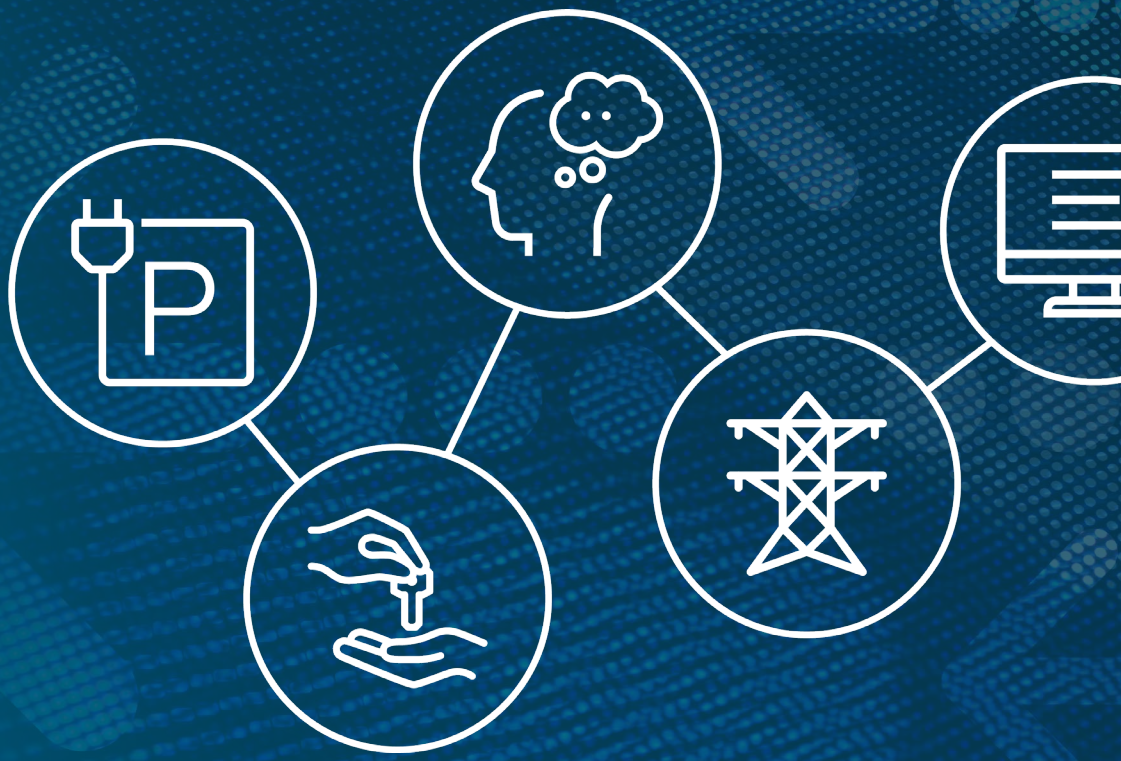
Australian Government
Department of Industry, Science, Energy and Resources

FUTURE FUELS AND VEHICLES STRATEGY

Powering choice

November 2021

Contents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Message from the Minister

Motor vehicles hold a special place in the heart of Australians – from a farmer's trusty ute and the cherished family sedan, to the large road trains travelling thousands of kilometres to make essential deliveries across Australia. The cars, SUVs, vans and trucks on our roads – and the fuels that power them – keep Australians connected and our economy running.

Road transport vehicles are currently undergoing a step change in technology. These low and zero emission vehicle technologies, over time, will reshape the way we drive.

Our Future Fuels and Vehicles Strategy sets out our vision to accelerate the uptake of these technologies. It will create the environment that enables consumer choice, stimulates industry growth, creates Australian jobs and reduces emissions in the transport sector. This is underpinned by the $2.1 billion the Australian Government has committed for new vehicle technologies and related charging, manufacturing and recycling projects.

We will implement this strategy based on 3 principles, which also supports our plan to deliver net zero by 2050:

1. Partnering with the private sector to support uptake and stimulate co-investment in future fuel technologies.
2. Focusing on reducing barriers to the rollout of future fuel technologies, not taxes.
3. Expanding consumer choice by enabling informed choices and minimising costs of integration into the grid.

Partnering with industry will be key to increase uptake of hybrid, hydrogen, electric and bio-fuelled vehicles. The government will focus on supporting consumer choice by getting the enabling environment ready for motorists. This includes backing even more infrastructure and ensuring our electricity grid is ready for increased uptake. Industry will do what it does best by continuing to innovate and improve to lower costs, which will make new technologies cost-competitive with existing alternatives.

Like we saw with our world-leading rooftop solar uptake, we know that when new technologies reach price parity, Australians rapidly adopt them.

Australians are already making this choice as prices continue to fall. For example, the Electric Vehicle Council has reported 8,688 battery electric vehicle and plug-in hybrid sales in the first six months of 2021, which is 26% higher than the whole of 2020.

By expanding the already successful Future Fuels Fund to $250 million, we will be able to support an even bigger rollout of enabling infrastructure in urban and regional Australia. This will add to the over 400 charging stations the government has already backed through the fund. The fund will include more support for business fleets and new technologies for long-distance and heavy duty vehicles. We will also co-invest with households to utilise smart chargers that will boost the reliability of local electricity networks.

We will bring forward priority market reforms to energy ministers that will ensure our grid is EV-ready. We must take action on this to avoid millions of dollars of network costs being passed on to consumers, keeping the lights on and bills low for all Australians. This strategy will ensure we get ahead of the curve.

The government's partnership with industry will stimulate almost half a billion dollars of public and private sector investment. Our strategy is the next example of our Long Term Emissions Reduction Plan in action. It reinforces our approach to reduce emissions the Australian way through technology, not taxes, while continuing to drive our economy forward.

The Hon Angus Taylor MP
Minister for Industry, Energy and Emissions Reduction

Glossary

Battery electric vehicle (BEV): An electric vehicle that exclusively uses chemical energy stored in rechargeable battery packs to power at least one electric motor with no secondary source of propulsion.

Biofuels: Biofuels are a class of renewable energy derived from living materials. The most common transport biofuels are ethanol, biodiesel and renewable diesel.

Charging: The process of restoring electrical energy in a battery or a battery-operated vehicle by connecting it to a power supply.

Charging blackspot: An area that does not have convenient access to public charging stations.

Conventional internal combustion engine (ICE) vehicle: A vehicle with only an internal combustion engine system.

Fleet vehicle: A vehicle owned or leased by a business.

Green Vehicle Guide: The Australian Government website that provides information about the environmental performance of new light vehicles sold in Australia.

Heavy duty vehicle: A vehicle of over 4.5 tonnes gross vehicle mass.

Hybrid vehicle: A hybrid vehicle combines a conventional internal combustion engine system with a battery electric propulsion system (hybrid vehicle drivetrain). The batteries in a hybrid vehicle are recharged by its on-board engine and generator only.

Hydrogen fuel cell electric vehicle (FCEV): An electric vehicle that uses electricity from a fuel cell powered by compressed hydrogen, rather than electricity from batteries.

Light commercial vehicle: Motor vehicles constructed to carry goods or specialised equipment that are less than or equal to 3.5 tonnes gross vehicle mass, such as utility vehicles, panel vans, cab chassis vehicles and goods vans.

Light vehicle: A vehicle of up to 3.5 tonnes gross vehicle mass.

Low emission vehicles: For the purposes of the strategy, the term 'low emission vehicles' includes battery electric vehicles, plug-in hybrid electric vehicles and hydrogen fuel cell electric vehicles.

Plug-in hybrid electric vehicle (PHEV): A hybrid electric vehicle whose battery can be recharged by plugging it into an external source of electric power, as well as by its onboard engine and generator.

Public charging: Electric vehicle charging at facilities that are available to the general public, as opposed to private charging facilities with limited access.

Vehicle-to-grid: The concept of discharging an electric vehicle's battery in order to serve a secondary, supportive purpose for the management of the electricity grid.

Zero emission vehicles: Vehicles that are able to operate with zero tailpipe emissions. Lifecycle emissions depend on the emissions intensity of the electricity or fuel supplied to the vehicle.

Executive summary

The Future Fuels and Vehicles Strategy sets out how the Australian Government will support a technology-led approach to reducing emissions in the transport sector.

Global demand is driving the world's largest vehicle manufacturers to develop new low emission vehicle technologies for a rapidly evolving market. Sales of low emission vehicles continue to increase in Australia as new models come to market. Since the release of the discussion paper in February 2021, there has already been a 20% increase in the number of battery electric, plug-in hybrid and hybrid vehicles available in Australia (see Appendix A). By 2030, battery electric and plug-in hybrid electric vehicles are projected to make up 30% of new light vehicle sales (Commonwealth of Australia 2021a).

The Australian Government has now made available $2.1 billion for low emission vehicle and future fuel technologies. The government will continue to partner with industry to invest in enabling battery charging and hydrogen refuelling infrastructure for road transport to give Australian consumers and business confidence to purchase low emission vehicles that work for them.

Australian industry can draw on our natural resources and skilled workforce to capture the benefits and opportunities of this rapidly evolving market. Capturing opportunities in electric vehicle and battery storage supply chains could create tens of thousands of jobs in Australia by 2030 (Future Battery Industries CRC 2021).

This significant government investment is already sending a strong signal to the market that Australia is ready to adopt more low emission vehicle technologies. Recent significant private sector announcements, such as BlackRock's investment in Australian electric vehicle charging network JOLT, demonstrate we are getting it right through our technology-led approach (Changarathil 2021).

Outcomes are also being seen in the market, with Australians already being confident to make the choice to switch to new technologies. The growth of electric vehicle sales in Australia is on the rise, with sales in the first 6 months of 2021 being 26% higher than in the whole of 2020. Battery electric and plug-in hybrid vehicles hit a record 8,688 sales in the first half of 2021, representing 1.57% of the total light vehicle market (Electric Vehicle Council 2021). Registrations of electric vehicles surged, almost doubling to 23,000 registrations from 2020 to 2021 (ABS 2021). Hybrid sales almost doubled in 2020, increasing from 31,191 vehicles in 2019 to 60,417 vehicles (FCAI 2020).

Automotive industry innovations mean global manufacturers are well placed to improve the cost of new technology so it is competitive with existing alternatives. As battery electric vehicles reach price parity, estimated to be around the middle of this decade for light vehicles (McKinsey 2019), it will become even easier for consumers to choose these new technologies.

The government is taking targeted action to support commercial investment and consumer uptake of low emission vehicles and future fuels. This approach is consistent with the role of government set out in Australia's Long-Term Emissions Reduction Plan and the Low Emissions Technology Statement 2021. Together with this Future Fuels and Vehicles Strategy, the government is prioritising enabling infrastructure and grid readiness, allowing industry to focus on technological improvements to reach price parity. This infrastructure rollout will also increase consumer confidence.

The government will leverage more private sector investment by focusing on 4 streams of key infrastructure and technology investment with an expanded $250 million Future Fuels Fund:

- public electric vehicle charging and hydrogen refuelling infrastructure
- heavy and long distance vehicle fleets
- light vehicle commercial fleets
- household smart charging.

