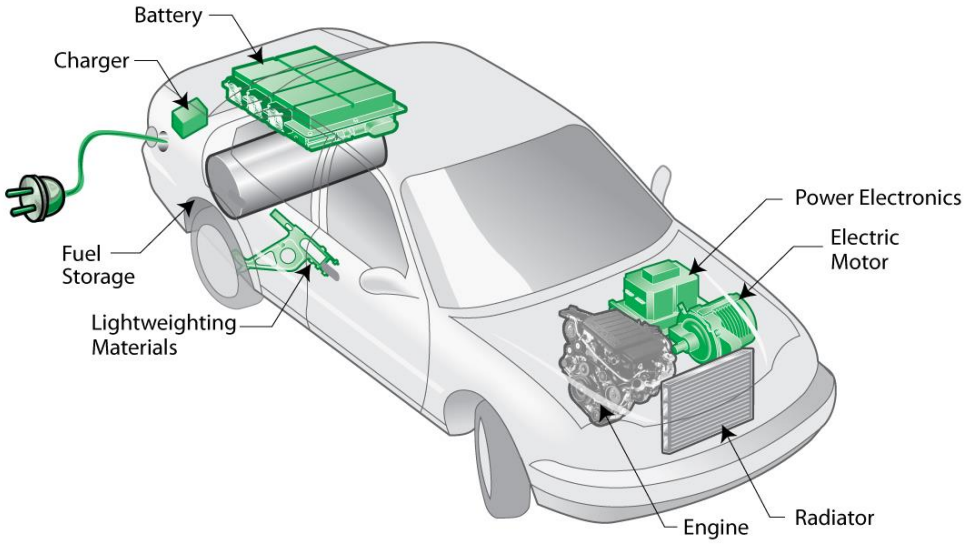


The Australia Institute
Research that matters.

If you build it, they will charge

Sparking Australia's electric vehicle boom

Governments around the world offer incentives to support electric vehicles. Australia does not. This paper examines how we can boost electric vehicle sales – in four proven, low-cost ways.

Briefing Note

Dan Cass
Matt Grudnoff
October 2017

ABOUT THE AUSTRALIA INSTITUTE

The Australia Institute is an independent public policy think tank based in Canberra. It is funded by donations from philanthropic trusts and individuals and commissioned research. Since its launch in 1994, the Institute has carried out highly influential research on a broad range of economic, social and environmental issues.

OUR PHILOSOPHY

As we begin the 21st century, new dilemmas confront our society and our planet. Unprecedented levels of consumption co-exist with extreme poverty. Through new technology we are more connected than we have ever been, yet civic engagement is declining. Environmental neglect continues despite heightened ecological awareness. A better balance is urgently needed.

The Australia Institute's directors, staff and supporters represent a broad range of views and priorities. What unites us is a belief that through a combination of research and creativity we can promote new solutions and ways of thinking.

OUR PURPOSE – 'RESEARCH THAT MATTERS'

The Institute aims to foster informed debate about our culture, our economy and our environment and bring greater accountability to the democratic process. Our goal is to gather, interpret and communicate evidence in order to both diagnose the problems we face and propose new solutions to tackle them.

The Institute is wholly independent and not affiliated with any other organisation. As an Approved Research Institute, donations to its Research Fund are tax deductible for the donor. Anyone wishing to donate can do so via the website at https://www.tai.org.au or by calling the Institute on 02 6130 0530. Our secure and user-friendly website allows donors to make either one-off or regular monthly donations and we encourage everyone who can to donate in this way as it assists our research in the most significant manner.

Level 5, 131 City Walk
Canberra, ACT 2601
Tel: (02) 61300530
Email: mail@tai.org.au
Website: www.tai.org.au

Summary

There is a race to transition the world's massive car fleet to electric vehicles and Australia is falling behind. Technological improvements make electric vehicles more affordable – particularly the price of lithium-ion batteries, which fell 93% between 1995 and 2014.[1] But there are structural impediments to Australians taking advantage of the increasing affordability of electric vehicles.

This paper will look at policies that Australian governments can implement to overcome these structural barriers. If governments act now to support the development of the market, financial and environmental benefits will flow.

Bloomberg New Energy Finance projects that in some markets electric vehicles will be cheaper than conventional fuel vehicles by 2022 even without subsidies or a global carbon price.[2] A newly published study by Beyond Zero Emissions modelled the cost of replacing the whole Australian car fleet with electric vehicles within ten years and found that it could cost 25% more than retaining the existing car fleet and may even cost about the same. If battery and other electric vehicle technologies progress rapidly and petrol prices rise, then electric vehicles will be cheaper than business as usual, once the climate, health and social costs of pollution are accounted for.[3]

Besides saving consumers money, electric vehicles offer great societal benefits: cleaning up air in cities, reducing greenhouse emissions and providing economic stimulus in manufacturing.

Just this year three countries have announced bold policies to encourage electric vehicles:

- India announced a massive plan to replace all of its petrol and diesel cars with EVs by 2030, using an innovative, revenue neutral financing model that allow Indians to purchase EVs with no down-payment.[4]
- The Netherlands will ban petrol and diesel cars from 2030.[5]

[1] Dan Cass, "Securing renewables: how batteries solve the problem of clean electricity" http://www.tai.org.au/sites/defualt/files/P234%20renewables%20and%20battery%20storage%20FINAL.pdf, Canberra, The Australia Institute, 2016: 14.

[2] Bloomberg New Energy Finance, 'Electric Vehicles to be 35% of global new car sales by 2040', http://about.bnef.com/press-releases/electric-vehicles-to-be-35-of-global-new-car-sales-by-2040/

[3] Beyond Zero Emissions, "Zero Carbon Australia Electric Vehicles." 2016

[4] Stephen Edelstein, 'India's ambitious goal: all electric vehicles on roads by 2030', Green Car Report, (31 March 2016), http://www.greencarreports.com/news/1103162_indias-ambitious-goal-all-electric-vehicles-on-roads-by-2030

- Norway is looking to ensure that all new cars are electric by 2025, and 75% of coaches and half of heavy trucks are electric by 2030.[6]

Cars contribute around 10 per cent of Australia's total carbon emissions – and Australia's vehicle emissions are particularly high. The average passenger vehicle sold in Australia in 2014 emitted 188 grams of carbon per kilometre. In contrast, France's average passenger vehicle emitted 114 grams per kilometre in the same year.

Electric vehicles could dramatically reduce the impacts of Australia's cars on emissions and the health of our cities. Yet sales of electric vehicles are low. Of the 1.1 million new cars Australians purchased in 2015, only 1,108 were electric vehicles (0.1 per cent of new vehicles sales). This compares unfavourably with the United States (0.7 per cent of new vehicle sales in 2015), France (1.4 per cent), and Norway (22.8 per cent).

Part of the reason for this reluctance is the lack of government incentives. An electric vehicle purchaser in California could earn both a federal tax credit of US$7,500 and a US$2,500 bonus payment from the state. In Australia, no such bonus schemes exist.

This report proposes four incentives to overcome structural barriers and help boost electric vehicle uptake:

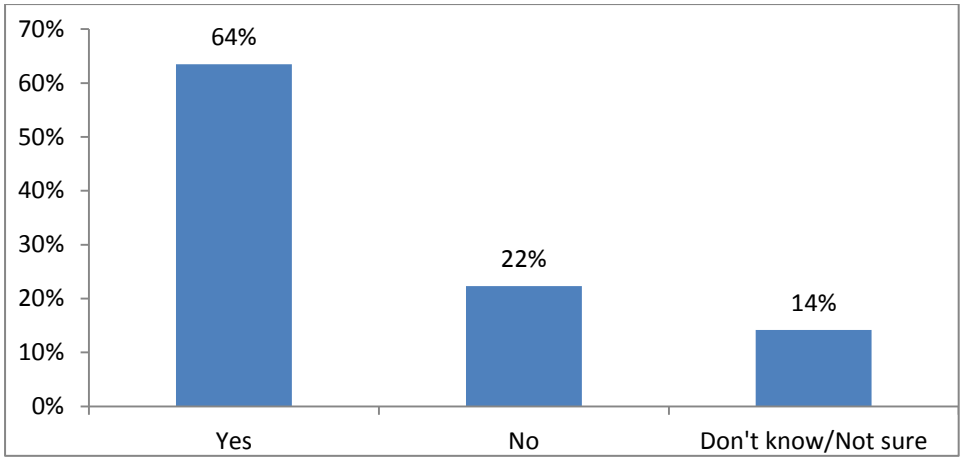
1. A Luxury Car Tax exemption for electric vehicles, to better target the scheme's two-tiered threshold structure towards environmental outcomes;
2. Charging station rebates, which would boost rollout of electric vehicle infrastructure and minimise duplication of sites and technological standards;
3. A scheme to reduce the upfront cost of electric vehicles without cost to the budget;
4. An offer to allow electric vehicles to utilise bus lanes in congested urban centres, supported by a rollout of EV-only license plates.

Public interest in electric vehicles continues to rise and policies to support electric vehicles are popular. Polling for The Australia Institute shows that nearly two thirds of voters support incentives for electric vehicles.

Figure 1: Do you support government incentives to encourage consumers to purchase electric cars?

[5] Electrek, 'The Dutch government confirms plan to ban new petrol and diesel cars by 2030', https://electrek.co/2017/10/10/netherlands-dutch-ban-petrol-diesel-cars-2030-electric-cars/

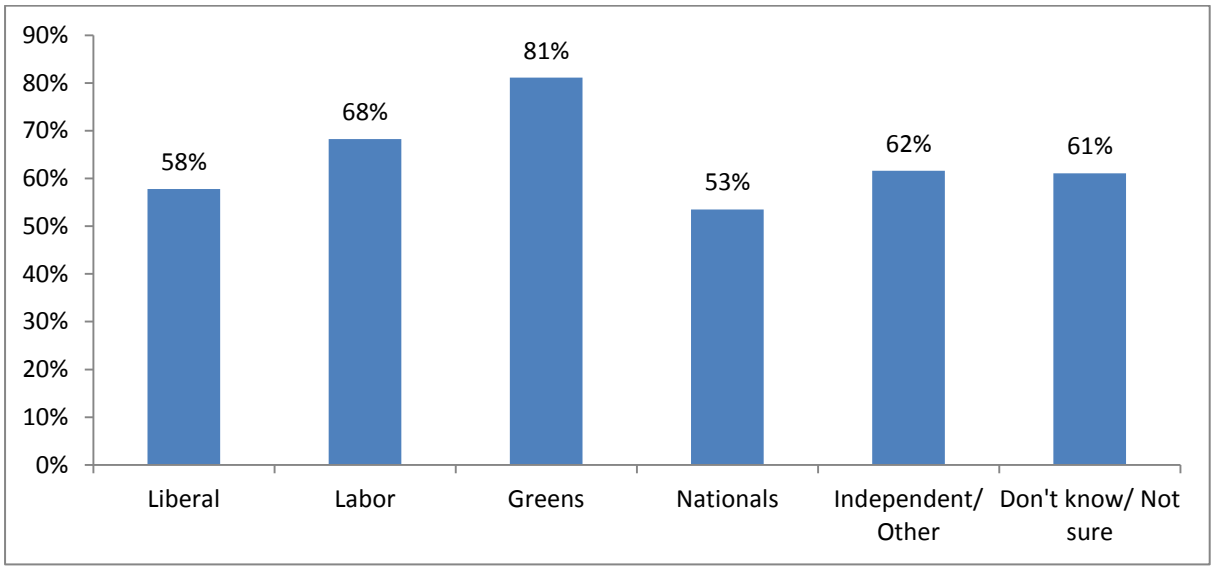
[6] Craig Morris, 'Will Norway ban gas & diesel cars by 2025?, *Renewables International*, http://www.renewablesinternational.net/will-norway-ban-gas-diesel-cars-by-2025/150/537/94287/,



