Understanding Barriers to Consumer Demand of Plug-in Vehicles in Australia

Alina Dini[1], Simon Washington[2], Gordon Hawkins

[1]Queensland University of Technology, 2 George Street, Brisbane, Queensland, Australia

[2]Queensland University of Technology, 2 George Street, Brisbane, Queensland, Australia

Email for correspondence: alina.dini@qut.edu.au

Abstract

Modern clean vehicles (e.g. electric vehicles, plug-in hybrids, etc) have been designed to reduce fuel consumption and for that reason are recognized globally for their environmental (especially when paired with renewable energy) and energy security benefits. In markets where introduction of these vehicles has been met with supportive policies, their demand has been relatively strong. However in Australia, due mainly to a lack of policy and industry support, a much smaller number of these vehicles have been available, resulting in markedly lower market penetration. While it has been asserted that the increased upfront cost of plug-in vehicles diminishes the "value proposition" to consumers who might otherwise be customers, early investigation of consumer attitudes toward these products in Australia indicate that there may be other factors at play.

Through a literature review of the existing marketplace for plug-in vehicles, and supported by preliminary findings from survey data collected at a public community test drive event called Green Zone Drive and held at the Gold Coast, Queensland in August 2012, this paper examines a variety of factors thought to influence motorists' impressions of modern clean vehicles and subsequent demand for these products. In addition to inherent vehicle feature preferences, factors stated by respondents to influence their opinions of these vehicles included the policy environment, social networks, media influence, and the car-buying experience. In this study early impressions from a small sample of first time clean vehicle Australian motorists shed light on consumer attitudes and misunderstandings of clean vehicle product offerings and will help to direct future research with a view to improve the marketability of these vehicles.

1. Introduction

In response to heightened demand for clean technologies to support policy goals, global automotive suppliers have increased development and production of clean or low emission vehicles (LEVs). Many of these vehicles have been produced to fulfil jurisdiction-specific policies or legislation requiring carbon reduction in the local transport sector or to decrease dependence on important petroleum. For example, in the United States, updated Corporate Average Fuel Economy (CAFE) Standards required that all new vehicles sold in the U.S. achieve a particular fuel economy standard, aiming to reduce overall fuel consumption per vehicle mile travelled. As a result of this legislation, the market offering of clean vehicles and market penetration has increased substantially and more than 20 different plug-in vehicles models were available from 2012 (IEA EV Outlook). However, even in markets where motor vehicle emission reductions are not driven by policy (such as Australia), clean vehicles are entering the marketplace.

Modern clean vehicles, particularly plug-in vehicles, are not a new technology (noting that electric vehicles were used as far back as the 1900s), however today's generation of plug-in vehicles has matured enough for it to be considered "new" to modern consumers, effectively establishing them at the start of their technology lifecycle. As with many innovative technologies, plug-in vehicles have attracted the most innovative customers to date (a small

minority), however have not yet reached the mainstream market (Rogers, 1995), hampering emissions reduction targets and other related policy goals.

In Australia, little information exists about clean vehicle consumers, their purchasing attitudes, behaviours and preferences, though studies exist in other markets. A preponderance of factors may substantiate the low market demand for modern clean vehicles, including their relatively high purchase cost (which comes in part to embedded technological enhancements designed to reduce fuel consumption), low production volumes in early models preventing economies of scale in the first product releases, and general lack of familiarity with the technology due to limited exposure. Additionally, an element of misinformation in the current plug-in vehicle market may be restricting their take-up. For one example, these vehicles, commonly branded as "environmentally-friendly" and targeted to customers who might be willing and able to pay for the vehicle's "clean" attribute with "eco" badging, are stereotyping their customer base, potentially diminishing the value proposition to consumers receptive to purchasing them for reasons outside their eco benefits.

Both policymakers and private industry alike are eager to understand what factors influence sale of clean vehicles locally and what more can be done to increase their demand, making their technology more mainstream, even in the absence of supportive policy.

This paper seeks to provide a review of literature to date summarizing consumer attitudes toward modern plug-in vehicles and how these attitudes may influence demand. A number of potential contributing factors from the literature are considered in evaluation of the phenomena as well as preliminary findings from a survey at the GreenZone Drive at the Gold Coast in August 2012.

2. Consumers and Plug-in Vehicles

2.1 Mainstreaming of Plug-in Vehicles Required to Meet Global CO$_2$ Emissions Reduction Targets

Plug-in vehicles are well known for their ability to achieve carbon emission reductions greater than the most efficient conventional petrol-fuelled vehicles. Zero emission driving can be achieved through use of 100 percent renewable energy when recharging a plug-in vehicle, a characteristic that separates plug-in vehicles from other commercial technologies currently available in the market. Otherwise, the carbon reduction potential of a plug-in vehicle depends on the electricity generation profile of the local grid (i.e. if local electricity mainly comes from a carbon intensive source such as brown coal, a plug-in vehicle's carbon impact will be greater than a grid whose electricity includes hydro or wind generation).

