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**Department of Infrastructure, Transport,
Regional Development, Communications and the Arts**

Cleaner, Cheaper to Run Cars: The Australian New Vehicle Efficiency Standard

Consultation Impact Analysis

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Executive Summary

Australia is a nation of drivers. In 2020, there were nearly twenty million cars in Australia. We bought more fuel for passenger carrying vehicles than we did for vehicles carrying freight, and almost 80% of our fuel consumption was for petrol.¹

Yet, Australians are being left behind as the major economies of the world benefit from more fuel-efficient cars¹ and greater access to new low and zero emissions technology. Australia and Russia are among the only advanced economies without a new vehicle efficiency standard (also known as a fuel efficiency standard²), so we spend more on fuel and have fewer choices of cheaper-to-run cars, cleaner.

Over 85% of cars sold worldwide are covered by a new vehicle efficiency standard, but in contrast, the one million new cars sold in Australia each year are not currently required to meet any level of fuel efficiency. Because of this, Australian new cars use significantly more fuel than new cars on the road in the United States. In fact, passenger cars in Australia on average, use 20% more fuel than passenger cars in the US. The inefficiency of our vehicles means that for every litre of fuel we buy, we drive fewer kilometres.

This means that Australians will accrue around \$143 billion in benefits out to 2050. This includes around \$108 billion in fuel savings to 2050 for everyday Australians, giving a hand to working families. The introduction of a new vehicle efficiency standard or NVES, will mean that global car manufacturers will need to supply the same advanced emissions technology to Australia that they already supply to other advanced economies. Overall, introducing the Government's policy will mean that for every dollar spent, there is a \$3.08 return.

The cars we drive are responsible for around 13% of Australia's greenhouse gas emissions (particularly carbon dioxide (CO₂)), with cars being the largest contributor to CO₂ emissions in the transport sector. The projected impact of these emissions on Australia's climate outlook, within our lifetime, cannot be ignored.

In submissions to the National Electric Vehicle Strategy in September 2022, there was strong support for an Australian new vehicle efficiency standard. In April 2023, the Government released a consultation paper seeking views on the design of a standard – and by June 2023, around 2,700 submissions were received, with the majority supporting a new vehicle efficiency standard. This document is the next step – which aims to present options, the costs and benefits associated with each option, and ultimately the Government's proposed policy. In summary, the Government's preferred settings for a new vehicle efficiency standard is to put in place arrangements by 2025 that mean we catch up to the US average vehicle emissions intensity by around 2028. This is an ambitious approach – but one that is required to give Australians more choice to use less petrol. This will deliver abatement of 369 million tonnes of CO₂ by 2050, and close to 100 million tonnes of CO₂ abatement by 2035.

We recognise that there are a range of different views in the community – especially given the cultural place that cars play in our society. That is why we have released this Impact Analysis, to seek feedback on the Government's proposed approach, and to determine what can be done to further enhance the value of a new vehicle efficiency standard to Australian society.

¹ By 'cars' we mean the sedans, hatchbacks, vans and utes that Australians drive. These are vehicles, generally that are lighter than 3.5 tonnes. Vehicles that are 4.5 tonnes or more are heavy vehicles – i.e. large trucks etc that are cargo carrying.

² We previously referred to this policy as a 'Fuel Efficiency Standard', but based on submissions to our first consultation process we have changed the name to 'New Vehicle Efficiency Standard' to better reflect that the standard would only apply to new cars, and applies to cars not fuel.