Source: The Australia Institute poll of 1,412 people

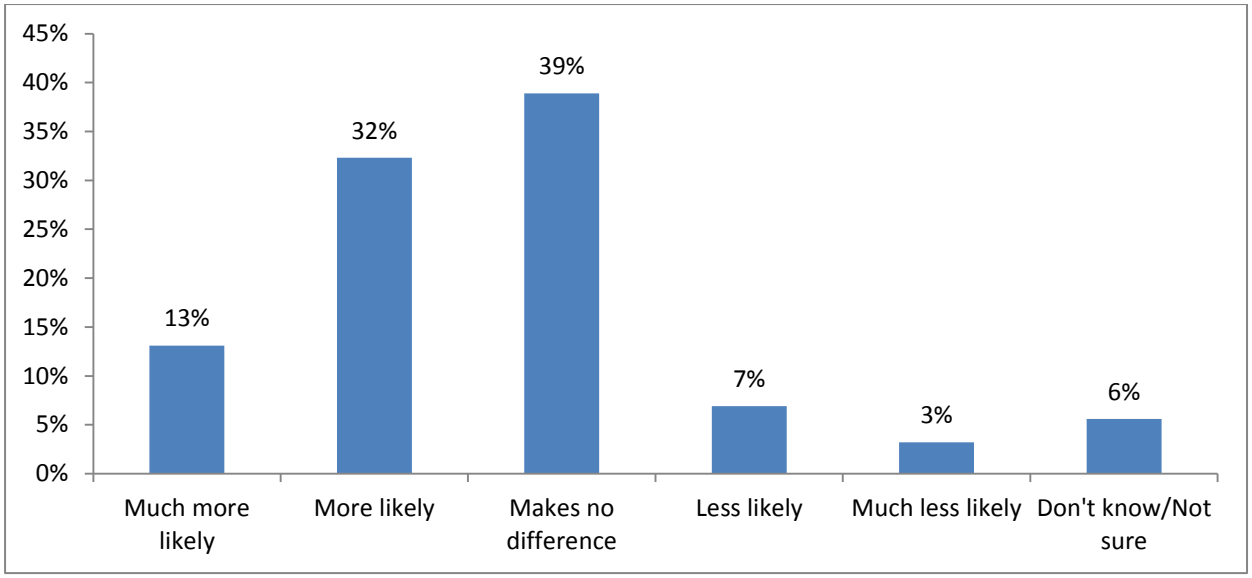
This support runs across political party voting intentions, with a majority of all party supporters in favour:

Figure 2: Supporters of electric vehicle policies by voting intention



45 percent of voters would be more likely to vote for a party with electric vehicle policies, while few voters oppose them:

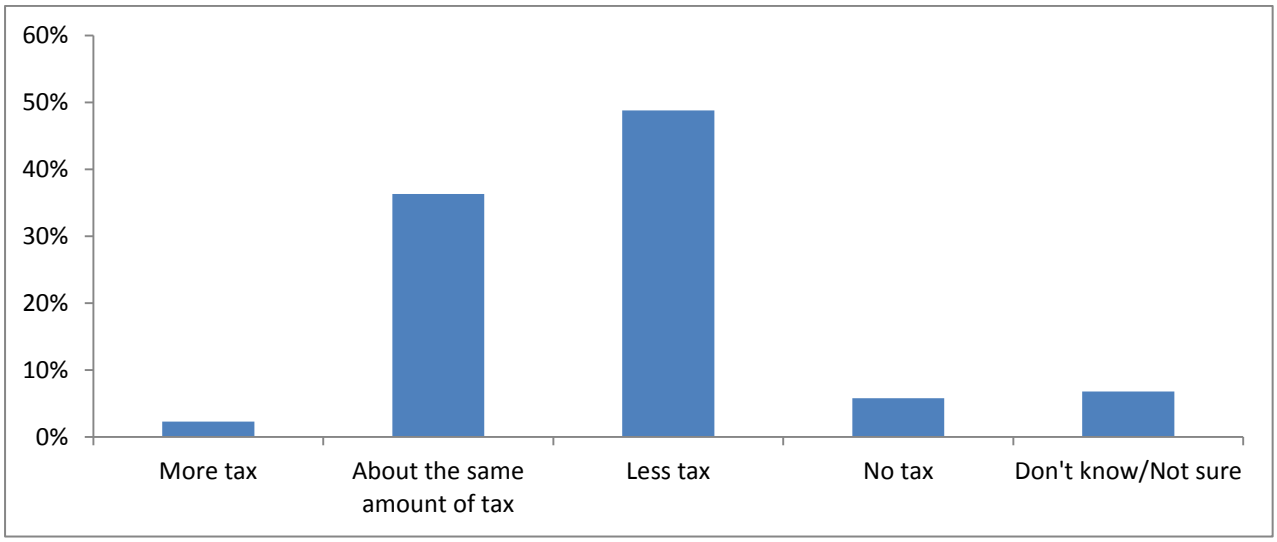
Figure 3: Would you be more likely or less likely to vote for a party which had a policy to accelerate the uptake of electric vehicles?



Source: The Australia Institute poll of 1,412 people

Policies around tax incentives for electric vehicles have strong support from the public

Figure 4: Do you think vehicles that run on electricity (which are generally less polluting) should pay less, more, or the same amount of tax as regular vehicles that run on petrol?



Source: The Australia Institute poll of 1,412 people

Such incentives could boost Australia's electric vehicle market, reducing air pollution, saving consumers, and cutting Australia's carbon emissions. The budgetary impact is negligible; the rewards are significant.

Introduction

The promise of electric vehicles (EVs) has excited governments around the world. It is not hard to see why. A fully-electric passenger fleet would see tailpipe emissions from light vehicles, which produce considerable local pollution and represent 10 per cent of Australia's total carbon emissions, fall to zero.[7, 8]

There is also the emissions impact of the energy used to charge the batteries, but even in the worst case scenario where an EV draws power from the grid, this would be less emissions intensive than the average efficient light vehicle.[9] Emissions from EV charging could be further reduced with increased clean energy generation.

Consumers would benefit via the back pocket. Nearly a fifth of household expenditure is dedicated to transport, and a fifth of transport expenditure is on fuel.[10]

Air quality would improve, lowering the associated health and productivity costs. The NSW Department of Environment estimates that motor vehicle emissions present an annual cost to Sydney of between $137–$1,296 million in 2015 dollars.[11] Other estimates put the cost much higher. A 2014 OECD report into Australia's cost of road transport pollution suggested the increased mortality and morbidity alone represented a cost of $5,828 million US dollars in 2010.[12]

---

[7] Climate Change Authority, "Light Vehicle Emissions Standards for Australia," Research Report (Melbourne: Commonwealth of Australia, June 2014), http://www.climatechangeauthority.gov.au/reviews/light-vehicle-emissions-standards-australia/opportunities-reduce-light-vehicle-emissions.

[8] Brian Parkin, "Musk Says Diesel Cheating Is Bad, CO2 Emissions Are Worse," *Bloomberg Business*, September 24, 2015, http://www.bloomberg.com/news/articles/2015-09-24/musk-says-while-diesel-cheating-is-bad-co2-emissions-are-worse.

[9] 'When powered by the current average Australian grid, the fully electric vehicles currently available in Australia are less emissions-intensive than the average light car, which is the most efficient class of light vehicle (Climate Change Authority calculation based on CCA 2014a; NTC 2013 and Commonwealth of Australia 2014c).' Climate Change Authority, "Light Vehicle Emissions Standards for Australia," Research Report (Melbourne: Commonwealth of Australia, June 2014), http://www.climatechangeauthority.gov.au/reviews/light-vehicle-emissions-standards-australia/opportunities-reduce-light-vehicle-emissions. p.20

[10] Australian Bureau of Statistics, "Household Energy Consumption Survey, Australia" (Commonwealth of Australia, September 24, 2013), 4670.0, http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4670.0main+features132012.

[11] New South Wales Department of Environment and Conservation, "Air Pollution Economics: Health Costs of Air Pollution in the Greater Sydney Metropolitan Region" (Sydney: Government of New South Wales, November 2005).

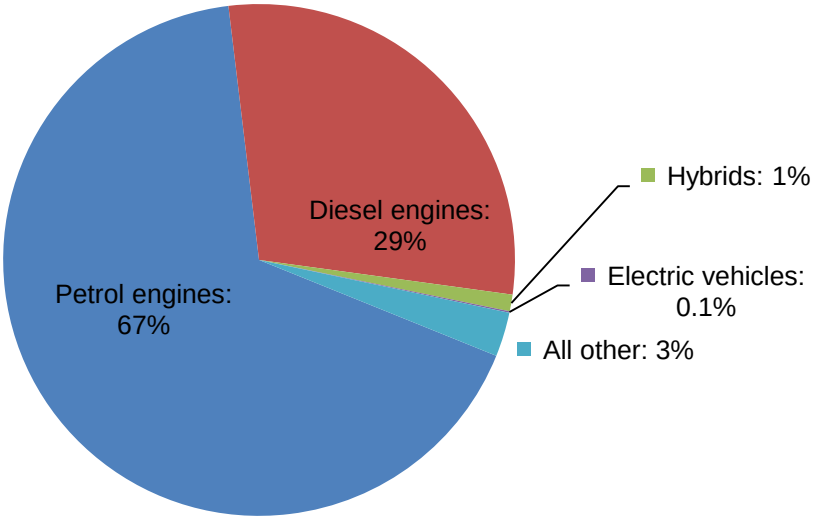
[12] OECD, *The Cost of Air Pollution* (Paris: Organisation for Economic Co-operation and Development, 2014), http://www.oecd-ilibrary.org/;jsessionid=4s8ho7bla0aqd.x-oecd-live-02content/book/9789264210448-en.

While the cost of air pollution from road transportation is punitive, reducing air pollution is not expensive. The European Union's estimates of costs and benefits of reducing air pollution detail the cost-effectiveness of action. A 2012 study into the aggregated costs and benefits for the union's then-27 member states looked at how many years of life were lost each year to air pollution.[13] The average economic returns of reducing air pollution by 25 per cent of the achievable limit are more than 40 to 1; that is, for every dollar spent reducing air pollution, more than 40 dollars are saved in associated health costs.

All up, with their potential to reduce air pollution in urban areas, curb carbon emissions from electricity and the transport fleet, save consumers money and improve vehicle safety standards, electric vehicles should be an easy sell in Australia.