Further investment in battery charging and hydrogen refuelling infrastructure will also be encouraged through the development of a new Emissions Reduction Fund method.

The Australian Government will champion and bring forward a package of priority market reforms to state and territory energy ministers to ensure the electricity grid is EV-ready. This list of reforms will grow as new issues emerge and will initially include the following priorities:

- exploring network tariff reform to identify additional opportunities to encourage charging behaviour and infrastructure rollout that will support optimal grid operation
- incentivising the use of smart chargers in households
- tasking the energy market bodies to partner with governments on grid integration matters.

By working with the states, territories and industry on these reforms, the government will integrate these new technologies into our energy networks in a way that benefits all consumers.

The government will also ensure consumers can access reliable, easy-to-understand information on low emission vehicles, helping consumers make informed choices about the vehicle that is right for them. The expansion of the government's Green Vehicle Guide will include comprehensive information about new light vehicle technology available in Australia.

Through the government's approach, it is estimated that:

- emissions will be reduced by over 8 Mt CO2-e by 2035
- charging infrastructure will be deployed in over 400 businesses, 50,000 households and over 1,000 new public access fast charging stations
- convenient access to public fast charging will be enabled for up to 84% of the population (over 21 million people)
- over 2,600 new jobs will be created
- health costs of around $200 million will be avoided out to 2035
- electricity network upgrades costs of $224 million will be avoided by 2030
- create the environment for there to be 1.7 million electric vehicles on the road by 2030.

What we heard from our consultation

In February 2021, the Australian Government released the discussion paper. The paper sought views on the government's proposed approach to support the uptake of low emission vehicle technologies, promote private sector deployment of enabling battery charging and hydrogen refuelling infrastructure and enable consumer choice.

The feedback we received has informed this strategy, which builds on existing government investment and the actions of Australians already choosing low emission vehicle technologies.

The feedback indicated broad support for the government's approach. It also highlighted the need for more investment in infrastructure to meet the needs of Australians and ensure the impacts on the electricity grid are planned and well managed.

> *"Further investment in infrastructure will provide overseas automobile manufacturers' confidence that there will be a growing market for their vehicles in Australia."* **– Evie Networks**

Feedback highlighted the high upfront costs of low and zero emission vehicles and the need to address regulatory and market barriers to increase their uptake.

Some feedback called for the government to provide subsidies or tax concessions to reduce the current price gap between conventional and low emission vehicles. However, reducing the total cost of ownership through subsidies would not represent value for the taxpayer, particularly as industry is rapidly working through technological developments to make battery electric vehicles cheaper. The Australian Taxation Office will investigate issuing updated guidance for businesses on the tax treatment of low emission vehicles to provide clarity for fleet purchasing.

A larger range of competitively priced low emission vehicles is expected to become available in the Australian market (see Appendix A). Battery electric and plug-in hybrid electric vehicles are projected to make up 30% of annual new passenger and light commercial vehicle sales in Australia by 2030. This translates to over 1.7 million battery electric and plug-in hybrid vehicles on Australian roads by 2030 (Commonwealth of Australia 2021a). By enabling this increased uptake, the expanded Future Fuels Fund is expected to reduce emissions by 8 Mt of CO_2 equivalent by 2035.

Technology-led plan

Long Term Emissions Reduction Plan

The Future Fuels and Vehicles Strategy forms part of the government's Long Term Emissions Reduction Plan (the plan) to act in a practical, responsible way to deliver net zero emissions by 2050 while preserving Australian jobs and generating new opportunities for industries and regional Australia.

The plan is guided by 5 principles that will ensure Australia's shift to a net zero economy will not put industries, regions or jobs at risk. The Future Fuels and Vehicles Strategy is an example of those 5 principles in action:

1. **Technology, not taxes**
   - The strategy focuses on providing choice in technology and creating the right enabling environment through infrastructure and regulatory reform, not forcing people out of the car they want to buy through bans or taxation.
2. **Expand choices, not mandates**
   - The strategy empowers consumers and businesses to buy a future fuel technology when it is right for them. By implementing important infrastructure co-funding through the $250 million Future Fuels Fund and ensuring the grid is EV-ready, we will support Australians to make informed choices.
3. **Drive down the cost of a range of new technologies**
   - In our partnership with industry, the government will work with the private sector to drive costs down for hybrid, electric, hydrogen and bio-fuelled vehicles. Industry is best placed to accelerate the technology development needed to reach price parity, but the government will continue to co-fund innovative R&D (for example, for new technologies like hydrogen) and rollout the necessary supporting infrastructure.
4. **Keep energy prices down with affordable and reliable power**
   - Our world leading investment in solar PV and work on integrating renewables means we are well placed to ensure the grid is EV-ready through market reform. We will apply the lessons learnt from the rapid uptake of rooftop solar, which will save consumers an estimated $224 million in avoided network costs. Our reforms will make sure the lights stay on, bills remain affordable and everyone can reap the benefits of electric vehicles.
5. **Be accountable for progress**
   - We will be accountable to consumers by ensuring they have the information needed to make informed choices. For example, consumers will have access to more information through updates to the Green Vehicle Guide and the new heavy freight information hub.
   - Transport emissions will continue to be fully accounted for in Australia's ongoing emissions reporting.

Technology Investment Roadmap

The Technology Investment Roadmap is the cornerstone of Australia's Long-Term Emissions Reduction Plan. Under the roadmap, the Low Emissions Technology Statement 2021 recognises the beneficial impact low and zero emission vehicles can have by prioritising electric vehicle charging and hydrogen refuelling as enabling infrastructure.

The Future Fuels Fund and other complementary initiatives will invest in enabling battery charging and hydrogen refuelling infrastructure. The government's investment will contribute to the plan by enabling the deployment at scale of electric vehicles and other emerging transport technologies. This will support consumer choice while reducing emissions, improving health outcomes and increasing fuel security.

The Future Fuels and Vehicles Strategy complements other technology-led government policies, including the:

- Technology Investment Roadmap
- Modern Manufacturing Strategy
- National Hydrogen Strategy
- forthcoming Bioenergy Roadmap
- ongoing work through both the Energy Ministers Meeting and Transport and Infrastructure Ministers Meeting.

Together, these strategies, along with work being progressed by states and territories, will enable Australia to scale up quickly and deliver the strongest economic and emissions reduction outcomes.

Battery prices are falling

Battery costs are the main contributor to the price premium for battery electric vehicles. Integral to electric vehicles reaching price parity with conventional vehicles is a reduction in the cost of manufacturing lithium-ion batteries, as a result of industry innovation.

Figure 1 shows how the price for lithium-ion batteries has dropped by over 89% since 2010 and is expected to fall to half of the current price by 2030 (BNEF 2021a).

As the price of battery electric vehicles reaches parity with some conventional vehicles in this decade, Figure 2 shows how global demand for electric vehicles is expected to drive growth in lithium-ion battery production (BNEF 2021a). The IEA (2021) notes that announced planned production capacity for lithium-ion batteries in vehicles equates to roughly 3,200 GWh by 2030, which will be sufficient to meet this expected demand. It will be important to continue to monitor global supply chains to ensure there are no constraints, especially in the case of high growth demand scenarios, as tightening of supply could impact on model availability and costs across the globe (BNEF 2021b).

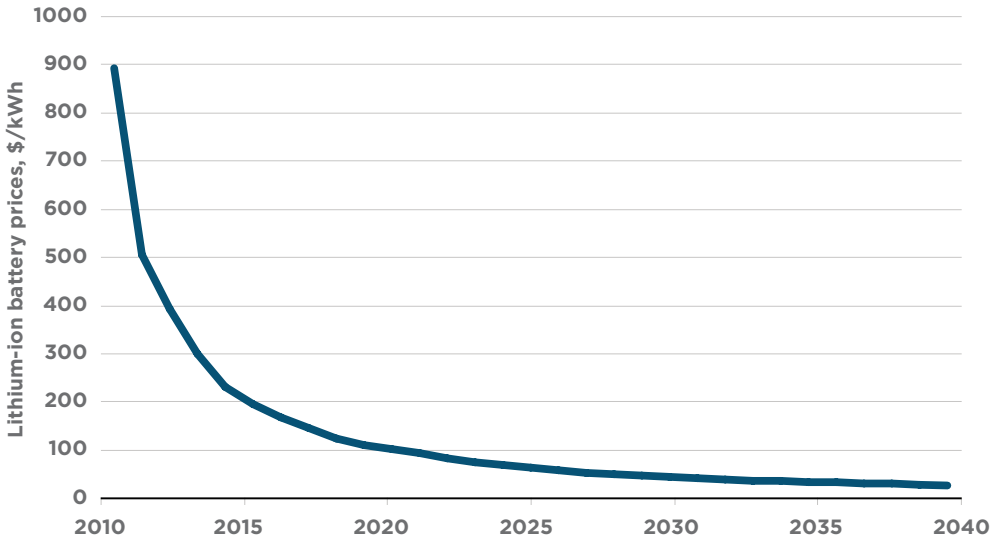


Figure 1: Global average lithium-ion battery cost[1]

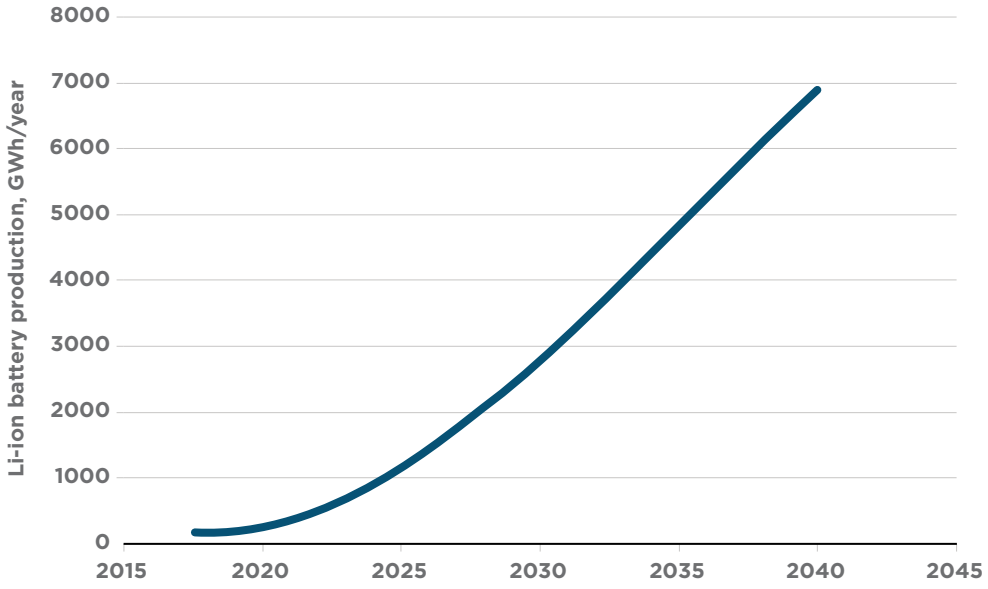


Figure 2: Annual lithium-ion battery production based on forecast demand[2]