According to the International Energy Agency (IEA), ongoing international climate change mitigation efforts have failed to reduce emissions globally and in fact, most recent estimates suggest a 1.4% increase in global energy-related CO$_2$ emissions in 2012 (IEA, 2013b, p 32). Transport is the single largest end-user sector for energy and for that sector emissions have increased since 2000 by an average of 1.7% per anum. Although most OECD countries have seen a decrease in their transport emissions (the non-OECD world has not) (IEA, 2013b, p 32), the IEA proposes that in future scenarios, up to $6.3 trillion USD (**Figure 1**) in low emission vehicle technologies investment will be required to support the carbon abatement targets (IEA, 2013b, p 39). Specifically when discussing plug-in vehicle demand, the IEA estimates that between 7-9 million plug-in vehicles will be required by 2020 to support carbon policy goals – a stark figure for 2013 when total global plug-in vehicle sales to date have only just exceeded 100,000 (IEA, 2013b, p. 25)

Figure 1. Global Spending Requirement to 2035 per Sector to Support 450ppm Scenario Carbon Reduction per the IEA
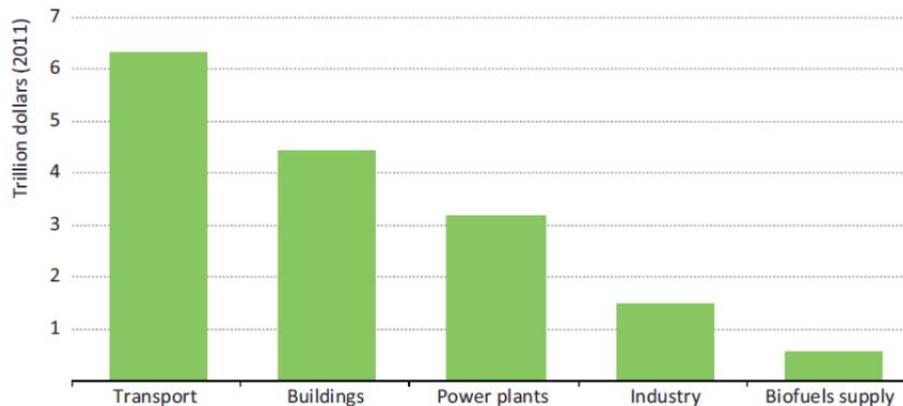
Note: Investment in power plants increases, but investment for transmission and distribution (not shown here) declines by a cumulative total of around $1.2 trillion over the period.

Global demand for clean vehicles remains niche and scaling of the technology is required to enable it to support sustainability policy goals such as emissions reduction, clean technology industry development, and diminished dependence on petroleum-based fuels. The factors preventing clean vehicles from appealing to the mainstream market must be identified and overcome to support broader adoption of these clean vehicles.

In particular, Australia has seen substantially lower demand of plug-in electric vehicles when compared to other markets in the OECD. Research of consumer attitudes toward plug-in electric vehicles over incumbent technologies has been undertaken in other markets, but in Australia is lacking. In the US, Accenture and PWC have both reported on large scale surveys of consumers attitudes toward clean vehicles (both 2011) and Kurani and Turrentine of the Institute for Transportation Studies at the University of California have conducted in-depth study of plug-in in vehicle users since the early 1990s including an assessment of the BMW Mini-E in trial to support the company's product refinement (2011), but similar studies have been limited for the Australian context.

2.2 Clean Vehicle Market Development: Globally

Since the 1990s, shifts in policy priority for energy security, air quality, sustainability and industry development have led to increased demand for clean vehicles. The International Energy Agency and Asia Pacific Economic Cooperation, amongst many other bodies, have reported on the rise of policy agenda globally to underpin the emergence of low emission vehicle technologies. Sierzcula and Baker (2012) also show an increase in the diversity of clean vehicles available in the market place over the 1991-2011 period, highlighting an increased demand for alternative fuels and technologies in the automotive market collectively and a number of large-scale global firms such as Deloitte (2011) and KPMG (2013) confirm a rapid growth trajectory for clean vehicles in the future.

Recent clean vehicle releases have been met with mixed levels of success in terms of sales, but still their market presence remains niche. "Clean vehicles" can include clean conventional vehicles, hybrids and alternative fuel vehicles. This paper focuses on the emerging market for plug-in electric vehicles (PEVs), primarily referencing the Australian marketplace.

3

Figure 2. Rogers' Technology Adoption Life Cycle
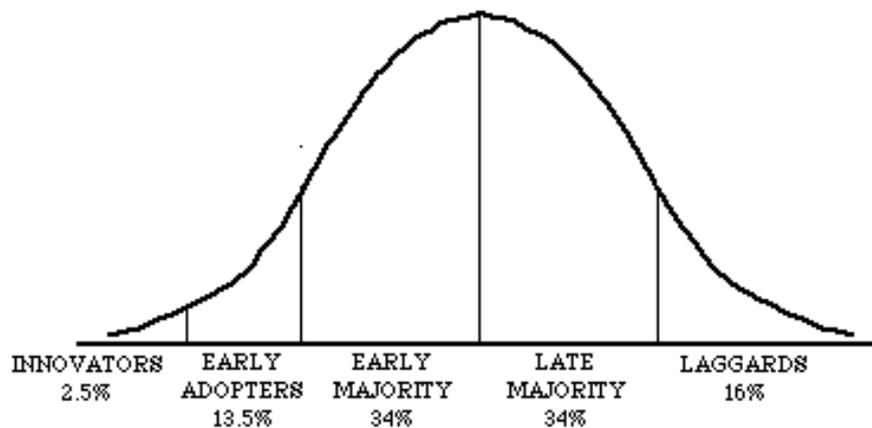
Although plug-in vehicles are not a new technology, their most recent generation of products has evolved significantly from prior generations, (e.g. compare a first generation MP3 player with a current model iPod), placing them essentially back to the start line of their technology life cycle. As with many nascent technologies, plug-in vehicles are fitted to the widely-referenced Rogers Technology Adoption Life Cycle curve (**Figure 2**) which illustrates their first customers are likely to be a very small subset of the mass population.