Key Terms

Term	Definition
ABS	The Australian Bureau of Statistics is the central statistical authority for the Australian Government and, by legal arrangements, provider of statistical services to Australian State and Territory governments.
ADR	The Australian Design Rules are the national standards for vehicle safety, anti-theft and emissions.
Attribute-based standard	Is a standard that is based on an attribute of a vehicle such as mass, or footprint (i.e. length and width), which is further defined by the limit curve.
BAU	Business as usual.
BCR	Benefit-cost ratio.
Car parc	A term that refers to all registered vehicles in Australia.
CO₂	Carbon dioxide, the key greenhouse gas expelled from the exhaust systems of internal combustion engines.
CO₂-e	Carbon dioxide equivalent (in terms of global warming potential).
CBA	Cost-benefit analysis.
Credits	A mechanism to track when a supplier beats its target.
DCCEEW	Department of Climate Change, Energy, the Environment and Water.
Debits	The monetary amount that a supplier would need to pay for each gram of CO ₂ their fleet is above the fleet limit in any given year. Debits can be banked, and extinguished through using the equivalent number of credits.
The department	Department of Infrastructure, Transport, Regional Development, Communications and the Arts.
EV	A vehicle that exclusively uses chemical energy stored in rechargeable battery packs to power at least one electric motor with no secondary source of propulsion.
FCEV	A hydrogen fuel cell electric vehicle, is an electric vehicle that is powered by electricity generated by a fuel cell that uses compressed hydrogen, as opposed to being powered by externally sourced electricity stored in an onboard battery like in a BEV.
NVES	A fuel efficiency standard is a legislative framework that regulates CO ₂ emissions from vehicles, usually by applying an average CO ₂ target to a suppliers' fleet of new vehicles. A NVES usually reduces over time. We now refer to this policy as a New Vehicle Efficiency Standard.
Fleet limit curve	Defines the amount of CO ₂ a supplier's fleet of cars is able to emit on average, over time and is often drawn on a graph against vehicle mass.
GVM	Gross vehicle mass is the maximum loaded weight of a vehicle while driving on the road.
GHGs	A greenhouse gas is any gas that contributes to global climate change. CO ₂ is one of the key GHGs emitted by ICE-powered vehicles.
GWP	Global-warming potential is used to describe the relative potency, molecule for molecule, of a greenhouse gas, taking account of how long it remains active in the atmosphere.
Hybrid / HEV	A hybrid electric vehicle is a vehicle that is powered by the combination of an internal combustion engine and an electric motor, which is not able to plugged into an external source of power to charge its internal battery.

Term	Definition
ICE	An internal combustion engine-powered vehicle solely utilises the power from its internal combustion engine and no other source of propulsion. ICE engines power cars that most Australians have historically driven and generally consume carbon-based fuels such as petrol or diesel. 'Advanced' ICE refers to ICE vehicles that have improved efficiency above what is currently available on the Australian market.
Intensity	The carbon dioxide emissions intensity for vehicles is calculated using the method described in Vehicle Standard (<i>Australian Design Rule 81/02 – fuel consumption labelling for light vehicles</i>) and expressed in grams of carbon dioxide per kilometre (g/km). Vehicle emissions intensity is a measure of vehicle efficiency, not actual vehicle emissions, which depend on many real-world factors, such as the distance travelled, the nature of the driving, and road and traffic conditions.
LCV	Light commercial vehicles are utes and vans. Under the relevant legislative framework (see <i>Vehicle Standard (Australian Design Rule – Definitions and Vehicle Categories) 2005</i>), we place NA (light goods vehicles) and NB1 (medium goods vehicles) in the light commercial vehicle category with exemptions available for some NB1 vehicles.
LZEV	Low and Zero Emission Vehicles is a catch-all term to describe, BEVs, HEVs and PHEVs.
MIRO	Mass In Running Order is mass of the vehicle with all fluids, standard equipment and 75kg for the driver.
Net zero	The United Nations defines net zero as cutting GHG emissions to as close to zero as possible, and where any remaining emissions are re-absorbed from the atmosphere, for example by forests or seas.
NEVS	The National Electric Vehicle Strategy sets out Australia's ambition to improve supply and access to EVs, improve EV infrastructure and increase demand for EVs.
NVES	A new vehicle efficiency standard is a legislative framework that regulates CO ₂ emissions from vehicles, usually by applying an average CO ₂ target to a suppliers' fleet of new vehicles. A NVES usually reduces over time. We previously referred to this policy as a Fuel Efficiency Standard.
PVs	Passenger vehicles are sedans, hatch backs, SUVs and most 4WDs. Under Australian legislation (see <i>Vehicle Standard (Australian Design Rule – Definitions and Vehicle Categories) 2005</i>) cars are further sub-categorised. Using the legislative categories, we generally put MA (passenger cars), MB (forward-control passenger vehicles) and MC (Off-road passenger vehicles) categories in the passenger vehicle category.
PHEV	A plug-in hybrid electric vehicle is a vehicle that is propelled by a combination of power from a battery that can be recharged by plugging it into an external source of electric power, in addition to its on-board ICE engine, which also acts as a generator to recharge the battery.
ROVER	ROVER (Road Vehicle Regulator) is an administration system for the <i>Road Vehicle Standards Act 2018</i> within the Department of Infrastructure, Transport, Regional Development, Communications and the Arts.
Supplier	An entity that holds an approval under the <i>Road Vehicle Standards Act 2018</i> to provide vehicles to the Australian market (for example, a company that imports cars into Australia). See extended definition in Chapter 7.
ZEV	A vehicle with no tailpipe emissions. Where reference is made in this document to a zero emissions vehicle for the purposes of a new vehicle efficiency standard, it is taken to mean a vehicle that does not have an internal combustion engine and therefore does not produce CO ₂ while driving. There may be other emissions, such as grid emissions from charging an EV or hydrogen electrolysis, and lifecycle emissions from manufacturing processes. See Chapter 4 for more analysis on this aspect.