1 Derived from BNEF data to 2035 (BNEF 2021a, chart 259)

2 Derived from BNEF data to 2035 (BNEF 2021a, chart 258)

Strategy at a glance

Future Fuels and Vehicles Strategy

OUR VISION

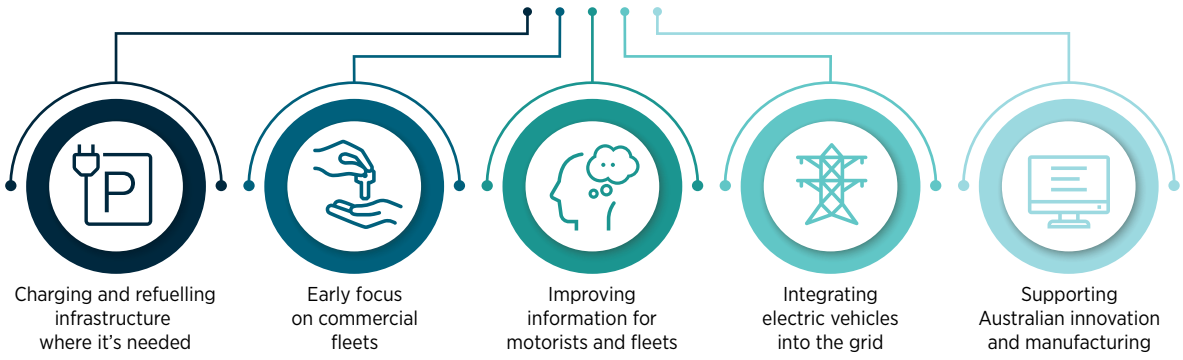
To create the environment that enables consumer choice, stimulates industry development and reduces emissions.

We are guided by three principles:

1. Partnering with the private sector to support uptake and stimulate co-investment in future fuel technologies
2. Focusing on reducing barriers to the roll-out of future fuel technologies, not taxes
3. Expanding consumer choice by enabling informed choices and minimising costs of integration into the grid

Focusing on five priority initiatives

In partnership with the private sector to address barriers and provide confidence to consumers to choose the vehicle that is right for them



Charging and refuelling infrastructure where it's needed	Early focus on commercial fleets	Improving information for motorists and fleets	Integrating electric vehicles into the grid	Supporting Australian innovation and manufacturing
Provide convenient access to fast charging and refuelling options in partnership with industry, including through the $250 million Future Fuels Fund	Unlock opportunities for business and commercial fleets to invest in low emission vehicle technologies, improve productivity and stimulate the second-hand market	Improve information to give business and consumers the confidence to invest in low emission vehicle technologies that best suit their needs	Ensure the grid is EV-ready and that all consumers benefit from increased uptake of electric vehicles by leading reforms through Energy Ministers	Create new jobs, increase skills and stimulate local and regional economies by supporting innovation and manufacturing

Initiatives delivered with $2.1 billion committed by the Australian Government....

....through Australian Government departments and ARENA, CEFC and CER

See section 'Underpinned by government investment' for a breakdown of the $2.1 billion Australian Government commitment.

Our principles

This strategy is guided by 3 principles:

1. Partnering with the private sector to support uptake and stimulate co-investment in future fuel technologies.
2. Focusing on reducing barriers to the rollout of future fuel technologies, not taxes.
3. Expanding consumer choice by enabling informed choices and minimising costs of integration into the grid.

Priority initiatives and objectives

The government is focusing on 5 priority initiatives to create an environment that promotes consumer choice, stimulates industry development and reduces emissions.

Priority Initiatives	Objectives
Electric vehicle charging and hydrogen refuelling infrastructure where it is needed	• Leverage private sector investment in charging and refuelling infrastructure to address public 'charging blackspots' and demonstrate hydrogen refuelling infrastructure through the $250 million Future Fuels Fund. • Incentivise transport emissions reductions, including additional investment through the Emissions Reduction Fund (ERF). • Ensure access to charging and refuelling infrastructure that effectively integrates with the grid and meets the needs of business and households. • Design actions and investments that can complement those made by other levels of government.
Early focus on commercial fleets	• Help businesses and consumers access the latest transport technologies that suit their requirements, including heavy and long distance vehicles. • Support businesses to have access to technologies that reduce operating costs, increase productivity and help them meet their customers' needs.
Improving information for motorists and fleets	• Give consumers access to useful information when buying a vehicle to ensure it is right for them. • Provide information about the effectiveness of low emission vehicles, including for heavy-duty vehicle technologies and alternative fuels.
Integrating battery electric vehicles into the electricity grid	• Ensure the electricity system is EV-ready – prepare for the large-scale uptake of battery electric vehicles while remaining reliable and affordable for all Australians. • Support the deployment of emerging charging technologies that promote grid security and unlock additional value for consumers and electricity market participants.
Supporting Australian innovation and manufacturing	• Encourage Australian innovation in transport technologies and future fuels production capability to continue creating local jobs. • Support Australia's high-value critical minerals mining and manufacturing capability to capture export markets through the government's Modern Manufacturing Strategy.

Underpinned by government investment

Building on strong foundations and partnering with industry

With the release of this strategy, the Australian Government has now committed $2.1 billion to partner with industry to support uptake of low and zero emission vehicles.

This includes investment totalling close to $360 million by 2026 for projects and programs focused on new vehicle technologies and future fuel development, through the Australian Renewable Energy Agency (ARENA).

Since its inception, the Clean Energy Finance Corporation (CEFC) has made available over $1.3 billion via its co-finance programs loans with major banks and non-bank lenders for low emission vehicle uptake and related projects. In addition, the CEFC has directly invested more than $450 million in projects and funds that will contribute to reducing emissions in the transport sector.[3]

Other government commitments include a $5 million grant to the Australian Clean Energy Electric Vehicle (ACE EV) Group to support domestic battery electric vehicle manufacturing and a vehicle-to-grid trial. The government is also investing in an upgrade to the Green Vehicle Guide and undertaking a number of studies to better understand transport fuel demand and ensure Australian electricity grids are ready for electric vehicles.

The estimated impacts of the expanded $250 million Future Fuels Fund include:

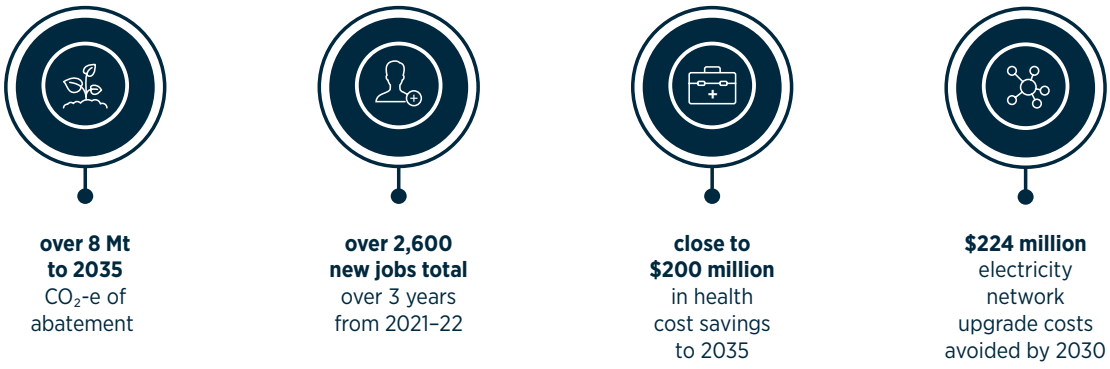
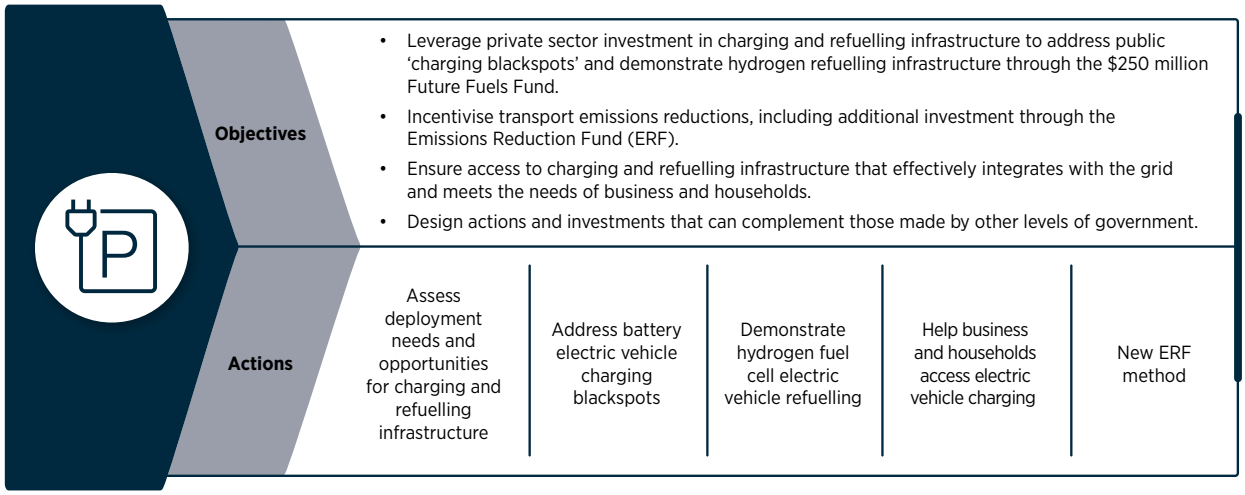


Figure 3: Expected impacts of Future Fuels Fund investments

The Australian Government is also investing in sectors that couple with the transport sector, including $464 million for the Clean Hydrogen Industrial Hubs program, which can include hydrogen-powered transport elements.

3 Figures as at 30 June 2021 (latest data published)

1. Electric vehicle charging and hydrogen refuelling infrastructure where it is needed



Opportunity

Australian motorists expect convenient access to competitively priced battery charging and hydrogen refuelling infrastructure for their vehicles.

"There is a lack of usable truck charging infrastructure to enable the potential rollout of plug-in battery electric heavy vehicles." **– Truck Industry Council**

"The National Farmers Federation strongly supports regionalisation and championing EV-friendly towns, and the associated infrastructure required for this cause" **– National Farmers Federation**

For businesses and households to incorporate low emission vehicles into their everyday lives, they need to be confident they can conveniently access battery charging and hydrogen refuelling infrastructure. Installing battery charging and hydrogen refuelling infrastructure can be expensive for businesses with large fleets or commercial vehicles, because they will likely also need to make substantial electrical upgrades (ChargeTogether Fleets 2020).

It is also important to take Australia's unique geography and the likely charging behaviour of Australian consumers into consideration when planning to rollout public charging infrastructure. Only around 25% of charging is likely to occur at work or through public electric vehicle charging infrastructure (McKinsey 2018). However, this may be vastly different for hydrogen fuel cell vehicles, which may mirror current petrol refuelling habits. Therefore, it is important to balance the need to increase consumer confidence in being able to access public charging in line with likely charging behaviour.