2.3 Clean vehicle market in Australia

In Australia, uptake of clean vehicles has been surprising low when compared to its OECD peer economies. Australia has the lowest sales of the popular Prius Hybrid series of any major developing economy – a surprising statistic when compared to Japan or California, where the Prius Hybrid is the top selling car. The Australian National Transport Commission reported sale of "clean vehicles" increased by 1.2% from 2011 to 2012 (NTC, 2013), however sales of clean vehicles in Australia is significantly lower than in similar economies world-wide (IEA 2013a). Despite the first release of plug-in vehicles in Australia in 2010, a recent survey of plug-in vehicle market development within the Asia-Pacific Economic Cooperation (APEC) membership, for example, lists Australia as having "Juvenile" level PEV market development (2012).

Very little research has been conducted to study clean vehicle attitudes and purchasing habits in Australia, and even less on Australian consumer perception of plug-in vehicles. Consumer focus groups conducted by the CSIRO Electric Driveways project (part of the Victorian Government EV Trial which is still ongoing) indicate that there is very little familiarity with plug-in electric vehicle technology in Australia and therefore reluctance to switch technologies (2010). The Victorian Trial surveys (2011) indicated that only a small subset of Australian motorists are influenced by the environmental attributes of vehicles when making purchasing decisions, yet most Australian EV market participants tout the environmental attributes of EV technology as a top selling point.

In Australia, transport energy is approximately 10% higher than the OECD average (Garnaut). Despite that, Australian consumers (unlike peers in the UK for example) do not have a national policy framework to underpin demand of clean vehicles, which may be a reason for low level consumer interest in environmental attributes. The UK introduced policy in 2007 to promote local purchase of clean vehicles, including the creation of the Office for Low Emission Vehicles (OLEV) in 2011 and financial subsidies for electric vehicles in 2011 (Parliament UK) and some reports indicate a higher degree of consumer interest in purchasing clean vehicles as a result (IEA, 2013a). Li, Clark et al (2013) agree that consumers with an expressed interest in energy security (e.g. fuel supply and cost) and environmental information are the likeliest of clean vehicle consumers and Potoglou and Kanaroglou (2007) report on the significance of financial incentives to offset initial vehicle

costs. However, policy supporting clean vehicles is only one probable cause for demand of these technologies in markets such as in the UK and US; evidence from these markets suggests other factors contribute to market success as discussed below.

2.4 Known barriers to Plug-in Vehicle Take Up

A number of factors may be responsible for low demand of plug-in vehicles. Factors will vary by jurisdiction, however the list of factors identified by the authors in **Figure 3** succinctly summarise the factors apparent in most global markets.

Of the factors listed, Australian consumers are disadvantaged by a lack of supportive policy (i.e. subsidies) for plug-in vehicles as well as a lack of domestic production of low emission vehicles, which limits local supply. While in some markets fit-for-purpose (i.e. based on travel behaviour) is a factor impeding plug-in vehicle demand, in Australia, motorists driving behaviour is consistent with the type of driving plug-in vehicles accommodate: a majority of the population live in urbanised areas, motorists tend to travel relatively short daily distances; vehicle ownership and off-street parking are abundant and Australians tend to be financially comfortable (Albrecht,et al, 2009).

