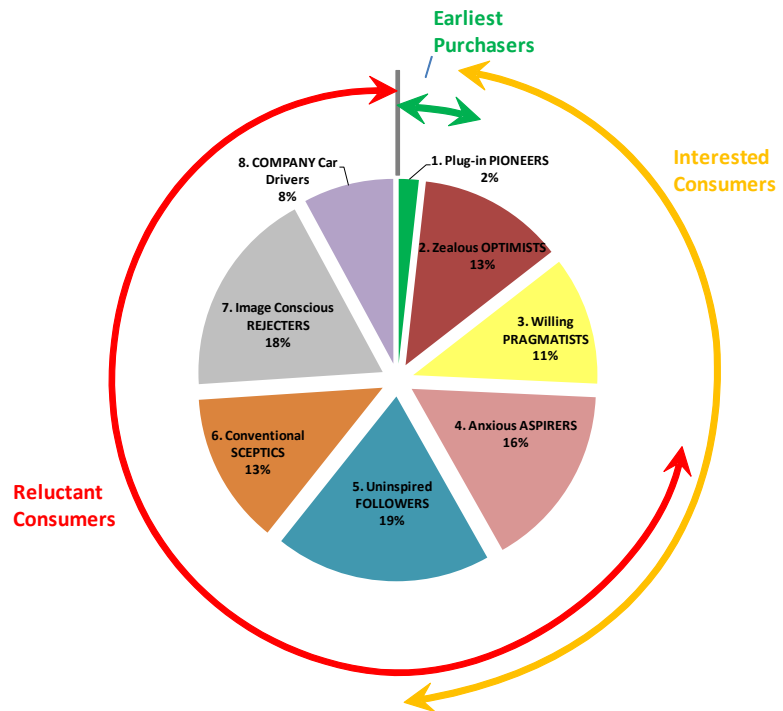


## Key Findings

The UK's new and nearly new car buying population can be segmented into eight groups:

- A very early adopter group ('Plug-in Pioneers');
- Early adopters of plug-in vehicles generally ('Zealous Optimists');
- Early adopters of PHEVs/RE-EVs specifically ('Willing Pragmatists');
- A group enthusiastic about both types of technology but who have strong actual and perceived constraints to adoption ('Anxious Aspirers');
- Three negative and sceptical groups who differ in the degree to which they care about image and in terms of their demographic characteristics ('Uninspired Followers', 'Conventional Sceptics' and 'Image-conscious Rejecters'); and

- ‘Company Car Drivers’ who show signs of openness towards Plug-in Vehicles, particularly PHEVs/RE-EVs and particularly as a second car (although the choice experiment indicates significant barriers to converting interest to a purchase choice).



The segments can be characterised by what they would be ‘most likely to say’.

Plug-in Pioneers	It’s about time. Why wouldn’t you?
Zealous Optimists	Yes please. It would save me how much fuel?
Willing Pragmatists	Yes please, but make it a plug-in hybrid for now, thanks.
Anxious Aspirers	Great, but not sure where I would charge it.
Uninspired Followers	If everyone else is, then maybe.
Conventional Sceptics	Will they save the planet? Don’t think so (and don’t care).
Image-conscious Rejecters	I’d never be seen in one of those.
Company Car Drivers	With my mileage? Convince me.

The top five factors which distinguish the segments most strongly from one another are:

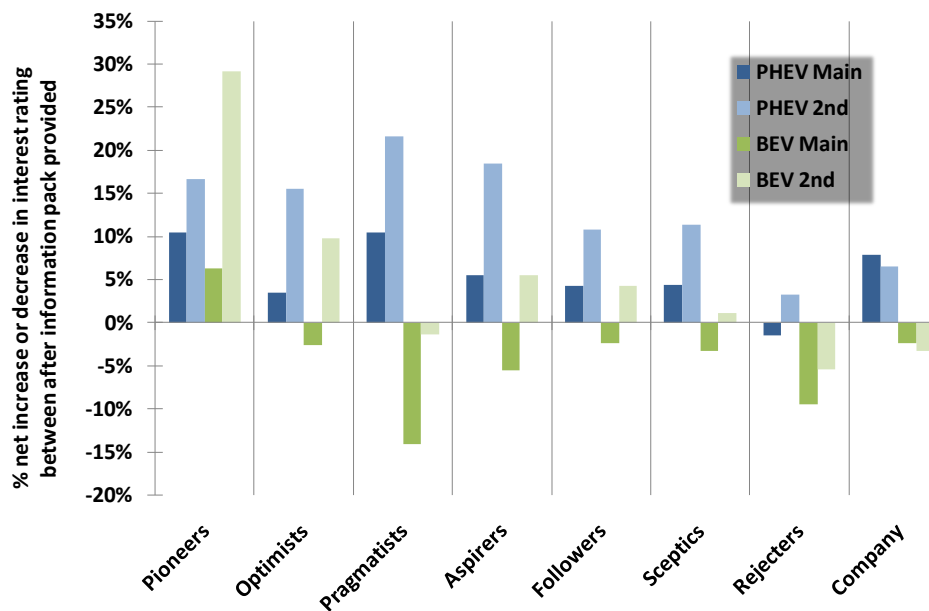
- ‘Identity’, which captures the degree to which people feel they associate with ‘typical’ plug-in vehicle owners;
- ‘Anxiety’, which captures the perceived suitability of these vehicles particularly in relation to range and the ‘hassle’ factor;
- ‘Parking difficulty’ specifically relating to the perceived ease of being able to recharge a vehicle at home;
- ‘Willingness to pay’ more for plug-in vehicles or environmental benefits; and
- ‘Symbolic motives’ which capture the perceived status, social acceptability and embarrassment or otherwise of owning a plug-in vehicle.