Recent private sector announcements indicate we already have an attractive environment in place to foster private investment in Australia for charging infrastructure, which is supported by more Australians already choosing to invest in new vehicle technologies. For example, BlackRock, the world's largest asset manager, has bought a stake in the Australian electric vehicle charging network JOLT, with an initial $100 million investment for building up the network (Changarathil 2021). This is BlackRock's first investment in electric vehicle infrastructure in the Asia Pacific, and its largest in this sector in the world. This type of private sector investment in battery charging and hydrogen refuelling infrastructure is expected to increase as more electric vehicles are on the road.

The government has a particular role to play in addressing market failures or gaps in the rollout of charging infrastructure. For example, the private sector is more likely to fund the early rollout of infrastructure in metropolitan areas where demand will initially be concentrated. However, this may lead to an inequality of access in regional areas where uptake may be slower. The government will be able to address this need through targeted co-investment with industry. Australian governments have been partnering with industry to develop a national highway of public fast chargers that will fill charging blackspots for battery electric vehicles. Through the Future Fuels Fund, the Australian Government has already provided approximately $25 million to rollout this enabling infrastructure.

Future Fuels Fund Round 1 is a success

The Australian Government recently announced $24.55 million of funding for round 1 of the Future Fuels Fund (administered by ARENA), focusing on metropolitan locations and major regional centres. This is generating a combined $79.9 million in public-private investment.

Figure 4 shows 403 fast charging stations will be built in blackspot areas in 14 of Australia's most populous regions. ARENA estimates this will give 75% of the population convenient access to fast public chargers. Figure 4 indicates the locations of existing charging stations and proposed charging station locations from round 1 of the Future Fuels Fund, with shading indicating a 100 km radius around each charger. The map does not show all planned charger investments by the private sector or state, territory and local governments. Having addressed major population centres, future support for public charging under the fund is expected to focus on regional blackspots, including linking regional areas with major population centres. The expanded $250 million Future Fuels Fund is expected to extend coverage to around 84% of the Australian population.

Future funding rounds will focus on co-investing with business in infrastructure that helps to shift their fleets to battery electric vehicles and explore opportunities with hydrogen and biofuel infrastructure. It will also partner with industry to explore opportunities for heavy and long-distance vehicles.

Further research and consultation will focus on regional charging needs and blackspots to help increase consumer choice in these areas. The scope of later rounds will be developed in consultation with industry.

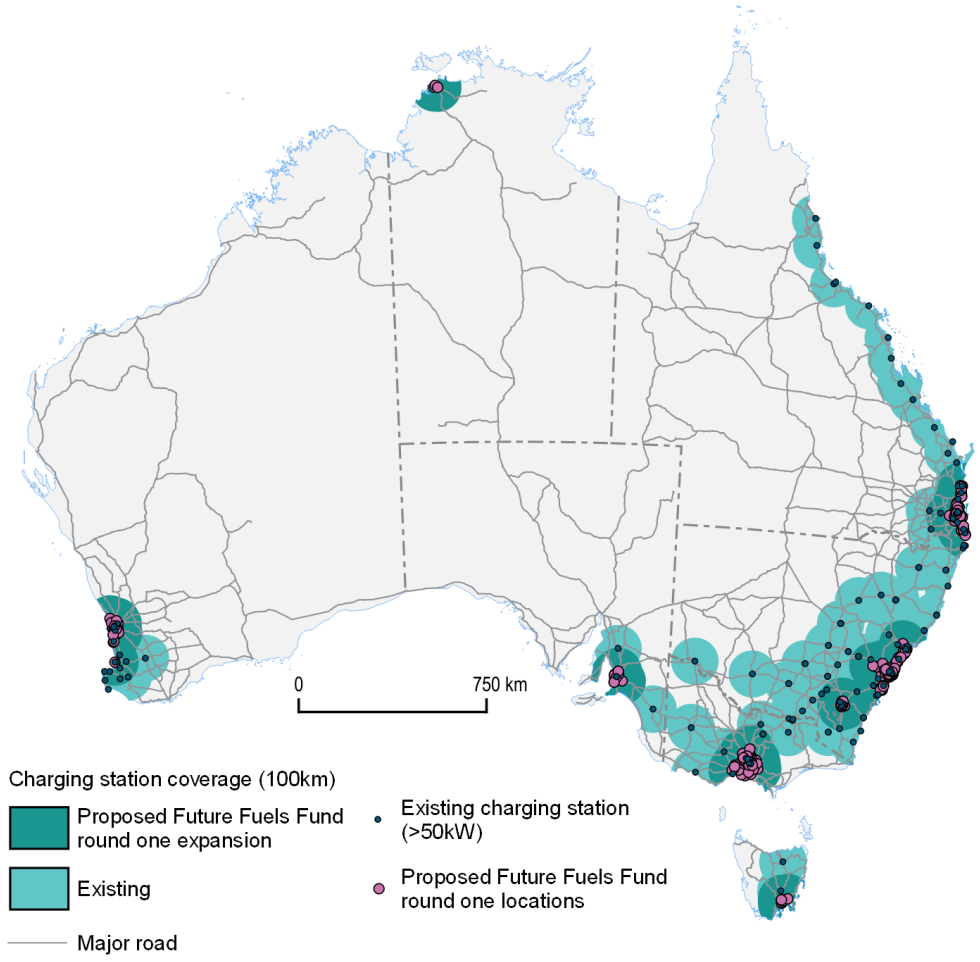


Figure 4: Existing and proposed electric vehicle charging station coverage in Australia from round 1 of the Future Fuels Fund

Actions

The government will increase access to public battery charging and hydrogen refuelling infrastructure through both co-investment and utilising the Emissions Reduction Fund (ERF). This will help drive down the cost of infrastructure and ensure it is deployed where needed.

In October 2021, the government announced that it would develop an ERF method that covers emissions reductions created by electric vehicle charging and hydrogen refuelling infrastructure. A new ERF method would aim to further incentivise the rollout of infrastructure (Action 1.5). The Clean Energy Regulator will lead on public consultations for this new method.

The government is further signalling to the market that investment into battery charging and hydrogen refuelling infrastructure is a priority by upgrading these technologies in the Low Emissions Technology Statement 2021 from emerging technologies to enabling infrastructure.

The government will continue co-investing to build Australia's charging networks, through the expanded $250 million Future Fuels Fund to support co-investment with the private sector and other governments. The fund will have 4 streams of key infrastructure investment to support early uptake and consumer choice:

- public electric vehicle charging and hydrogen refuelling infrastructure (Action 1.2 and 1.3)
- heavy and long distance vehicle fleets (Action 1.3 and 1.4)
- light vehicle commercial fleets (Action 1.4)
- household smart charging (Action 1.4).

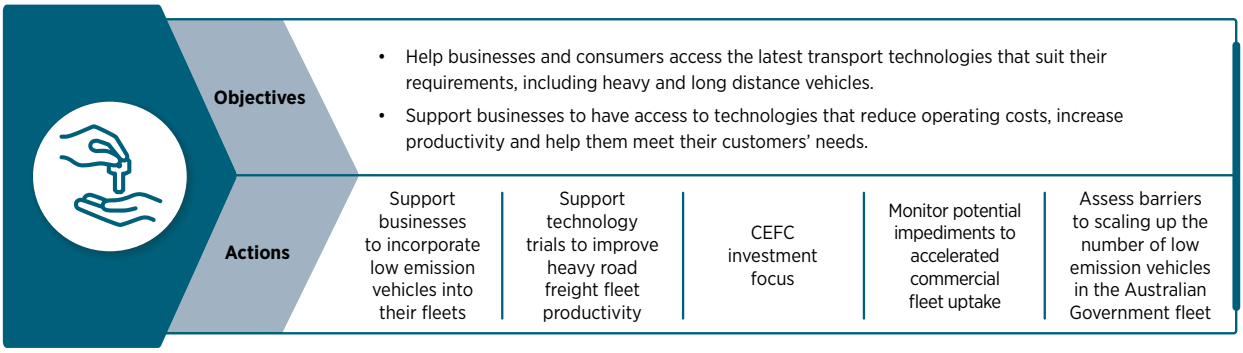
This investment is expected to deploy charging infrastructure in over 400 businesses, 50,000 households and 1,000 public charging stations.

The government will also ensure that enabling infrastructure is rolled out ahead of demand and is not duplicative by undertaking analysis to inform these co-investments with industry (Action 1.1).

As part of the Trajectory for Low Energy Buildings, all Australian governments committed to ensuring new buildings can accommodate electric vehicle charging. The Australian Building Codes Board is considering how to ensure readiness for future installation of electric vehicle charging in the next update of the National Construction Code, scheduled for 2022.

Action		Lead agency	Delivery
1.1	**Assess deployment needs and opportunities for battery charging and hydrogen refuelling infrastructure** The government is investigating where demand for low emission vehicles is likely to grow. The following studies will inform investment decisions to rollout battery charging and hydrogen refuelling infrastructure to meet this demand: • The Bureau of Infrastructure and Transport Research Economics (BITRE) will investigate charging blackspot locations in regional Australia. • The Department of Industry, Science, Energy and Resources (DISER) will develop a roadmap to identify, at a national level, the optimal locations of future battery charging and hydrogen refuelling infrastructure and how this can be effectively integrated into Australia's electricity network. • DISER is completing a National Hydrogen Infrastructure Assessment to identify hydrogen infrastructure rollout priorities.	BITRE and DISER	BITRE project: 2022 DISER roadmap: 2022 to 2024 DISER Hydrogen Infrastructure Assessment: 2024
1.2	**Address battery electric vehicle charging blackspots** The $250 million Future Fuels Fund will continue co-investing with industry and state and territory governments to roll out public charging infrastructure where it can have the greatest impact for regional and metropolitan motorists.	ARENA	2021 to 2025
1.3	**Demonstrate hydrogen fuel cell electric vehicle refuelling** The $250 million Future Fuels Fund will support the demonstration of hydrogen refuelling stations for hydrogen hubs, major freight routes and passenger road corridors. Hydrogen funding is also available through the $464 million Clean Hydrogen Industrial Hubs program, as well as through ARENA and the CEFC.	ARENA	2023 to 2025
1.4	**Help business and households access electric vehicle charging** The $250 million Future Fuels Fund will help commercial fleets and consumers with installation and electrical upgrades for charging infrastructure, including for heavy and long-distance vehicles (such as those used in the logistics, agriculture and mining sectors) and smart charging for households.	ARENA	2022 to 2025
1.5	**New ERF method** The government will develop a method to incentivise emissions reductions in transport, including through electric vehicle charging and hydrogen refuelling infrastructure.	CER and DISER	2021 to 2022

2. Early focus on commercial fleets



Opportunity

Fleet vehicles generally travel greater distances than private vehicles, resulting in higher fuel costs and more frequent servicing.[4] As noted in the discussion paper, the fuel and maintenance savings from low emission vehicles can help offset their higher upfront prices.[5] This will mean low emission vehicles used in fleets will reach price parity first, with hybrids already cost competitive with traditional vehicles (McKinsey 2019; BNEF 2020). This will not only see businesses save money, but will have a bigger impact on emissions reduction in the transport sector due to the proportion of commercial fleets.

