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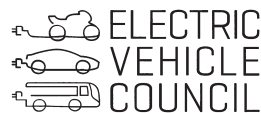
APRIL 2016

The path forward for electric vehicles in Australia

Stakeholder recommendations



Project partners



About us

The Path Forward for Electric Vehicles in Australia has been prepared by an informal initiative aimed at driving the uptake of Electric Vehicles (EVs) in Australia. The collaboration is convened by ClimateWorks Australia, and draws on input from a range of expert member organisations including Transgrid, NRMA, AGL, the Australasian Convenience and Petroleum Marketers Association, Jet Charge and others, and is working closely with the Electric Vehicle Council.

The following organisations are co-signatories to this submission and support the requested measures outlined to help drive uptake of EVs within Australia to meet our climate, energy productivity and air quality goals:

ClimateWorks Australia: ClimateWorks Australia - an independent, research-based, non-profit organisation committed to catalysing reductions in greenhouse gas emissions in Australia.

Transgrid: TransGrid is the operator and manager of the NSW high voltage transmission network.

AGL: AGL Energy is one of Australia's leading integrated energy companies providing electricity, gas, solar and renewable energy services to homes and businesses.

Australasian Convenience and Petroleum Marketers Association (ACAPMA): ACAPMA is the leading association and national peak body responsible for the development and growth of the petroleum distribution and petrol convenience retail industries.

JET Charge: JET Charge is a leading supplier, installer and manager of Electric Vehicle Charging Infrastructure.

Electric Vehicle Council: The Electric Vehicle Council is comprised of representatives from academic, industry and corporate sectors, who act as advocates for the adoption of electric vehicles. The Electric Vehicle Council provides a voice to the electric mobility industry transitioning to a progressive, sustainable and secure transport network.

Ergon: Ergon supply electricity to homes and business, and maintain and expand the electricity network in regional Queensland.

City of Sydney: The City of Sydney is the local government authority for central Sydney and surrounds.

Swinburne: Swinburne is a large and culturally diverse organisation with a vision to be Australia's leading university of science, technology and innovation.

Future Climate Australia (FCA): FCA is a not-for-profit environmental organisation that provides strategies for individuals, business and government to address climate change, particularly in the area of transport and mobility.

Moreland City Council: Moreland City Council's vision is for a sustainable Moreland that supports a resilient community who live in an attractive, accessible and safe environment, with a strong local economy and services that meet their diverse and growing needs.

Wingmate: WINGMATE provides data logging and analysis solutions in particular for hybrid and electric vehicles.

TR Fleet Australia: TR Fleet Australia provides Modern Fleet Management solutions focussed on Electric Vehicles and Grey Fleet Management

Tritium: Tritium is a Brisbane-based designer, manufacturer and exporter of world-leading charging stations for electric vehicles.

Tesla: Tesla Motors' goal is to accelerate the world's transition to sustainable transport with a full range of increasingly affordable electric cars. California-based Tesla designs and manufactures electric vehicles as well as renewable energy storage. Tesla has delivered more than 90,000 electric vehicles to customers worldwide.

Renault Australia: One of Europe's leading car manufacturers and part of the global Renault-Nissan Alliance.

Adelaide City Council: Adelaide City Council is the capital city council of South Australia with a population of 23,169, founded in 1840 and covering 15.57km².

ChargePoint: ChargePoint holds the exclusive Australian and New Zealand license for electric vehicle charging technology developed by Silicon Valley based company ChargePoint, Inc.

Australian Electric Vehicle Association (AEVA): AEVA is a non-profit organisation founded in 1973, with the purpose to create greater awareness of EVs in Australia.

ClimateWorks acknowledges the contributions of the co-signatories to this report, as well as input from a range of contributors including RACV, Queensland University of Technology, Tom Garrish and Origin Energy.

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Executive Summary

The Path Forward for Electric Vehicles in Australia has been prepared by a collaboration of industry representatives from the Electric Vehicle (EV) ecosystem, to explore the role of EVs in reducing greenhouse gas emissions, improving air quality and achieving improvements in energy productivity.

This submission aims to provide a summary of views from across the Australian EV ecosystem, resulting from industry and consumer representative feedback, and drawing on research and evidence that supports opportunities to reduce emissions at national and regional levels. Research shows that uptake of electric vehicles, when linked to a cleaner supply of electricity, can provide emission reductions of 16 and 47 per cent in the Passenger and Light Commercial Vehicle segments by 2050. This impacts one of Australia's fastest growing sources of emissions, growing by 47.5 per cent since 1990, representing 17 per cent of Australia's emissions and projected to rise by a further six per cent to 2020, reaching 97 mega tonnes CO₂. In an increasing range of applications, EVs can provide cost effective emission reductions, plus a broader range of economic and air quality benefits. The uptake of EVs also addresses issues of fuel security, where Australia is uniquely vulnerable to disruption due to the high fuel import dependency.

In order to support the uptake of EV adoption in Australia, this submission recommends a series of measures, through the following categories:

1. Treatment of Electric Vehicles under CO₂ and noxious emission standards

- Providing allowances for low or zero emission vehicles in the short term under CO₂ emission standards to encourage manufacturers to increase model availability across market segments
- Consideration of the broader benefits of EVs to health, air quality, fuel security, energy productivity and electricity supply in any Regulatory Impact Statements undertaken

2. Increasing demand, awareness and value

- Co-ordinating and incentivising infrastructure deployment, fuel consumption labelling, fleet purchasing policies, a National Electric Vehicle Roadmap, and Luxury Car and Fringe Benefit Tax exemptions

These measures are aimed at supporting the greater uptake of EVs in Australia, in particular at early stages in order to increase model choice and supporting infrastructure. International evidence suggests a strong correlation between sales and the number of vehicle models offered. The lack of vehicle choice in Australia sits alongside the relatively high price of electric vehicles in Australia, where internationally a range of financial and non-financial consumer incentives boost both supply and demand.

The lack of a national policy framework in Australia has led to limited overall support and incentives in comparison to our global peers, which has contributed to our poor ranking among major OECD countries for the energy efficiency of our transport sector. While there is recognition of the short term nature of some recommendations, they are derived from global 'best practice' vehicle electrification strategies aimed at near term uptake and support, to ensure Australia is ready for enhanced uptake of EVs in order to meet our climate, energy productivity and air quality goals.

Summary of requested measures

1. Treatment of EVs under CO₂ emission standards
1.1 That for any light vehicle CO ₂ standard introduced, manufacturers are incentivised to increase model diversity across market segments.
1.2 That any Regulatory Impact Statement undertaken adequately consider the broader benefits of EVs including health, fuel security, energy productivity, Australia's balance of payments, jobs and broader benefits to the electricity supply chain.
2. Role of EVs in addressing noxious emissions
2.1 That any Regulatory Impact Statement undertaken for Euro 5/6 considers the potential benefits EVs can provide to reduce noxious emissions, and consequent reductions in externalities.
3. Complementary measures to support uptake of electric vehicles
<i>Measures to increase demand and to strengthen current understanding of the value proposition of lower emission vehicles and fuels</i>
3.1 To enhance short term uptake and increase EV model availability, up front purchase incentives, in line with those seen in leading markets, should be provided across the Australian market.
3.2 A framework for operating incentives should be developed across all levels of government offering annual registration rebates, priority lanes, reduced parking etc
<i>Measures to encourage the supply of supporting infrastructure</i>
3.3 Coordination of national strategy on EV infrastructure deployment: <ul style="list-style-type: none"> • Undertake stocktake of existing and planned EV charging infrastructure deployment • Investigate incentives for charging infrastructure deployment • Consider future charging requirements in terms of likely fleet mixes • Harmonise charging standards before the mass rollout of EV charging infrastructure • Ensuring planning and infrastructure development is EV ready
3.4 Work with other levels of government to incentivise infrastructure deployment (e.g. stimulate charging infrastructure deployment through reducing parking levy for CBD based parking facilities with EV charging infrastructure or reduced parking rates for commuter parking stations, work to remove legislative barriers to kerbside charging deployment etc.)
3.5 Support local businesses providing innovation in charging infrastructure development and innovative deployment business models
3.6 Ensure that government fleet charging infrastructure is placed in areas, where possible, that can also be accessed by the public.

<i>Awareness raising and fuel consumption labelling</i>
3.7 Support industry efforts to facilitate the development of a second hand market for electric vehicles to ensure that consumers not purchasing a new vehicle have access to this technology
3.8 Support early stage demonstration and deployment of electric vehicles with both government and business fleet owners
3.9 Support local government, consumer groups and industry initiatives to increase consumer exposure to electric vehicles
<i>Fleet purchasing policy</i>
3.10 The Federal government mandate that new fleet purchases include electric vehicles, and set targets for electric vehicle uptake within fleets
3.11 All levels of government work with manufacturers to help aggregate demand for electric vehicles, encouraging lower prices and deployment of new models within the Australian market
3.12 A scheme similar to the US DOE's Workplace Charging scheme be developed to provide the tools for fleet managers to assess suitability of electric vehicles for their fleet, benchmark performance, share best practice and promote those fleets actively deploying electric vehicles, raising awareness
3.13 Government fleets (all levels) should be required to develop a plan to reduce fleet emissions (CO ₂ , NO _x and PM), and produce an annual public report on progress
<i>Luxury Car Tax</i>
3.14 Provide full exemption to BEVs from the Luxury Car Tax from 2016-17, and add a further threshold exemption for low emissions vehicles (such as PHEVs), or replace the LCT with an Emissions Tax for Luxury Vehicles
<i>Fringe Benefits Tax / Novated Leasing</i>
3.15 Create a Fringe Benefits Tax (FBT) exemption for electric vehicles to account for their higher capital costs in the period through to their expected pricing parity with internal combustion engine vehicles in 2020-22
3.16 Ensure that the FBT exemption extends to novated leasing arrangements, and extend this exemption beyond the sunset period for the business fleet vehicle exemption
<i>Other Measures</i>
3.17 Federal Government support for the development of a National EV Roadmap to: <ul style="list-style-type: none"> ● Establish a national electric vehicle uptake target ● Identify key priorities and actions required to drive uptake ● Facilitate consultation and engagement across industry, consumer and government stakeholders

Part One:

An overview of EVs in Australia

Role of EVs in reducing vehicle emissions in Australia and other benefits

As a signatory to the Paris Agreement, Australia has now committed to the global transition to net zero emissions, requiring the development of long-term 2050 decarbonisation strategies. The Pathways to Deep Decarbonisation in 2050 research by ClimateWorks and ANU demonstrates that Australia could achieve net zero emissions by 2050 with continued economic growth, and with technologies that are currently available¹. ClimateWorks and ANU worked with CSIRO to identify decarbonisation pathways for Australia which focus on meeting Australia's carbon budget optimised for the lowest cost across four pillars; ambitious energy efficiency, low carbon electricity, electrification and fuel switching in transport, industry and buildings and sequestering offsetting non-energy and remaining emissions².

