



Australian Government
Infrastructure Australia

Infrastructure Australia Submission Select Committee on Electric Vehicles

Electric Vehicles are coming

Across a whole range of sectors, we are seeing traditional business models being disrupted by new technologies, new markets and new ways of engaging with customers. This of course is no truer than for the transport sector, which is undergoing unprecedented change. The advent of electrification, automation, sharing and connectivity could bring the largest transformation the transport sector has seen since the shift from steam to diesel locomotives. If well managed, this change demonstrates a real opportunity to harness the technology for the benefit of all Australians.

Infrastructure Australia's position sees the mainstream uptake of Electric Vehicles (EVs) as an inevitable shift. However as a country we have been comparatively slow in adoption of this new technology. EV sales accounted for just 0.2% of vehicle sales in 2017, which is roughly 2,200 vehicles.ⁱ However, this is certainly not indicative of where the broader market is heading. Currently, when it comes to EVs, Australian consumers face a lack of vehicle choice. There is limited after-market support, a scarcity of charging infrastructure and high upfront sticker prices.

As Australia does not have a domestic car manufacturing industry, international markets are therefore the best indicator of the direction of our own domestic market. Globally, from 2016 to 2017, EVs registered a 54% increase in uptake – with the number of EVs worldwide now exceeding the three million mark.ⁱⁱ

Large manufacturers are shifting investment away from internal combustion engine vehicles and focusing instead on EVs. We are seeing companies like Mercedes Benz, Volvo and Jaguar Land Rover, pledging to end the production of internal combustion engine vehicles within four years, while Volkswagen and BMW have committed \$80 billion and \$47 billion (USD) respectively to develop their EV offering.ⁱⁱⁱ Toyota will introduce an electric or hybrid variant of all their models by 2030.

Crucially, this shift isn't solely being driven by commercial investment, but also shifts in public policy. Overseas, governments are legislating to reduce their reliance on combustion vehicles. For example, Norway have banned combustion engine sales from 2025, Netherlands, Germany, Israel and Ireland from 2030, England and France by 2040. Emerging nations including China and India are also reportedly considering bans.

As major car manufacturers and countries transition to electric vehicles and hybrids, Australia will have little choice but to follow suit. It is critical that governments and industry are not caught flat footed. When Infrastructure Australia released the 2015 Australian Infrastructure Audit, EVs were certainly not front and centre. In the 2019 Audit preparing for mainstream uptake of EVs is a key focus.

A win for consumers

Electric vehicle uptake is a once in a generation opportunity that can be capitalised upon with coordination and forward planning. Electric vehicles are poised to deliver significant

benefits to consumers, with the potential to increase Australia's productivity and support economic growth.

Electric vehicles are cheaper to run, they have more torque, provide a smoother ride and produce less noise. The environmental and economic benefits to consumers are significant. KPMG estimate that instead of the 0.18 cent per kilometre charge to drive a petrol vehicle, on average it would cost an electric vehicle user 0.05 cents per kilometre.^{iv} AEMO estimates that electric vehicle owners spend \$380 per annum on maintenance, while ICE vehicle owners pay \$750 per annum. This is important because transport spending accounts for 14% of the total goods and services expenditure of a household.^v Up to 97% of this expense goes towards car travel alone.^{vi}

If integrated correctly, EV uptake will likely bring improvements in our air quality, a reduction in emissions, less noise from traffic and better public health outcomes. They could also reduce Australia's reliance on imported fossil fuels.

Impacts on the electricity grid

But as we seek to better understand the benefits, it is prudent to also seek to better understand the potential impacts. As the size of the EV fleet grows, so could the potential impacts on the power system and peak demand.

Regulators and industry need to be preparing for the network impacts an increase in EV uptake will have across the energy sector. An electric vehicle have a need for energy equivalent from half to the equivalent of a house. Forecast electric vehicle grid consumption varies. AEMO and CSIRO predict that in the next 5 years, electric vehicles will have negligible impacts on grid consumption.