With 40% of light vehicles sold in Australia in 2020 being purchased by businesses (FCAI 2020), unlocking early opportunities for commercial fleets to invest in low emission vehicles will help drive uptake and stimulate the second-hand market. Fleet vehicles are also generally replaced more regularly than private vehicles, and new low and zero emission vehicles also include the latest safety features (ANCAP 2021).

"The fleets first approach is not without its merit – supporting fleet access to new vehicle technologies will flood the second-hand market." – **Electric Vehicle Council**

"In 2018 we began trialling larger electric vehicles for supermarket deliveries, testing their capabilities, shortfalls and needs as a long-term technology solution. We are also working to introduce electric vehicle online delivery trucks to our fleet this year." – **Woolworths Group**

The Department of Finance is already trialling battery electric vehicles in the government's fleet of COMCAR vehicles. This is in addition to hybrid vehicles, which currently make up 28% of the COMCAR fleet. Outcomes from this trial will help to inform the government's future fleet purchasing decisions.

By undertaking this trial and supporting businesses to explore the latest transport technologies through ARENA and the CEFC, the government is demonstrating the application of low emission vehicles in Australian conditions. These actions will encourage others to use low emission vehicles in their fleets. They will also encourage manufacturers to increase supply for Australian consumers.

4 Based on ABS (2019) data, an average of 13,700km is travelled per year for passenger, 17,100km for light commercial and an estimated 51,300km for fleet vehicles (3 x light commercial kms per year).

5 In 2019, electricity was $0.30/kWh AEMC (2019) and a litre of petrol was $1.43 BITRE (2019). This equates to ~$3.50/100km for an EV compared to between $8 and $12/100km for a small to large ICE vehicle and a pre-paid service plan for a Hyundai Kona EV costs about 40% less than for a Kona with a conventional engine (Hyundai 2020).

CEFC finance options for low and zero emission vehicles

Since its inception, the CEFC has made available over $1.3 billion via its co-financing programs with major banks and non-bank lenders for low emission vehicle uptake and related projects. In addition, the CEFC has directly invested more than $450 million in projects and funds that will contribute to reducing emissions in the transport sector.[6]

The CEFC's Clean Energy Innovation Fund has invested in several Australian companies:

- Transgrid / Zenobe ($24.5 million) to back the nation's largest fleet of electric buses through a new pilot program that will see 40 new vehicles deployed across Sydney.
- Zoomo / Bolt Bikes ($9.2 million) is expanding its offer of smart utility e-bikes for the parcel, mail, food and grocery delivery sector.
- SEA Electric ($5 million) is converting medium-duty trucks and commercial vans into electric vehicles.
- 3ME Technology ($5 million) is supporting miners to replace diesel engines with cutting-edge battery electric systems, reducing their emissions and supporting safer, more-efficient mine operations.
- Jet Charge ($3.5 million), Australia's largest electric vehicle charging infrastructure specialist, is deploying smart charging hardware. This will help drive down the cost of smart and connected electric vehicle charging stations and make them more user-friendly for drivers.
- Relectrify ($3.25 million) is developing and commercialising control technology that unlocks extra performance in battery systems. It does this by boosting their second-life storage capability and lifespan once they are no longer effective as electric vehicle batteries.

The CEFC is also supporting the development of an Australian biofuels industry. This could reduce emissions in the transport sector, particularly in heavy freight, shipping and aviation.

Actions

This strategy takes a 'fleets-first' approach to help fast-track the number of low and zero emission vehicles on the road. This will make more affordable models available to more people.

The $250 million Future Fuels Fund will increase consumer choice by attracting a wider variety of vehicles to Australia. It will do this by focusing on fleets with high demand and turnover, helping generate a second-hand market. This market stimulation and co-investment with businesses to upgrade their infrastructure will help overcome barriers to incorporating low emission vehicles into their fleets (Action 2.1).

The fund will not only support fleets that utilise passenger or light commercial vehicles, but also long distance or heavy duty vehicle technologies. This could include trucking, buses or specialist vehicles used in the agricultural or mining sectors that incorporate larger batteries or hydrogen technologies. For example, the Australian Government recently supported a joint venture between Transgrid and Zenobe, with support from Transit Systems and Transport NSW, with $24.5 million from the CEFC and $5 million from ARENA. This project will back the nation's largest fleet of electric buses through a new pilot program that will see 40 new vehicles deployed across Sydney.

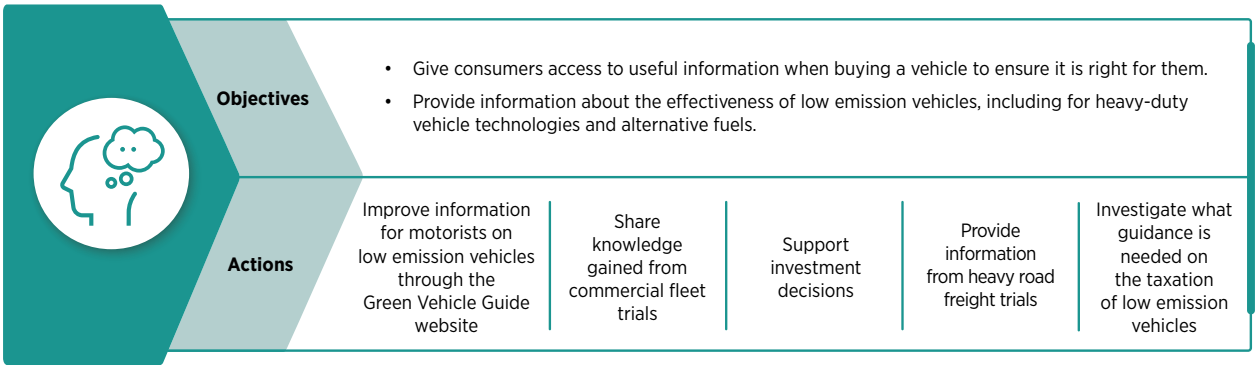
To complement the fund, the government's $24.5 million Freight Energy Productivity Program will increase the energy productivity of heavy road freight. It will give businesses the evidence they need to invest in more energy-efficient heavy-duty fleet vehicle technologies (Action 2.2). These programs build on the CEFC's continued work across the economy to accelerate investment in measures to reduce transport-related emissions, and support innovative Australian businesses (Action 2.3).

The government is also monitoring potential taxation and procurement barriers to accelerate uptake in commercial and government fleets (Actions 2.4 and 2.5).

6 Figures as at 30 June 2021 (latest data published)

Action		Lead agency	Delivery
2.1	**Support businesses to incorporate low emission vehicles into their fleets** The $250 million Future Fuels Fund will co-invest with light and heavy vehicle fleets to upgrade their infrastructure. These upgrades will help businesses to remove barriers to incorporate low emission vehicles and fuel options across the range of fleet vehicles used in Australia.	ARENA	2022 to 2025. Round 2 for fleet charging support will commence in early 2022
2.2	**Support technology trials to improve heavy road freight fleet productivity** The $24.5 million Freight Energy Productivity Program will help businesses improve vehicle productivity through assessing and evaluating the benefits of new energy efficiency technologies for heavy road freight vehicles.	ARENA and DISER	2022 to 2025
2.3	**CEFC investment focus** The CEFC will continue working across the economy to accelerate investment in measures to reduce transport-related emissions. This includes: • electrifying urban transport • charging infrastructure • finance available for electric vehicles.	CEFC	Ongoing
2.4	**Monitor potential impediments to accelerated commercial fleet uptake** Treasury will monitor the adequacy of regulatory and/or taxation settings.	Treasury	Ongoing
2.5	**Assess barriers to scaling up the number of low emission vehicles in the Australian Government fleet** Assess and adopt any appropriate lessons from the ongoing COMCAR trial to remove procurement barriers to expanding low emission vehicles across the government fleet.	Department of Finance	Ongoing

3. Improve information for motorists and fleets



Opportunity

Low emission vehicles have cost, health and safety benefits for motorists. However, in some cases, a lack of information about these technologies can inhibit consumer confidence in choosing them when making a new vehicle purchase (Electric Vehicle Council 2020).

Historically, vehicle technologies have developed incrementally, as have the regulations and taxes that underpin them. But battery and hydrogen fuel cell electric vehicles represent significant changes in vehicle technology, both in terms of use and how vehicles are powered, which can inhibit informed consumer choice.

Feedback on the discussion paper stressed the importance of access to quality information about low emission vehicles. The feedback indicated that the most important considerations for consumers are cost, range and charging or refuelling locations. Consumers are also interested in comparisons with conventional vehicles, taxation arrangements and environmental, safety and health benefits.

"We understand that when customers make vehicle purchase decisions, among other things they consider cost and convenience.... Good availability of information on available charging options will be important to ensure a convenient experience once a vehicle has been purchased." **– Ausgrid**

Consumers are often anxious about range and charging availability. For consumers to be confident an electric vehicle will suit their needs, they need to know the range of the vehicle, where they can charge and how long it might take to recharge.

Quality information on websites, apps and physical signage will help address 'range anxiety' and other barriers to electric vehicle purchases. This will help consumers make informed choices about the vehicle that is right for them.

Actions

The government will ensure consumers can access reliable, easy-to-understand information so they can make informed choices when looking to purchase a new vehicle through the ongoing work to update and improve the Green Vehicle Guide (Action 3.1).

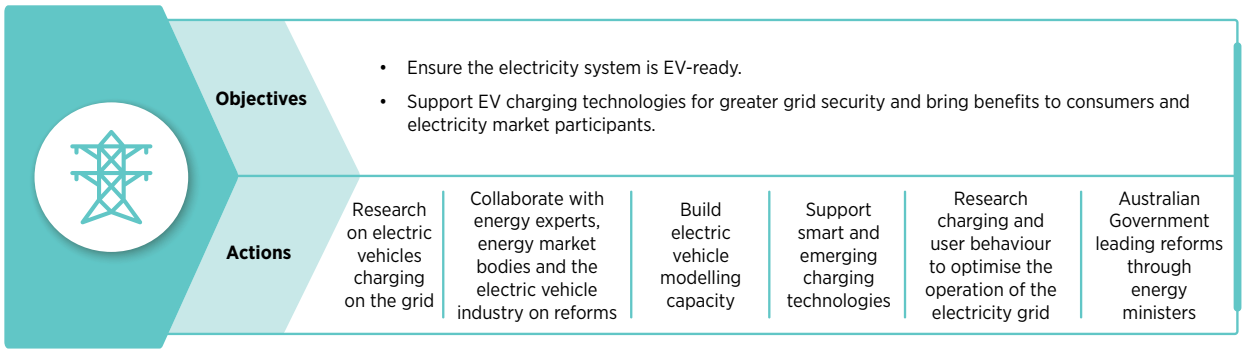
Commercial fleet trials undertaken through the Future Fuels Fund will produce 'investment grade' information that will be shared through the ARENA Knowledge Bank. The Knowledge Bank will be updated with the latest results and insights from funded projects. Businesses can use this information to assess the implications of adding low emission vehicles into their fleets (Action 3.2).

The government's Freight Energy Productivity Program will connect heavy freight businesses with expert advice and provide information on energy productivity measures and their costs and benefits (Actions 3.3 and 3.4).