The transport sector is one of the fastest growing sources of emissions within Australia, increasing by 47.5% since 1990³, however it also represents the most financially attractive emission reduction opportunity across the Australian economy⁴. The transport sector accounts for 17% or 92 MtCO₂e of Australia's emissions in 2013-14, with Passenger and Light Commercial vehicles contributing 62% of the sector's total emissions⁵. The sector's emissions have been projected to rise by a further 6% to 2020, to reach 97 MtCO₂e, driven primarily by population and income growth for passenger travel and economic growth for freight transport⁶.

The implementation of standards aimed to improve the fuel efficiency of conventional internal combustion engines (ICE) will only go so far in achieving the Australian Government's greenhouse gas emissions reduction targets, air quality objectives, and improvements in energy productivity. Demand for hybrid electric vehicles (HEVs) continues to increase and the pathway leading to electric vehicles as a predominant vehicle-type in Australia will continue to include a vast array of different drive-train technologies and fuels. It is however, the development of policies to support the broad-scale adoption of new and emerging technologies, in particular electric vehicle technology, that could bring significant changes in terms of not only the technologies utilised for personal transportation but also in moving economies away from petroleum and lessening the environmental footprint of transportation.

Research by ClimateWorks for the UNFCCC Taskforce investigating Australia's post 2020 emission reduction target identified that uptake of electric vehicles, in tandem with decarbonisation of the electricity grid or sourcing electricity from low carbon sources,

¹ ClimateWorks Australia (2014)

² ClimateWorks Australia (2014)

³ DIICSRTE (2013)

⁴ ClimateWorks Australia (2010)

⁵ DIICSRTE (2013)

⁶ DCEE (2010)

could provide emission reductions of 9 Mt CO₂e by 2030, and 27 MtCO₂e by 2050⁷. For the critical Passenger and Light Commercial vehicle segments, this represents reductions of 16% and 47% compared to 2013-14.

In 2011 AECOM completed modelling of electric vehicle uptake and impacts with a specific focus on the Victorian market. Under a scenario supportive of electric vehicle adoption, greenhouse gas emissions were reduced by nearly 1.5 MtCO₂e in 2030 as part of \$5.5 billion in wider economic benefits for the Victorian economy⁸. Furthermore, the breakeven year for the economic benefits arising from electric vehicle adoption was brought forward by government policies designed to encourage electric vehicle uptake. These benefits mostly go to consumers in the form of lower transport costs.

The AECOM modelling also highlights the air quality benefits arising from electric vehicle adoption. Under the supportive scenario alluded to above, electric vehicle adoption in 2030 was forecast to deliver air pollutant reductions of almost 10,000 tonnes of NO_x and 2,000 tonnes of PM₁₀. According to EPA Victoria, these figures represent around 10% of the 2006 inventories for these pollutants in the Port Phillip region⁹. CSIRO modelling from 2012 found that electric vehicle adoption will be concentrated in metropolitan areas of Victoria¹⁰, where population densities are at their highest. When it is considered that the impact of air pollution on human health depends on where the pollution is in relation to where people are located, electric vehicle uptake has the potential to deliver meaningful benefits to community health.

Electric vehicle adoption also addresses broader issues of fuel security. Australia is uniquely vulnerable to a disruption to transport fuel supplies¹¹ due to the current and increasingly high oil and fuel import dependency, where Australia's combined dependency on crude and fuel imports for transport has grown from around 60% in 2000 to over 90% today¹². In addition there is zero government owned or mandated stocks and transport fuel use is projected to increase, growing steadily at an average rate of 1.3% a year driven largely by economic growth¹³.

Australia is a member of the International Energy Agency (IEA) as a signatory to the International Energy Program (IEP) Treaty, which has a requirement to hold the equivalent of 90 days of the previous year's net imports¹⁴. Increasing demand for oil and petroleum products along with declining indigenous oil production has created a shortfall against Australia's IEP Treaty stockholding commitment. A multi-agency taskforce has been established to develop options to inform a decision to resolve IEP Treaty non-compliance¹⁵.

Analysis is based on the 2050 Pathways Calculator developed by ClimateWorks, in partnership with NRMA and with funding from ARENA, presents an overview of the potential options to reduce demand for imported oil and fuel in Australia, and the benefits this provides to national fuel security and carbon reduction targets. With the increase of electric vehicles into the Australian fleet broadly consistent with the Deep Decarbonisation Pathways Project, stocks of fuel would increase from 18 to 21 days in 2030 and from 16 to 20 days in 2050. Oil/fuel imports would decrease 16 percentage points in 2030 and 28 percentage points in 2050.

⁷ ClimateWorks Australia (2015)

⁸ AECOM (2011)

⁹ EPA Victoria (2011)

¹⁰ CSIRO (2012)

¹¹ Blackburn (2015)

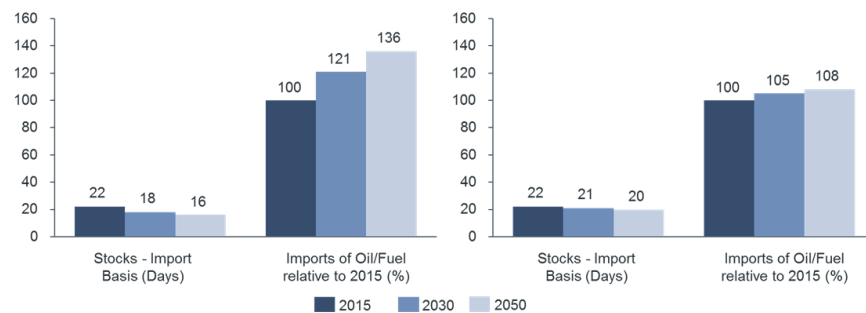
¹² Blackburn (2014)

¹³ Bureau of Resources and Energy Economics (2014)

¹⁴ International Energy Agency (2012)

¹⁵ Department of Industry, Innovation and Science (2016)

Figure 1: Australia's fuel security in terms of oil stocks and ratio of imported oil, under business as usual (left) and under deep decarbonisation EV uptake assumptions (right)



Source: ClimateWorks analysis (2016)

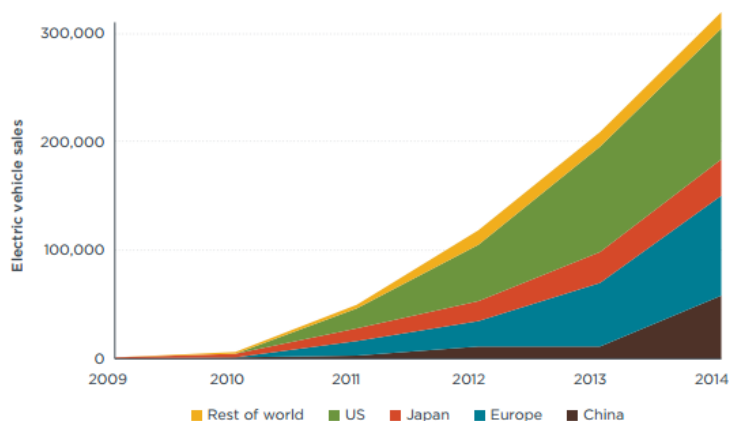
Increased uptake of EVs within Australia also presents a potential opportunity to increase local employment opportunities. Employment will be created potentially through sales, charging infrastructure deployment, and potential opportunities to create new manufacturing jobs specialising in batteries, EV components or charging infrastructure technologies. There will also be potential increased employment and economic benefits from the increased demand for locally produced electricity, replacing the predominantly imported petroleum based fuels.

By 2050, electric vehicles and biofuels could reverse increasing transport fuel imports, as well as reducing costs, improving air quality, reduce IEP compliance gap and reducing greenhouse gas emissions¹⁶.

Current state of play – EVs in Australia and our global peers

Global electric vehicle stock is continuing to increase, rising from about 180,000 electric cars on the road in late 2012 to over 665,000 on the road at the end of 2014¹⁷. Approximately two-thirds of global electric vehicle stock is located in just three countries, the United States (39%), Japan (16%) and China (12%). Early-adopter markets such as California and Norway are moving towards mainstream adoption, while fast-follower markets such as the United Kingdom are building on the lessons learnt¹⁸.

Figure 2: Annual global electric vehicle sales



Source: International Council on Clean Transportation (2015)

¹⁶ CSIRO (2015)

¹⁷ Clean Energy Ministerial (2015)

¹⁸ International Energy Agency (2014)

The number of electric vehicles sold each year is growing rapidly, increasing from 45,000 electric vehicles sold in 2011 to more than 300,000 in 2014. In 2014 in the Netherlands, Norway, Sweden and the United States, electric vehicles represented more than 1% of total new car sales¹⁹.

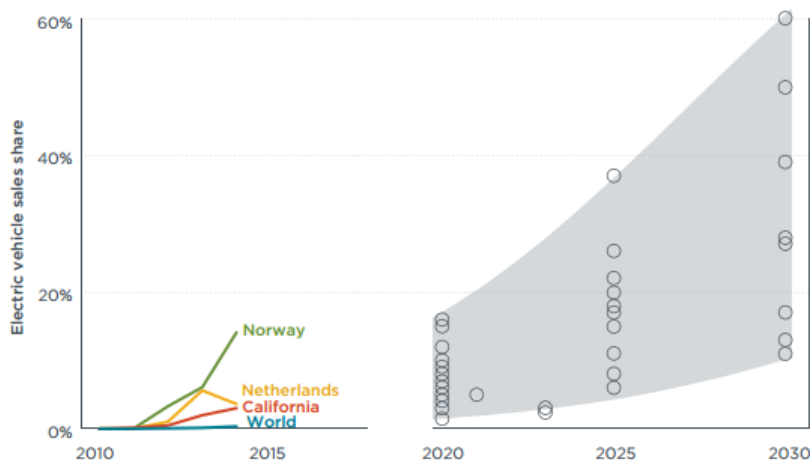
In addition, vehicle electrification has also gone multi-modal, with 46,000 electric buses and 235 million electric two-wheelers deployed by the end of 2014²⁰. China is currently leading the multi-modal deployment, with 230 million e-bikes, 83,000 electric cars, and 36,500 e-buses on the road in 2014²¹.