And yet, they are not. Of the 1.1 million new cars Australians purchased in 2015, only 1,108 were electric vehicles. As shown in 5, combined sales of hybrid and electric vehicles were 1.1 per cent of all new cars sold. All-electric vehicles made up only 0.1 per cent.

Figure 5: Australia vehicles sales for calendar year 2015, by fuel type[14]



Australia's electric vehicle market lags behind those of other developed nations, such as the United States (0.7 per cent of new vehicle sales in 2015), France (1.4 per cent), and Norway (22.8 per cent).[15] [16]

[13] Mike Holland, "Cost-Benefit Analysis of Scenarios for Cost-Effective Emission Controls after 2020," Corresponding to IIASA TSAP Report 7 (Austria: International Institute for Applied Systems Analysis, November 2012).

[14] VFACTS, "Industry Summary" (Federal Chamber of Automotive Industries, January 11, 2016), www.fcai.com.au.

Why are sales so disappointing? One reason is price. Because of the cost of the technological components of an electric vehicle, drivers around the world pay a premium for the privilege of owning an electric vehicle. One-third of the retail price of a 24 kWh Nissan LEAF, for example, is the cost of its battery.[17] As a result, there are no models available in Australia with an on-road cost below $50,000.[18]

While vehicle model base prices are similar in most countries, government subsidies and other cost reductions have a dramatic effect on the price customers pay.[19] An electric vehicle purchaser in California could earn both a federal tax credit of US$7,500 and a US$2,500 bonus payment from the state.[20] In Australia, no such bonus scheme exists.

Another reason for disappointing electric vehicle sales is range anxiety: the fear that, in setting out from A to C, your electric vehicle will only to manage to take you to point B. A lack of charging infrastructure along even well-travelled routes reinforces this fear.

Electric vehicles face an uphill battle. There are few models available in Australia; those that are available are too expensive for many consumers. Those that can afford the vehicles must then overcome the fear that they will not be able to use it reliably.

While these challenges seem daunting, they are not insurmountable. Other markets have successfully lowered barriers to widespread adoption. In Norway, more than one in every five new vehicles purchased is an electric vehicle. Californians own one in 50 of the world's registered vehicles, but one in five of the world's electric vehicles.[21]

The success of others is a lesson for Australia. To promote electric vehicles, Australia must look to what is working elsewhere.

---

[15] ACEA, "New Passenger Car Registrations 2015," Provisional Data (Brussels: European Automobile Manufacturers Association, January 15, 2016).

[16] United States Bureau of Economic Analysis, "Light Weight Vehicle Sales: Autos and Light Trucks" (Federal Reserve Bank of St. Louis, January 20, 2016), https://research.stlouisfed.org/fred2/series/ALTSALES.

[17] Tali Trigg et al., "Global Ev Outlook: Understanding the Electric Vehicle Landscape to 2020," *International Energy Agency*, Electric Vehicles Initiative, 2013, 1–40.

[18] RedBook, "Research & Value of Vehicles (Electric)" (Automotive Data Services Pty Ltd, January 20, 2016), http://www.redbook.com.au/portal/tabID__2807404/DesktopDefault.aspx.

[19] At exchange rates for 21 January 2016, for example, the difference between the base model Nissan Leaf S 2016 manufacturer recommended retail price in Canada and the UK is less than 1 per cent.

[20] Mock and Yang, "Driving Electrification: A Global Comparison of Fiscal Incentive Policy for Electric Vehicles."

[21] Trigg et al., "Global Ev Outlook: Understanding the Electric Vehicle Landscape to 2020."; Global Health Observatory, "Number of Registered Vehicles: Situation and Trends" (World Health Organisation, 2015).

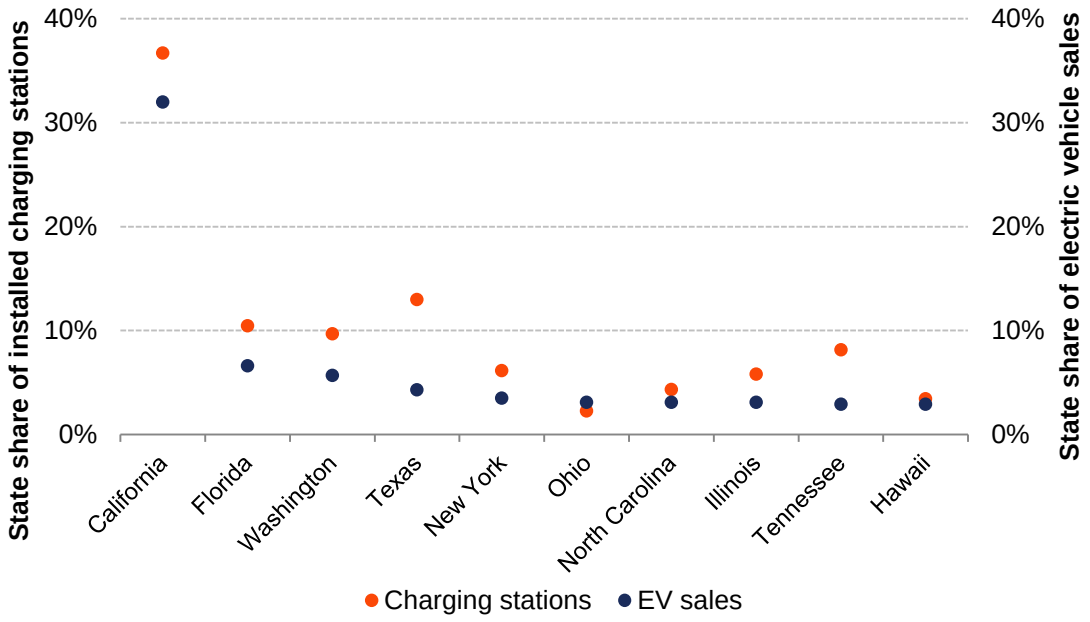
What is being done elsewhere?

Electric vehicle uptake in Australia is experiencing teething problems – problems that similar countries have managed to surmount.

Electric vehicles, like many emergent technologies, must first convince consumers that they are viable. Governments of other countries have encouraged widespread EV adoption using policy incentives. Australia can learn from the successes of other governments, which have encouraged EV adoption directly, with consumer subsidies, perks and ongoing financial incentives, and indirectly, with greenhouse gas reduction targets, fleet efficiency standards and infrastructure provision.

Take infrastructure provision for example. In the United States, availability of charging stations is closely correlated with electric vehicle demand. This suggests the two are related – boosting one will boost the other.

Figure 6: Share of sales of electric vehicles and share of installed electric vehicle charging station, by state, USA[22]



New Hampshire's charging station rebates

In the United States, home to the majority of the world's electric vehicle stock, governments at both federal and state levels offer incentives to encourage demand for electric vehicles.

[22] Jennifer Miller, "Electric Vehicle Tourism," White Paper (Phoenix: Arizona State University, 2014).

New Hampshire's government offers rebates against the cost of the installation of public EV charging stations in non-residential properties. The value of the rebate depends on the capacity of the charging station and the cost of the installation project.

The state government restricts eligibility to charging stations that suit the scheme's intentions (namely, the expansion of the EV market and the marketing of the EV-friendly network). To qualify for a state grant, the proposed charging station must be:

- Available to the public at all times;
- Positioned in an easily-accessed site;
- Protected from vehicle damage;
- Appropriately signposted;
- Operational for a minimum of two years.[23]

The program cordons the state into regions, and prioritises them based on coverage (how available electric vehicle charging stations are) and strategic value (how useful stations would be for drivers travelling in and through the state). An area or route popular with drivers but with no electric vehicle charging station would have the highest priority.[24]

Once location priorities are established, the state holds a competitive tender process for the rights to the site's allocated rebate. Bidders compete on cost and competence, with the winner receiving a rebate to cover up to 75 per cent of the total project cost.

Significant state rebates such as New Hampshire's means most applicants will first go through the state's planners in a bid to reduce their own costs. The state thus has the luxury of being able to pick and choose the projects it helps fund. State regulators need not contend with a sprawling, anarchic network of EVs placed in suboptimal locations. Rather, the advance planning nature of the scheme in effect means the government releases a plan for where it would most desire a charging station, then allows the private sector to compete for that location.

One advantage of this model is the potential for coordination between jurisdictions. According to the department, the rebate program is designed to "enable operation of EVs throughout New Hampshire *and* connect to charging corridors in neighbouring states."[25]

---

[23] New Hampshire Department of Environmental Services, "New Hampshire Electric Vehicle Infrastructure Rebate Program," Guidance Document (Concord: Government of New Hampshire, October 14, 2015). Rebates that fund charging stations operational for less than two years must be repaid to their full original value.

[24] These regions tend to be vehicle corridors. Mid-level regions are most frequently interstates or major arterials, as well as areas of the state not yet covered by charging stations in any way. Low-level priorities are workplace chargers, as well as tourist-appropriate locations.

[25] Paul Lockwood, "NDHES Announces Electric Vehicle Charging Equipment Rebates" (New Hampshire Department of Environmental Services, March 10, 2015), http://des.nh.gov/media/pr/2015/20150310-electric-vehicle.htm. Emphasis added.

New Hampshire positions itself to take advantage of growing numbers of EVs in nearby states by placing its own network of charging stations in range of interstate travellers.

France's Bonus–Malus

A 'feebate' (a portmanteau of 'fee' and 'rebate') is designed to achieve three things: provide an incentive to buy a low-emitting vehicle, provide a disincentive to buy a high-emitting vehicle, and to make these incentives immediate at the point of purchase. France's *bonus–malus* system is a 'feebate' that places an extra charge on purchases of high-emitting vehicles and pays a rebate on purchases of low-emitting vehicles.

The beauty of France's *bonus–malus* system is that the buyers of the dirtiest vehicles subsidise the buyers of the cleanest. The fee or rebate is benchmarked against a standard, so the cleaner the vehicle the higher the rebate, and the dirtier the vehicle the higher the fee.

France's original incarnation of the scheme imposed a financial penalty on the most polluting vehicles of up to €2,600 in addition to its ticket price. [26] The scheme rewarded the less polluting by rebating up to €1,000 of the purchasing price.[27] While the particular figures and benchmarks have been revised, the principle has remained the same.

The scheme was immediately successful. The average carbon emissions per kilometre per new vehicle purchased fell six grams in the first month of the scheme's operation.[28] As shown in Table 1, the change was driven by both a steep uptick in demand for very clean vehicles, and a drop in demand for the most heavily-polluting:

Table 1: French bonus–malus scheme tiers; effect on registrations by scheme tier, 2008[29]

Emissions of CO2 (g/km)	Bonus (-) or Malus (+) per vehicle registered (€)	New registrations, 2007	New registrations, 2008	Percent change
=<60	- 5,000	-	-	**0%**
61 to 100	- 1,000	352	1,657	**371%**
101 to 120	- 700	412,598	721,235	**75%**
121 to 130	- 200	215,010	194,143	**-10%**
131 to 160	-	936,139	846,030	**-10%**
161 to 165	+ 200	66,415	41,161	**-38%**
166 to 200	+750	305,296	184,202	**-40%**

[26] Xavier d'Haultfoeuille, Pauline Givord, and Xavier Boutin, "The Environmental Effect of Green Taxation: The Case of the French 'Bonus/Malus,'" *The Economic Journal* 124, no. 578 (2014): 444–80.