The government is also investigating guidance for businesses on the taxation of low emission vehicles (Action 3.5).

Action		Lead agency	Delivery
3.1	**Improve information for motorists on low emission vehicles through the Green Vehicle Guide website** The Green Vehicle Guide website is being redeveloped and expanded to include information about new light vehicle technology available in Australia. The update will draw on market research to ensure it is designed for consumers.	Department of Infrastructure, Transport, Regional Development and Communications in partnership with DISER	2022
3.2	**Share knowledge gained from commercial fleet trials** Publishing results from fleet trials funded through the $250 million Future Fuels Fund will help establish credible real-world information on performance and costs.	ARENA	2022 to 2025
3.3	**Support investment decisions** The $24.5 million Freight Energy Productivity Program will assist the heavy road freight sector with access to information and experts to support fleet investment decisions.	ARENA and DISER	2022 to 2025
3.4	**Provide information from heavy road freight trials** Outcomes of the Freight Energy Productivity Program technology trials (Action 2.2) will be published so the wider industry can assess the benefits about energy productivity measures, and their related costs.	DISER	2022 to 2025
3.5	**Investigate what guidance is needed on the taxation of low emission vehicles** The Australian Taxation Office will investigate and issue updated guidance for businesses on the tax treatment of low emission vehicles to provide clarity for fleet purchasing.	Australian Taxation Office	Ongoing

4. Integrate battery electric vehicles into the electricity grid



Opportunity

Feedback on the discussion paper stressed that the rollout of electric vehicle charging and related incentives should promote energy reliability and minimise impacts on other electricity consumers.

The government also understands that it is important to take steps to ensure Australia's electricity grid is EV-ready. This will ensure all consumers who use the electricity grid can benefit without additional costs being imposed on the public or the reliability of the grid being compromised.

McKinsey (2018) estimates that around 75% of electric vehicle charging will occur at home, with the other 25% occurring at work or public chargers. We can meet the increased demand for charging at home by using lessons learned from the integration of Australia's rapid uptake of household rooftop solar (AEMC 2021). This will also allow us to take advantage of bidirectional electric vehicle chargers, enabling electric vehicle-to-grid capability in periods of low and high network demand.

This large proportion of at-home charging means the government must consider how this behaviour may impact the grid, including the impact on those who do not own an electric vehicle. For example, at a local level, if multiple electric vehicles are charging at the same time in close proximity (in the same apartment complex or street), increased demand on the local grid may increase the risk of overloading the network.

However, well-managed battery electric vehicle charging offers a new form of flexible demand to support the electricity grid. Taking early action to manage the additional stress that electric vehicle charging could place on the grid will avoid electricity network upgrade costs (AEMO 2020). We estimate investing in smart charging infrastructure and working with energy market bodies will ensure a reliable and affordable electricity supply for all Australians, helping to avoid network costs of around $224 million being imposed on consumers.

Smart charging technology manages electric vehicle charging in response to what is happening in the electricity grid. This includes taking advantage of periods of reduced demand or excess generation. Charging electric vehicles when there is a lot of renewable energy generation or outside peak demand times will minimise impacts on the grid. This is also when electricity prices are likely to be lower, benefiting consumers.

Smart charging technology and pricing incentives can help address the emerging challenges of electric vehicle integration. The technology allows consumers, aggregators and grid operators to effectively and accurately manage potential impacts on the electricity grid.

"Shifting this load to other parts of the day therefore enables customers to gain more favourable pricing and enables networks to better manage demand. We therefore see this as a critical piece of information that motorists need to understand. If we can shape their behaviour from the day they receive their EV, we can establish positive usage patterns that will benefit both motorists and networks in the long term" **– CitiPower, Powercor and United Energy**

Actions

On 1 October 2021, National Cabinet endorsed the final package of reforms for the Post-2025 National Electricity Market design. This ongoing work also identifies a pipeline of future market reforms to address these issues. This includes measures to encourage flexible demand to enable consumers to respond to market signals. These reforms will incentivise charging and discharging of electric vehicles when the system is at risk due to very low or very high demand.

In addition to this work, the Australian Government will proactively work with state and territory energy ministers to accelerate priority reforms to ensure the grid is EV-ready.

The government will ensure that any reforms progressed to make the grid EV-ready will:

- prioritise the reliability of the grid and affordability of electricity prices for all Australians
- reduce regulatory barriers to the rollout of new technologies to stimulate private sector investment
- encourage new technology uptake in both metropolitan and regional areas to promote fair access and consumer choice.

The government will take a list of priority reforms to state and territory energy ministers to progress. This list will grow as new issues emerge, but will initially include the following priorities:

- exploring network tariff reform to identify additional opportunities to encourage charging behaviour and infrastructure rollout
- incentivising the use of smart chargers in households, including assessing regulatory options
- tasking the energy market bodies to partner with governments on grid integration matters.

Energy market bodies will be tasked by energy ministers to help with grid integration and strengthening market assessments. These bodies include the Australian Energy Market Operator (AEMO), Australian Energy Market Commission (AEMC) and Australian Energy Regulator (AER).

These priority reforms will complement the work on the Energy Security Board's Distributed Energy Resources (DER) implementation plan to safely and efficiently integrate DER, including electric vehicles. This work considers reforms such as smart charging standards, interoperability standards, and flexible trader models as part of an increasingly 2-sided market. These reforms will support optimal grid operation and stability to minimise costs and benefit all electricity consumers.

These reforms will be informed by work such as the Australian Government's existing grid integration analysis study (Action 4.1) and complement other government work to ensure the grid is secure, reliable and affordable for Australians.

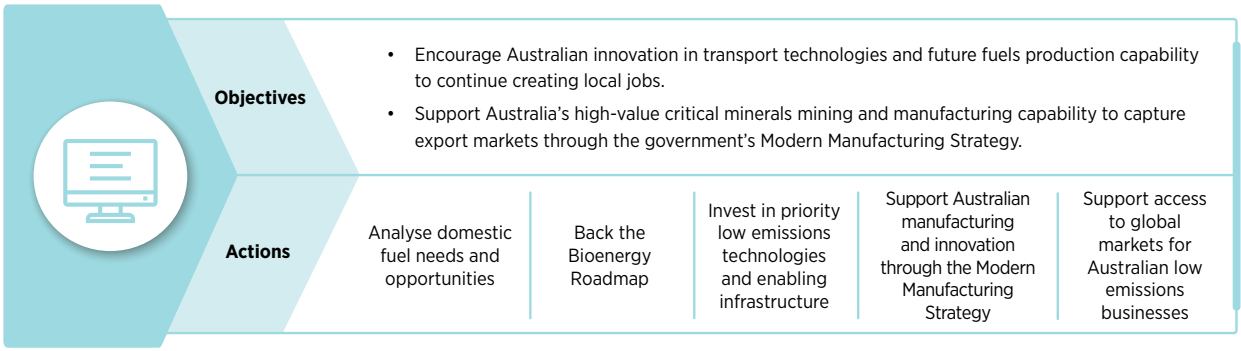
The government will collaborate with energy market experts and the electric vehicle industry to plan for large numbers of battery electric vehicles (Actions 4.2 and 4.3).

Exploring reforms and the incentives for household smart charging is also supported through the rollout of key infrastructure funding through the expanded Future Fuels Fund. This will see the government co-investing with industry to rollout an estimated 50,000 new smart chargers in Australian households and continue to trial emerging charging technologies (Action 4.4) and undertake studies to better understand charging user behaviours (Action 4.5).

The results from these projects, along with research and modelling, will be used to advance Australian Government-led priority energy market reforms through state and territory energy ministers (Action 4.6).

Action		Lead agency	Delivery
4.1	**Research on electric vehicles charging on the grid** The government is undertaking a grid integration analysis. The study is exploring: • ways to encourage motorists to charge at periods of low demand to keep electricity prices low • how this will be integrated into future retail electricity market offerings.	DISER	2021 to 2022
4.2	**Collaborate with energy experts, energy market bodies and the electric vehicle industry on reforms** Through state and territory energy ministers, the government will collaborate with energy market bodies and the electric vehicle industry on reforms. Work with industry through ARENA's Distributed Energy Integration Program (DEIP) Electric Vehicle Working Group with a focus on finding the best opportunities to integrate battery electric vehicles with electricity grids.	DISER and ARENA	Ongoing
4.3	**Build electric vehicle modelling capacity** Build government modelling capability to: • forecast impacts of increased electric vehicle ownership on electricity grids • help identify requirements for a roadmap to rollout electric vehicle infrastructure.	DISER	2022 to 2025
4.4	**Support smart and emerging charging technologies** The $250 million Future Fuels Fund will support the installation of smart charging technology in households to manage the impact of charging on the grid. ARENA is currently supporting trials of emerging technology such as bidirectional chargers. These trials will explore the potential for battery electric vehicles to serve as distributed energy resources that: • provide benefits for business and households • contribute to grid security and reliability.	ARENA	2022 to 2025 See the ARENA Knowledge Bank latest results and insights
4.5	**Research charging and user behaviour to optimise the operation of the electricity grid** Examine how electric vehicle charging and user behaviour can be incentivised to optimise operation of the electricity grid. This includes making the most of low cost and low emissions generation.	DISER	2022 to 2025
4.6	**Australian Government leading reforms through energy ministers** Consider results from actions 4.1 to 4.5 above, and the Energy Security Board's post-2025 electricity market design, to lead reforms through the Energy National Cabinet Reform Committee. In addition, reforms to support the integration of hydrogen technologies into the energy and transport sectors will be considered.	DISER	Ongoing

5. Support Australian innovation and manufacturing



Opportunity

Low emission vehicles draw on skills and innovation in automotive design, systems integration, component manufacturing and mining of critical minerals.

Australia's workforce has world-class skills in these areas. We also have businesses that generate high-value intellectual property in these areas. Some of these businesses are:

- Tritium
- Carbon Revolution
- Nissan
- ACE EV Group
- truck manufacturers such as PACCAR, Volvo and SEA Electric
- bus manufacturers such as Custom Denning and Volgren.

Australia has significant reserves of the critical minerals, rare earths and important base metals needed for electric vehicle and battery technologies. Capturing opportunities in the electric vehicle and battery energy storage supply chain could create 34,700 jobs in Australia by 2030. Global demand for batteries could increase tenfold to reach $151 billion by the same year (Future Battery Industries CRC 2021).

Australian Clean Energy Electric Vehicle (ACE EV) Group

The Australian Government is supporting domestic battery electric vehicle manufacturing through a $5 million grant to ACE EV Group for an advanced manufacturing facility and vehicle-to-grid trial.

Australia's resources sector is already responding to this opportunity. Australia's combined export earnings from key battery metals (lithium, copper and nickel) are forecast to grow to $19.6 billion in 2022–23 (Commonwealth of Australia 2021b).

Initial rounds of grant opportunities available through the Australian Government's Modern Manufacturing Strategy shows that the private sector is willing to co-invest in transport-related manufacturing. The areas with the most potential are:

- heavy transport manufacturing (including battery electric and hydrogen trucks and buses)
- electric vehicle charging equipment.