Comparatively, electric vehicle sales in Australia in 2014 totalled 948²² representing approximately 0.32% of global electric vehicle market share. Of the approximately 1.08 million new vehicles sold in 2014, this represents less than 0.09% of the Australian market.

Numerous studies have been conducted that model and forecast the deployment of electric vehicle sales under various market and policy conditions, however projections of potential increases in electric vehicle sales vary greatly, depending on region as well as policy drivers, technology progress, market conditions, and other factors.

Figure 3 below summarizes projections from numerous studies that analysed future electric vehicle deployment²³. Generally, studies that assumed greater technical advancement such as in battery technology and increased policy support in areas such as R&D, infrastructure, and regulation, found that 20% to more than 50% electric vehicle shares were possible in leading electric vehicle markets in the 2025-2030 timeframe²⁴. Alternatively, studies that factored in lesser policy support and lesser technical advancement generally found that the electric vehicle market, in various countries and globally, could remain as low as 5%-10% in the 2025-2030 timeframe²⁵.

Figure 3: Electric vehicle 2010-2014 sales share for selected regions and 2020-2030 sales share projections for U.S., EU, China, Japan, and the world from various studies



Source: International Council on Clean Transportation (2015)

¹⁹ International Energy Agency (2015)

²⁰ International Energy Agency (2015)

²¹ International Energy Agency (2015)

²² National Transport Commission (2015)

²³ International Council on Clean Transportation (2015)

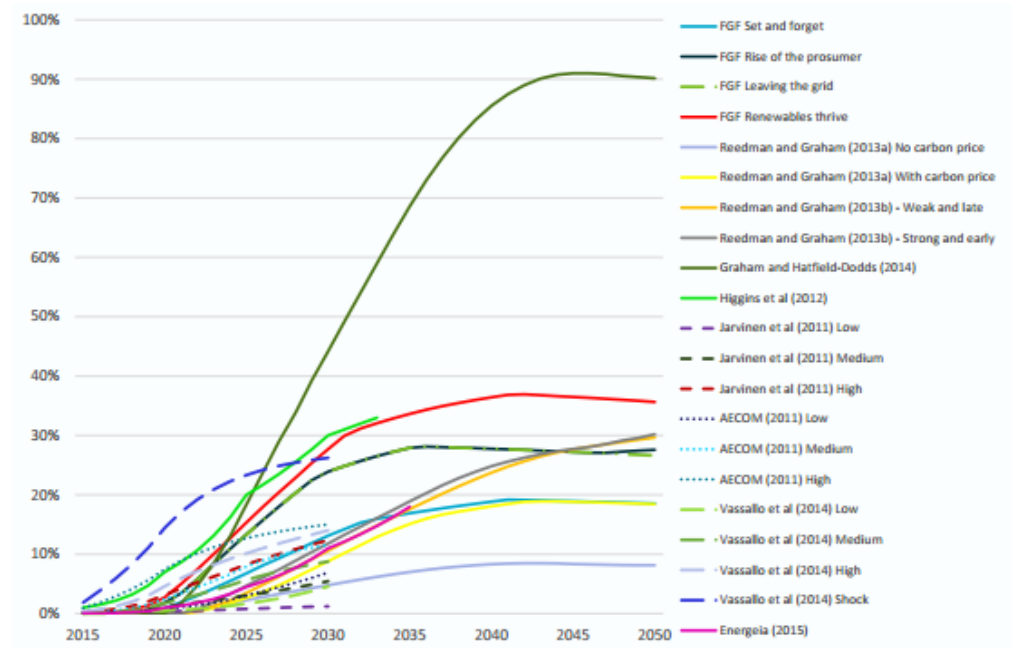
²⁴ International Council on Clean Transportation (2015)

²⁵ International Council on Clean Transportation (2015)

A summary of electric vehicle adoption projections is presented below in Figure 4. The top half of the projections, down to and including Higgins et al, are all based on the CSIRO Energy Sector Model. This includes a model of the Australian road fleet and assumes investment choices are based primarily on economic merit but also includes some additional constraints such as limits on the share of short range vehicles²⁶. Noting also that the Energy Sector Model includes the use of electric trucks in the rigid truck fleet while the remaining references generally deal with the passenger vehicle market only.

If electric vehicles become economically viable there is no real upper limit on their adoption except the rate of turnover of the vehicle stock. Through the CSIRO's Future Grid Forum, it was clear that there is a lot of uncertainty in terms of forecast uptake rates of electric vehicles, and that the higher end projections are feasible given the potential appeal of the technology, and the significant advances in battery technology. The scenario presented below with higher uptake rates, modelled by CSIRO for ClimateWorks' Deep Decarbonisation Pathways Project, is reflective of a world that is committed to meeting the emission reduction commitments of the Paris agreement, and highlights the important role that electric vehicles play in helping Australia meet its carbon budget to 2050²⁷.

Figure 4: Projections of electric vehicle fleet shares in Australia



Source: Energy Network Association and CSIRO (2015)

²⁶ Energy Network Association and CSIRO (2015)

²⁷ ClimateWorks Australia (2014)

International evidence suggests a strong correlation between cumulative electric vehicle sales and the number of vehicle models being offered, with the greater number of models available increased consumer choice can lead to further increases in sales²⁸. In 2012, there were 6 to 8 electric vehicle models widely available to the general public in several countries. This has increased to over 30 in 2015, depending on geographical location²⁹. While most leading car manufacturers have one or more models in production or development, the availability of models is dependent on geographic location and market demand.

In Australia there is currently a limited number of models available, outlined in Table 1 below³⁰. Notable omissions include the highest selling electric vehicles from international markets, including the Nissan LEAF Gen 2, Chevrolet Volt and Bolt (not being built in right hand drive), and Renault ZOE. Nissan introduced the Gen 1 Leaf to the Australian market, but is not planning on bringing the Gen 2 version which is now available in other markets. Nissan Australia CEO, Richard Emery, has previously stated that manufacturers need “government help, the same kind of assistance that governments in Europe, the USA and Japan provide” to overcome barriers to EV uptake in Australia and increase model availability³¹. In an intensely-competitive market containing over 400 passenger and light commercial vehicle options, there are a mere 14 plug-in makes/models. Furthermore across the 30 vehicle segments and over 1.1 million new vehicle sales, plug-in options were available in just 12 segments accounting for less than 20% of the market³². This means that for the overwhelming majority of Australian buyers, plug-in vehicles are not even available.

Table 1: Australian EV market outlook for 2016

BEV	Passenger Light	Passenger Small	Passenger Medium	Passenger Large	Passenger Upper large	Passenger People Mover	Passenger Sports	SUV Small	SUV Medium	SUV Large	SUV Upper large
<30000											
30-50											
50-70											
70-90		BMW i3									
90+					Tesla S					Tesla X	

PHEV	Passenger Light	Passenger Small	Passenger Medium	Passenger Large	Passenger Upper large	Passenger People Mover	Passenger Sports	SUV Small	SUV Medium	SUV Large	SUV Upper large
<30000											
30-50									Mitsubishi Outlander		
50-70			Audi A3 e-Tron								
70-90		BMW i3	BMW 330e								
90+			Merc GLF350e	Porsche Panamera						BMW X5e Volvo XC90 T8 Porsche Cayenne SE	

Source: ClimateWorks Australia analysis

Table 1 illustrates the availability of models in Australia in 2016. The lack of choice (low model diversity) is clear in all columns and the lack of choice - especially in lower cost vehicles – is clear in all rows. Addressing these two weaknesses is fundamental to increasing adoption of these classes of vehicles in Australia.

Europe is driving change in this area by requiring total fleet CO2 emissions for an OEM to drop every few years. OEMs achieved their CO2-by-vehicle-mass targets for 2015, in most cases several years in advance. The next targets are in 2020 and 2025 and OEMs are expected to achieve these targets through planning and roll-out (sale) of a suitable mix of vehicles. As petrol/diesel will not achieve such targets in future on their own, an increasing mix of PHEVs and BEVs will have to be sold by OEMs to achieve the targets in order to avoid the significant financial penalties which would accompany such failure. This is illustrated by the diagram below, which shows that an increasing proportion of BEVs and PHEVs (as well as HEVs) will be required to achieve future targets.

²⁸ International Energy Agency (2015)

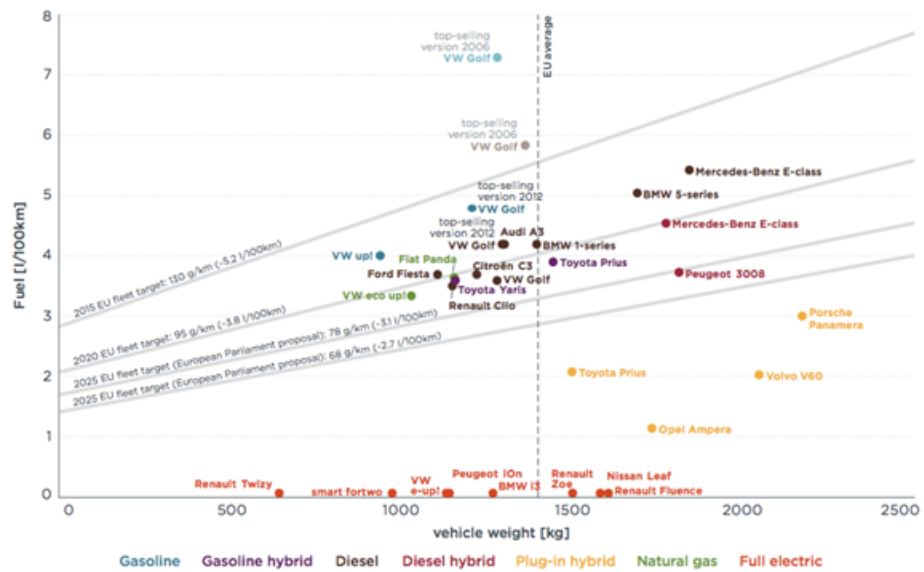
²⁹ EV Obsession (2016)

³⁰ Electric Vehicle Council (2016)

³¹ Motoring.com.au (2015)

³² Federal Chamber of Automotive Industries (2015)

Figure 5: CO2 emissions of selected commercially available passenger car models in the EU in 2013



Source: ICCT 2014

OEMs will each have to develop a suitable mix of vehicles to achieve these European targets. Australia can benefit from this development by simply following the trajectory of the European experience. Even the European target dates can be followed as Australian OEMs will soon not manufacture locally any more and the next target date – in 2021 – may be sufficiently far ahead to give local OEMs time to adjust.