Figure 3. Barriers to Plug-in Vehicle Demand
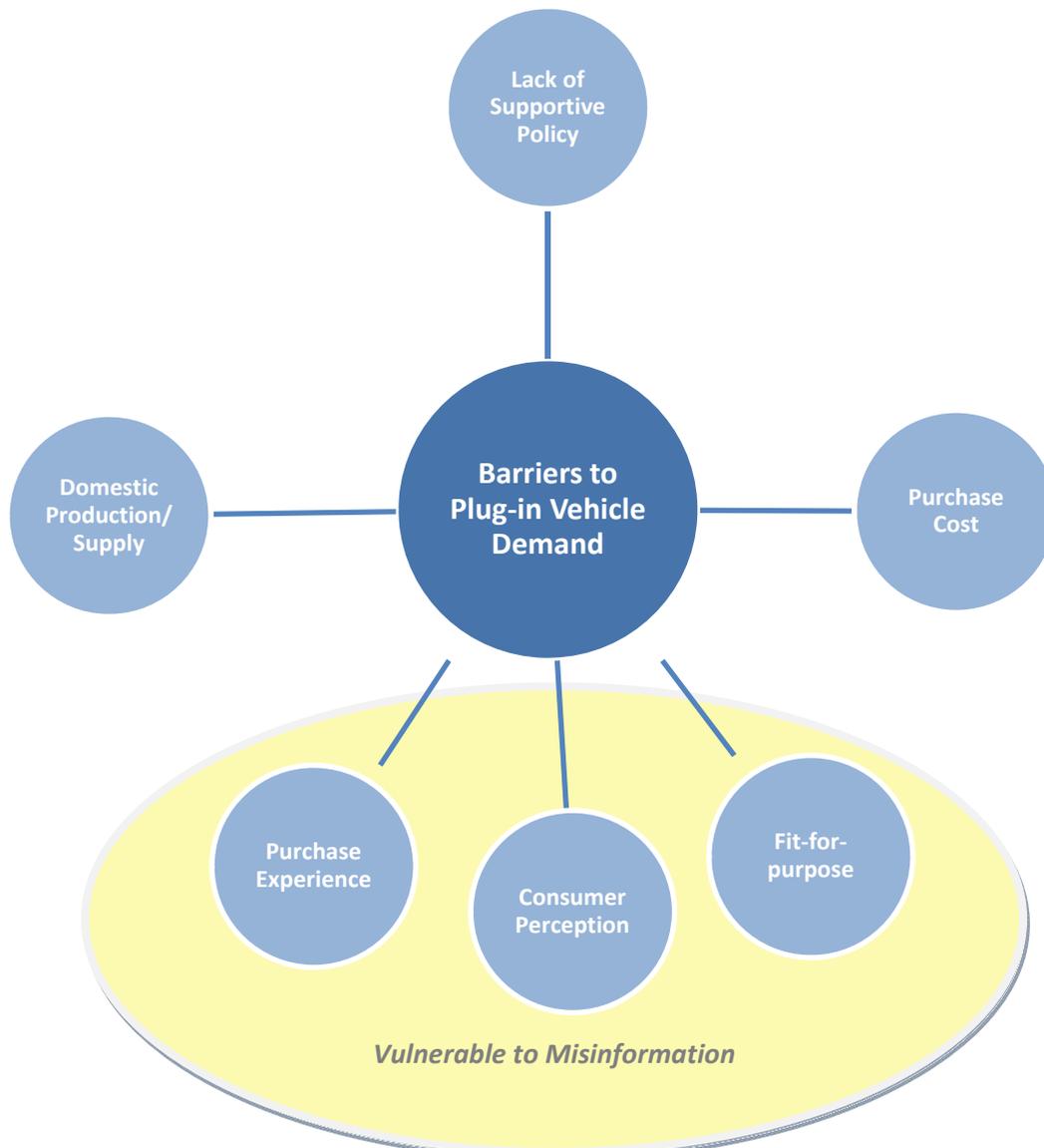
Total product cost is clearly one of central factors for consumer decision-making, as is willingness-to-pay for specific product features. Clean vehicles have entered the market at a higher price point than their conventional vehicles counterparts, underscoring the importance of understanding consumer's marginal cost threshold for certain product attributes. A number of studies have investigated the marginal cost of plug-in vehicle attributes, to determine a price point for additional features, such as increased battery storage capacity for extended driving range. Hidrue et al, (2011) discovered that U.S. drivers were willing to pay up to $75 for each additional mile of driving range in a battery electric vehicle, and Curtin et al (2008) learned that if a consumer added $2500 to the base price of a conventional vehicle, on average, they would be almost 50% more likely to consider a plug-in vehicle. AECOM, on behalf of the New South Wales (2009) and Victorian Governments (2011), conducted an analysis on the economic viability of electric vehicles in each state, but modelling of consumer choice has not yet been undertaken in the plug-in vehicle market in Australia.

2.5 Consumer Perception of Clean Vehicle Technology (To Date)

Consumer perception of plug-in vehicle technology is another factor that plays a role in purchasing decision, specifically, 'revealed preferences'. Consider consumer perception is key in assessing its demand: *What do consumers think of this technology and how it may or may not apply to them or their lives?*

To start, Heffner and Kurani (2007) uncovered the personal and social significance of vehicle purchase, ownership and use, when studying hybrid owners in California. In fact, a number of studies undertaken by research at the Institute for Transportation Studies in the University of California in Davis have considered the relative importance of human subjectivity and irrational decision-making when choosing vehicles for ownership. Axsen and Kurani (2011) underscore the importance of a car-buyers social network in supporting vehicle purchase, with particular emphasis placed on the workplace network.

In additional to the importance of a positive affective experience (e.g. self-esteem, social status, autonomy) experienced by the vehicle owners described above, Graham-Rowe et al (2011) suggested vehicle "utility" is also considered an important factor for a motoring consumer (we would consider vehicle "utility" to be synonymous with "fit-for-purpose" for a motorist). According to the researchers in the this UK team characterizes vehicle "utility" as convenience factors for the owners such as reduced purchase and operating cost, reduced travel time and trip planning effort. Woodjack et al (2012) addressed the issue of consumer perceptions of PEVs, with emphasis on the limited range of battery-powered vehicles and the need for drivers to understand their own travel behaviour, independent of the type of vehicle they drive. In their study, motorists with repeated exposure to plug-in vehicles found their driving needs were met most of the time. In fact, none of the households in the U.S. who trialled a Mini-E for one full year found PEVs unsuitable for daily use.

2.5 The Role of Misinformation

Misinformation in the plug-in vehicle market is also impacting its growth. Market theorist Moore (2000), in his Technology Adoption Life Cycle, illustrates the importance of product positioning in the market to "cross the chasm" between the early adopter subset of the market and the mainstream consumer. Woodjack (2012) suggests that a primary initial barrier to uptake of PEVs stems from consumers perceiving an incorrect fit-for-purpose when comparing the vehicle's features with their own perceived driving habits, illustrating the manner in which plug-in vehicles are presented to motoring consumers also may be hindering their demand. In a study of public knowledge of plug-in vehicles in 21 U.S. cities, Krause and Carley (2012) uncovered that most Americans are either uninformed or misinformed about the attributes about plug-in vehicles and that this information gap is leading to low level consumer interest in the mainstream. And finally, Tal's evaluation of early plug-in vehicle owners in California from 2009-2012 (2013) acknowledges that an

absence of empirical plug-in consumer data (due to the newness of the technology in the marketplace) has potentially muddied assumptions for prospective demand.

