ENGINEERS
AUSTRALIA

Inquiry into the transition to electric vehicles

Engineers Australia submission

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Engineers Australia

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1. Engineers Australia

Engineers Australia is the peak body of the engineering profession representing the collective voice of over 120,000 individual members. Constituted by Royal Charter, our mission is to advance the science and practice of engineering for the benefit of the community.

Engineers and engineering are indispensable contributors to Australian prosperity and lifestyles. Engineering services are embodied in almost every good or service consumed, used or traded by Australians. Engineers are the enablers of productivity growth because they convert "brilliant ideas" into new commercial products, processes and services. Engineers also ensure society gets the most out of existing facilities by optimising their operations and maintenance.

Engineers are enthusiastic participants in public discourse, contributing to meaningful community and policy discussions that impact the economy and society. Engineers Australia formulates its policy positions through engagement with members and non-member engineers, industry, educators, government officials, and other experts across Australia and internationally. By synthesising these diverse perspectives, we develop evidence-based policy aligned with the highest professional standards.

The following comments have been developed through close consultation processes with our members, including those from the Transport Australia society (TAs). Further information can be found in the following submissions:

1. Future Fuels Strategy available here
2. National Battery Strategy available here
3. National Electric Vehicle Strategy available here
4. Fuel Efficiency Standard available here
5. New Vehicle Efficiency Standard available here

Please do not hesitate to reach out to Engineers Australia if you would like to discuss this or any other relevant submission further. You can contact us at policy@engineersaustralia.org.au.

2. General comments

The main barrier to EV uptake has been the purchase price relative to internal combustion engine (ICE) vehicles. Low-priced EVs are not being offered to Australia, as the limited supply has been prioritised to countries with emissions standards or offering incentives. At present, the average premium associated with an EV, relative to an equivalent ICE, varies by segment and is reducing.[1] Australian consumers nominate high costs as their biggest purchase barrier. However, recent research indicates the cost of EVs is coming down quicker than previously thought, led by reductions in the costs of batteries.[2]

Measures reducing the upfront cost of EVs, such as waivers on import duties and taxes, stamp duty and registration directly address the largest uptake barrier. This drives up demand, which then encourages manufacturers to bring more EV models to the Australian market. Such interventions are almost uniformly available in markets with high uptake.

While purchase price and limited model availability are significant barriers, charging infrastructure is also seen as an important factor. Users are reluctant to embrace EVs until public charging infrastructure is available and reliable, but many businesses will not invest in charging until EV uptake grows. While

[1] How much more expensive are electric cars in 2024?, Henry Man, WhichCar, 2023, https://www.whichcar.com.au/advice/how-much-more-expensive-are-electric-cars-2024

[2] Peter Slowik, Aaron Isenstadt, Logan Pierce, Stephanie Searle, *Assessment of light-duty electric vehicle costs and consumer benefits in the United States in the 2022-2035 time frame*. International Council on Clean Transportation (ICCT), October 2022, https://theicct.org/wp-content/uploads/2022/10/ev-cost-benefits-2035-oct22.pdf

nearly all current EV owners charge mostly at home, there is a disconnect between perceived and actual charging needs. Those without off-street parking will rely more on public charging infrastructure.

Consumer information will be key. Government and industry must work together to provide information on model choice, whole-of-life cost savings, emission reductions and public charging networks, amongst other topics. The consultation process has demonstrated how some elements will circulate misinformation to the public regarding EVs. Governments, along with other stakeholders, have a role to play in countering misinformation and ensuring the public are provided with impartial and accurate information about Electric Vehicles. The New South Wales government Vehicle Emissions Star Rating (VESR) website is an example of providing consumers with information about emissions per kilometre driven - https://www.vesr.gov.au/. Lenders have started providing EV cost comparison tools so consumers can compare costs over a period of years.

Australia has conducted numerous inquiries into these issues, and many organisations have made well-researched and thoughtful contributions. The task of decarbonising the transport sector is urgent, and it is time to take action. In the year to September 2023, transport emissions rose by 4.5% whilst emissions from the electricity sector fell by 4.9%. [3]

Other countries have already accelerated EV uptake, and if Australia does not respond, the costs of doing so will only increase. The adoption of EVs in Australia will reach a tipping point, which also increases the urgency of these actions if we are to avoid the downsides of disruptive transformation.

We commend the government for focussing on this important element of the energy transition, through numerous consultations and inquiries, and urge immediate action to build on the work done to date.