This lack of vehicle choice sits alongside the relatively high price of electric vehicles in Australia. Key influences include the shipping costs from distant production facilities, and the fixed costs associated with local market introduction (e.g. ADR compliance/homologation; sales, distribution and service infrastructure) that must be amortised across low sales volumes. The outcome is a negative feedback loop for Australian vehicle sellers and buyers who are exposed to higher investment risks than their international counterparts and respond accordingly.

Internationally, a range of financial and non-financial consumer incentives to boost both supply and demand for EVs have been utilised; including support for EV charging infrastructure, upfront rebates or tax credits, discounted tolls and parking fares, as well as preferential parking spaces, access to restricted highway lanes, and expedited permitting and installation of charging units.

A number of international electric vehicle support policies deliver significant direct incentives for consumers, or significant indirect incentives through fuel economy standards³³. Countries that have a leading market share of electric vehicle sales have introduced upfront financial incentives; in the form of tax breaks, stamp duty discounts and direct subsidies to assist consumers in overcoming the higher purchase price³⁴.

Direct vehicle subsidies to the equivalent to US\$12,000 per vehicle for battery electric and plug-in hybrid electric vehicles are offered in China. The Netherlands currently offers the highest

³³ Energeia (2016)

³⁴ Energeia (2016)

level of electric vehicle incentive through stamp duty exemptions, and Norway grants a full exemption to the 25% Value Added Tax (VAT) for the purchase of battery electric vehicles. While these incentives have allowed electric vehicles purchased in the Netherlands and Norway to achieve or exceed purchase price parity with equivalent ICE vehicles³⁵, it has been reported that there some of these incentives may be wound back³⁶.

While there is recognition that incentives are a temporary solution, in the short term they are aiding electric vehicle market development and are a ‘best practice’ strategy in supporting global vehicle electrification efforts. In considering best practice incentives, there is a need to contextualise potential incentives to ensure the best fit to meet the needs of a given country or city³⁷.

Table 2: Summary of government electric vehicle promotion actions in selected areas

Area	Action	China	France	Germany	Japan	Netherlands	Norway	United Kingdom	United States (excl. California)	California
Global market share	Vehicle sales in 2014 (million vehicles)	22	2.2	3.3	4	0.5	0.2	2.6	14	1.7
	Vehicle manufacturing in 2014 (million vehicles)	22	1.7	5.7	10	<0.1	<0.1	1.6	11	<0.1
	Percent of 2014 global electric vehicle sales	17%	4%	4%	10%	5%	6%	5%	19%	19%
Vehicle manufacturer	Research and development support	X	X	X	X	X	X	X	X	X
	Long-term efficiency standards	X	X	X	X	X	X	X	X	X
	Incentive provisions within efficiency regulations	X	X	X		X	X	X	X	
	Cumulative sales goal	X	X	X		X	X	X	X	X
	Vehicle deployment requirements									X
	Vehicle production subsidy	X								
Consumer purchase	Vehicle purchase subsidy (tax credit)								X	
	Vehicle purchase subsidy (rebate)	X			X			X		X
	Vehicle purchase tax exemption					X	X		/	
	Vehicle fee-bate scheme		X					X		
	Government fleet vehicle purchasing preferences		X		X			X	X	X
	High fuel price and greater fuel savings		X	X		X	X	X		
Consumer use	Annual vehicle fee exemption			X	X	X	X	/	/	
	Discounted/free electric charging				X	X	X	/	/	X
	Preferential lane (e.g., bus, HOV lane) access			/		X	X		/	X
	Reduced roadway tax or tolls			X	X	X	X	X		
	Preferential parking access		/	/		/	/	/	/	/
Fuel provider, infrastructure	Carbon pricing scheme	X	X	X	X	X	X	X	/	X
	Low carbon fuel incentive for electricity providers							/		X
	Public charging network funding	X	X	X	X	X	X	X	X	X
	Home charging equipment tax incentives		X						/	/
Consumer awareness	Public outreach activities to educate on consumer benefits	X	X	X	X	X	X	X	X	X

based on IEA, 2015a; Jin et al., 2014; Mock & Yang, 2014; NRC, 2015; OECD, 2015; OICA, 2015a,b; "X" denotes national program; "/" signifies smaller local or regional program

Source: International Council on Clean Transportation (2015)

³⁵ Energeia (2016)

³⁶ The Norwegian Government introduced incentives with the aim of putting 50,000 electric cars on the roads by 2017; however this target was met in April 2015, two years ahead of schedule. Norway now intends to gradually ramp down incentives completely by 2020 (Gordon-Bloomfield (2015)).

³⁷ International Energy Agency (2015)

Australia does not currently have a national electric vehicle policy framework and there is limited overall support and incentives in comparison to our global peers. There has been policy activity at a state and local government level, however overall policy has been limited to modest registration discounts and partial support for public charging³⁸. The table below outlines current electric vehicle policy support measures in Australian states and local governments.

Table 3: Current electric vehicle policy support measures in Australian states and local governments

Policy Type	QLD	NSW	SA	VIC	ACT	WA	Score
Direct Vehicle Incentive	✖	✖	✖	✖	✖	✖	0
Charging Infrastructure Support	✓	✓	✓	✖	✖	✖	3
Registration Incentives	✓	✓	✖	✓	✓	✖	4
Stamp Duty Discounts	✓	✖	✖	✖	✓	✖	2
Government Fleet Incentives	✖	✖	✖	✖	✖	✖	0
Vehicle Lane Privileges	✖	✖	✖	✖	✖	✖	0
Toll Lane Exemption	✖	✖	✖	✖	✖	✖	0
Discounted Parking	✓	✖	✓	✓	✖	✓	2
Free Charging	✓	✓	✓	✓	✖	✓	5
Score	5	3	3	3	2	2	-

Source: Energeia (2016)

Despite the advances that vehicle electrification has made in recent years, there are still significant barriers that stand in the way of widespread adoption; technological, financial, market, and policy challenges could hinder market transformation if not addressed through further RD&D investments, public-private collaboration, and innovative policy and business solutions³⁹.

Economic viability remains the most serious barrier and source of uncertainty in projections. The difficulty for forecasting uptake lies in the chicken and egg paradox; electric vehicles will be cost competitive when scale in manufacturing is reached, however large scale consumer uptake will only occur when electric vehicles are cost competitive⁴⁰. Incentives have been used to overcome this chicken and egg problem, and has worked to achieve an increase in global electric vehicle production by 50 percent to 300,000 per annum in 2014⁴¹.

³⁸ Energeia (2016)

³⁹ International Energy Agency (2015)

⁴⁰ Energy Network Association and CSIRO (2015)

⁴¹ Energy Network Association and CSIRO (2015)

Table 4: Electric vehicle adoption barriers and policy actions

Potential barrier	Potential actions to help overcome barrier	Examples of regions with action
Vehicle ownership cost	Provide fiscal incentives to defray incremental upfront cost	France, Norway, Netherlands, U.K., U.S.
	Extend electric vehicle fiscal incentives to 2020 or later	California, China
	Offer non-fiscal incentives (e.g., preferential road, parking, lane access) to provide effective monetary benefits to vehicle users	California, China, Norway
Vehicle range	Deploy extensive plug-in vehicle charging network , including strategic coverage for early adoption communities and high-traffic corridors	Japan, Norway, U.K.
	Deploy extensive hydrogen refuelling network , including strategic coverage for early adoption communities and high-traffic corridors	California, Germany, Japan, Netherlands, U.K.
	Encourage and create incentives for workplace charging infrastructure	U.S.
	Placement of vehicles in car-sharing fleets	France, Germany
	Introduce minimum range requirements to shift public fiscal and non-fiscal incentives to greater incentivize longer-range electric vehicles	
Vehicle recharge time	Provide charging infrastructure incentives for private deployment of more and faster at-home, workplace, public charging stations	
	Deploy extensive public quick charging network	Japan, Norway
Consumer knowledge and awareness	Provide information regarding state, local, and utility incentives widely, at dealerships, on websites, through advertising in broad awareness campaign	California, U.K.
	Provide cost evaluation tools and information to prospective electric vehicle consumers on vehicle ownership fuel-saving benefits (websites, consumer labels)	
	Conduct public events (e.g., ride-and-drive with public officials) to increase awareness and encourage first electric vehicle experiences	
	Place electric vehicles in government, company, and car-sharing fleets	China, Québec

Source: International Council on Clean Transportation (2015)

With the consideration of issues associated with the implementation of CO₂ emission standards and more stringent standards for noxious air pollutant emissions, an opportunity exists to establish best practice policies to support uptake of electric vehicles to reduce oil consumption, climate-related emissions, local air pollution and to take a leadership position in new advanced technology⁴².

⁴² International Council on Clean Transportation (2015)

Part Two:

Response to issues raised in the Discussion Paper

Treatment of EVs under CO₂ emission standards

Australia is one of the few remaining developed countries without light vehicle CO₂ emission standards in place, with standards covering over 80 per cent of the global automotive market⁴³ including many developing nations such as China, Brazil, India and Mexico. This has meant that in comparison to our global peers, Australia has scored poorly in the energy efficiency of its land transport sector. The recent American Council for an Energy-Efficient Economy (ACEEE) International Scorecard ranked Australia last out of 16 major OECD countries for the energy efficiency of our transport sector⁴⁴.

Whilst fuel efficiency standards vary in their ambition and design by country, in general they set average CO₂ emission levels which a manufacturer must meet across its annual fleet of new vehicle sales. Emissions are calculated using a range of vehicle test cycles, and policy design may include exemptions for manufacturers who sell small volumes or credits for certain very low emissions vehicle technologies, such as electric vehicles.