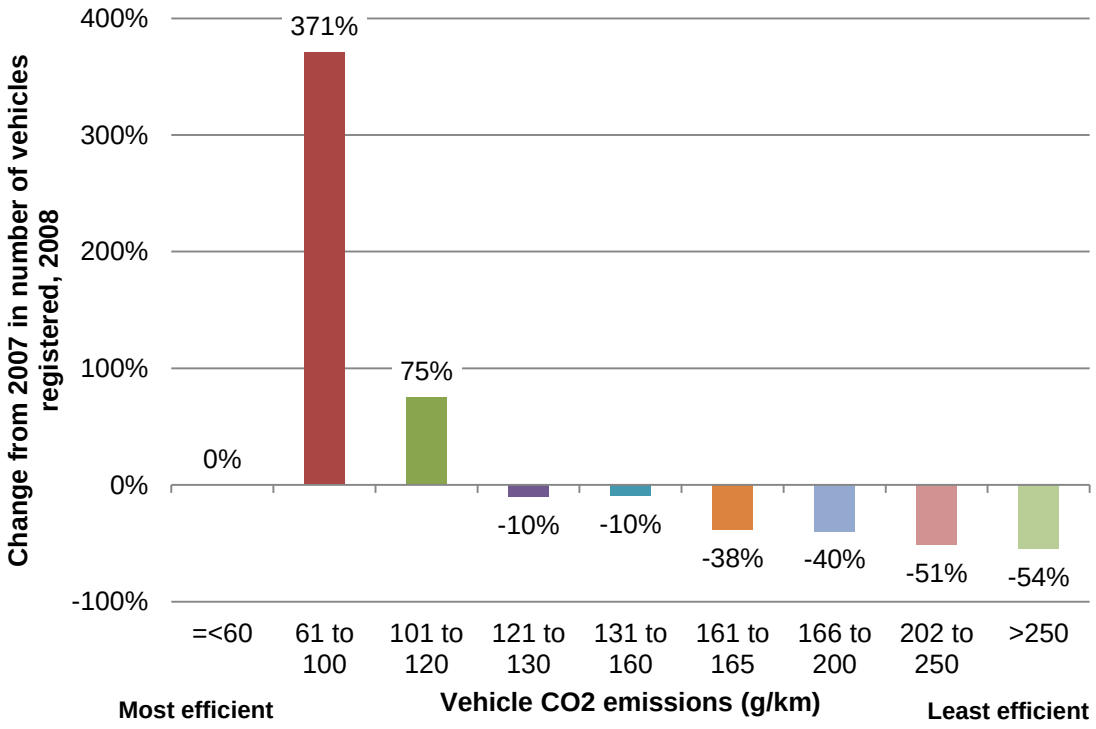
[27] A €5,000 bonus was theoretically on offer, but no newly purchased vehicles registered in 2007 or 2008 were eligible to receive it.

[28] David L. Greene, "Fiscal Incentives for GHG Mitigation: Feebates" (Climate Change Mitigation: The Importance of Passenger Vehicle Efficiency, Mexico City: United Nations Environment Programme, 2010).

[29] Ibid.

202 to 250	+ 1,600	95,416	46,614	**-51%**
>250	+ 2,600	33,317	15,241	**-54%**

Figure 7: First year effects of French bonus–malus on vehicle registrations, by emissions per kilometre



The reduction has proved resilient and ongoing. The average carbon emissions for a new passenger vehicle sold in France in 2014 were 114 grams per kilometre, down from 149 grams in 2007 (the year before the bonus malus scheme was introduced).[30] In contrast, Australia's national average carbon dioxide emissions intensity for new passenger and light commercial vehicles sold in 2014 was 188 grams per kilometre.[31]

In light of recent budgetary pressures, the vehicle incentive scheme is under review. The French government's success with the scheme has been a mixed blessing – while the French EV market is booming, the scheme has failed in its second target – revenue neutrality.

This development is due to two complementary factors. First, repeated revisions of the value of the penalty and the reward have left some gap between the two. Second, the system does not assign quotas to the number of vehicles eligible for the financial bonus, which means that so long as the difference between the value cap of the bonus and the

[30] European Environment Agency, "New Cars' CO2 Emissions Well below Europe's 2015 Target" (European Union, April 15, 2015), http://www.eea.europa.eu/highlights/new-cars2019-co2-emissions-well.

[31] National Transport Commission, "Carbon Dioxide Emissions Intensity for New Australian Light Vehicles 2014," Information Paper (Melbourne: Commonwealth of Australia, July 7, 2015).

penalty remains mispriced, France's system can have too many rewards being funded by too few penalties.

The challenges faced by French policymakers are not insurmountable. A continuous, dynamic, consistent program offers an alternative.

Norway's perk package

Norway's portfolio of policy incentives is the envy of the pack. The list of perks available to EV drivers is impressive, including that:

- EV drivers may use bus and taxi lanes
- EV drivers pay no parking charges anywhere
- Electric vehicles are exempt from road tolls
- Electric vehicles are exempt from VAT and have no registration charges
- The annual 'driving fee' is less than a seventh of the regular driving fee[32]

The incentive of access to high occupancy vehicle lanes, or HOV lanes, means drivers can avoid the congestion of peak hour, making the perk a particularly attractive one. The perk, which was trialled in 2003 and made permanent in 2005, captures economic rents by distributing property rights (access to HOV lanes) for an underutilised resource (surplus HOV lane capacity).[33]

A 2015 European Union review of Norway's various incentives available to electric vehicle drivers found the provision allowing electric vehicle drivers to utilise public transit lanes typically reserved for buses to be the most effective incentive on offer.[34] The report found the incentive provides the greatest effect on uptake per dollar in budgetary cost; it also generates the lowest cost to the budget per tonne of CO_2 emissions reduced.

This result is controversial. The authors assume there is spare capacity within Oslo's bus lanes. This assumption yields a supply glut, making the marginal cost of one extra electric vehicle in a HOV lane low relative to the marginal benefit (one fewer vehicle on the otherwise congested road, in addition to the replacement of that vehicle with an EV alternative). As the authors make clear, the assumption is pivotal to producing such a high benefit to cost ratio:

[32] Leigh Phillips, "Norway's Electric Vehicle Revolution: Lessons for British Columbia," Briefing Note (British Columbia: Pacific Institute for Climate Solutions, 2015).

[33] Erik Figenbaum and Marika Kolbenstvedt, "Electromobility in Norway: Experiences and Possibilities with Electric Vehicles," Report, Norwegian Centre for Transport Research (Oslo: Institute of Transport Economics, November 2013).

[34] Nils Fearnley et al., "E-Vehicle Policies and Incentives: Assessment and Recommendations," Institute of Transport Economics Report (Oslo: Norwegian Centre for Transport Research, August 2015).

> *As long as there is ample bus lane capacity*, BEV access is associated with close to zero cost and has noticeable effect on BEV sales in urban and suburban areas.[35]

In markets characterised by an excess supply of space in HOV lanes, such an assumption is reasonable. Yet not all markets have such a feature; when the results of a HOV lane access incentive are measured in these markets, the ratio of benefits to costs is less spectacular. Other markets produce very different benefit cost ratios. One analysis of California's HOV lane incentives argued the scheme was "not free once opportunity cost is taken into account, and [its] effectiveness may be much lower than an equivalent subsidy".[36]

Nonetheless, the result demonstrates that, so long as there is space in HOV lanes, the incentive is cost-effective. This result is not disputed. All that is in question is how long it remains cost-effective; this measure must be monitored.

The European Union's review also made clear that the federal, top-down approach of the incentives package contributed significantly to the success of the Norwegian model. According to the researchers, national incentives appear to outperform local and regional alternatives, owing to their stability and predictability when considering the lifetime benefits of a vehicle purchase.[37]

The success of Norwegian policies has led to Norway to ensure that all new cars are electric by 2025, and 75% of coaches and half of heavy trucks are electric by 2030.[38]

Other countries' recent announcements

Other countries are also planning to enact policies to encourage the uptake of EVs.

India announced a massive plan to replace all of its petrol and diesel cars with EVs by 2030, using an innovative, revenue neutral financing model that allows Indians to purchase EVs with no down-payment.[39]

The Netherlands will ban petrol and diesel cars from 2030.[40]

---

[35] Ibid. Emphasis added.

[36] Sharon Shewmake and Lovell Jarvis, "Hybrid Cars and Hov Lanes," *Transportation Research Part A: Policy and Practice* 67 (August 27, 2014): 304–19.

[37] Fearnley et al., "E-Vehicle Policies and Incentives: Assessment and Recommendations."

[38] Craig Morris, 'Will Norway ban gas & diesel cars by 2025?, *Renewables International*, http://www.renewablesinternational.net/will-norway-ban-gas-diesel-cars-by-2025/150/537/94287/

[39] Stephen Edelstein, 'India's ambitious goal: all electric vehicles on roads by 2030', Green Car Report, (31 March 2016), http://www.greencarreports.com/news/1103162_indias-ambitious-goal-all-electric-vehicles-on-roads-by-2030

[40] Electrek, 'The Dutch government confirms plan to ban new petrol and diesel cars by 2030', https://electrek.co/2017/10/10/netherlands-dutch-ban-petrol-diesel-cars-2030-electric-cars/

Australia's policy

In contrast, Australia's policy incentives are disappointingly few. Some state governments have run trials or pilot programs involving electric vehicles within the governmental fleet. These programs, ostensibly to test the viability of electric vehicles as a full-time, permanent option for government, also intend to boost the technology's visibility to the broader public.

Yet these pilots are too small in scale to produce meaningful results. The Victorian government's trial saw 54 electric or hybrid vehicles take to the roads over the period from 2010 to 2014, a figure easily swamped by the state's overall fleet of 4.5 million vehicles.[41, 42] It is not clear whether these trials are producing valuable data. Meanwhile, the continued preference for trials simply reinforces the public perception that the EV technology is unreliable. Proven technologies rarely require trialling.

While sales of EVs have been low, introducing policies to support electric vehicle sales has strong support among the Australian public, as discussed in the next section.

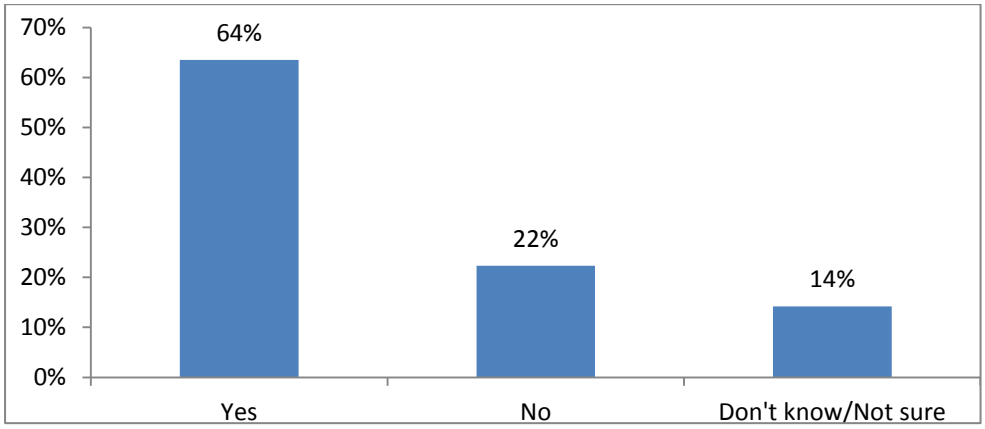
[41] Department of Transport Victoria, "Creating A Market: Victorian Electric Vehicle Trial Mid-Term Report" (Melbourne: Government of Victoria, 2013).