3. Resources, systems and infrastructure to support transition to EVs

3.1 Focus on public and active transport to complement the move to EVs

While shifting the road fleet towards EVs is a crucial element of transport decarbonisation, a like-for-like substitution would not represent an environmentally or economically optimal path to achieve emissions abatement. Cars dominate the Australian transport landscape. Private vehicles are used for around 80 per cent of all journeys – a figure that has remained relatively static for 40 years. Also virtually unchanged is the share attributed to public transport modes (under 15 per cent) and active transport (around 5 per cent), which have lower carbon impact and greater economic efficiency. While interrelated technological and socio-cultural forces support car use, mode choice is also strongly correlated with convenience and comfort. Governments influence transport choices through their infrastructure investment priorities.

3.2 Charging network

For most motorists, the use of electric vehicles requires only a small change in their mindset because range, speed and safety are similar to current vehicles. However, those undertaking regular long journeys will need to consider the proximity, availability and reliability of charging stations. Uptake of

[3] National Greenhouse Gas Inventory update, Department of Climate Change, Energy, the Environment and Water, 2024 https://www.dcceew.gov.au/climate-change/publications/national-greenhouse-gas-inventory-quarterly-update-september-2023

electric vehicles will likely be slower for this group of drivers without direct investment in infrastructure networks. Apartment dwellers also have an additional challenge in terms of charging at home, which is where most current EV owners commonly charge their vehicles.

Delivering the charging network required by a large electric road fleet is a challenge of considerable scale. There is a need to provide appropriate charging for different purposes, including long-distance travel, commuting, and activities closer to home. These different uses will require different rates of charging at relevant locations. The government should consider universal chargers, chargers on power poles, and anything else that makes charging EVs more accessible to everyone.

Several measures could support the increased provision of charging infrastructure. Increased investment is the direct option. This could be provided solely by governments or in partnership with the private sector and, ideally, focussed on areas neglected by the market. A national charging infrastructure target may also catalyse increased private investment. Ease of billing is another potential area for cooperation between infrastructure providers.

Building codes and planning regulations could also be used to drive investment. New builds or major renovations of apartments, large commercial sites, and/or buildings in areas with little public charging could be required to deliver charging or in preparation for later installation.

EV owners want to charge in the most convenient way possible, which currently often means at home on overnight off-peak rates or weekends using their surplus solar generation. Charging equipment in homes should have communication capability that is nationally consistent and aligned with international approaches. This does not mean it has to be externally controlled. A mixture of controlled charging, time-of-use tariffs and owner education to avoid peak times will allow high penetration of EVs and lessen the need for grid upgrades. Some studies indicate that only a small percentage of EV charging needs to be directly controlled to allow every household to host an EV using the existing electricity network.[4]

4. The impact, including fuel excise loss, existing auto industry component manufacturers and the environment.

Getting the pace of change right will be an important and challenging factor. The government will need to be clear about what measures, supports, and infrastructure are appropriate at what time to catalyse the transition.

Governments need to replace the fuel tax revenue for the transition to proceed smoothly. The Transport Society, NRMA and many other bodies have been calling for a debate on a 'fairer' model for road funding for many years.

4.1 Decarbonisation

The overarching benefit of moving to EVs is the reduction in greenhouse gas emissions. The 2018 Australian Renewable Energy Agency / Clean Energy Finance Corporation Australian Electric Vehicle Market Study predicted early adoption of electric vehicles will primarily be in passenger vehicles. By 2040, the report predicted electric vehicles will grow to comprise 30% of the passenger vehicle fleet with no government intervention, 55% with moderate intervention and 70% with accelerated

[4] Electric Vehicle Uptake and Charging, ENA
https://www.energynetworks.com.au/miscellaneous/ev-uptake-and-charging-review-report-1/

government intervention. The uptake rate under the no government intervention scenario is insufficient to meet 2050 emission reduction targets under the Paris Convention.

To assist in the reduction of emissions in the transport sector, an emissions reduction trajectory could be set to help guide the transition.

As an immediate action, the government should adopt a fuel efficiency standard.

4.2 Fuel Efficiency Standard (FES)

Australia does not manufacture light vehicles and accounts for one per cent of the global car market. Because Australia is not a big market, we need to make it easy for manufacturers to bring low-emission vehicles here by setting targets consistent with jurisdictions that are supplied by the same range of manufacturers.

The targets should aim for zero emissions for new light vehicles by 2035. This gives 15 years to renew the remaining light vehicle fleet to reach close to zero emissions by 2050. The target could align with the EU FES of 95 g CO2/km for cars from the outset and aim for zero emissions by 2035 at the latest. This provides a clear and unambiguous message on Australia's targets. However, the important point is to agree on a target and institute it.

Engineers Australia supports adopting the World harmonised Light vehicle Testing Procedure (WLTP). Most world vehicles are manufactured to comply with it. WLTP reflects real-world emissions more accurately, which is critical. For the integrity of an emissions regulation with potential financial penalties attached, a credible testing facility will need to be contracted with a suitably equipped technical centre, such as the Australasian New Car Assessment Program (ANCAP) or a university engineering faculty.