The most enthusiastic segments tend to be largely male, wealthier and more highly educated than average. Age is a more complex predictor of segment membership with the ‘Plug-in

*Pioneers* and the *Company Car* drivers being the youngest of all groups, but the *Willing Pragmatists* and the *Zealous Optimists* being older.

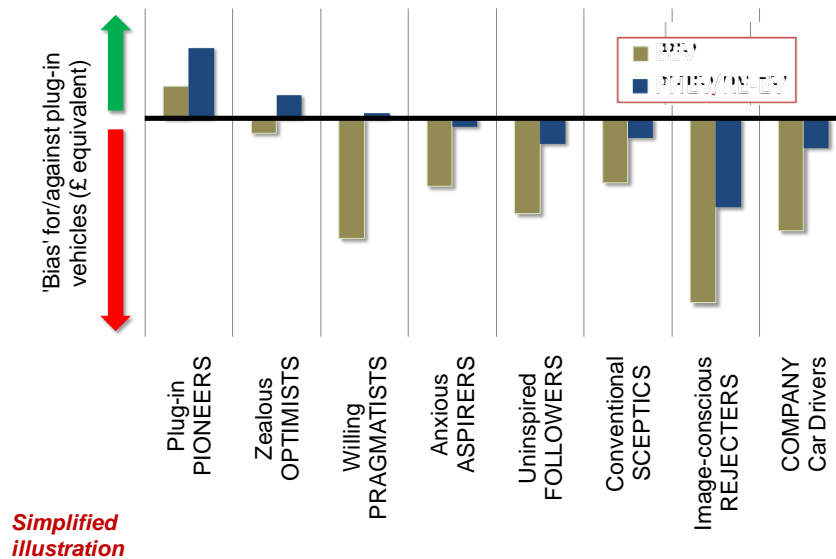
The four less enthusiastic segments are more diverse with a mixture of male and female and old and young profiles. However, they consistently tend to be less wealthy and less educated than the more enthusiastic groups.

The biggest challenge with undertaking consumer research with a new product type is lack of familiarity. The 40 trials with mass-market consumers were used to identify the important issues that arise during familiarisation with plug-in vehicles. To mitigate the lack of consumer familiarity with plug-in vehicles in the detailed surveys, an innovative two wave approach was adopted; responses were given before and after background information was provided. The chart below shows how respondents' attitudes changed as a result of this additional information. Broadly, respondents became more convinced about PHEVs/RE-EVs as a main or second car and BEVs as a second car, but less convinced about BEVs as a main car.



The priorities of consumers vary by market segment, but for most consumers, purchase price is the most important factor when choosing a vehicle, followed by practicality (number of doors, number of seats and vehicle size). Economy and running costs are typically only the third or fourth priority in purchase decisions.

The potential for consumer 'interest' to convert into purchase choices in an open market was quantified through the choice experiment. This shows that, while a significant number of consumers express 'interest' in plug-in vehicles, far fewer are willing to change their purchase choices unless they anticipate making a significant financial saving (many £'000s) relative to the conventional equivalent. Consequently, market projections based on relative economic 'offers' are expected to significantly overestimate the market size.