[42] Australian Bureau of Statistics, "Survey of Motor Vehicle Use, Australia, 12 Months Ended 30 June 2012" (Commonwealth of Australia, June 25, 2015), http://www.abs.gov.au/ausstats/abs@.nsf/mf/9208.0.

Public support for electric vehicles

The Australia Institute commissioned a survey to gauge public support for policies that would support electric vehicle sales and usage.[43] Overall there is strong support for incentives to encourage the uptake of electric vehicles. As shown in Figure 8 below, nearly two thirds of Australians support such policies with only 22 percent opposed:

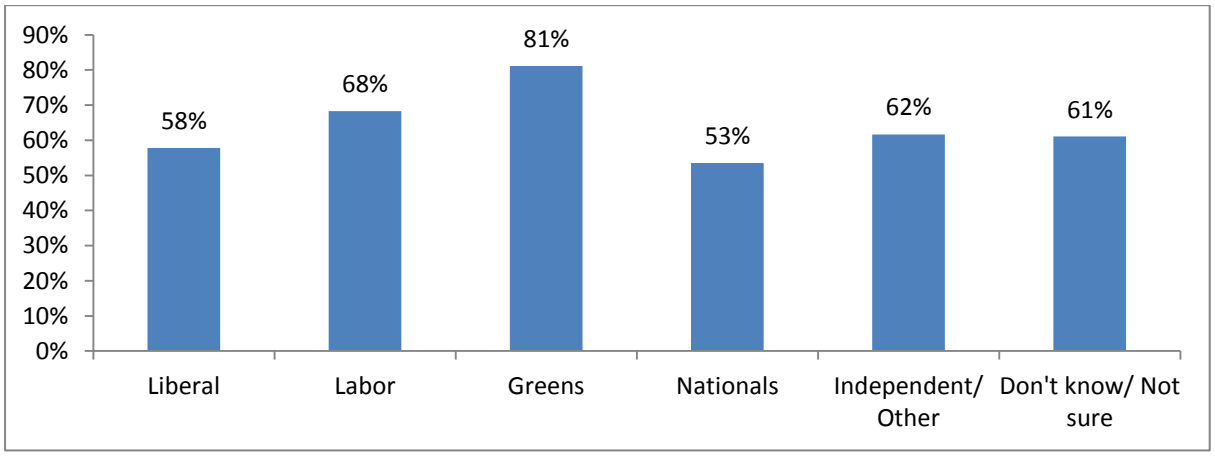
Figure 8: Do you support government incentives to encourage consumers to purchase electric cars?



Source: The Australia Institute survey

More than 50 percent of all party supporters are in favour of policies to increase use of EVs:

Figure 9: Supporters of electric vehicle policies by voting intention

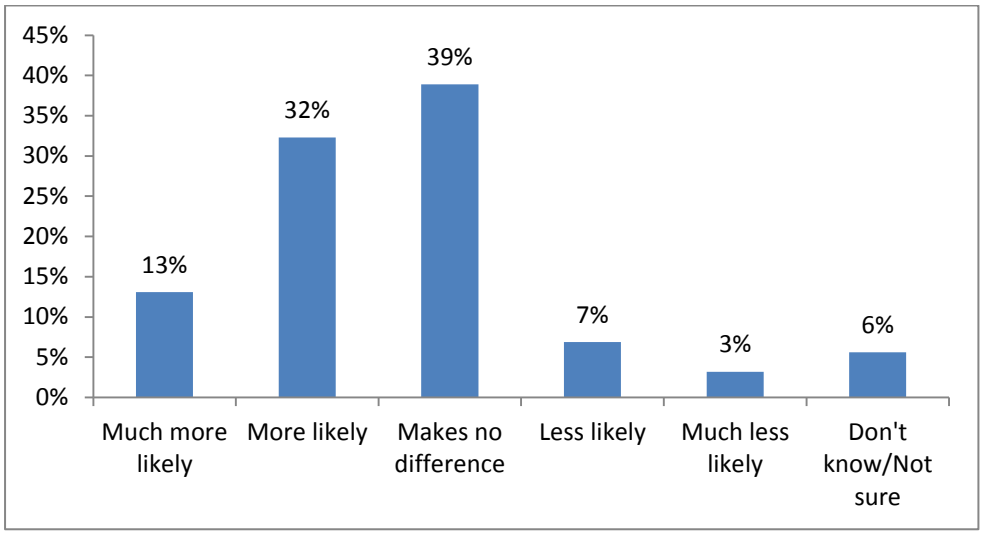


Source: The Australia Institute survey

[43] The survey was conducted in February-March 2016 by specialised polling company Research Now. 1,412 adults were surveyed using an online poll. The people surveyed reflect the overall Australian population in terms of gender, age, state, voting intention and other socioeconomic characteristics.

As may be expected from Figure 9 above, many voters are more likely to vote for a party with electric vehicle policies, as shown in Figure 10 below:

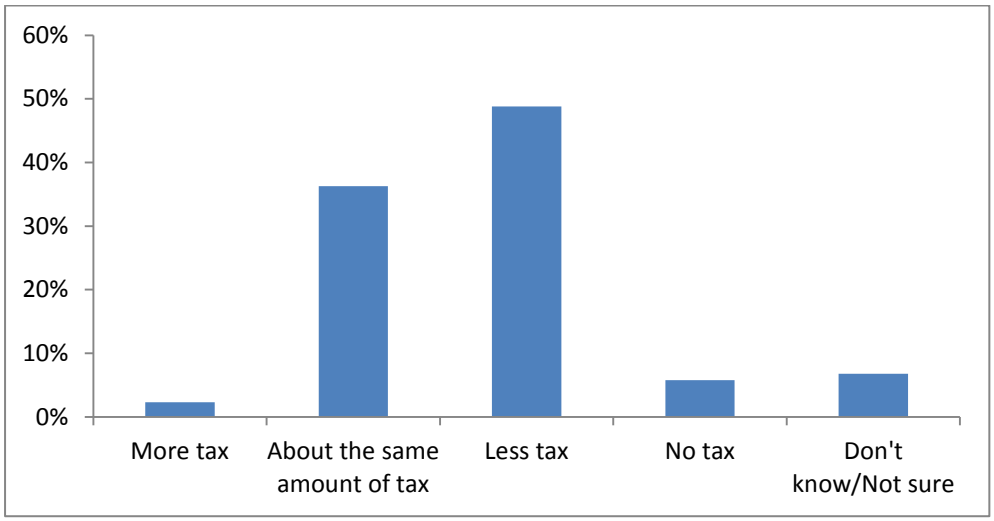
Figure 10: Would you be more likely or less likely to vote for a party which had a policy to accelerate the uptake of electric vehicles?



Source: The Australia Institute survey

Figure 10 shows that only 10 percent of voters would be less likely to vote for a party that supported electric vehicles, with a further six percent unsure. In particular, policies around tax incentives for electric vehicles have strong support from the public:

Figure 11: Do you think vehicles that run on electricity (which are generally less polluting) should pay less, more, or the same amount of tax as regular vehicles that run on petrol?



Source: The Australia Institute survey

Given this strong support for policies to support EV uptake, the next section examines policy options for Australia.

What should we do?

Recommendation 1: Exempt all electric vehicles from LCT

The upfront cost of vehicles may be a barrier to promoting EV uptake. A recent global survey by Deloitte asked consumers for their opinions on electric vehicles. In Australia, 69 per cent of respondents indicated an unwillingness to pay any premium for an electric vehicle whatsoever. This result, which is consistent with those found around the world, suggests electric vehicle models need to be cost-competitive at point of sale to advance sales and mature the EV market.[44] Three in four Australian respondents surveyed by Deloitte indicated an interest in purchasing an EV – so long as it was priced at $30,000 or less.[45]

Offering a price subsidy is also one of the most effective ways to boost uptake. A recent study into the effectiveness of various incentives made available to American electric vehicle purchasers between January 2000 and December 2010 found direct financial incentives produced the most pronounced uptick in sales. In the absence of any other support, electric vehicle sales increased by 4.6 per cent for every $1,000 offered in price incentives.[46]

The upfront price penalty of some electric vehicles is amplified by Australia's taxation system. Sales of vehicles priced above $63,184 attract a Luxury Car Tax, or LCT (vehicles with a fuel efficiency of seven litres or less consumed per 100 kilometres have a slightly higher threshold at $75,375 for the 2015–16 financial year). The LCT is levied at 33 per cent on the amount of a vehicle model's sale price above the threshold; the higher the threshold, the lesser the tax liability.

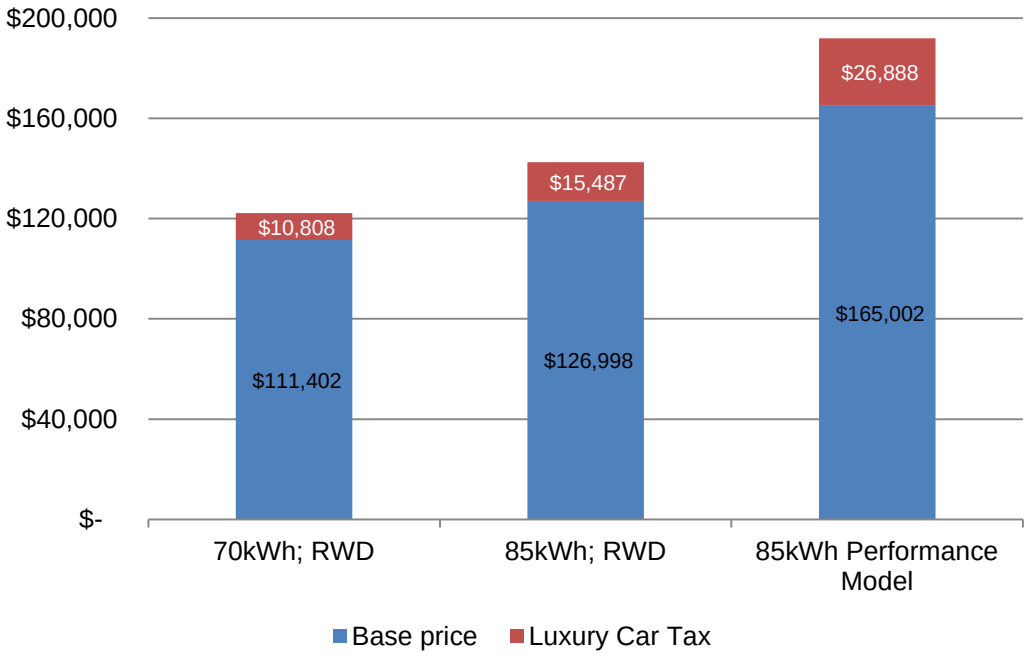
As of November 2015, the only fully-electric vehicle subject to the LCT is the Tesla Model S. Figure 12 below presents an illustration of the effect of the LCT on the sale price of three varieties of the vehicle:

[44] Jordi Perdiguero and Juan Luis Jiménez González, "Policy Options for the Promotion of Electric Vehicles: A Review," Working Paper (Barcelona: Research Institute of Applied Economics, August 2012).