2.6 Purchase Experience

A final factor for consideration is an automotive consumer's "purchase experience" – the period between when an automotive consumer decides he will by a new vehicle and when he transacts the purchase. A purchase experience is separate to the process of gaining market intelligence for recreation or general knowledge (e.g. consumer perception); instead it identifies consumers who seek information about products because they intend to buy. This period can range from hours to days, depending on the customer.

Recognising a number of factors can influence the sale of a vehicle, few have explored the critical "point-of-sale" moment for clean vehicle consumers. The digital age has opened doors for information access, broadening the "purchase experience" period beyond the dealership, and therefore increasing of "point-of-purchase influencers". For example, a purchase experience might involve a single visit to a dealership wherein a customer purchases the exact vehicle she had in pre-selected before arriving, or it may involve a change of opinion on behalf of the consumer after an extended period of research. Given nascent vehicle technology such as plug-in vehicles, there is great uncertainty about what factors sway clean vehicle consumers and when.

The 'purchase experience' is critical to understanding demand and barriers to the market for clean vehicles.

3. Early Market Intelligence

3.1 *GreenZone Drive*

In August of 2012, Queensland hosted a *GreenZone Drive* event where everyday motorists were given an opportunity to try 12 different models of low emission vehicles currently (or soon to be) available for sale in the Australian marketplace. Vehicles on offer were an assortment of ultra-efficient petrol and diesel engine conventional, hybrid and pure battery-electric (or plug-in) cars. Attendees were offered a chance to take a low emission vehicle on a test drive, escorted by a representative of the vehicle's manufacturer or a dealer who also provided them with information about the vehicle and its attributes.

Organised by the Australian Low Emission Vehicle (LEV) Partnership, local motoring clubs the RACV and RACQ, and sponsored by automotive industries such as car manufacturers, and component suppliers, Queensland's *GreenZone Drive* was the fourth of its kind. Previous events were held in Melbourne and Adelaide in prior years. The Queensland event was spanned a weekend (Friday to Monday) and was held at the RACV Royal Pines Golf Resort at the Gold Coast.

As part of its work with the AutoCRC to investigate Australian motorists' perceptions of clean vehicles, Queensland University of Technology (QUT) administered a short survey to test drive participants to collect information on their impressions of the vehicles they test drove. Information queried of event participants included:

- Demographics (age, education and income levels, gender)
- Current vehicle driven
- Test vehicle driven
- If they had driven a clean vehicle before
- Likes / dislikes about the vehicle
- Their top 3 decision factors in vehicle purchase

- Their inclination to buy a clean vehicle after test drive

Event attendees were invited to participate in a survey at the completion of their test drive.

3.2 Preliminary Findings

Survey responses shed some light on Australian consumers' stated preferences for the top 3 vehicle attributes which influence their decision to purchase a vehicle. As illustrated in **Figure 4**, from a list of 18 vehicle attributes listed, an overwhelming majority of consumers are concerned with costs to them – principally up-front purchase cost, followed by maintenance costs and fuel efficiency (which can be extrapolated to an interest in the relative cost of fuel consumption per X distance travelled).

Figure 4. Stated Top 3 Factors Consumers Consider Before Purchase
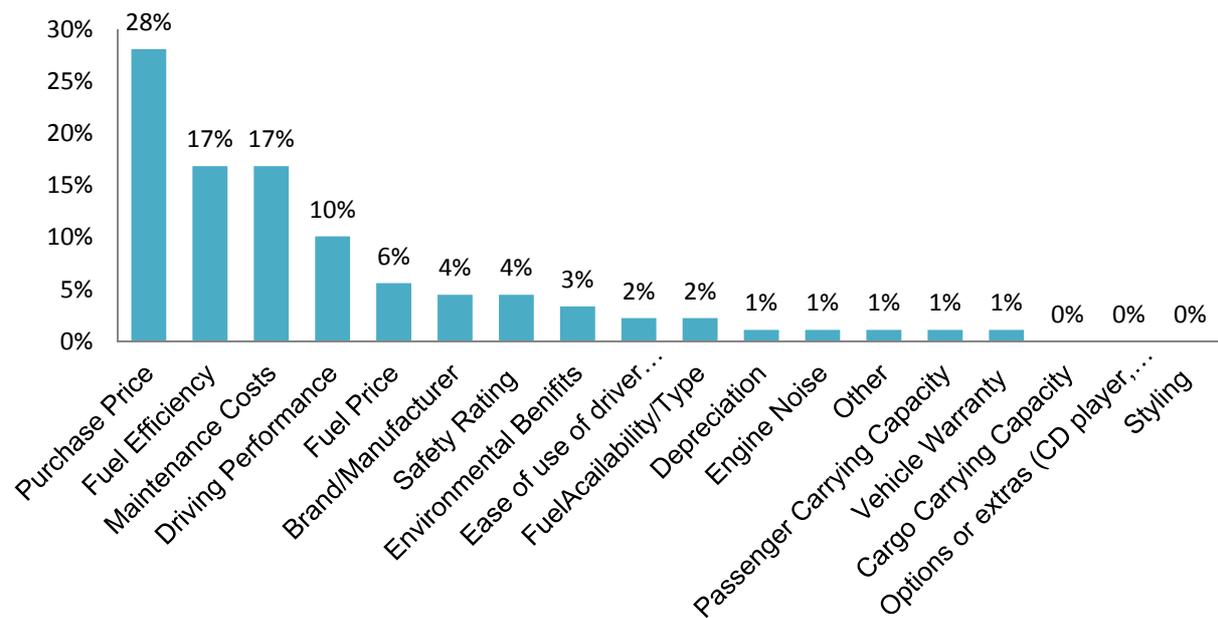
When looking at what vehicle attributes respondents reported on after a test drive, at Gold Coast *GreenZone Drive* drivers revealed that the driveability (or driving experience) of a vehicle was forefront in their mind. For example, from a list of 20 attributes, the majority of respondents claimed that smoothness (62%), engine noise, lack of (53%), and torque (47%) were among the preferred attributes they experienced in their test drive of a clean vehicle. Purchase cost (23%), torque (17%), and engine noise, lack of (14%) were the three top disliked attributes for respondents. Curiously both "torque" and "engine noise, lack of" were both among the most liked and most disliked attributes of respondents