In respect to the New Vehicle Efficiency Standard consultation, Engineers Australia supports Option B or preferably the more ambitious Option C. Both Options B and C include a mechanism for reviewing and tightening limits if required, and the critical point is to get a sound mechanism in place as quickly as possible. Option A is not an appropriate or ambitious enough response to the challenge.

4.3 Circular economy

Batteries differ in chemistry and construction, which makes it difficult to create efficient recycling processes. Regulation is needed to ensure battery manufacturers consider these issues from the design stage. Consideration of the ease of recycling at the design stage, and clear labelling of batteries so recyclers know what they are dealing with, will make the process more efficient. Reducing complexity will encourage battery reuse. Regardless, recovering key battery minerals will be vital and increasingly economically viable.

Disposal and recycling should only happen after reuse. A battery that is no longer capable in a vehicle may be suitable for a stationary application, especially if the battery type/chemistry has low fire hazard. Battery recycling facilities are being developed in Australia through work by the Future Batteries Industry CRC and CSIRO.

Circular economy means much more than recycling. In fact, recycling can be seen as the lowest order strategy of a circular economy. Greater focus is required for higher-order strategies: reduce, reuse, repair, refurbish, repurpose and recycle.

5. Fuel savings, consumer energy technologies and savings for outer suburban/regional motorists

5.1 Cost of living pressures

Cost of living pressures are at the forefront of consumers' and governments' minds right now. The difference between capital costs and operation costs for battery electric new vehicles compared to internal combustion engine vehicles and hybrid vehicles is good and getting better.

Analysis from the Climate Council has shown that Australian cars consume significantly more fuel than European, Chinese and American cars.[5] Petrol prices are rated as one of the top three causes of financial stress. The New Vehicle Efficiency Standard will mean the average new car will consume less fuel to travel the same distance thereby benefitting all Australians regardless of whether they drive a new EV or ICE vehicle.

In Norway, a country considered a leader in adopting electric vehicles, part of their success is due to providing incentives (including reductions in taxes) for buying and driving electric vehicles. Through this policy, over 90 per cent of vehicle sales are EVs. These types of tax incentives have an added environmental benefit and reduce business costs since the operating costs of electric vehicles are lower than traditional fuelled vehicles.

The majority of Australia's refined fuel is either imported or refined from imported crude oil. Reducing oil imports will have a significant economic benefit.

6. The impact on electricity consumption and demand

As discussed above, a like for like swap of vehicle drives is not the most efficient path to decarbonisation. Approaches that reduce demand, such as a focus on active transport and he development of more efficient batteries, also need to be an integral component of the transition.

As the cost of day-time energy falls, a higher percentage of the energy price will be driven by consumer convenience. Tariffs could be based on instantaneous electricity prices, and a discount could be provided if the customers shed the charging load on request. Some network operators and electricity retailers are already offering “solar soak” tariffs that offer lower cost (and in one case ‘free’) electricity in the middle of the day.

6.1 Vehicle Grid Integration

Vehicle batteries can work synergistically with the grid, but the system needs to account for significant impact on the load profile. The impact of the overall load is likely to be much less than that of the peak load, which drives investment. Norway now has 20 per cent EVs, yet the impact on power demand has been small.[6] With the right policies and technology in place, EVs could do much to assist the transition to renewable energy generation by providing the distributed storage needed to smooth variable supply (for example, by absorbing excess photovoltaic generation during the day and using that stored energy through vehicle-to-home and vehicle-to-grid technology to supply peaks in load in the early evening), as well as providing significant customer savings.

There needs to be a framework or strategy for ensuring the grid remains balanced while we introduce variable energy resources and EV ownership steadily increases. The grid will need to balance daily fluctuations in generation and demand as well as seasonal variations. Bi-directional grids need to be strategised in a way that can relieve pressure from the grid during peak times. This could be achieved by smart demand management strategies to ensure supply and demand are balanced 24/7.

[5] Climate Council, February 2024, https://www.climatecouncil.org.au/resources/aussies-would-pay-less-petrol-pump-with-clean-efficient-cars/
[6] Jack Ewing, New York Times, 2023, https://www.nytimes.com/2023/05/08/business/energy-environment/norway-electric-vehicles.html

The Australian Government has committed to working with states and territories, industry, and other experts to ensure the grid is 'EV-ready'. The Commonwealth's Integrated Systems Plan (ISP) accounts for EV support policies currently in place within the National Electricity Market (NEM). It also models EV uptake scenarios and the advent of vehicle-to-grid discharging from EVs. The ISP expects significant domestic investment in roof-top solar to support the plan and could be linked to EV ownership to reduce the impact on the grid and local distribution issues. Nonetheless, the precise impacts of EVs on the grid will require ongoing monitoring, research and investment.