[45] Craig Giffi et al., "Unplugged: Electric Vehicle Realities versus Consumer Expectations," Research Report, Global Manufacturing Industry Group Survey (Deloitte Touche Tohmatsu Limited, 2011), http://www2.deloitte.com/us/en/pages/manufacturing/articles/unplugged-electric-vehicle-realities-vesrus-consumer-expectations.html#.

[46] Alan Jenn, Inês L Azevedo, and Pedro Ferreira, "The Impact of Federal Incentives on the Adoption of Hybrid Electric Vehicles in the United States," *Energy Economics* 40 (2013): 936–42.

Figure 12: Tesla Model S variants, base price and luxury car tax[47]



While smaller EVs are below the LCT threshold, premium EVs such as the Tesla Model S are not. These premium EVs, which are more expensive owing to the larger battery size required of a fully-electric vehicle, have their price premium compounded by the application of the Luxury Car Tax.

Such a policy outcome is inconsistent with the two-tiered threshold's original intention. As detailed in Table 2, the price benefits of the two-tier LCT system are not accruing in proportion with environmental credentials. The LCT discount, which measures how much less expensive a model's price tag becomes when compared to the price it would otherwise be with no higher tier of LCT for fuel-efficient vehicles, is highest for cars whose price tags put them closest to the upward threshold, and lower the further the car moves from that threshold. As a result, two similarly priced vehicles will face similar price imposts regardless of their respective environmental impacts.

[47] Base prices include GST, as the tax is included in the LCT calculation base. Other charges, such as registration and stamp duty, are excluded. These charges differ between states and territories. The base price refers to a model with no additional extras. Prices sourced from Tesla Motors Australia.

Table 2: Luxury Car Tax liability, discount, and emissions by vehicle model

Model	kg CO2-e/100km[48]	Base price (MRLP[49])	Discounted LCT[50]	Undiscounted LCT[51]	LCT discount[52]
2015 Audi TT S 2.0 TFSI Quattro	16.2	$83,930	$2,567	$6,224	**4.1%**
2016 Mercedes-Benz C250	16.4	$70,990	$ -	$2,342	**3.2%**
2015 Tesla Model S 85	-	$114,200	$11,648	$15,305	**2.8%**
2016 Range Rover Sport Hybrid	17.2	$124,970	$14,879	$18,536	**2.5%**
2016 Porsche Cayenne S E-Hybrid	8.3	$140,800	$19,628	$23,285	**2.2%**
2016 Infiniti Q50 3.5 Hybrid S	16.2	$67,900	$ -	$1,415	**2.0%**
2016 BMW i8 Hybrid 2-door Coupe	5.0	$299,000	$67,088	$70,745	**1.0%**

The only EVs that may benefit from the current model are those whose technology is not expensive enough to push their price into the higher bracket. The LCT's tiered system thus serves to reduce the price of only those clean vehicles with a price tag between the two thresholds. These EVs are typically 'hybrids'. While hybrid EVs have lower emission outputs than conventional internal combustion engines (ICEs), they still emit more than all-electric vehicles. However, because the components required to produce an all-electric vehicle are more expensive than those of a hybrid, the outcome is a perverse one: the beneficiaries of

[48] Department of the Environment, "National Greenhouse Accounts Factors," Australian National Greenhouse Accounts (Commonwealth of Australia, July 2014), http://www.environment.gov.au/system/files/resources/b24f8db4-e55a-4deb-a0b3-32cf763a5dab/files/national-greenhouse-accounts-factors-2014.pdf.

[49] Manufacturer recommended list price.

[50] $LCT_i = \frac{10}{3}(P - t_i)$, where P = MRLP and t the respective threshold i for the LCT. Values rounded to the nearest whole dollar.

[51] LCT calculated at threshold t_1 as opposed to t_2, the higher threshold. Values rounded to the nearest whole dollar.

[52] Discount is calculated as $1 - (\frac{P+LCT_2}{P+LCT_1})$; that is, one minus the base price plus the additional LCT when the higher threshold applies divided by the base price plus the additional LCT applicable if the lower threshold applied.

the LCT's tiered structure, which ostensibly seeks to incentivise cleaner vehicle purchases, are not the drivers of the cleanest vehicles.

Excluding electric vehicles from the LCT would benefit the EV market, effectively lowering the upfront price disadvantage. The budgetary impact only becomes significant when the EV market is well-stocked. When the impact becomes too great, the incentive will have worked and can be wound up.

Recommendation 2: Bonus–malus

The regulatory environment in Australia is less favourable to electric vehicles than many other nations. While Australia's vehicle emission standards have restricted some air pollutants since the early 1970s, carbon dioxide emissions remain unregulated.[53] On the metric of average carbon dioxide emissions per kilometre driven by a passenger vehicle, Australia does worse than the United States, South Korea, China, Canada, Mexico, India, and the European Union.[54] Australia is also the only nation amongst this cohort without standards regulating vehicle carbon emissions.[55]

A carbon pricing system would naturally benefit electric vehicles, as carbon-emitting vehicles would face a price premium in proportion to their performance. Yet the costs of heavily-polluting vehicles are not transparent at point of purchase; even when lifetime operating costs are clearly signalled when consumers are deciding between purchase options, low upfront ticket prices are disproportionately favoured over high ongoing future costs.

How should governments price vehicle carbon emissions in the absence of a formal carbon price, while making clean vehicles attractive enough to appeal to consumers at point of sale? One option is to offer price subsidies for clean vehicles.

The promise of a financial reward to those who purchase vehicles with an emissions standard below a fixed benchmark would no doubt stimulate demand for lower-emission vehicles. Yet such a subsidy would cost the budget for every additional sale it supports. The French system of bonus–malus presents an alternative to direct subsidies, which, if calibrated correctly, can also be revenue neutral.

The French system effectively adjusts the purchase price of a new vehicle by establishing a benchmark performance standard and comparing the vehicle's performance against it. If a vehicle is cleaner than the benchmark, its purchase price is reduced (and vice versa). In

[53] Department of Infrastructure and Regional Development, "Summary of Emission Requirements for New Petrol Passenger Cars in Australia" (Commonwealth of Australia, September 29, 2015), https://infrastructure.gov.au/roads/environment/files/Emission_Standards_for_Petrol_Cars_1972_2018.pdf.
[54] Climate Change Authority, "Light Vehicle Emissions Standards for Australia."
[55] Ibid.

principle, the scheme is revenue neutral, as the penalty for vehicles with underperforming emissions standards is used to fund the rewards for vehicles that over-perform.

A review of the experiences and designs of bonus–malus schemes around the world by the International Council on Clean Transportation culminated in five recommendations for policymakers.[56] Together, they constitute a model of best practice for bonus–malus scheme implementation:

1. Unlike standards, which equally reward all vehicles with a performance above a benchmark, the scheme must be **continuous**. The incentive should always be higher on a better-performing vehicle;
2. The scheme should convert the uncertainty of future savings to be gained from improved fuel efficiency into an **immediate, tangible, upfront benefit;**
3. The scheme should offer a **known, certain price** for any future reduction in fuel consumption and CO2 emissions, which should respond consistently as vehicle performance standards diverge from the midpoint;
4. The scheme's benchmark performance standard **should balance revenues and fees**. Over time, as the average performance of the fleet improves, the benchmark should be adjusted to maintain balance between the two; and
5. The scheme should require as little revision as possible. Scheme **consistency** offers confidence in future manufacturing and purchasing decisions.

Measured against these criteria, France's model is flawed. When the scheme was first implemented, consumers responded immediately. Low-emission vehicle sales spiked, as consumers took advantage of the scheme's bonus component payment. The corresponding sales of more heavily-polluting vehicles flat-lined, starving the rebate scheme of approximately €600 million a year in revenue.[57] Yet, with some tweaks, deficiencies in the French model of implementation are easily addressed.

For example, while the French scheme relied on large bins of reward and penalty values, centred on a static benchmark value; it is preferable to scale the system dynamically (though, administratively, this is a new challenge).[58] Setting the value of rewards or penalties on a stepwise schedule of return is less effective than a continuous 'feebate' as

[56] John German and Dan Meszler, "Best Practices for Feebate Program Design and Implementation," Feebate Review and Assessment (San Francisco: The International Council on Clean Transportation, April 2010).

[57] Hui He and Anup Bandivadekar, "A Review and Comparative Analysis of Fiscal Policies Associated with New Passenger Vehicle Co2 Emissions" (Washington, D.C.: International Council on Clean Transportation, February 2011).

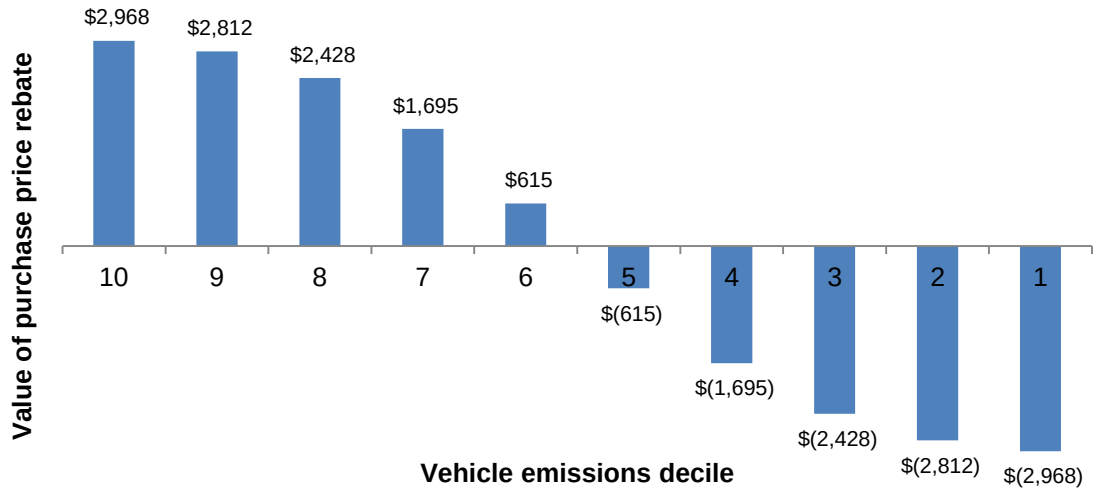
[58] In principle, authorities will be able to simply maintain a record of the fuel efficiency of each registered vehicle, as this data will be necessary to calculate the *bonus/malus* in the first instance. So long as the distribution of fuel efficiency ratings is updated with regularity and frequency, the scheme should remain revenue neutral.

there is no incentive to improve the performance of vehicles that are not close to the next step along the schedule. Manufacturers and consumers are encouraged to 'bunch'.

