Electric and hybrid trends

EXAMINING THE DEVELOPMENT AND UPTAKE OF ELECTRIC AND HYBRID VEHICLES

There is much media coverage and excitement surrounding the emergence of electric (and to a lesser degree) hybrid vehicles into global markets – but what really does the future hold for these cars and is it likely that you will have one parked in your garage any time soon?

Drawing on key findings from the latest report in the Powertrain Series, Electric & Hybrid Vehicles Australia: An Automotive Perspective, Natalie Roberts, the Principal Engineer at ABMARC provides a view of the future of Electric and Hybrid vehicles in Australia.

From the desk of Natalie Roberts, ABMARC

Before delving deeper into a discussion on the future of electric and hybrid vehicles, it's important to first make sure that we are using common terminology, and have a good understanding of the different vehicle types.

Motor – A device that converts electrical energy into mechanical work

Engine – A device that converts heat energy (such as that produced when combusting fuel) into mechanical work

Hybrid – Combination of two or more device types

Powertrain – Propulsion system (such as engine, motor or combination of the two) and transmission

All EVs and hybrids require their batteries to be charged with electricity. This electricity comes from the electricity network (the grid) in the case of EVs, or from an on-board generator in the case of hybrids.

The on-board generator converts energy that would normally be lost as heat when the vehicle is slowing down or braking, into electricity and stores this in the battery. The vehicle then utilises this 'stored' energy to assist in propelling the vehicle. In doing so, a hybrid car can offer improved efficiencies (better fuel economy and lower CO2 emissions) over a conventional petrol vehicle of around 30 percent.

There are three key types of hybrid vehicle systems, being: series (example – the Fisker), parallel (example – Honda Integrated Power Assist) and powersplit (example – Toyota Hybrid Synergy Drive). Manufacturers will select a petrol, diesel or LPG fuelled engine as the primary propulsion source.

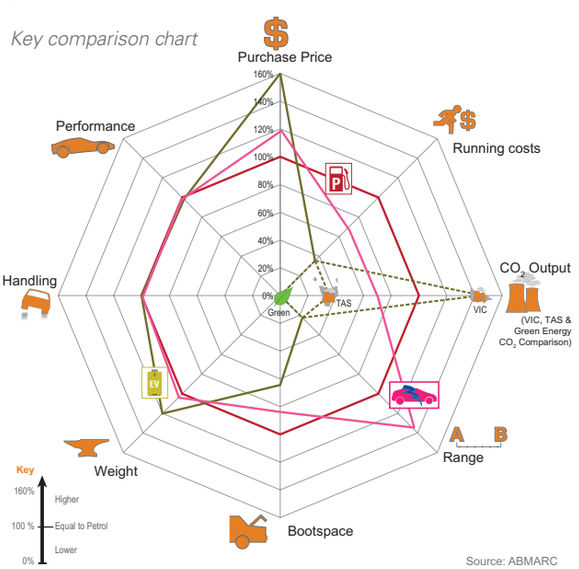
Due to the multiple hybrid system types, and the various marketing strategies used by vehicle manufacturers, a large number of motorists are unsure about what technologies exist and how each of the different technologies works. One of the common themes raised by motorists in the ABMARC electric and hybrid vehicle survey was that they found the topic 'confusing'. This confusion will be further compounded by the motorist's vehicle choice no longer being just a matter of 'petrol versus diesel', but also a range of full electric or hybrid series, parallel, powersplit and potentially any of the hybrids with 'plug-in' capability.

Vehicle Evaluation & Comparative Analysis

As part of the Electric & Hybrid Vehicle report, ABMARC conducted a comprehensive comparative analysis and technical evaluation of five vehicles. Whilst all vehicles scored well in the evaluation for drivability, and proved themselves to be capable performers on the road, some key features of the two electric vehicles may not meet the expectations of most drivers in terms of the price premium over a comparative petrol car and the range.

It should be noted however, that electric vehicles represent a dedicated commitment to improving vehicle technology, and offer their target market, vehicles that cannot be matched by conventional petrol or diesel cars in terms of exceptional drivability and NVH (noise, vibration, harshness) performance.

Key comparison chart



Source: ABMARC

Looking at the key comparison chart (above) of typical vehicle characteristics, it is clear the hybrid car presents a much more compelling story for the motorist than EVs do across features such as range, price, weight and bootspace.

Of the cars evaluated, the Holden Volt (marketed by GM as a 'range extender' but considered a

plug-in hybrid by our definitions) was the leader in our assessment. Whilst it may have been the most expensive, the Volt was the most drivable, with the best performance and the most advanced interior. More than any other vehicle tested – the Volt made you feel as if you were driving the "next generation" in vehicle design.

It is our view that the hybrid operating strategy adopted in the Honda Insight (one of our evaluation vehicles) is moving in the right direction with regards to making hybrid technology affordable, and in integrating hybrid systems into 'everyday vehicles', as it pairs a small motor with the engine to improve overall efficiency. This also has the benefit of utilising a smaller battery than other hybrid vehicle architectures. A smaller motor and battery result in lower costs, less intrusion on interior space to accommodate the technology, and less overall additional weight.