However, over the next 5 – 10 years, AEMO forecast that electric vehicles will begin to have sizeable impacts on consumption. In this period, consumption is forecast to increase at an annual average rate of approximately 1.3%.^{vii} Finkel found a 20% EV uptake could account for 4% of grid demand. Extrapolating on that figure, 100% uptake could account for 20% of grid demand.^{viii}

Modelling for Infrastructure Victoria identified that total EV consumption could be as high as 56% by 2046. The potential costs of additional generation investment in the electricity sector to meet EVs consumption requirements could be substantial – in Victoria alone there could be a need for an investment between \$2.2 billion and \$9.7 billion by 2046 depending on how EV uptake is managed, with additional investment required to support hydrogen vehicles.^{ix}

Chargers could also place demand on local networks. An electric vehicle charger running at 7 kW, which is already available to residential customers, is like having two kettles constantly on the boil. A DC Fast Charger 350 kW ultrafast charger requires on-demand power similar to an industrial facility, and will place demands on the local network, especially were delivered at scale.

Making sure electric vehicles do not contribute to peak demand is crucial to keeping network costs down for consumers and taxpayers. This is largely about ensuring charging occurs in a managed way, and not simultaneously when most people arrive home at 6pm. At present, peak electricity demand occurs in the evening as people arrive home and turn on lights, air conditioners and cook their meals. Peaks are also heavily influenced by weather, 25% of electricity bills in New South Wales are used to meet just 40 hours of high demand each year.^x

Without careful planning, an electrified fleet of vehicles will place additional demands on the grid. As a result, additional network infrastructure would need to be upgraded to cater for the increased load of electric vehicles. A cost which is inevitably worn by consumers and taxpayers.

Distributed electricity generation is here

Increased EV uptake in Australia is also occurring alongside another important shift towards distributed electricity generation. The country now has 1.8 million households with rooftop solar.^{xi} At this current rate of adoption, according to AEMO, Australia could have the most decentralised energy system in the world by 2023.^{xii}

Greater consumer awareness and increased household investment in renewable electricity is changing the way that electricity is produced and consumed. Where once there was no choice but to obtain electricity through a central, utility-based system, now a plethora of options exist to either subsidise household use, or generate it entirely off-grid. As a result, we must now account for consumers who are investing independently in products that sit 'behind the meter', beyond network control.

Technology is putting customers in control of their energy resources – and they are seizing the opportunity, with impacts to be felt across the entire supply chain.

Cross sectoral disruption

So why is this cross sectoral disruption that is currently happening across transport and energy such a challenge for governments and industry? At present, there is limited interaction between the transport and energy sectors that works to the benefit of users or networks more broadly.

EV users may charge their cars or batteries using home solar systems, but they cannot feed this stored energy back to the grid during times of high demand. Similarly, there are limited incentives for EV users to charge their vehicles at times when electricity supply is abundant and cheap during the day, or when demand is low in the middle of the night.

Furthermore, consumers now have 2,000 MW of demand response at their fingertips, yet only a small fraction of this is currently available for export to the grid.^{xiii} This shows that at present most customers are not sufficiently incentivised or do not receive signals to engage in demand responses. There is a lack of connection between the incentives for individual users and what works best for all users.

By 2030-31 AEMO estimates that consumers could have as much as 33,136 MW of solar PV and 4,969 MW of battery storage, as well as the battery capacity of their electric vehicles.^{xiv} We need new market mechanisms that recognise these assets' capabilities and optimizes the value of customer's investment whilst maintaining security and reliability.

Change to harness opportunities

We need changes to empower customers to use their assets to increase reliability and demand side responses, reduce network investment and save consumers costs. Customers need information to help them decide when best to charge their electric vehicle to avoid high network costs. To achieve this they will require cost reflective pricing tariffs and smart meters.

Regulatory changes are also needed so that energy market operators and network operators can see where the full range of distributed energy resources are being installed, including solar PV, batteries, electric vehicles and chargers.

With the right frameworks in place, electric vehicles will be useful grid assets whose benefits will increase the more electric vehicles are adopted. EVs used in a smart network could be used as a short-term storage of excess, off-peak electricity generated from renewable sources that could flexibly be dispatched counteract peak demand. They could also be used for local, residential consumption.