Australia can be globally competitive for these advanced products, especially where we have an innovation edge.

There is also a role for the government to continue to support research and development of new technologies through bodies such as CSIRO and ARENA. This is particularly important for hard-to-abate sectors beyond road transport, such as in the maritime and aviation sectors. Over $75 million has already been committed through ARENA to advance low emissions transport technologies, including for hydrogen, electric vehicles and biofuels.

"Given that Australia has extensive reserves of minerals that are used for vehicles that utilise electrified powertrains, developing the capability to process these products beyond the raw material stage would no doubt be advantageous."
– Federal Chamber of Automotive Industries

Actions

The Australian Government will identify opportunities to invest in future fuels. Investments will reinforce the government's objective of supporting innovation and competitive modern manufacturers.

The government is analysing Australia's likely future fuel mix, including ensuring we have the right access to both traditional fuels and new technologies to ensure energy security (Actions 5.1 to 5.3).

Co-investment will support Australian manufacturers and innovators to scale up, become more competitive, and capture opportunities across the value chain in new domestic and international markets (Actions 5.4 and 5.5).

Action		Lead agency	Delivery dates
5.1	**Analyse domestic fuel needs and opportunities** The government is funding research to model Australia's future mix of transport fuels. This work will demonstrate: • the industry growth opportunities future fuels can bring • the mix of fuels needed in the future, including traditional fuels and future fuel technologies.	DISER	2021 to 2022
5.2	**Back the Bioenergy Roadmap** The forthcoming Bioenergy Roadmap will consider the role of biofuels across transport sectors, including road and hard-to-abate sectors, such as aviation and maritime.	ARENA	Forthcoming
5.3	**Invest in priority low emissions technologies and enabling infrastructure** The Low Emissions Technology Statement 2021 identifies hydrogen as a priority low emissions technology and hydrogen refuelling as enabling infrastructure. The government is investing in hydrogen production and infrastructure so Australia can become a leading exporter by 2030. The upcoming National Hydrogen Infrastructure Assessment will also help to determine the infrastructure needed to support future use of hydrogen in transport.	DISER, CEFC and ARENA	Ongoing
5.4	**Support Australian manufacturing and innovation through the Modern Manufacturing Strategy** The government's $1.5 billion Modern Manufacturing Strategy is helping Australian manufacturers build scale, competitiveness and resilience. Transport-related opportunities have been identified in the National Manufacturing Priority areas, including recycling and clean energy, resources technology and critical minerals processing, and defence.	DISER	Ongoing
5.5	**Support access to global markets for Australian low emissions businesses** The Special Adviser to the Australian Government on Low Emissions Technology is working with international partners to strengthen collaboration between Australian and international businesses, including to facilitate opportunities in global markets for Australian businesses. This work is funded by the government's $565.8 million commitment to deliver low emissions international technology partnerships and initiatives by funding research and demonstration projects.	DISER	Ongoing

Other Australian Government activities

The Australian Government is undertaking a range of actions to complement the 5 priority initiatives and the activities of states, territories and industry. Some of these actions are described in Table 1 below.

Table 1: Australian Government activities, categorised by lead organisation

Lead organisation	Action
Department of Education Skills and Employment	Under current arrangements for industry engagement in vocational education and training (VET), the Australian Industry and Skills Committee (AISC) is responsible for national training package product development. The AISC oversees work by a network of Industry Reference Committees to develop and update nationally-recognised qualifications and skill sets that meet industry skills needs, including in the automotive sector. Skills ministers have agreed to introduce new industry engagement arrangements from January 2023. Industry Clusters will be established to provide industry with a stronger, more strategic voice and a broader role in ensuring the national VET system addresses skills and workforce challenges across the economy, including for new and emerging industries such as the low emission vehicles sector.
Department of Industry, Science, Energy and Resources	To support our long-term fuel supplies, the Australian Government has developed a comprehensive fuel security package. The government's long-term fuel security goal is to increase our domestic storage and to hold a sovereign refining capability that meets our needs during an emergency, as well as into the future. Under the package, we are: • bringing forward improvements to fuel quality (sulfur) from 2027 to 2024 • maintaining a sovereign refining capability through a variable Fuel Security Services Payment for refiners and support for major refinery infrastructure upgrades • keeping domestic fuel stocks above a set level through a minimum stockholding obligation and a $260 million co-investment infrastructure program to boost diesel storage capacity by 40%.
Department of Infrastructure, Transport, Regional Development and Communications	Leading work to consider adopting international standards on acoustic vehicle alerting systems for hybrid, battery electric and hydrogen fuel cell electric vehicles. This is due to the low noise these vehicles create when in operation. Evaluating whether the government should mandate the Euro 6 and Euro VI noxious emissions standards for light and heavy vehicles in Australia. Evaluation will include considering comments on the draft regulation impact statements.

Lead organisation	Action
Infrastructure and Transport Minister's Meeting	Collaborating across jurisdictions to consider the road-related revenue implications of new technology vehicles. Evaluating international standards and overseas experiences of installing public charging infrastructure, including: • streamlining payment options for charging battery electric vehicles • integrating electric vehicles into registration data • developing guidelines to support the installation of battery charging and hydrogen refuelling infrastructure • developing national signage standards to help identify battery charging and hydrogen refuelling infrastructure.
The National Measurement Institute (NMI)	The NMI is participating in an international technical committee to develop a standard for measuring energy in battery electric vehicle charging stations. As part of this, NMI is engaging with industry and consumers to ensure the standard serves Australia's needs. In parallel, NMI is working with Australian industry and consumers to establish an interim plan to support confidence in the accurate measurement of energy in battery electric vehicle charging stations. NMI is working with industry partners to implement international standards that will support the use of hydrogen dispensers for vehicles. The frameworks being developed by NMI will provide confidence in the measurement of hydrogen purity required to ensure vehicle performance, as well as the accurate measurement of the quantities of hydrogen purchased by consumers.

Reference list

ABS (Australian Bureau of Statistics) (2019) Survey of Motor Vehicle Use.
https://www.abs.gov.au/statistics/industry/tourism-and-transport/survey-motor-vehicle-use-australia

ABS (Australian Bureau of Statistics) (2021) Australian Vehicle Fleet hits 20 million.
https://www.abs.gov.au/media-centre/media-releases/australian-vehicle-fleet-hits-20-million

AEMC (Australian Energy Market Commission) (2019) Trends in national supply chain components.
https://www.aemc.gov.au/data/price-trends-2019/national-summary

AEMC (Australian Energy Market Commission) (2021) New standards will help power system handle more home solar.
https://www.aemc.gov.au/news-centre/media-releases/new-standards-will-help-power-system-handle-more-home-solar

AEMO (Australian Energy Market Operator) (2021) Electricity Statement of Opportunities.
https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-reliability/nem-electricity-statement-of-opportunities-esoo

ANCAP (Australasian New Car Assessment Program) (2021) ANCAP Safety Ratings.
https://www.ancap.com.au/safety-ratings

BITRE (Bureau of Infrastructure and Transport Research Economics) (2019) Electric Vehicle Uptake: Modelling a Global Phenomenon. https://www.bitre.gov.au/publications/2019/bitre-report-151

BNEF (Bloomberg New Energy Finance) (2020) Electric Vehicle Outlook 2020.

BNEF (Bloomberg New Energy Finance) (2021a) Electric Vehicle Outlook 2021.

BNEF (Bloomberg New Energy Finance) (2021b) New Energy Outlook 2021.

Changarathil V (24 August 2021), 'BlackRock in $100m-plus equity, loan deal with Jolt Charge to boost EV uptake', The Australian, https://www.theaustralian.com.au/business/blackrock-in-100mplus-equity-loan-deal-with-jolt-charge-to-boost-ev-uptake/news-story/8ad5cd5953da4bc5e9e709969a878d92

ChargeTogether Fleets (2020) Charger installation process and costs.
https://fleets.chargetogether.org/article/installation-process-and-costs

Commonwealth of Australia (2021a) Australia's emissions projections 2021.
https://www.industry.gov.au/data-and-publications/australias-emissions-projections-2021

Commonwealth of Australia (2021b) Resources and Energy Quarterly June 2021.
https://publications.industry.gov.au/publications/resourcesandenergyquarterlyjune2021/index.html

Electric Vehicle Council (2020) State of Electric Vehicles.
https://electricvehiclecouncil.com.au/wp-content/uploads/2020/08/EVC-State-of-EVs-2020-report.pdf

Electric Vehicle Council (2021) State of Electric Vehicles.
https://electricvehiclecouncil.com.au/wp-content/uploads/2021/08/EVC-State-of-EVs-2021.pdf

FCAI (Federal Chamber of Automotive Industries) (2020) VFACTS December 2020.

Future Battery Industries CRC (2021) Future Charge Building Australia Battery Industries.
https://fbicrc.com.au/wp-content/uploads/2021/06/Future-Charge-Report-Final.pdf

Hyundai (2020) Pre-paid service quote calculator. https://www.hyundai.com/au/en/pre-paid/calculator

IEA (International Energy Association) (2021) Global EV Outlook 2021.
https://www.iea.org/reports/global-ev-outlook-2021

McKinsey (2018) Charging Ahead: Electric Vehicle Infrastructure Demand. https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/charging-ahead-electric-vehicle-infrastructure-demand

McKinsey (2019) Making electric vehicles profitable.
https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/making-electric-vehicles-profitable

Redbook.com.au (2021) Research & Value Cars. https://www.redbook.com.au/

Appendix A

Australians are already choosing low emission vehicles. Hybrid sales almost doubled in 2020, increasing from 31,191 vehicles in 2019 to 60,417 vehicles (FCAI 2020). Battery electric and plug-in hybrid vehicles hit a record 8,688 sales in the first half of 2021, representing 1.57% of the total light vehicle market (Electric Vehicle Council 2021). Registrations of electric vehicles surged, almost doubling to 23,000 registrations from 2020 to 2021 (ABS 2021).

Table 2 illustrates that in September 2021, Australians had access to 60 passenger vehicle models including 17 battery electric vehicles, 21 plug-in hybrid vehicles and 22 hybrid vehicles. This is a 20% increase since the discussion paper was published in February 2021. A number of these models also come in different battery and power specifications. Thirty-one of these models are available under $65,000 including 7 battery electric vehicles, 6 plug-in hybrid vehicles and 18 hybrid vehicles. For the commercial market, 22 battery electric light and heavy duty vehicle models are available in Australia.

Table 3 shows the growing range of low emission vehicles that are expected to be available in the Australian market soon, which has more than doubled since the discussion paper.