Policies Influencing Change

Instead of motorists driving the trend towards electric and hybrid vehicles, it is actually being propelled mostly by government policies and regulation. The USA, Europe and Japan are encouraging new technologies through a combination of more stringent vehicle emission standards, tougher fleet average CO2 or fuel economy reduction targets and the linking of research and development (R&D) grants provided to automotive manufacturers and suppliers to the investment in, and production of 'green' technologies and vehicles.

To reduce the CO2 emissions of a vehicle, there are two fundamental approaches that can be taken. The first is to increase the powertrain efficiency – as is the case with hybrid or diesel technologies (and EVs, although this is dependent on the source emissions of the power generator); the second is to use lower carbon fuels such as LPG, CNG or biofuels (that have a 'net' CO2 benefit).

Manufacturers are increasingly likely to choose hybrid technologies as they don't require additional investment in refuelling infrastructure, and are therefore more 'global' in platform design, (which is important to keep R&D and production costs down). Importantly, hybrid vehicles provide fewer compromises for the owner when compared to some other alternatives.

These global government policies have had a direct impact on the model line-up of all the major automotive manufacturers, who have responded with more fuel efficient vehicles. For example, today in the USA there are 15 electric, 3 plug-in hybrid and 38 hybrid vehicle models available – with a growing number planned for release in the coming years. With greater choice, the hybrid car will continue to grow in popularity and will soon no longer be an 'alternative' vehicle but a mainstream type. As an example, in Japan, hybrid cars now account for 9 percent of all new vehicles sold, and sales are on target to reach 20 percent by 2020.

Regarding EVs, many governments, particularly in Europe have set ambitious targets for their adoption. Some of these plans have been accompanied by significant subsidies (such as €7,000 in France) for the purchase of new electric vehicles. Despite this, the uptake by consumers has been well below expectations. EV sales are currently well below both manufacturer and government hopes and it is likely that the optimistic targets for their mass adoption will not be met. An additional challenge for electric cars is that they are chasing a moving target – with advances in petrol and diesel technologies resulting in more efficient and powerful engines every year (efficiencies that hybrid cars are able to capitalise on).

Fast Facts from the ABMARC Electric & Hybrid Vehicle Survey:

ABMARC conducted a survey of more than 640 motorists to understand their knowledge of, attitudes towards, and future purchase considerations of electric and hybrid vehicles. Some of the key results show that:

- Australian motorists understanding of 'what' a hybrid or electric vehicle is, is high
- Of current vehicle fuel/powertrain ownership, hybrid vehicle owners reported the best experience with 88 percent describing it as 'great'!
- Motorists who would consider buying an electric car are more likely: to be male and live in the inner city, hold a university degree and presently own a hybrid vehicle
- Importantly only 51 percent of respondents had a convenient recharge point at their home and this number decreased dramatically for those motorists living in the inner city
- Regarding future purchase consideration, 22 percent of respondents said they 'would definitely consider a hybrid' which contrasted to only 2 percent definitely considering an electric car at a $15,000 price premium (over an equivalent petrol vehicle)

The Trend in Australia

Presently, Australia has no Federal government incentives for the promotion of electric and hybrid vehicles. Without these, it is unlikely that there will be a significant uptake of electric cars to 2020 unless there is a breakthrough in battery technology. ABMARC forecasting shows that with current trends and policy settings, EVs may constitute only 0.4 percent of new vehicle sales in 2020.

Additionally, the makeup of Australia's power generation, mainly based on the burning of fossil fuels, does not always lend itself to a 'greener' outcome when using electric or plug-in hybrid electric vehicles. To ensure a cleaner outcome when operating plug in vehicles, consumers can purchase 'green' electricity, but this will be at an additional cost. The price of electricity compared to petrol is high in Australia, and has increased further due to the carbon tax and the underlying annual price growth. This makes the payback period of an electric or plug-in hybrid vehicle longer than in most other countries.

The growth in hybrid (including PHEV) sales however, is expected to be quite dramatic to 2020. ABMARC forecasts sales to grow strongly in this segment over the next 8 years to a combined 6.4 percent of the new vehicle market.

Key results of future buying consideration from the ABMARC Electric & Hybrid vehicle survey, conducted exclusively for the report, shows that 22 percent of Australian motorists would definitely consider a hybrid car for their next vehicle purchase – this compared to only 2 percent considering an EV at a purchase price premium of $15,000, with many citing range or price of the EV as a concern. Of note, the survey identified that current hybrid vehicle owners loved their cars, with 88 percent reporting a 'great' experience (this compared to petrol vehicle owners at only 29 percent). Hybrid owners were much more likely than the other respondents to consider the purchase of both an electric or hybrid vehicle in the future.

Whilst it is likely that in the short to mid-term, electric cars will fill only a niche in the market, there will be large growth in hybrid vehicle sales – driven by the increasing line-up of models available, positive customer experiences and a decreasing price differential to an equivalent petrol car. In 2020, the hybrid (including PHEV) will no longer be an 'alternative' vehicle type, but the vehicle of choice for a large number of Australian motorists.

For more information contact ABMARC on 03 5964 8402.

- ABMARC

ABMARC is the authoritative source for unbiased and comprehensive analysis of conventional and alternative powertrains, energy, transport and fuels.

ABMARC is an independent company of engineers offering a broad range of services and was established to provide businesses with the tools they need to achieve successful outcomes.