When considering the structure of best practice standards from our global peers, the EU and United States standards present opportunities for learning.

In the EU, legislation sets mandatory emission reduction targets for new vehicles with the tightening of targets every five years. Emission limits are set according to the mass of vehicle, using a limit value curve which allows heavier vehicles to have higher emissions than lighter cars. Only the fleet average is regulated, so manufacturers are still able to make vehicles with emissions above the curve provided these are balanced by vehicles below the curve⁴⁵. If the average CO₂ emissions of a manufacturer's fleet exceeds the limit value in any year from 2012, the manufacturer is required to pay an excess emissions premium for each additional vehicle registered.

The structure of the legislation also allows additional incentives, known as 'super credits', for manufacturers to produce vehicles with extremely low emissions, below 50 gCO₂/km. Low emission vehicles are counted as 3.5 vehicles in 2012 and 2013, 2.5 in 2014, 1.5 in 2015 and 1 vehicle from 2016 to 2019⁴⁶. Super-credits will also apply in the second stage of emission reductions, from 2020 to 2023. During this stage, each low-emitting vehicle will be counted as 2 vehicles in 2020, 1.67 in 2021, 1.33 in 2022 and 1 vehicle from 2023.

⁴³ International Council on Clean Transportation (2015)

⁴⁴ American Council for an Energy-Efficient Economy (ACEEE) (2014)

⁴⁵ European Commission (2016)

⁴⁶ European Commission (2016)

Alternatively in the United States, incentives for electric vehicles, plug-in hybrids, fuel cell vehicles and compressed natural gas vehicles have been put in place to facilitate market penetration of the most advanced vehicle technologies as rapidly as possible.

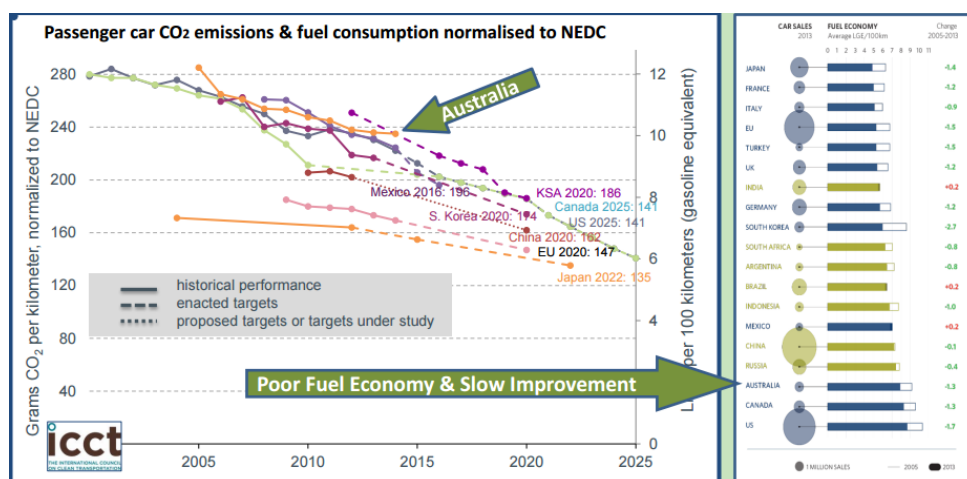
The US Environmental Protection Agency has developed an incentive multiplier for compliance purposes for all vehicles with advanced technologies sold from 2017 through to 2021. This multiplier approach means that for approved vehicles, each one sold would count as more than one vehicle in relation to the manufacturer's compliance calculation. Electric vehicles and fuel cell vehicles will commence with a multiplier value of 2 in 2017, phasing down to a value of 1.5 by 2021⁴⁷. Plug-in hybrids and compressed natural gas vehicles will start at a multiplier value of 1.6 in 2017 which will phase down to a value of 1.3 in 2021. There are no multipliers from 2022 to 2025⁴⁸.

For electric vehicles and plug-in hybrid vehicles, the Environmental Protection Agency is setting a 0 gCO₂/mi as the tailpipe compliance value from 2017 to 2021, with no limit on the quantity of vehicles eligible for 0 gCO₂/mi tailpipe emissions accounting. From 2022 to 2025, 0 gCO₂/mi will only be allowed up to a per-company cumulative sales cap of 600,000 vehicles for companies that sell 300,000 electric vehicles or plug-in hybrid vehicles in 2019 to 2021, or 200,000 vehicles for all other manufacturers. For sales above these thresholds, manufacturers will be required to account for the net upstream GHG emissions for the electric portion of operation⁴⁹.

The Government has the opportunity to introduce best practice standards, which if designed well in collaboration with industry and consumer stakeholders, and supported with suitable complementary measures, present a significant opportunity to reduce emissions from the transport sector whilst providing broader benefits for vehicle owners and the economy.

If Australia were to target the same levels of fuel economy improvement in leading markets, a 50 per cent improvement over 10 years, and as a 'technology taker' with an increasingly large proportion of our fleet sourced from markets with standards already in place, Australia can expect to replicate the rate of improvement in a shorter timeframe than previously seen in markets such as the United States and Europe. Conversely, in the continued absence of CO₂ emission standards, Australia runs the risk of becoming the dumping ground for low-specification models and falling further behind international peers, resulting in relatively higher fuel costs for motorists and businesses.

Figure 6: Global comparison of CO₂ emission and fuel consumption standards



Source: Global Fuel Economy Initiative (2015)

⁴⁷ United States Environmental Protection Agency (2012)

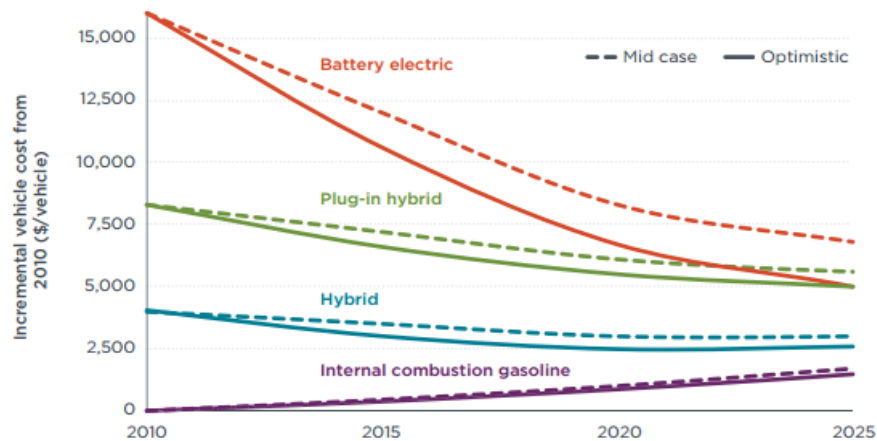
⁴⁸ United States Environmental Protection Agency (2012)

⁴⁹ United States Environmental Protection Agency (2012)

If Australia were able to achieve a 50 per cent improvement on fuel economy for new light vehicles over 10 years equating to 130 gCO₂/km in 2020, and 95 gCO₂/km in 2025, there would be financial benefit to consumers through reduced fuel bills. ClimateWorks' analysis shows that net annual savings of approximately \$350 for average drivers of conventional internal combustion engine vehicles over a five year ownership period could be achieved, and economy wide these fuels savings would total almost \$8 billion per year by 2025⁵⁰.

For electric vehicles however, higher cost savings can be achieved over the life of the vehicle due to increased fuel savings.

Figure 7: Incremental technology cost of electric and conventional vehicles through 2025



Source: International Council on Clean Transportation (2015)

The introduction of standards with supportive measures for low or zero emission vehicles as seen in other markets, would also incentivise manufacturers to introduce new models of electric vehicles into the Australian market, as a means to help meet average fleet emissions targets with the flow on benefit of increasing consumer choice.

Although electric vehicles have zero carbon dioxide tailpipe emissions, there may be carbon dioxide emissions contributed from elsewhere depending on the nature of the source power⁵¹. In South Australia and Western Australia, EVs using grid energy will deliver emissions reductions right now. In Tasmania, which uses predominantly hydro-electricity, EVs may actually be 'zero emissions' driving. Conversely in Victoria, even with expected improvements in grid emissions intensity, EVs may be worse than ICEV equivalents for sometime to come⁵².

In order to demonstrate the impact on emissions of electric vehicles under different emission intensities of the electricity used to charge them, ClimateWorks has prepared the analysis presented in Figure 7. This presents the equivalent CO₂ emissions for a typical EV, the Gen 1 Nissan Leaf, under two different grid emission intensity scenarios. The first scenario is a BAU scenario for Australia's NEM, based on recent analysis undertaken for the 2014 Renewable Energy Target Review⁵³, which factors in current policy settings. The second scenario is based on CSIRO modelling undertaken for the Deep Decarbonisation Pathways Project, which gradually decarbonising the grid to meet Australia's carbon budget outlined by the Climate Change Authority.

⁵⁰ ClimateWorks Australia (2015)

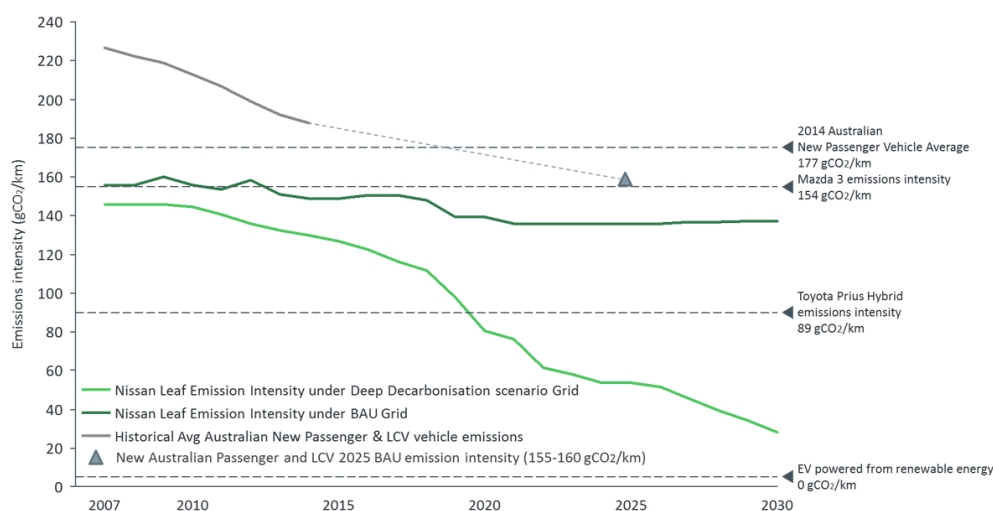
⁵¹ NTC (2015)

⁵² Victorian Government Department of Transport (2012)

⁵³ Climate Change Authority (2014a)

What this shows is that based on current NEM average emission intensity, a Nissan Leaf has lower emission intensity than the average new car sold in Australia, and also lower than the Mazda 3, Australia's top selling vehicle. It also shows that out to 2025, a Nissan Leaf using NEM average electricity, will perform better than the projected BAU average for a new passenger and light commercial vehicle. This is important in terms of timing given projections for mainstream uptake of EVs post 2020. Under a decarbonisation scenario, a Nissan Leaf will outperform a Toyota Prius Hybrid from 2020, and achieve emission intensity of below 30 gCO₂/km by 2030.