6.2 Standards

Smart grid applications for bi-directional energy flows require technical standards such as AS/NZS 4777 to ensure the system is capable and compatible. Amendments to AS/NZS 4777 to provide for Vehicle to Grid (V2G) are underway and public comments closed recently. Smart charging systems should be capable of generating vehicle-to-grid or vehicle-to-home energy flows. This would provide further benefits to grid stability as well as enable greater uptake of renewable energy while minimising expenditure on energy storage systems. Standards Australia is currently preparing two National Guidelines relating to Electric Vehicles – one for Residential owners and the second focussing on Commercial Charging infrastructure. These are expected to be completed in mid-2024.

6.3 Australian Battery Industry

The development of the battery industry in Australia is an exciting opportunity to develop better batteries and systems for a sustainable future. While we acknowledge competing with gigafactories producing at an immense scale will be difficult, Australia can:

- move up the value chain, starting in mineral processing and focussing on all processes and precursors prior to mass manufacturing
- focus on assembly in niche applications, including those designed and built for Australia's climate, remote communities and defence needs
- concentrate on safety standards and ESG credentials as a competitive advantage.

Australia has vast reserves of the raw materials needed for batteries and is the dominant player in mining battery materials. We produce 60 per cent of the world's lithium but import 100 per cent of our lithium-ion batteries, which highlights both the lack of secondary manufacturing of new technologies and the significant opportunity in Australia. While our natural resources are the obvious advantage, they are located low in the value chain. As well as providing funding, the government can facilitate coordinated research in partnership with universities and industry.

Australia's research and development (R&D) capacity is comprehensive, distributed across the country and well positioned to support this growing industry. Australia is currently doing excellent research, and the commercialisation of innovation could focus on promising areas, and include emerging technologies such as sulphur, sodium, graphite, and flow or solid batteries.

Research could also be focused on developing new products with improved performance and safety, would create new business opportunities and a competitive advantage.

Developing standards for all parts of the battery industry to ensure public safety, interoperability and competitive advantage is critical.

7. Limited EV supply compared to peer countries

The Australian strategy for the transition to EVs should consider a global trend of fast-paced adoption of electric vehicles in other countries. In response to this shift, many major car manufacturers will stop

making petrol and diesel-powered cars in less than two decades. As Australia no longer manufactures traditional cars, we are reliant on vehicles from the international market and are subject to its trends. If Australia's uptake of these new technologies (and corresponding infrastructure) is not at pace with international markets, the medium to long-term costs may be significant and require large-scale government support or direct investment at both a federal and state level.

Government analysis shows new vehicles in Australia use 15 per cent more fuel than in New Zealand, 20 per cent more than in the US and 40 per cent more than in the EU. The analysis also shows that Australians have fewer than 100 models to choose out of the 500 available globally.[7]

There are many implications, including:

- reliance on global fuel supply fluctuations with long supply lines and inadequate domestic reserves
- limited and expensive EV vehicle options available for sale
- lost opportunities to ensure EVs are integrated into an effective energy system designed to meet future needs
- increasing transport greenhouse gas (GHG) emissions, undermining Australia's ability to reach a net zero emissions economy
- poor air quality and increasing exceedances of air quality goals, particularly in urban areas
- global supply chains for EV components may mature, and Australia will lose opportunities to create new manufacturing jobs.

8. Other relevant matters

8.1 Engineering workforce

Engineering expertise is critical to the success of a variety of emerging technologies, including battery technology, recharging infrastructure for electric vehicles and integration with the grid. Engineers Australia commends the efforts of Jobs and Skills Australia and other stakeholders working on the analyses and planning of the clean energy workforce. This is critical and urgent work.

Reaching net-zero by 2050 will require a workforce transformation that includes strengthening the engineering workforce and ensuring we have engineering advice central to all government decision making, including:

- Strengthen the engineering talent pipeline by increasing participation rates in STEM at school, graduating 60,000 additional engineers over the next ten years, developing a fit for purpose migration program, ensuring the retention of mid-level and senior engineers and addressing a lack of diversity in the profession, including the underrepresentation of women.
- Strengthen the capacity and capability of engineering decision making in the public service, led by the appointment of a national Chief Engineer.
- Re-train and re-skill workers in regional communities engaged in fossil fuel industries to bolster the workforce and to maintain social license for the energy transition.

[7] Lisa Visentin, Stoush over caps on car emissions heats up, Sydney Morning Herald, 10/3/2024, https://www.smh.com.au/politics/federal/stoush-over-caps-on-car-emissions-heats-up-20240308-p5faw7.html.