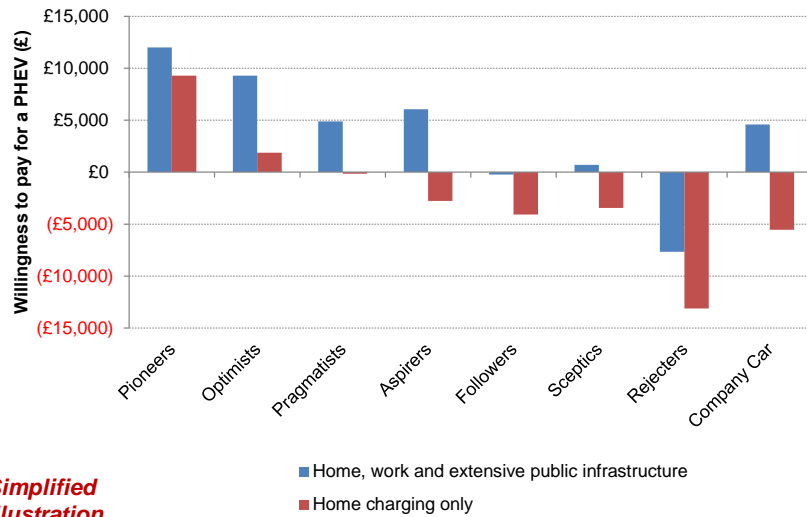


Furthermore, this data also shows that PHEVs/RE-EVs are preferred over and above BEVs by all consumer segments. This suggests that the BEV market will saturate quickly and, once PHEVs/RE-EVs become widely available, purchase choices towards BEVs would switch away in favour of PHEVs/RE-EVs.

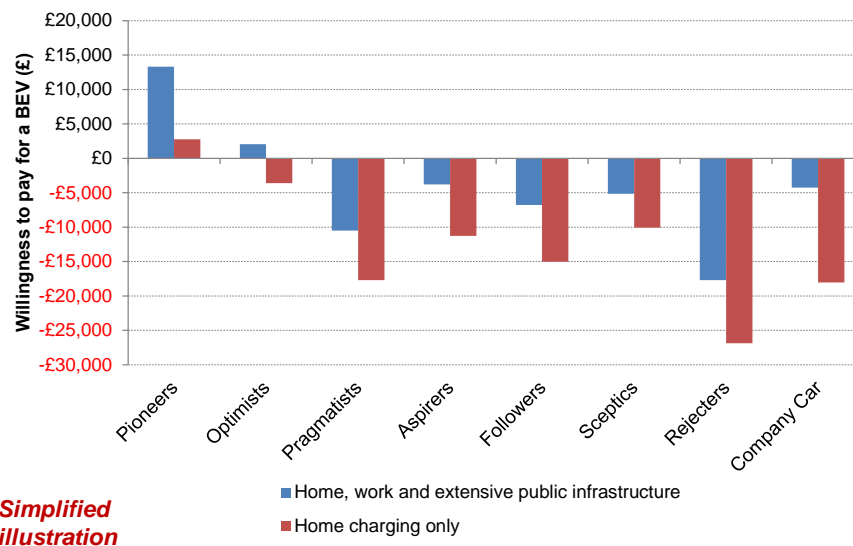
The choice experiment data reveals several things that can be done to increase the price consumers are willing to pay for plug-in vehicles (besides simply reducing the price through subsidies). The most significant of these is the deployment of recharging infrastructure, which typically increases the price consumers are willing to pay for plug-in vehicles by over £5k<sup>1</sup>. Workplace and domestic recharging infrastructure have the highest impact. Public access recharging infrastructure is valued as a complimentary measure.

For PHEVs/RE-EVs, the availability of extensive recharging infrastructure increases to 44% the number of consumers willing to pay a significant premium (>£5k) over and above a conventional equivalent. This is from ~2% when only home recharging is available. This is shown in the chart below.

<sup>1</sup> There are multiple factors affecting willingness to pay. The data presented is isolated from other factors to give clarity, but the absolute willingness to pay will increase or decrease as these other factors are varied. The willingness to pay figures presented are additional price relative to an equivalent conventional vehicle.



For BEVs, such extensive recharging infrastructure has a similar effect but appears insufficient on its own to overcome the attitudes of all but the *'Plug-in Pioneers'* who are willing to pay a significant premium (>£5k) over and above a conventional equivalent. This is shown in the chart below.



It has been found that the CO<sub>2</sub> emissions attribute of vehicles has very little direct effect on the price consumers are willing to pay for vehicles (there is an indirect effect through fuel cost or taxation savings though).

The data also enables the price consumers are willing to pay for certain vehicle attributes to be quantified. The most interesting of these is the electric range of a BEV. While it differs between segments, the average price consumers are willing to pay for each kilometre of electric range above 80km in a BEV is £27. Consumers also appear unwilling to pay anything significant for increasing the range of a BEV beyond 240km. This has significant implications for vehicle design as the cost of providing electric range is currently significantly higher than consumers' willingness to pay for it.