Figure 8: Emissions intensity of electric vehicles based on Australian grid emissions forecasts



Source: ClimateWorks Australia analysis

What this also shows is that when powered by renewable electricity, EVs can achieve 'zero emissions', which is available today. Many options exist to link EVs to renewable energy sources, such as carbon offsets, including certification against the National Carbon Offset Standard, and GreenPower are market-mechanisms that allow EV charging demand to be reconciled against renewable generation sources. Inexpensive software solutions allow EV charging loads to be coordinated in line with renewable energy generation. Business model innovation combined with growing consumer awareness, understanding and acceptance of the technology will allow EVs to be fully utilised through complete integration into the National Electricity Market.

Overseas experience shows that, while mandatory fuel efficiency standards are key to achieving emissions reductions in passenger and light commercial vehicles, these reductions can be enhanced with a range of complementary measures which are detailed in a subsequent section.

Requested measures:

- That for any light vehicle CO₂ standard introduced, manufacturers are incentivised to increase model diversity across market segments.
- That any Regulatory Impact Statement undertaken adequately considers the broader benefits of EVs including health, fuel security, energy productivity, Australia's balance of payments, jobs and broader benefits to the electricity supply chain.

Role of EVs in addressing noxious emissions

Vehicles significantly contribute to levels of hydrocarbons, oxides of nitrogen, carbon monoxide and particulate matter in the air, which can adversely affect acute and chronic health conditions⁵⁴.

In Europe, noxious emission standards vary depending on whether the vehicle uses petrol or diesel, as well as the class of the vehicle. The Euro 5 standard implemented in Europe applied to the sale of all new vehicles from January 2011 until September 2015. From September 2015, all new vehicles sold in Europe must be Euro 6 compliant. The implementation of the Euro 6 standard will reduce NOx emissions by a further 55%⁵⁵, and will limit overall emissions of diesel and petrol vehicles close to parity, provided that vehicles of both fuel types conform to standards in real-world driving conditions⁵⁶.

In the United States, the standards applied which are referred to as the Tier 2 program, are more stringent than Euro 6. The Tier 2 program sets out the standards for tailpipe emissions for all passenger vehicles and stipulates a fleet average NOx close to 40 mg/km for both diesel and petrol engines⁵⁷. The Tier 2 program will be replaced at the beginning of 2017 with the stricter Tier 3 standards.

Australia, like many other countries, has had vehicle standards to reduce air pollutants in place since the early 1970s, and existing vehicle emissions standards are set by Australian Design Rules (ADRs) which are legislative instruments under the Motor Vehicle Standards Act 1989⁵⁸. In 2011, the adoption of stronger emissions standards was announced, with the first stage being the Euro 5 standards being fully implemented in 2016. These standards mirror those adopted by the European Union, but on a staggered timeframe⁵⁹.

With the implementation of the Euro 5 standard in Australia, the amount of particulate matter for diesel vehicles from the previous standards should be reduced by 80% or from 25 mg/km to 5 mg/km, and by 28% for NOx emissions or from 250 mg/km to 180 mg/km⁶⁰. The adoption of Euro 5 standards has forced the use of diesel particulate filters for light-duty diesel vehicles.

A previous Regulatory Impact Statement conducted by the Department of Infrastructure and Transport reviewed the implementation of Euro 5 and 6 light vehicle emission standards. The benefit-cost analysis demonstrated an overall net benefit in adopting the Euro 5/6 emissions standards for the new light vehicle fleet. There are costs associated with shifting from Euro 5 to Euro 6 relating to compliance, however estimating actual costs can be difficult. As a guide, the European Commission estimated an average cost increase of \$980 for a diesel vehicle to comply with Euro 6 standards relative to Euro 4. If these cost were fully passed on to the consumer, this would represent a price increase of around 4.5% for a \$22,000 vehicle and 2.5% for a \$40,000 vehicle⁶¹. In addition, the magnitude of the benefit was also influenced by key assumptions including avoided health costs, the value of a statistical life, the length of the analysis period, the start date for the standards and the discount rate.

⁵⁴ Climate Change Authority (2014)

⁵⁵ AirClim (2012)

⁵⁶ International Council on Clean Transportation (2015)

⁵⁷ United States Environmental Protection Agency (2016)

⁵⁸ Department of Infrastructure and Regional Development (2014)

⁵⁹ Climate Change Authority (2014)

⁶⁰ Mortimore (2015)

⁶¹ Department of Infrastructure and Transport (2011)

In considering the potential costs associated with the purchase of more efficient vehicles, the upfront capital costs and lifetime cost benefits of an electric vehicle could become more attractive. In addition and in considering the purpose of noxious emission standards, electric vehicles provide a zero emission solution. Table 5 below provides a comparison of Euro 5 and Euro 6 emission limits by vehicle fuel source.

Table 5: Comparison of Euro 5 and Euro 6 emission limits by vehicle fuel source

Level	Euro 5			Euro 6		
Emission	Petrol/ LPG	Diesel	Electric	Petrol/ LPG	Diesel	Electric
Oxides of Nitrogen	60	180	0	60	80	0
Particulates	4.5 (for direct injection petrol engines)	4.5	0	4.5 (for direct injection petrol engines)	4.5	0

Source: Department of Infrastructure and Regional Development (2015) and ClimateWorks Australia (2015)

Requested measures:

That any Regulatory Impact Statement undertaken for Euro 5/6 considers the potential benefits EVs can provide to reduce noxious emissions, and consequent reductions in externalities.

Complementary measures to support uptake of electric vehicles

Based on the results of various government actions promoting electric vehicles and recent research on effective policies, some basic principles are emerging regarding electric vehicle policy. Complementary measures and electric vehicle policies are ideally targeted at helping overcome known potential barriers to prospective electric vehicle users; including incremental vehicle cost, vehicle range, lower residual values, vehicle recharge time, and consumer awareness regarding electric vehicle ownership benefits. Many countries are seeking to overcome these barriers and promote electric vehicle technology, mobility, and sales⁶².

This section provides an overview of electric vehicle specific incentives that are currently in place in the international market, consideration for the effectiveness of these incentives and how these could be best applied in the Australian context.

⁶² International Council on Clean Transportation (2015)

Well-designed financial incentives for consumers at the national and local levels are lowering upfront costs for electric vehicles, increasing sales and infrastructure deployment in a number of global markets. These types of incentives are not only of benefit to early adopters, but also give car manufacturers and other consumers confidence in market development.

Non-financial incentives have also benefited increased deployment; priority road and parking use has impacted uptake of electric vehicles, utilities are demonstrating support through off-peak rates and governments are pursuing fleet acquisitions and partnering with the private sector on mobility initiatives. Car sharing has also proved to be a good use of electric vehicles, allowing drivers to access the benefits of electrified transport without the higher upfront cost.

Information and education

Measures to increase demand and to strengthen current understanding of the value proposition of lower emission vehicles and fuels

There are a number of potential government actions that could assist in increasing market demand and in overcoming the barrier of prospective consumers' knowledge of the value proposition of lower emission vehicles and fuels.

Several basic design principles appear important in policy implementation. Consumer interest could be motivated by setting incentives for the purchase of fuel efficient and lower emission vehicles including both financial and nonfinancial mechanisms. Financial incentives could be in the form of annual incentives (including tax rebates, annual registration and stamp duty reductions, parking fee deductions and vehicle emission taxes) or punctual incentives (including differential road tolls and pricing, free parking, higher fuel prices)⁶³.

These policy options can be illustrated through the example of the California Clean Vehicle Rebate Project. This project offers up to \$5,000 for the purchase or lease of a zero emissions plug-in hybrid or light-duty vehicle, and has put over 100,000 clean vehicles on the roads⁶⁴. Non-financial incentives could include benefits such as priority lanes and reserved parking spaces. These types of initiatives have been utilised by both State and Local governments in Australia and internationally with varying degrees of success. Currently 10 U.S. States offer unrestricted access to high-occupancy vehicle (HOV) or carpool lanes for electric vehicle drivers⁶⁵, and the Brisbane City Council and City of Sydney offer reduced parking fees for hybrid vehicles when parking specifically in the council-owned car parks.

Requested measures:

To enhance short term uptake and increase EV model availability, up front purchase incentives, in line with those seen in leading markets, should be provided across the Australian market.

⁶³ ClimateWorks Australia (2015)

⁶⁴ Center for Sustainable Energy (2015)

⁶⁵ Lutsey, N. (2015)

Measures to encourage the supply of supporting infrastructure

Another key question being posed in international markets is how fast to install EV charging infrastructure, including basic electrical provisioning in new buildings and refurbishments, commuter charging facilities in workplaces, and publicly-accessible charging facilities of varying charging speeds and capacities. Interviews with government officials in a variety of jurisdictions generally revealed that most believe that the majority of charging (90% or more) will take place at home. Evidence from The EV Project in the United States found that despite installation of extensive public charging infrastructure, the vast majority of charging was done at home and work⁶⁶. Given the relatively higher cost of retrofitting EV charging infrastructure, there should be consideration going forward to ensure that all new multi dwelling buildings, apartments and office buildings have electric vehicle charging planned and built in from construction.

Furthermore, targeted programs aimed at encouraging workplace and home charging would benefit electric vehicle drivers. For example, the UK Office for Low Emissions Vehicles administer a Homecharge Scheme, designed to offset approximately 75% of the capital and installation costs of installing an electric vehicle charging station (up to £700)⁶⁷.