Figure 5. State Preferences for 'Liked' Attributes Post Test Drive
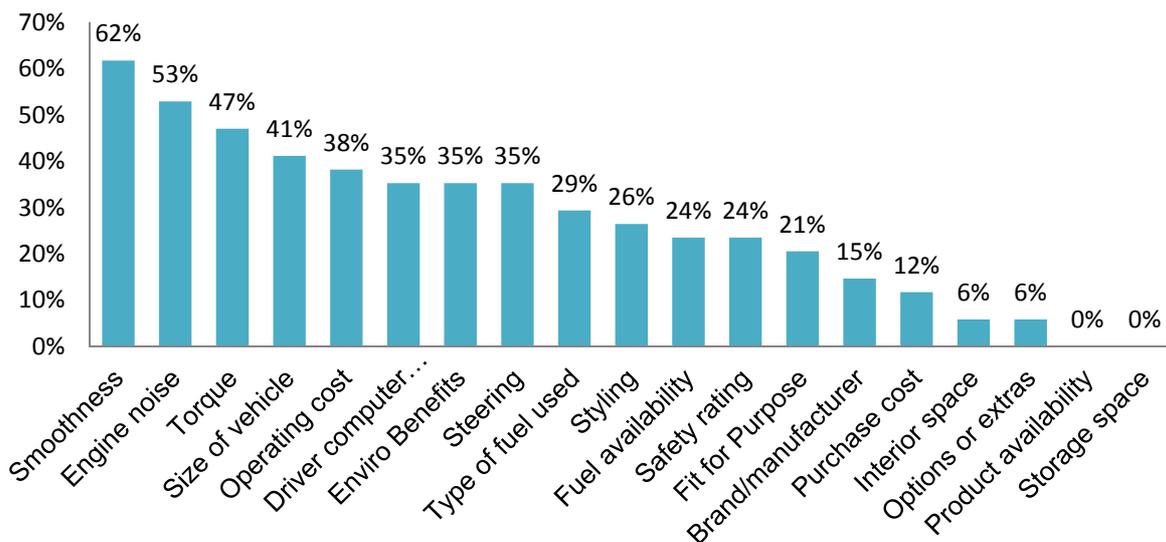
Figure 6. State Preferences for 'Dis-liked' Attributes Post Test Drive
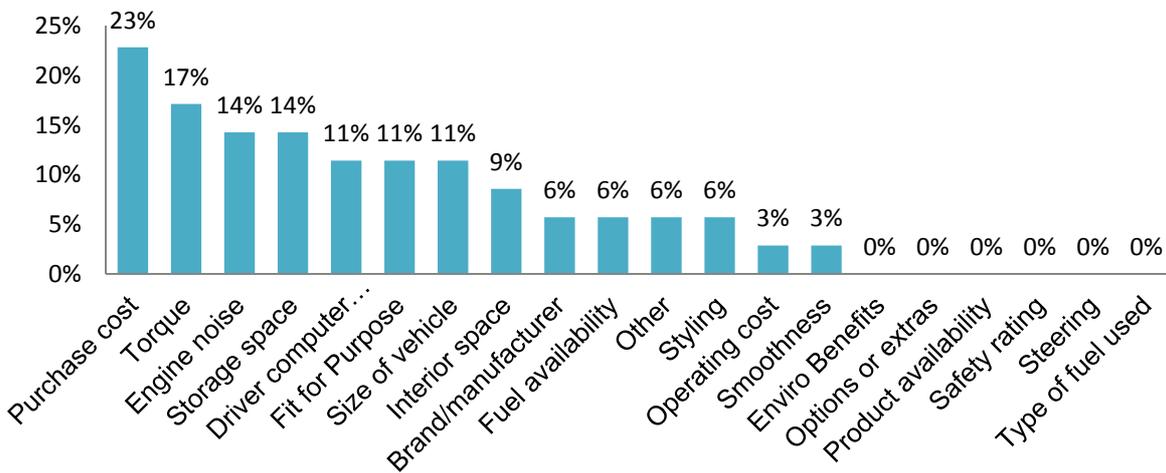
Australians' lack of familiarity with plug-in vehicle technology emerged as a key findings of the Gold Coast *GreenZone Drive* survey. Of the participants survey (all of whom were self-selected), more than half (57%) stated they had never drive a clean vehicle before. However, after their test drive, no respondents said they'd be 'less inclined to buy a clean vehicle' in future. In fact, 82% of respondents were 'more inclined to buy a clean vehicle' after their test drive and the remaining 18% claimed to have 'no change of opinion'. Specifically from the plug-in vehicle segment of the test drive, 11 of the 15 people who test drove an electric car said they'd be more inclined to purchase one after taking it for a test drive.