A dynamic, continuous bonus–malus scheme would offer a superior alternative. Like a stepwise schedule, the scheme would offer a credit or penalty to each vehicle's purchase cost based on where along the fleet's fuel efficiency distribution it sits. A middling performance will net the average vehicle no benefit and no charge; a superior fuel efficiency rating will reward the driver, and an inferior fuel efficiency rating penalises the driver according to how far behind the average their vehicle sits. Unlike the stepwise model, however, its linear continuity allows for consistent marginal benefits to improving the vehicle's performance.

A visual illustration of the principle is presented in 13 below, which supposes a cap of +/- $3,000 across the fleet.[59]

Figure 13: Illustrative vehicle bonus/malus scheme rebate value, by emissions decile



The model recommended by this report fulfils each of the criteria of best practice, as set out by the International Council on Clean Transportation. It adapts and improves upon an already-successful international example. It is revenue-neutral, levied against the purchase price of the vehicle, priced predictably and consistently, continuously benchmarked, and designed to operate with minimal need for intervention.

[59] The design in 13 assumes fuel efficiency follows a normal distribution across the population, and is priced to compensate for this distribution by maintaining constant marginal costs and benefits for each marginal improvement in fuel efficiency. If the population follows another distribution, the pricing mechanism will require revision.

Recommendation 3: Offer grants for electric vehicle public charging stations

There is a 'chicken-and-egg' paradox afflicting the maturation of the Australian EV market. Consumers will not flock to electric vehicles without the reassurance offered by a network of public charging stations. Yet governments and utilities will not invest in public charging stations without the reassurance that such an investment will be recovered (a reassurance offered by an on-road fleet of electric vehicles).

Part of the solution to this coordination problem must be optical. A visible, densely-distributed network of public charging stations will soothe consumer's 'range anxiety' fears of being left stranded in a vehicle with a tapped battery.

The development of this network requires careful management. Left unregulated, there is a risk that competing technology standards cannibalise the EV market. In time, loss-leading strategies to establish market share will see consumers favour the manufacturer able to offer the greatest network of charging stations. Competing EV manufacturers would face significant upfront costs attempting to establish their own networks of charging stations. The uncertainty of a return on that investment results in a natural monopoly, which benefits neither the consumer nor the government.

We are already witnessing the first stages of this strategy. Currently, the technology powering public charging stations restricts access only to those with compatible hardware. Electric vehicle manufacturer Tesla Motors is developing a network of proprietary 'Supercharger' fast-charging stations. The chargers will allow Tesla owners to refuel, for free, at incredible pace. The technology is not compatible with other electric vehicles.

The threat posed by fragmentation to the diffusion of EV technology and the need for public regulation is clear: fragmentation will provoke consumer uncertainty and dampen demand for electric vehicles. Yet the typical policy prescription – to standardise charging station technology across the board, similar to wall power sockets – is the epitome of 'picking winners' and offers no efficiency gain relative to business as usual.

Instead, governments should support competition of heterogeneous charging standards by offering partial grants to charging companies that wish to provide a public charging station. This strategy does not favour any one technology, allowing consumers to reveal their own preferences.

Here, the New Hampshire model is instructive. By reducing the cost of establishing a charging station by up to 75 per cent, the incentive for a manufacturer to attempt to secure a natural monopoly is lessened. The cheaper a charging station is to install, the easier it is for a competitor to establish one next to yours.

The government should identify strategic priority locations for these chargers. As well as maximising the benefit per dollar committed to the grant scheme, a similar model of public investment to New Hampshire will push an increasing number of electric vehicle companies into licensing agreements with small businesses, as each bid for a foothold within the area covered by the small business' real estate.

Left to the private sector, the rollout of public charging infrastructure is piecemeal and clustered. Faced with a commercial prerogative to market EVs to the demographic most likely to respond with sales, electric vehicle companies will maximise their exposure by concentrating their installation of charging stations in urban, affluent areas.

Though urban drivers are those currently most likely to purchase an electric vehicle, they are those who drive the fewest kilometres. Because electric vehicles have lower operating costs over their lifetime, the drivers most likely to recover the upfront price premium of an electric vehicle are those who drive the most kilometres; namely, those outside urban areas.[60]

Thus, assuming charging infrastructure is available equally across geographic locations, electric vehicles present the greatest value proposition to those in regions less serviced by public transport and other transportation alternatives. These areas are valuable mid- to long-term markets for electric vehicles.

Recommendation 4: Unrestricted bus and transit lane access, for a short time

There is much to like about Norway's HOV lane incentive for electric vehicles. Structured appropriately, the incentive builds a market to allow the trading of the valuable, underutilised resource of bus lane space.

Because of this attractiveness, EV access to high-occupancy vehicle lanes (HOV lanes) is an often-aped incentive. Similar schemes have been introduced in regions of Germany, the Netherlands, and the American states of Virginia, California, New York, Florida and Utah.[61]

Despite the promise of the incentive, its success is less than assured. There are only so many vehicles that can take advantage of the relatively uncongested HOV lane before the advantage disappears altogether. Buses will experience delays long before this occurs. In response, frustrated commuters may reject buses altogether, preferring the convenience of an electric vehicle. The result is one more car on the road – a clean one, admittedly, but no cleaner than one more person on a bus. Indeed, in terms of travel time, the greatest

[60] AECOM Australia, "Economic Viability of Electric Vehicles" (Sydney: Department of Environment, Climate Change and Water NSW, September 4, 2009), http://www.environment.nsw.gov.au/resources/climatechange/ElectricVehiclesReport.pdf.

[61] Perdiguero and Jiménez González, "Policy Options for the Promotion of Electric Vehicles: A Review."

congestion cost of such a policy is borne by existing public transport users, who have the lowest environmental footprint per kilometre travelled.[62]

Every additional vehicle in a HOV lane adds to lane congestion and marginally reduces the incentive of owning an electric vehicle. The appeal of electric vehicles as an opportunity to use relatively uncongested HOV lanes exists only so long as electric vehicles remain a niche product. Consumers successfully swayed by the incentive are effectively placing a wager that they will remain a minority of overall drivers; the observability of the incentive's success, then, becomes a mixed blessing.

Norway's example also demonstrates the policy response required when electric vehicles reach a critical level of saturation, and the average speed of traffic travelling within the bus lane will reduce due to congestion. In an effort to combat delays, in May 2015, Norwegian authorities restricted peak hour access to bus lanes to EVs transporting more than one person.[63]

Despite the challenges, the potential upside to the incentive is substantial, and policymakers should proceed with its trialling. Many of the potential problems raised within this report are borne of success. If the result of providing EVs access to HOV lanes is congestion within bus lanes, it is a symptom of an unprecedented increase in electric vehicle uptake. Remember that currently only 0.1 per cent of new car sales in Australia are EVs. Such an uptake will not go unnoticed; rather than allowing the situation to become unmanageable, there are opportunities to rescind such access at any point, as indeed Oslo authorities are doing for single occupant EVs today.

It is true that offering such a perk risks inviting misuse. Some vehicles are difficult to identify as all-electric without close examination (Nissan's latest iteration of its bestselling Leaf model is, according to the company's design chief and senior Vice-President, designed to look indistinguishable from a conventionally-fuelled vehicle).[64] Sydney's bus lane cameras, which register only a vehicle's number plate and its assumed distance travelled within the lane, cannot reliably distinguish between electric vehicles and ICEVs in their current form.[65]

The limitation makes policing HOV lane access a challenge. If traffic authorities are unable to differentiate between the legal and illegal use of an HOV lane, regulating access becomes practically impossible and the advantage of owning an EV is devalued.

---

[62] Tina Hodges, "Public Transportation's Role in Responding to Climate Change," Federal Transit Administration Report (Washington, D.C.: United States Department of Transportation, January 2009).

[63] AFP, "Electric Cars Lose Right to Drive in Oslo Bus Lanes," *The Local*, May 6, 2015, http://www.thelocal.no/20150506/norway-strips-electric-cars-of-ke.

[64] Bengt Halvorson, "2017 Nissan Leaf: Will Less 'EVness' Make It More Appealing?," *Green Car Reports*, October 8, 2014, http://www.greencarreports.com/news/1094830_2017-nissan-leaf-will-less-evness-make-it-more-appealing.

[65] N. S. W. Roads and Maritime Services, "Bus Lanes," *Roads and Maritime Services*, accessed January 27, 2016, http://www.rms.nsw.gov.au/roads/using-roads/buses/bus-lanes.html.

One option is to provide on- or in-vehicle identification. Craig Emerson, former Trade Minister and adjunct professor at Victoria University's College of Business, argues state governments should combine HOV access for electric vehicles with a rollout of license plates clearly identifying the attached vehicle's status as an electric vehicle.[66] The aims of the proposal are three-pronged:

a. Advertise the presence (and implied viability) of EVs on the road;
b. Market one of the perks of driving an EV over driving a conventional vehicle (namely, the opportunity to beat the traffic by using the HOV lane); and
c. Allow law enforcement officials to identify those drivers legitimately and legally taking advantage of HOV lanes.

In light of this potential, this report recommends electric vehicles be granted access to HOV lanes, and no other light vehicles be granted the same. Some conditions should be met:

- **The incentive should be temporary**. The provision should be affixed with an expiration date, upon which time the incentive will be retired and replaced with other incentives less reliant upon low levels of uptake.
- **The incentive should apply only to all-electric vehicles.** Norway's experience, which trialled access to HOV lanes for electric vehicles as well as for minibuses, found congestion quickly rendered the incentive unappealing.[67] Offering the incentive only to all-electric vehicles (and not to hybrids) allows policymakers more time to leave the incentive in place, and a more gradual, manageable migration of vehicles into the HOV lanes.
- **The incentive should be offered retroactively, to any registered EV, rather than to any EV purchased from the point of implementation onward.**
- **The incentive should be paired with a rollout of identifying license plates for electric vehicles.** These plates will make policing access to HOV lanes much simpler.

[66] Craig Emerson, "The Big Switch to Electric Cars," *Australian Financial Review*, November 10, 2015, http://www.afr.com/opinion/the-big-switch-to-electric-cars-20151109-gkubt4.

[67] Figenbaum and Kolbenstvedt, "Electromobility in Norway: Experiences and Possibilities with Electric Vehicles."

Conclusion

Electric vehicles promise benefits to both consumers and governments. Nonetheless, the market for electric vehicles remains underdeveloped, and progress has been slow. Australia's electric vehicle market is, by international standards, a laggard. This is in no small part to a lack of public investment in establishing the conditions necessary for growth.

First-mover advantages that we have foregone must be recovered in other ways. Australia should learn from the successes and failures of other jurisdictions and borrow the practices that have most effectively boosted uptake.

Take, for instance, price support. EVs attract higher up-front prices but lower ongoing operating costs. This premium price-tag exposes the technology to costs such as the luxury car tax, higher import duties, and higher stamp duty – all of which depress demand for the product. This outcome is against the interests of the both the government and the consumer.

An up-front reduction in the purchasing price via an exemption from Luxury Car Tax and a subsidy reflecting the vehicle's emissions impact would 'smooth out' an EV's lifetime costs, rather than stacking the bulk at the point of sale.