Nonetheless, it has been concluded that widespread public infrastructure is needed to mitigate range anxiety on the part of prospective purchasers. As a result, many jurisdictions have aggressive plans under way to install public infrastructure⁶⁸.

To develop the right infrastructure including charging stations for plug-in vehicles, federal, state and local governments could utilise urban planning powers coupled with grant programs towards businesses to stimulate the installation of infrastructure dedicated to lower emission vehicles. An example of this is the EV Infrastructure Rebate Program in Illinois, which covers 50% of the cost of equipment and installation of EVs charging stations, with a cap based on the type of station; more than \$350,000 was awarded in 2013, funding a total of 130 stations⁶⁹.

There are currently multiple plug standards for both AC and DC charging. Picking a standard for AC, and a standard for DC charging, would streamline infrastructure deployment, reduce costs, avoid legacy and redundant charging stations, and reduce confusion in the market. Car manufacturers currently incorporate different plug standards for different regions, so the implementation of a single standard would not be a commercial burden. A standard should be set before the mass rollout of public EV charging infrastructure, as replacement and retrofitting is expensive.

Requested measures:

- Coordination of national strategy on EV infrastructure deployment:
 - Undertake stocktake of existing and planned EV charging infrastructure deployment
 - Investigate incentives for charging infrastructure deployment
 - Consider future charging requirements in terms of likely fleet mixes
 - Harmonise charging standards before the mass rollout of EV charging infrastructure
 - Ensuring planning and infrastructure development is EV ready

⁶⁶ Idaho National Laboratory (2015)

⁶⁷ Office for Low Emissions Vehicles (2015)

⁶⁸ International Council on Clean Transportation (2015)

⁶⁹ Jin et al. (2014)

- Work with other levels of government to incentivise infrastructure deployment (e.g. stimulate charging infrastructure deployment through reducing parking levy for CBD based parking facilities with EV charging infrastructure or reduced parking rates for commuter parking stations, work to remove legislative barriers to kerbside charging deployment etc.)
- Support local businesses providing innovation in charging infrastructure development and innovative deployment business models
- Ensure that government fleet charging infrastructure is placed in areas, where possible, that can also be accessed by the public.

Awareness raising and fuel consumption labelling

International research suggests that a majority of prospective consumers are not well informed about the existing policy incentives or the potential fuel savings from replacing their conventional vehicles with electric vehicles⁷⁰. Education and awareness activities would ideally involve state and local governments, consumer groups and utilities providing information about relevant purchasing and charging incentives at dealerships, on websites, and through advertising campaigns.

Providing information to prospective electric vehicle consumers on total cost of ownership and vehicle fuel-saving benefits on websites and consumer labels is an important basic step. Consumer groups have indicated that there is often feedback on real-world fuel consumption versus the manufacturer's specifications, which indicates that consumers are relying on the labelling system. The Green Vehicle Guide website has been a useful resource, however with the recent update and removal of the star rating guide the information become less accessible for consumers. Consumer groups have indicated that the presentation of data as the actual g/km or L/100 km is more difficult for the average motorist to understand.

Public events, including ride-and-drive with public officials and increased placement of electric vehicles in government fleets, increase awareness regarding the new technology. Finally, the placement of vehicles in company, rental, and car-sharing fleets can also help to overcome the basic foundational lack of awareness and comfort regarding available electric vehicle models.

There are a number of options available to raise awareness and educate Australian consumers about fuel efficient and lower emission vehicles and their benefits, and resolve misinformation.

1. Simplifying and mainstreaming fuel economy labelling:

Labels covering both new and used vehicles, combining direct disclosure and comparative ratings:

- Type: The current Australian fuel consumption labelling system discloses direct fuel consumption and CO₂ emission values. According to the IEA, a label combining direct disclosure and an eye catching comparative rating is the most useful to vehicle purchasers. This combined fuel economy labelling system has been applied in New Zealand⁷¹. The fuel economy label for new vehicles in New Zealand displays their fuel economy values in litres per 100km alongside a star rating. The labels also displays future financial savings. In addition, the UK provides an easy to read comparative bar graph that gives an immediate indication of where the vehicle's fuel economy fits within the market.

⁷⁰ International Council on Clean Transportation (2015)

⁷¹ International Energy Agency (2012)

- Coverage: Several countries, including New Zealand and the UK, mandate the labelling of fuel economy on new and/or used vehicles. The current Australian labelling system only mandates it for new vehicles.

2. **Setting up information campaigns and tools:**

The former Victorian Fleetwise Program presents a useful model for the structure of an information program. The program engaged with organisations' fleet managers through information seminars to provide guidance on how to improve fleet energy efficiency. The program resulted in a reduction of 149 tonnes CO₂e⁷².

3. **Hosting exposure events and encouraging short term test drives:**

These could potentially be organised by State and Local governments in partnership with motoring clubs, and could include tests drive events, or broader events such as an Australian leg of the Formula E.

Requested measures:

- Support the development of a second-hand market for electric vehicles to ensure that consumers not purchasing a new vehicle have access to this technology
- Support early-stage demonstration and deployment of electric vehicles with both government and business fleet owners
- Support local government, consumer groups and industry initiatives to increase consumer exposure to electric vehicles

Fleet purchasing policy

The importance of fleet sales is difficult to overemphasize. In 2015 46% of Australian new vehicle purchases went to fleets⁷³. For vehicle sellers, fleet sales are often key to achieving corporate sales targets and thereby ensuring that their upstream investments in new product development and manufacture can be recouped. Furthermore, fleets typically turn vehicles over at 3-5 years, and in doing so provide a large proportion of the second-hand vehicle market.

For EVs the role of fleet sales is even more crucial. Fleets provide many would-be buyers with their first experience of EVs, and in doing so greatly improve the likelihood of adoption⁷⁴. Fleet operators generally have a better understanding of the total cost of ownership, duty cycle and are more understanding of issues stemming from the deployment of new technology.

Government fleets are perhaps the most important of all. In recognition of the broader societal benefits and economic rationale behind support for emerging technology, governments around the world are making significant commitments to EV adoption that reduce investment risk for providers and accelerate the market adoption:

⁷² Department of Economic Development, Jobs, Transport and Resources (DEDJTR) (2015)

⁷³ FCAI (2015)

⁷⁴ Wikstrom (2014)

- In July 2014 the UK Government provided funding to all its car fleets to support introduction of over 150 plug-in vehicles for the first wave of deployments⁷⁵;
- In March 2015 U.S. President Barack Obama ordered that zero emission or plug-in hybrid vehicles account for at least 20% of the federal agencies fleet of 655,000 vehicles by 2020⁷⁶;
- In March 2016 Bloomberg reported that China's fourfold surge in EV sales was probably being driven by government purchases, having accounted for almost half of the 185,900 electric vehicle sold in 2015⁷⁷.

Governments in smaller markets such as Sweden⁷⁸ and New Zealand⁷⁹ have been or are considering fleet procurement as a means to aggregate purchase volumes and incentivize EV model introductions to address local supply constraints.

In contrast, there are no reports of any EVs being deployed into the Australian Government's fleet of over 12,000 vehicles. With the demise of local manufacturing, fleet policies have moved away from "Australian-made" such that a fleet of nine BMW 7 Series were deployed in January 2016⁸⁰. Clearly the opportunity is for the Australian Government to start "leading by example" through fleet policies designed to promote adoption of EVs.

Requested measures:

- The Federal government mandate that new fleet purchases include electric vehicles, and set targets for electric vehicle uptake within fleets
- All levels of government work with manufacturers to help aggregate demand for electric vehicles, encouraging lower prices and deployment of new models within the Australian market
- Government fleets (all levels) should be required to develop a plan to reduce fleet emissions (CO₂, NO_x and PM), and produce an annual public report on progress
- A scheme similar to the US DOE's Workplace Charging scheme be developed to provide the tools for fleet managers to assess suitability of electric vehicles for their fleet, benchmark performance, share best practice and promote those fleets actively deploying electric vehicles, raising awareness.

Tax and other policy measures

Luxury Car Tax

At present, luxury car tax (LCT) in Australia imposes a tax on cars with a GST-inclusive value above the LCT threshold. The ATO stipulates this threshold in 2015-16 at \$63,184. There is a higher threshold for fuel efficient cars (those with fuel consumption of 7L / 100km or less), for which electric vehicles are applicable, of \$75,375⁸¹. LCT is then imposed on the amount above the threshold at a rate of 33%, and is paid by those who sell or import luxury cars.

⁷⁵ UK Government (2014)

⁷⁶ Office of the Whitehouse (2015)

⁷⁷ Ma (2016)

⁷⁸ Eltis (2015)

⁷⁹ Smellie (2015)

⁸⁰ Motoring.com (2016)

⁸¹ ATO (2016)

There are a range of electric vehicles within Australia which currently face the LCT. By exempting BEVs from LCT, and creating a further threshold exemption for low emission vehicles (such as PHEVs) it can help drive uptake of these vehicles.

An alternative to this is to replace the LCT with an Emissions Tax for Luxury Vehicles (or equivalent). This would see zero emission vehicles paying no tax, and those with higher fuel consumption receiving higher tax on a sliding scale. This approach would not only encourage consumers to consider EV technology, but also encourage the sale of more efficient vehicles in market by manufacturers.

In Hong Kong, the Government has been actively promoting the wider use of electric vehicles in order to meet air quality, fuel security and emission reduction objectives. Included in their suite of measures is the full waiver of first registration tax (FRT) for EVs since 1994. Through this and other initiatives, the uptake of EVs in Hong Kong has increased from 74 in 2010 to 2,658 in September 2015, with an increase in EV model availability in Hong Kong market also noted⁸².

Requested measures:

Provide full exemption to EVs from the Luxury Car Tax from 2016-17, and add a further threshold exemption for low emissions vehicles (such as PHEVs), or replace the LCT with an Emissions Tax for Luxury Vehicles

Fringe Benefits Tax (FBT)

Given the traditional propensity for Australian employers to offer the private use of an organisationally-owned vehicle to a large number of employees, FBT represents a major fleet-related operational cost for most organisations. In recognition of the disadvantage posed by the most commonly-applied FBT calculation method to “higher capital cost/lower operating cost” vehicles, we propose that an FBT exemption be applied to electric vehicles for the period leading up to their expecting pricing parity with internal combustion engine vehicles around 2020-22.