3.3 Conclusions

Relative to the Australian context, the role of misinformation may play a substantial role determining demand.

From *GreenZone Drive* we learned that first-hand exposure to clean vehicles leads to a greater inclination for test drivers to consider them for their next vehicle purchase. This conclusion is supported in the literature by Turrentine et al (2011) in their assessment of Mini-E trial households over 1 year and also by Woodjack (2012). Furthermore, the emergence of new business models such as Zip Car (commercial car share), GetAround (peer-to-peer car share) and Cloud9 (extended test drive experiences), all of which offer

short term "plug-in vehicle" test drive experiences illustrates a market demand for exposure to this technology to dispel misinformation prior to purchase.

Additionally, *GreenZone Drive* revealed a need to study further the stated preferences of consumers after experiencing a drive of a clean vehicle. Specifically, there is a need to query test drivers about their preferences for vehicle performance attributes as well as their perceptions of these attributes comparing clean and conventional vehicles, as their mechanical differences (i.e. hybrid vs. electric vs. diesel) can result in difference in driving experiences. For example, both hybrid and electric cars tend to be marketed to "eco-conscious" motorists, potentially limiting their appeal to consumers who might be sold on the top liked attributes of 'smoothness', 'lack of engine noise' and 'torque'. *GreenZone Drive* respondents showed like *and* dislike these attributes. With further understanding of these specific vehicle attributes and consumers' preferences of them, it would be possible to help automotive manufacturers hone communication of the product attributes and potential encourage greater sales.

3.4 Limitations

Despite extensive publicity of the *GreenZone Drive* event at the Gold Coast, it was poorly attended, resulting in a substantially smaller data sample than anticipated (34 responses total), noting that not all attendees completed surveys. Statistical modelling of the survey data conducted post-event using NLOGIT software did not yield significant output, resulting in a decision to withhold reporting on the results of quantitative data collected. Therefore the findings discussed are mainly descriptive in nature and are used to illustrate areas of suggested further work.

While the data collected in the GreenZone Drive survey provide some indicative insights into the consumer perceptions of clean vehicles in Australia, they are constrained by the following limitations:

- The sample size and composition of the population at GreenZone Drive was limited and not random. Event attendees were self-selected and evidence of their bias appeared in data (i.e. 91.8% male respondents). Further biases may have resulted from the date (concurrent with another major event in Queensland public event which may have limited attendance), the location (a golf resort on the Gold Coast), and accessibility (no nearby public transport or inconvenient for foot traffic).

- Due to low turn-out, survey administration was not strictly enforced, to not discourage test drives, thus further limiting the sample size.

- Survey items dropped toward the end of the survey, revealing fatigue of respondents. This is evident in the difference in number of responses illustrated in **Figures 5 and 6.**

The authors recognise the limitations of the data provided by the survey and reported on in this paper and reiterate that findings are considered to be indicative of areas where further work is required.

4. Future Work

In Australia, a clear picture of consumer attitudes and impressions of clean vehicle technologies (particularly at the point-of-sale) is required to understand what barriers the market faces in generating demand locally.

A detailed study of both stated and revealed consumer preferences (as recommended by Axsen, Mountain, and Jaccard in 2009) will help to uncover the role of misinformation in the marketplace. Through understanding of how consumers react to information they are presented about clean vehicles, relevant industry stakeholders can shape market offerings to

better appeal to mainstream consumers and possibly inform future policy initiatives designed to support carbon abatement programs in the transport sector.

The authors introduce these findings from the Gold Coast's *GreenZone Drive* to underpin an argument for further research in this area, and to highlight the planned research to be undertaken at the Queensland University of Technology relating to consumer perceptions of clean vehicles as part of the AutoCRC's program of work. QUT's research will seek to understand the true impact of misinformation for potential plug-in vehicle consumers at the point-of-sale, in particular:

- What does the purchase experience look like for clean vehicle customers? How does that differ from conventional vehicle customers? What are the trigger points for purchase?
- Does the purchase experience accurately present clean vehicle technologies?
- For clean vehicles, what are the most critical influences at the point-of-sale (the critical moment before a clean vehicle enters the marketplace)?

It is expected that improved understanding of these research questions will improve the delivery of information to target segments of the market and in the long run, help identify preferred ways to commercialise clean vehicles in Australia.

5. Acknowledgements

References

Albrecht, et al. (2009) 'Uptake and Use of Electric Vehicles in Australia.' AutoCRC. C2-16 M003.

Accenture. (2011a) 'Plug-in electric vehicles, Changing perceptions, hedging bets Accenture end-consumer survey on the electrification of private transport.'

Accenture. (2011b) 'Changing the game: Plug-in Electric Vehicle Pilots.'