To realise these changes, a balanced policy approach is required that capitalises on the opportunities of electric vehicle uptake while managing the risks of new costs. The risks posed to the energy sector are manageable but more cooperation and discussion between the transport and energy sectors needs to occur.

Putting the user first

Both the transport and electricity sectors need clear, straightforward planning policies. We need an approach that can be understood by all stakeholders – including regulators, industry participants, households and vehicle users.

This is critical because it ensures a range of stakeholders across both the transport and energy sectors have an opportunity to engage with the national reform effort. Most importantly, in making decisions about efficiency, affordability, security and resilience, the long-term interests of the average user need to be paramount, regardless of the complexity of the challenges.

Concluding remarks

In coming months, Infrastructure Australia will be releasing further research on EVs to consider some of the unprecedented shifts occurring across the infrastructure sector. Our paper will seek to provide a roadmap for Australia to maximise the benefits of electric vehicle uptake, while avoiding the potential pitfalls of this transition. Electric vehicle need to be introduced at the right scale and at the right time so that they can deliver the greatest net economic benefits to the community.

Infrastructure Australia is of the view that if we get the regulatory approach right, electrification of our private vehicles has the potential to bring benefits for motorists, the Australian economy and the community. And as with many aspects of infrastructure in 2018 data use will be critical to planning for and responding to the challenges posed by EVs.

The next steps are to ensure the transition is smooth, orderly and in the best interests of motorists, electricity consumers and taxpayers. We look forward to sharing the results of our research with you, and contributing further to this important opportunity for infrastructure reform.

ⁱ Climate Works (2018) *The State of Electric Vehicles*, available at: https://climateworks.com.au/sites/default/files/documents/publications/climateworks_australia_state_of_electric_vehicles2_june_2018.pdf

ⁱⁱ International Energy Agency (2017) Global EV outlook, available at <https://www.iea.org/gevo2018/>

ⁱⁱⁱ Bloomberg New Energy Finance (2018) *Electric Vehicle Outlook 2018*, available at: <https://about.bnef.com/electric-vehicle-outlook/>

^{iv} Evidence Base Report – Advice on Automated and Zero Emissions Vehicles Infrastructure - August 2018

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- ^v ABS (2017) 6530.0 - Household Expenditure Survey, Australia: Summary of Results, 2015-16, available at: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6530.02015-16?OpenDocument>
- ^{vi} Australian Securities and Investments Commission's MoneySmart (2012) *Australian spending habits*, available at: <https://www.moneysmart.gov.au/managing-your-money/budgeting/spending/australian-spending-habits>
- ^{vii} AEMO (2018) *Electricity Statement of Opportunities*, available at: https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/NEM_ESOO/2018/2018-Electricity-Statement-of-Opportunities.pdf
- ^{viii} Finkel, A (2017) *Independent Review into the Future Security of the National Electricity Market- Blueprint for the Future*, available at <https://www.energy.gov.au/publications/independent-review-future-security-national-electricity-market-blueprint-future>
- ^{ix} KPMG (2018) *Automated and Zero Emissions Vehicle Infrastructure Advice: Energy Impacts Modelling*, available at: https://yoursay.infrastructurevictoria.com.au/download_file/299/380
- ^x Productivity Commission (2013) *Electricity network regulation: Inquiry*, available at: <http://www.pc.gov.au/inquiries/completed/electricity/report>
- ^{xi} AEMO (2018) *Open Energy Networks*, available at: <https://www.aemo.com.au/-/media/Files/Electricity/NEM/DER/2018/OEN-Final.pdf>
- ^{xii} AEMO (2018) *Open Energy Networks*, available at: <https://www.aemo.com.au/-/media/Files/Electricity/NEM/DER/2018/OEN-Final.pdf>
- ^{xiii} Oakley Greenwood prepared for AEMC, *Current Status of DR in the NEM: Interviews with Electricity Retailer and DR Specialist Service Providers*, 2016, p.3.
- ^{xiv} AEMO (2018) *Integrated Systems Plan*, available at: <https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Integrated-System-Plan>