Under the ATO rules an electric vehicle does not qualify as being exempt for FBT – the employer, or employee, will therefore bear any FBT liability should the vehicle be available for ‘private use’ and must therefore calculate and pay the FBT liability in full based on the vehicle’s ‘Taxable Value’.

An employer calculates the taxable value of a car fringe benefit using either of the following methods:

1. The Statutory Formula Method - regardless of the actual kilometres travelled, the Taxable Value of the car fringe benefits is the statutory rate multiplied by the car's base value:

$$\text{Taxable Value} = \frac{(A \times B \times C)}{D} - E$$

Where:

- A = the base value of the car
- B = the applicable statutory percentage (currently 20%)
- C = the number of days in the FBT year when the car was used or available for private use of employees
- D = the number of days in the FBT year
- E = the employee contribution

⁸² Hong Kong Government (2015)

2. The Operating Cost Method - the Taxable Value of the car fringe benefit is a percentage of the total costs of operating the car during the Fringe Benefits Tax (FBT) year, where the percentage varies with the extent of actual private use:

$$\text{Taxable value} = (A \times B) - C$$

Where:

- A is the total operating costs
- B is the percentage of private use (evidenced via vehicle logbooks)
- C is the employee contribution.

The overwhelming majority of fleet operators use the Statutory Formula Method due to the higher administrative burden of the Operating Cost Method (which requires logbooks). As illustrated by the following example calculations, this approach disadvantages “higher capital cost/lower operating cost” emerging technologies such as electric vehicles.

Scenario One – Statutory Formula on an Internal Combustion Engine Vehicle:

The Statutory Formula Method

A	Base Value of the Car	\$ 22,000.00
B	the applicable statutory percentage	0.2
C	days in the FBT year was used or available for private use of employees	365
D	number of days in the FBT year	365
E	employee contribution	\$ -
Taxable Value		\$ 4,400.00
Operating lease cost		\$ 4,800.00
Vehicle cost to business		\$ 9,200.00

Scenario Two – Statutory Formula on an Electric Vehicle:

The Statutory Formula Method

A	Base Value of the Car	\$ 35,000.00
B	the applicable statutory percentage	0.2
C	days in the FBT year was used or available for private use of employees	365
D	number of days in the FBT year	365
E	employee contribution	\$ -
Taxable Value		\$ 7,000.00
Operating lease cost		\$ 9,600.00
Vehicle cost to business		\$ 16,600.00

The current delta of \$7,400 in the ‘Vehicle cost to business’ is driven by a combination of the higher ‘Base Value of the Car’ for the electric vehicles (and the commensurate impact this has on the FBT Taxable Value) and the higher ‘Operating lease cost’ on the electric vehicle – which, in turn, is primarily the result of lower Residual Value expectations on the electric vehicles when compared against a standard internal-combustion engine vehicle.

The third scenario illustrates an FBT exemption for the electric vehicles under the current Statutory Formula method, using the same ‘Base Value of the Car’ and ‘Operating lease cost’ assumptions above.

Scenario Three – FBT-exempt status on current Electric Vehicles:

The Statutory Formula Method

A	Base Value of the Car	\$ 35,000.00
B	the applicable statutory percentage	0.2
C	days in the FBT year was used or available for private use of employees	365
D	number of days in the FBT year	365
E	employee contribution	\$ -
Taxable Value		\$ -
Operating lease cost		\$ 9,600.00
Vehicle cost to business		\$ 9,600.00

When compared with the 'Vehicle cost to business' in Scenario One above, the 'Vehicle cost to business' in Scenario Three is now approaching parity – this is a direct result of the FBT exemption on the electric vehicles. The resulting expectation is that with the removal of the financial impost posed on the electric vehicle by FBT, entities in the Public and Private sector are now more likely to consider the use of such vehicles in their fleets.

Scenario Four will now assume the Australian automobile market in 2020-22 where, as a result of the impact of the FBT-exempt status for electric vehicles, vehicle manufacturers have increased the range of electric vehicles available in our market. As a result of this model promulgation, the average capital cost for an electric vehicles is also assumed to have decreased.

Scenario Four – FBT-exempt status on current Electric Vehicles in 2020-22:

The Statutory Formula Method

A	Base Value of the Car	\$ 28,000.00
B	the applicable statutory percentage	0.2
C	days in the FBT year was used or available for private use of employees	365
D	number of days in the FBT year	365
E	employee contribution	\$ -
Taxable Value		\$ -
Operating lease cost		\$ 8,400.00
Vehicle cost to business		\$ 8,400.00

The 'Vehicle cost to business' under Scenario Four, when compared to Scenario One above, now demonstrates a more cost effective solution for the end user in using the electric vehicle when compared to against the standard internal-combustion engine vehicle.

Additional arguments in favour of the FBT exemption include:

- The marginal contribution of electric vehicle to current FBT revenue streams – given their extremely low level of sales, an exemption will have negligible impact on the tax revenue
- FBT is a tax liability that currently impacts both the private and fleet buyer, such that an FBT exemption for electric vehicles would be broad-based and not just a tax break for business
- The existing FBT exemption framework that provides a streamlined pathway for introduction and operation, including for removal as electric vehicles approach conventional internal combustion engine vehicles pricing parity
- The clear and positive message this move would send to vehicle OEMs who may not be considering the Australian market as a viable proposition for future electric vehicle product lines

- The positive long-term impact the move would have on the second-hand market values of current electric vehicles already operating in the Australian market
- The positive message this would send to Leasing and Fleet Managements companies who currently set extremely conservative (and therefore uncompetitive and unrealistic) residual values on existing electric vehicles in the Australian market

An additional FBT-related issue/opportunity is also set out in the section on “Novated Leasing” below.

Novated Leasing

In response to the operational cost impacts from FBT obligations on organisationally-owned vehicles, a number of organisations now offer novated leases to their employees. From an employer’s point of view, a novated lease has the benefit of shifting the FBT liability of the vehicle directly to the employee.

Under a novated leasing arrangement, an employee leases a vehicle from a financier using a standard finance lease agreement. The employee, the employer and the financier then enter into a novated lease, which transfers the following to the employer for the term of the lease:

- the employee's obligation to pay the lease payments
- the right to use the vehicle
- other obligations under the finance lease.

A car fringe benefit arises where the employer is the lessee of a car that is provided for the private use of an employee or associate of the employee. Cars under a full novated lease are subject to the same car fringe benefit valuation rules as other vehicles leased by the employer/business (refer to the section on “Fringe Benefits Tax” above).

An employer in the novated lease is entitled to a deduction for lease expenses where the vehicle is used in the business or provided to an employee as part of a salary packaging arrangement. These expenses would nominally include charging energy if this formed part of the operational costs of the vehicle, however the entitlement depends on the employer being able to evidence how they incurred the expense.

As an illustration of how this inhibits electric vehicle adoption, a typical operating arrangement for a novated lease electric vehicle would see the vehicle charging overnight at the employee’s home. Assuming the electricity bill at the residence is in the name of the employee, the employer would nominally be unable to claim a deduction for the charging energy as part of the vehicle operating costs. Even if the charging energy was able to be separated out from the rest of the household load and rebilled to the employer, this pathway represents a far greater administrative overhead than for novated lease internal combustion engine vehicles.

For this reason it is proposed that the FBT exemption requested above be extended to novated leasing arrangements. Importantly, the novated leasing FBT exemption should persist beyond the sunset period for business fleet vehicles in recognition of the obstacles to reasonable claims on electric vehicle charging operational costs by employers.

Requested measures:

- Create a Fringe Benefits Tax (FBT) exemption for electric vehicles to account for their higher capital costs in the period through to their expected pricing parity with internal combustion engine vehicles in 2020-22
- Ensure that the FBT exemption extends to novated leasing arrangements, and extend this exemption beyond the sunset period for the business fleet vehicle exemption

Other Measures

The EV market is often described as an ‘ecosystem’, reflecting the diverse range of participants that interact across it; including vehicle suppliers, charging infrastructure providers, electricity market participants, fleet operators and private users. As each of these participants evolves in their understanding of the technology, there must be a negotiation across issues characterised by uncertainty and risk. Due to the recent evolution of the market, there is an understandable absence of forums in which issues and opportunities can be tabled and addressed.

As a result, there is limited overarching coordination of electric vehicle deployment within Australia. Establishing an overarching roadmap to assist in driving uptake of electric vehicles to help meet Australia’s emission reduction, energy productivity and energy security targets can help ensure strategic deployment of electric vehicles to provide maximum benefits to consumers, by facilitating improved market coordination.

An example of this has been demonstrated in Scotland, where the Scottish Government developed *Switched on Scotland: A Roadmap to Widespread adoption of Plug-in Vehicles*, to assist in meeting their commitments to “almost complete decarbonisation of the road transport sector by 2050”⁸³. This roadmap developed a shared vision for the EV ecosystem and objectives within Scotland, and set future priorities and actions to drive uptake and to advance wholesale adoption of electric vehicles. Outcomes have also included increased awareness of EV technology and benefits, vastly improved coordination across the market that de-risks investment for all participants, and a portfolio of initiatives conceived and deployed in line with the Roadmap.

A different but still successful example of an EV market collaboration model exists in the California Plug-in Electric Vehicle Collaborative. A public/private organisation focused on accelerating the adoption of EVs to meet California’s economic, energy and environmental goals, the PEV Collaborative “convenes, collaborates and communicates on emerging PEV market trends and works to address challenges and enable strong PEV market growth”⁸⁴. The PEV Collaborative was established after the development of a Strategic Plan in 2010. The plan lays out the vision, based on achieving six goals for PEV market success by 2020. As of October 2015, the PEV Collaborative had 45 members and “has resulted in many successful - and at times unexpected - cooperative relationships resulting in positive actions that have moved the needle on PEV adoption”⁸⁵.

Requested measures:

Federal Government support for the development of a National EV Roadmap to:

- Establish a national electric vehicle uptake target
- Identify key priorities and actions required to drive uptake
- Facilitate consultation and engagement across industry, consumer and government stakeholders

⁸³ Transport Scotland (2013)

⁸⁴ California Plug-In Electric Vehicle Collaborative (2016)

⁸⁵ California Plug-In Electric Vehicle Collaborative (2015)

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