Axsen J. & Kurani K. (2011) 'Interpersonal influence within car buyers' social networks: Developing pro-societal values through sustainable mobility policy.' Conference Proceedings, International Transport Forum Annual Summit.

Axsen J, Mountain D, & Jaccard M. (2009) 'Combining stated and revealed choice research to simulate the neighbor effect: The case of hybrid-electric vehicles' *Resource and Energy Economics*, vol. 31, issue 3, pp 221-238.

Bucolo, S & Matthews, J. (2011) A Conceptual Model to Link Deep Customer Insights to Both Growth Opportunities and Organisational Strategy in SME's as part of a Design Led Transformation Journey. *Design Management Toward a New Era of Innovation.*

Christensen, C. 2000. *The Innovator's Dilemma.* Harper Business, New York

Curtin, R, Shrago Y, & Mikkelsen J. (2009). 'Plug-in Hybrid Electric Vehicles'*.* Reuters/University of Michigan, pp 263.

Dini, A. & Simpson A. (2012) *Stock-Take of Electric Vehicle Interface with Electricity and Smart Grids across APEC Economies and the Potential for Harmonisation.* Asia Pacific Economic Cooperation.

Electric Power Research Institute. (2011) 'Southern Company Electric Vehicle Survey: Consumer Expectations for Electric Vehicles'.

Feeney, K. (2009). 'Economic Viability of Electric Vehicles.' AECOM.

Gardner J, Quezada G and Paevere P. (2011) 'CSIRO Electric Driveway Project Social Study on Attitudes, Drivers and Barriers to the Uptake of Electric Vehicle.' Report Number: EP113815.

Garnaut, R. (2011) 'Garnaut Climate Change Review – Update 2011'.

Giffi, Craig et al. (2011) 'Unplugged: Electric vehicle realities versus consumer expectations.' Deloitte.

Hidru M., et al (2011) 'Willingness to pay for electric vehicles and their attributes.*' Resource and Energy Economics,* vol. 33, issue 3, pp. 686-705.

International Energy Agency. (2013a) 'Global EV Outlook: Understanding the Electric Vehicle Landscape to 2020.'

International Energy Agency. (2013b). 'Redrawing the Energy-Climate.'

International Energy Agency. (2011). 'Technology Roadmap: Electric and plug-in hybrid electric vehicles.'

KPMG. (2013) 'Global Automotive Executive Survey 2013.'

Kinghorn, R. and Dominic Kua (2011). 'Forecast Uptake and Economic Evaluation of Electric Vehicles in Victoria.' AECOM.

Kurani K, Heffner R & Turrentine TS (2008) 'Driving Plug-In Hybrid Electric Vehicles: Reports from U.S. Drivers of HEVs converted to PHEVs, circa 2006-07.' Institute of Transportation Studies, University of California, Davis, Research Report UCD-ITS-RR-08-24

Li, X et al. (2013) 'Consumer purchase intentions for flexible-fuel and hybrid-electric vehicles.' *Transportation Research Part D*, vol. 18, pp 9-15.

Moore, G. (2000) '*Crossing the Chasm.'* Second Edition. Capstone Publishing, New York.

Parliament UK. Houses of Parliament, Parliamentary Office of Science and Technology. (2010) 'Electric Vehicles*.'* Post Note 365. [online], Available: http://www.parliament.uk/documents/post/postpn365_electricvehicles.pdf [28 April 2013]

Potoglou, D & Kanaroglou PS.(2007) 'Household demand and willingness to pay for clean vehicles'. *Transportation Research Part D*, vol. 12, pp. 264-274.

Rogers, E. (1995) 'Diffusion of Innovations.' Fourth Edition. The Free Press, New York. 1995.

Schwartz, P.(1991) 'The Art of Longview.' Doubleday Currency, New York.

Sierzchula, William et al. 'Technological diversity of emerging eco-innovations: a case study of the automobile industry.' *Journal of Cleaner Production.* 24 July 2012.

Simpson, Andrew. (2009) 'Environmental Attributes of Electric Vehicles in Australia.' Curtin University Sustainability Policy Institute.

Tal, Gil, et al. (2013) 'Who Is Buying Electric Cars in California? Exploring Household and Vehicle Fleet Characteristics of New Plug-in Vehicle Owners.' Institute of Transportation Studies, University of California, Davis, Research Report UCD-ITS-RR-13-02.

Trigg T, Fulton L, & Kaneko H.(2012) 'The Road Ahead for Electric Vehicles: National Targets, Manufacturing Plans, Costs, and the Role for International Collaboration.' Conference Proceedings, EVS26, Los Angeles.

Turrentine TS, Sperling D, & Kurani KS. (1992) 'Market Potential of Electric and Natural Gas Vehicles.' Institute of Transportation Studies, University of California, Davis, Research Report.

Turrentine, TS, et al (2011) 'The UC Davis MINI E Consumer Study.' Institute of Transportation Studies, University of California, Davis, Research Report UCD-ITS-RR-11-0

Victorian Department of Transport (DOT). (2010) 'EV Trial Market Research Phase 2 RACV Ballot Participants Survey Full Report.'

Woodjack, Justin, et al. (2012) 'Consumer Perceptions and Use of Driving Distance of Electric Vehicles: Changes over Time Through Lifestyle Learning Process. *Transportation Research Record: Journal of the Transportation Research Board 2287,*pp 1 - 8