Public vehicle charging stations, which advertise the viability of electric vehicles and extend their usefulness, have not reached a critical mass. Government rebates against the cost of their installation will provide a low-cost, strategically effective means of promoting the development of a charging network.

Eventually, there will no longer be any requirement for these incentives. Thanks to technology improvements, cost reductions, diffusion of consumer awareness and the growth of confidence in the technology, the EV market will one day be self-reliant. When this happens, government incentives will have done their job. The four recommendations within this report offer the surest path to that result.

Bibliography

ACEA. “New Passenger Car Registrations 2015.” Provisional Data. Brussels: European Automobile Manufacturers Association, January 15, 2016.

AECOM Australia. “Economic Viability of Electric Vehicles.” Sydney: Department of Environment, Climate Change and Water NSW, September 4, 2009. http://www.environment.nsw.gov.au/resources/climatechange/ElectricVehiclesReport.pdf.

AFP. “Electric Cars Lose Right to Drive in Oslo Bus Lanes.” *The Local*. May 6, 2015. http://www.thelocal.no/20150506/norway-strips-electric-cars-of-ke.

Australian Bureau of Statistics. “Household Energy Consumption Survey, Australia.” Commonwealth of Australia, September 24, 2013. 4670.0. http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4670.0main+features132012.

———. “Survey of Motor Vehicle Use, Australia, 12 Months Ended 30 June 2012.” Commonwealth of Australia, June 25, 2015. http://www.abs.gov.au/ausstats/abs@.nsf/mf/9208.0.

Beyond Zero Emissions. "Zero Carbon Australia Electric Vehicles." 2016.

Bloomberg New Energy Finance. "Electric Vehicles to be 35% of global new car sales by 2040", *Bloomberg New Energy Finance*, (25 February 2016) http://about.bnef.com/press-releases/electric-vehicles-to-be-35-of-global-new-car-sales-by-2040/, Accessed 4 April 2016

Bureau of Infrastructure, Transport and Regional Economics. “Greenhouse Gas Emissions from Australian Transport: Projections to 2020.” Working Paper. Canberra: Commonwealth of Australia, December 2009. https://bitre.gov.au/publications/2009/files/wp_073.pdf.

Dan Cass, “Securing renewables: how batteries solve the problem of clean electricity” http://www.tai.org.au/sites/defualt/files/P234%20renewables%20and%20battery%20storage%20FINAL.pdf, Canberra, The Australia Institute, 2016.

Climate Change Authority. “Light Vehicle Emissions Standards for Australia.” Research Report. Melbourne: Commonwealth of Australia, June 2014. http://www.climatechangeauthority.gov.au/reviews/light-vehicle-emissions-standards-australia/opportunities-reduce-light-vehicle-emissions.

Department of Infrastructure and Regional Development. “Summary of Emission Requirements for New Petrol Passenger Cars in Australia.” Commonwealth of Australia, September 29, 2015. https://infrastructure.gov.au/roads/environment/files/Emission_Standards_for_Petrol_Cars_1972_2018.pdf.

Department of the Environment. “National Greenhouse Accounts Factors.” Australian National Greenhouse Accounts. Commonwealth of Australia, July 2014. http://www.environment.gov.au/system/files/resources/b24f8db4-e55a-4deb-a0b3-32cf763a5dab/files/national-greenhouse-accounts-factors-2014.pdf.

Department of Transport Victoria. “Creating A Market: Victorian Electric Vehicle Trial Mid-Term Report.” Melbourne: Government of Victoria, 2013.

d'Haultfoeuille, Xavier, Pauline Givord, and Xavier Boutin. "The Environmental Effect of Green Taxation: The Case of the French 'Bonus/Malus.'" *The Economic Journal* 124, no. 578 (2014): 444–80.

Electrek, 'The Dutch government confirms plan to ban new petrol and diesel cars by 2030', https://electrek.co/2017/10/10/netherlands-dutch-ban-petrol-diesel-cars-2030-electric-cars/

Edelstein, Stephen. "India's ambitious goal: all electric vehicles on roads by 2030", *Green Car Report*, (31 March 2016), http://www.greencarreports.com/news/1103162_indias-ambitious-goal-all-electric-vehicles-on-roads-by-2030 Accessed 1 April 2016

Emerson, Craig. "The Big Switch to Electric Cars." *Australian Financial Review*. November 10, 2015. http://www.afr.com/opinion/the-big-switch-to-electric-cars-20151109-gkubt4.

European Environment Agency. "New Cars' CO2 Emissions Well below Europe's 2015 Target." European Union, April 15, 2015. http://www.eea.europa.eu/highlights/new-cars2019-co2-emissions-well.

Fearnley, Nils, Paul Pfaffenbichler, Erik Figenbaum, and Reinhard Jellinek. "E-Vehicle Policies and Incentives: Assessment and Recommendations." Institute of Transport Economics Report. Oslo: Norwegian Centre for Transport Research, August 2015.

Figenbaum, Erik, and Marika Kolbenstvedt. "Electromobility in Norway: Experiences and Possibilities with Electric Vehicles." Report. Norwegian Centre for Transport Research. Oslo: Institute of Transport Economics, November 2013.

German, John, and Dan Meszler. "Best Practices for Feebate Program Design and Implementation." Feebate Review and Assessment. San Francisco: The International Council on Clean Transportation, April 2010.

Giffi, Craig, Joe Vitale, Michelle Drew, Yuki Kuboshima, and Masato Sase. "Unplugged: Electric Vehicle Realities versus Consumer Expectations." Research Report. Global Manufacturing Industry Group Survey. Deloitte Touche Tohmatsu Limited, 2011. http://www2.deloitte.com/us/en/pages/manufacturing/articles/unplugged-electric-vehicle-realities-vesrus-consumer-expectations.html#.

Global Health Observatory. "Number of Registered Vehicles: Situation and Trends." World Health Organisation, 2015.

Greene, David L. "Fiscal Incentives for GHG Mitigation: Feebates." Mexico City: United Nations Environment Programme, 2010.

Halvorson, Bengt. "2017 Nissan Leaf: Will Less 'EVness' Make It More Appealing?" *Green Car Reports*, October 8, 2014. http://www.greencarreports.com/news/1094830_2017-nissan-leaf-will-less-evness-make-it-more-appealing.

He, Hui, and Anup Bandivadekar. "A Review and Comparative Analysis of Fiscal Policies Associated with New Passenger Vehicle Co2 Emissions." Washington, D.C.: International Council on Clean Transportation, February 2011.

Hodges, Tina. "Public Transportation's Role in Responding to Climate Change." Federal Transit Administration Report. Washington, D.C.: United States Department of Transportation, January 2009.

Holland, Mike. "Cost-Benefit Analysis of Scenarios for Cost-Effective Emission Controls after 2020." Corresponding to IIASA TSAP Report 7. Austria: International Institute for Applied Systems Analysis, November 2012.

Jenn, Alan, Inês L Azevedo, and Pedro Ferreira. “The Impact of Federal Incentives on the Adoption of Hybrid Electric Vehicles in the United States.” *Energy Economics* 40 (2013): 936–42.

Lockwood, Paul. “NDHES Announces Electric Vehicle Charging Equipment Rebates.” New Hampshire Department of Environmental Services, March 10, 2015. http://des.nh.gov/media/pr/2015/20150310-electric-vehicle.htm.

Miller, Jennifer. “Electric Vehicle Tourism.” White Paper. Phoenix: Arizona State University, 2014.

Mock, Peter, and Zifei Yang. “Driving Electrification: A Global Comparison of Fiscal Incentive Policy for Electric Vehicles.” White Paper. Washington: The International Council on Clean Transportation, May 2014.

Morris, Craig. "Will Norway ban gas & diesel cars by 2025?", *Renewables International*, http://www.renewablesinternational.net/will-norway-ban-gas-diesel-cars-by-2025/150/537/94287/, Accessed 4 April 2016

National Transport Commission. “Carbon Dioxide Emissions Intensity for New Australian Light Vehicles 2014.” Information Paper. Melbourne: Commonwealth of Australia, July 7, 2015.

New Hampshire Department of Environmental Services. “New Hampshire Electric Vehicle Infrastructure Rebate Program.” Guidance Document. Concord: Government of New Hampshire, October 14, 2015.

New South Wales Department of Environment and Conservation. “Air Pollution Economics: Health Costs of Air Pollution in the Greater Sydney Metropolitan Region.” Sydney: Government of New South Wales, November 2005.

OECD. *The Cost of Air Pollution*. Paris: Organisation for Economic Co-operation and Development, 2014. http://www.oecd-ilibrary.org/;jsessionid=4s8ho7bla0aqd.x-oecd-live-02content/book/9789264210448-en.

Parkin, Brian. “Musk Says Diesel Cheating Is Bad, CO2 Emissions Are Worse.” *Bloomberg Business*. September 24, 2015. http://www.bloomberg.com/news/articles/2015-09-24/musk-says-while-diesel-cheating-is-bad-co2-emissions-are-worse.

Perdiguero, Jordi, and Juan Luis Jiménez González. “Policy Options for the Promotion of Electric Vehicles: A Review.” Working Paper. Barcelona: Research Institute of Applied Economics, August 2012.

Phillips, Leigh. “Norway’s Electric Vehicle Revolution: Lessons for British Columbia.” Briefing Note. British Columbia: Pacific Institute for Climate Solutions, 2015.

RedBook. “Research & Value of Vehicles (Electric).” Automotive Data Services Pty Ltd, January 20, 2016. http://www.redbook.com.au/portal/tabID__2807404/DesktopDefault.aspx.

Roads and Maritime Services, N. S. W. “Bus Lanes.” *Roads and Maritime Services*. Accessed January 27, 2016. http://www.rms.nsw.gov.au/roads/using-roads/buses/bus-lanes.html.

Shewmake, Sharon, and Lovell Jarvis. “Hybrid Cars and Hov Lanes.” *Transportation Research Part A: Policy and Practice* 67 (August 27, 2014): 304–19.

Tesla Motors. “Tesla Superchargers in Australia.” *Teslamotors.com*, January 22, 2016. http://www.drive.com.au/motor-news/france-mulls-fuelefficiency-incentives-20080607-1445n.html.

Trigg, Tali, Paul Telleen, R Boyd, F Cuenot, D D’Ambrosio, R Gaghen, JF Gagné, A Hardcastle, D Houssin, and AR Jones. “Global Ev Outlook: Understanding the Electric Vehicle

Landscape to 2020." *International Energy Agency*, Electric Vehicles Initiative, 2013, 1–40.
United States Bureau of Economic Analysis. "Light Weight Vehicle Sales: Autos and Light Trucks." Federal Reserve Bank of St. Louis, January 20, 2016. https://research.stlouisfed.org/fred2/series/ALTSALES.
VFACTS. "Industry Summary." Federal Chamber of Automotive Industries, January 11, 2016. www.fcai.com.au.
Wickham, Shawne. "Electric Vehicles Finding Favor, Power." *New Hampshire Sunday News*. July 11, 2015. http://www.unionleader.com/apps/pbcs.dll/article?AID=%2F20150712%2FNEWS05%2F150719857%2F0%2Fnews.