Table 2: Hybrid and electric vehicles available in Australia, September 2021[7]

Brand	Models*	BEV/PHEV/ Hybrid	Size	Battery Range (km)	Price
Audi	e-tron Quattro 50	BEV	SUV	336	$136, 472 – $137,100
	e-tron Quattro 55	BEV	SUV	436	$145,472 – $146,100
	e-tron Quattro Sportback 50	BEV	SUV	342	$147,472 – $148,100
	e-tron Quattro Sportback 55	BEV	SUV	444	$156,472 – $157,100
BCI	Citirider E	BEV	Bus	300	Via commercial arrangements
BMW	i8	PHEV	Sports	55	$318,900 – $348,900
	i3s 120Ah	BEV	Subcompact	260	$71,900
	330e	PHEV	Sedan	57	$82,400 – $84,900
	530e	PHEV	Sedan	54	$121,971 – $122,900
	745e	PHEV	Sedan	52	$209,400
	X5 xDrive45e	PHEV	SUV	80	$134,971 – $135,900
BusTech Group	ZDI	BEV	Bus	325	Via commercial arrangements
BYD	BYD T3	BEV	Van	300	$34,950
Custom Denning	Element	BEV	Bus	500	Via commercial arrangements
EV Automotive	EC11	BEV	Van	200	Via commercial arrangements

7 The information provided is for illustrative purposes only and is based on publicly available information for 2020 and 2021 models (where available) as at 9 September 2021. Prices were sourced from Redbook.com.au and the EV Council State of EV Report 2021, wherever available, and represent the new vehicle price provided by manufacturers. Battery ranges were sourced from the Green Vehicle Guide and EV Council State of EV Report 2021, wherever available.

Brand	Models*	BEV/PHEV/ Hybrid	Size	Battery Range (km)	Price
GB Auto	TEMBO 4x4 E-LV	BEV	Converted Toyota Land Cruiser 70 series and Hilux	80 – 160	Via commercial arrangements
Honda	Accord VTi-LX	Hybrid	Sedan	N/A	$55,800 – $60,400
Hyundai	Ioniq (4)	PHEV/BEV	Sedan	63 – 311	$42,410 – $54,010
	Kona (2)	BEV	SUV	449 – 484	$54,500 – $64,000
	Ioniq Hybrid	Hybrid	Hatch	N/A	$35,690 – $41,390
JAC motors	N55 EV truck	BEV	Light duty truck	200	Via commercial arrangements
Jaguar Land Rover	I PACE	BEV	SUV	470	$127,620 – $151,432
	Range Rover (2)	PHEV	SUV	48	$135,559 – $216,575
Lexus	CT 200h	Hybrid	Hatch	N/A	$41,750 – $58,500
	ES 300h	Hybrid	Sedan	N/A	$62,525 – $77,000
	IS 300h	Hybrid	Sedan	N/A	$64,500 – $73,000
	UX 250h	Hybrid	Luxury SUV	N/A	$52,025 – $64,100
	LC 500h	Hybrid	Luxury Coupe	N/A	$193, 925 – $218,925
	LS 500h	Hybrid	Luxury Sedan	N/A	$195,325 – $200,450
	NX 300h	Hybrid	SUV	N/A	$60,500 – $78,737
	RX 450h	Hybrid	SUV	N/A	$91,760 – $112,460
Mercedes Benz	EQC400	BEV	SUV	434	$124,300 – $146,671
	A250e	PHEV	Hatch/ Sedan	73	$64,800 – $67,800
	C300e	PHEV	Sedan	52	$82,300 – $84,472
	GLC300e	PHEV	SUV	46	$93,800
	E300e	PHEV	Sedan	50	$118,673 – $123,500
MG Motors	ZS EV	BEV	SUV	263	$44,990
	HS	PHEV	SUV	52	$47,990
MINI	Countryman	PHEV	Mini	19	$60,900 – $69,000
	Electric hatch	BEV	Subcompact	242	$55,650 – $62,825
Mitsubishi	Outlander	PHEV	SUV	54	$47,990 – $56,490
Nexport BYD Gemilang	BYD K9RA	BEV	Bus	TBC	Via commercial arrangements
Nexport BYD Volgren	TBC	BEV	Bus	TBC	Via commercial arrangements

Brand	Models*	BEV/PHEV/ Hybrid	Size	Battery Range (km)	Price
Nissan	Leaf	BEV	Small car	315	$49,990
	Leaf e+	BEV	Small car	450	$60,490
	Pathfinder ST (2)	Hybrid	SUV	N/A	$47,240 – $62,140
Porsche	Cayenne E-hybrid (8)	PHEV	SUV	42	$140,600 – $299,300
	Panamera E-Hybrid (10)	PHEV	Sedan / wagon	50 – 56	$245,300 – $426,500
	Taycan (12)	BEV	Sedan	365 – 434	$156,300 – $345,800
Renault	Kangoo MAXI	BEV	Light commercial van	200	$50,290
Safescape	Bortana EV	BEV	Converted Agrale	120	Via commercial arrangements
SEA Electric	E4V	BEV	Van	300	Via commercial arrangements
	E4B	BEV	Mini-Bus	300	
	SEA 300-85	BEV	Truck Cab-Chassis	275 (unladen)	
	SEA 500-140	BEV	Truck Cab-Chassis	200 (unladen)	
	SEA 500-225	BEV	Truck Cab-Chassis	220 (unladen)	
	SEA 300-45	BEV	Truck Cab-Chassis	275 (unladen)	
Subaru	XV Hybrid (2)	Hybrid	SUV	N/A	$35,490 – $40,790
	Forester Hybrid (4)	Hybrid	SUV	N/A	$40,490 – $47,190
Tesla	Model S (3)	BEV	Sedan	628 – 837	$129,990 – $199,990
	Model X (2)	BEV	SUV	547 – 580	$129,990 – $174,990
	Model 3 (3)	BEV	Sedan	508 – 657	$62,900 – $89,900

Brand	Models*	BEV/PHEV/ Hybrid	Size	Battery Range (km)	Price
Toyota	Yaris Hybrid (4)	Hybrid	Hatch	N/A	$29,020 – $32,200
	Corolla Hybrid (10)	Hybrid	Hatch/ Sedan	N/A	$27,395 – $30,795
	Camry Hybrid (7)	Hybrid	Sedan	N/A	$31,790 – $46,990
	Prius (2)	Hybrid	Hatch	N/A	$38,365 – $45,825
	Prius V (2)	Hybrid	Wagon	N/A	$37,590 – $45,380
	RAV4 Hybrid (6)	Hybrid	SUV	N/A	$37,070 – $46,415
	C-HR Koba	Hybrid	SUV	N/A	$37,665
	Yaris Cross (6)	Hybrid	SUV	N/A	$28,990 – $37,990
Voltra	e-cruiser	BEV	Converted Toyota Land Cruiser 70 series	100	Via commercial arrangements
Volvo	XC90 T8	PHEV	SUV	44	$115,990
	XC60 T8 Polestar	PHEV	SUV	44	$100,690
	XC40	PHEV	SUV	44	$64,990 – $66,990
	XC40 Pure Electric	BEV	SUV	450	$76,990
	S60 T8	PHEV	Sedan	49	$84,990
	V60 T8	PHEV	Wagon	49	$86,990
	FL Electric	BEV	Prime mover	<220	Via commercial arrangements
	FE Electric	BEV	Prime mover	<220	
Yutong	E12 e-bus	BEV	Bus	TBC	Via commercial arrangements
Zero automotive	ZED70	BEV	Mining utility vehicle	350	Via commercial arrangements

*Some models have been combined due to the range of model configurations available. Every individual model may not appear in this list.

Table 3: Low emission vehicles which may be available in Australia in the near future[8]

Brand	Models	BEV/ FCEV/ PHEV/ Hybrid	Size	Battery Range (km)	Indicative Price#
ACE EV	ACE Cargo Light	BEV	Light commercial van	200	TBC
	ACE Yewt	BEV	Utility van	200	TBC
Atlis Motors	Atlis XT	BEV	Ute	800	TBC
Audi	e-tron S	BEV	SUV	374	TBC
	e-tron GT	BEV	Sedan	488	TBC
BMW	iX	BEV	SUV	460	TBC
	X3 xDrive30e	PHEV	SUV	46	TBC
	iX xDrive40	BEV	SUV	400	TBC
	iX xDrive50	BEV	SUV	600	TBC
BYD	EA1	BEV	Hatchback	500	<$35,00
	Han	BEV	Sedan	560	TBC
	Han	PHEV	Sedan	81	TBC
	Tang	BEV	SUV	500	TBC
	Song	PHEV	SUV	TBC	TBC
	E2	BEV	Hatchback	305	<$35,000
	E6	BEV	MPV	>500	$39,999
	Qin	BEV	Compact sedan	450	TBC
	Qin	PHEV	Compact sedan	55	TBC
EV Automotive	EC11	BEV	Van	200	TBC
FORD	Ford Escape ST	PHEV	SUV	50	$52,940
Fuso	e-canter	BEV	Truck	100	TBC
Genesis	G80	BEV	SUV	500	TBC
H2X Australia	Warrego 66	FCEV	Ute	500	$189,000
	Warrego 90	FCEV	Ute	500	$235,000
	Warrego 90 XR	FCEV	Ute	750	$250,000
Hyundai	Santa Fe Hybrid	Hybrid	SUV	N/A	TBC
	Ioniq 5	BEV	SUV	386	TBC
	Nexo***	FCEV	SUV	666	TBC
Janus Electric	Kenworth T403	BEV	Truck conversion	400 – 500	TBC

8 The information provided is for illustrative purposes only and is based on publicly available information as at 5 October 2021. Prices were sourced from the EV Council State of EV Report 2021, wherever available. Price for the Atlis Motors model and the H2X Australia models was sourced from The Driven. Price for the BYD E6 was sourced from EVDirect. Price for the Polestar 2 was sourced from Polestar.

Kia	Sorento	Hybrid/PHEV	SUV	480	TBC
	EV6	BEV	SUV	510	TBC
Lexus	UX300e	BEV	SUV	400	TBC
	GV60	BEV	SUV	TBC	TBC
Mazda	MX-30	BEV	SUV	224	$65,490
Mercedes-Benz	EQA250	BEV	SUV	480	$76,800
	EQB	BEV	SUV	TBC	TBC
	EQS	BEV	Sedan	TBC	TBC
Nissan	Leaf e+	BEV	Small car	384	TBC
Peugeot	e-2008	BEV	SUV	332	TBC
	508	PHEV	SUV	63	TBC
	3008	PHEV	SUV	59	TBC
Polestar	Polestar 2 (single motor)	BEV	Sedan	440 – 540	$59,990 – $64,900
	Polestar 2 (dual motor)	BEV	Sedan	480	$69,990
Porsche	Taycan 4S Cross Turismo	BEV	Wagon	436	$201,000
	Taycan Turbo Cross Turismo	BEV	Wagon	425	$271,200
SAIC motor	Maxus LDV EV30	BEV	Van	200	TBC
Tesla	Model Y	BEV	SUV	505	TBC
Toyota	bZ4X	BEV	SUV	500	TBC
	Kluger hybrid	Hybrid	SUV	N/A	TBC
	Mirai***	FCEV	Sedan	> 600	TBC
Volvo	XC40	PHEV/BEV	SUV	78 – 400	$64,990
Volkswagen	ID.4	BEV	SUV	520	TBC

*** At the time of writing, this vehicle was available in limited numbers for lease to fleets but not on the general market.

Manufacturers have not supplied prices of vehicles that may be available in the future and indicative prices are subject to change.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