Chapter 1: Introduction

This consultation Impact Analysis represents the second and final phase of consultation about the design of a new vehicle efficiency standard for Australia. As many readers will be familiar with, long standing Australian Government policy is that substantive regulatory decisions should be accompanied by an impact assessment (previously known as a Regulation Impact Statement, or RIS).

In this paper, we have set out the Government's proposed policy position in relation to the design and introduction of an Australian New Vehicle Efficiency Standard (NVES). Following this consultation, Government will decide on the design of the NVES and final Impact Analysis will be developed.

In this introduction we set out:

- the structure of this document
- the questions we want to ask you
- background, the process to date and next steps.

1.1 Structure of this document

An Impact Analysis helps policymakers consider how proposals affect businesses, individuals and community organisations, as well as broader economic and other impacts. A strong evidence-based impact analysis is a powerful tool when applied intentionally and consistently. The Australian Government's Policy Impact Analysis Framework ensures that decision makers are supported with the necessary evidence base, and that policy is well-designed, well-targeted and fit-for-purpose.

All impact analyses follow the Australian Government requirements, addressing seven key questionsⁱⁱ. In this paper, we have provided content in line with these questions. In some instances, such as where we would set out who we consulted with and how we incorporated feedback, that content will appear in the final Impact Analysis and be published on the Office for Impact Analysis' (OIA) website. The OIA's seven Impact Analysis questions are:

Question	Related chapters in this document
1. What is the policy problem you are trying to solve and what data is available?	Chapter 2
2. What are the objectives, why is government intervention needed to achieve them, and how will success be measured?	Chapter 3
3. What policy options are you considering?	Chapter 4
4. What is the likely net benefit of each option?	Chapter 5
5. Who did you consult and how did you incorporate their feedback?	Chapter 6
6. What is the best option from those you have considered and how will it be implemented?	Chapter 7
7. How will you evaluate your chosen option against the success metrics?	Chapter 8

1.2 Background and process to date

Since at least 2008, successive Australian governments have considered measures that would improve the fuel efficiency of cars. These efforts have not yet translated into action. While vehicle fuel efficiency technology has improved over time, it has not been enough to offset emissions from the increasing number of cars that Australians drive.

Figure 1 below shows that, over time, Australia's transport sector (light vehicles, heavy vehicles, domestic aviation, domestic maritime etc.) emissions (depicted as millions of tons (Megatons or Mt)) of carbon dioxide equivalent (CO₂-e) have been steadily rising, against a range of initiatives by both government and industry. This work has failed to translate into effective abatement of emissions.

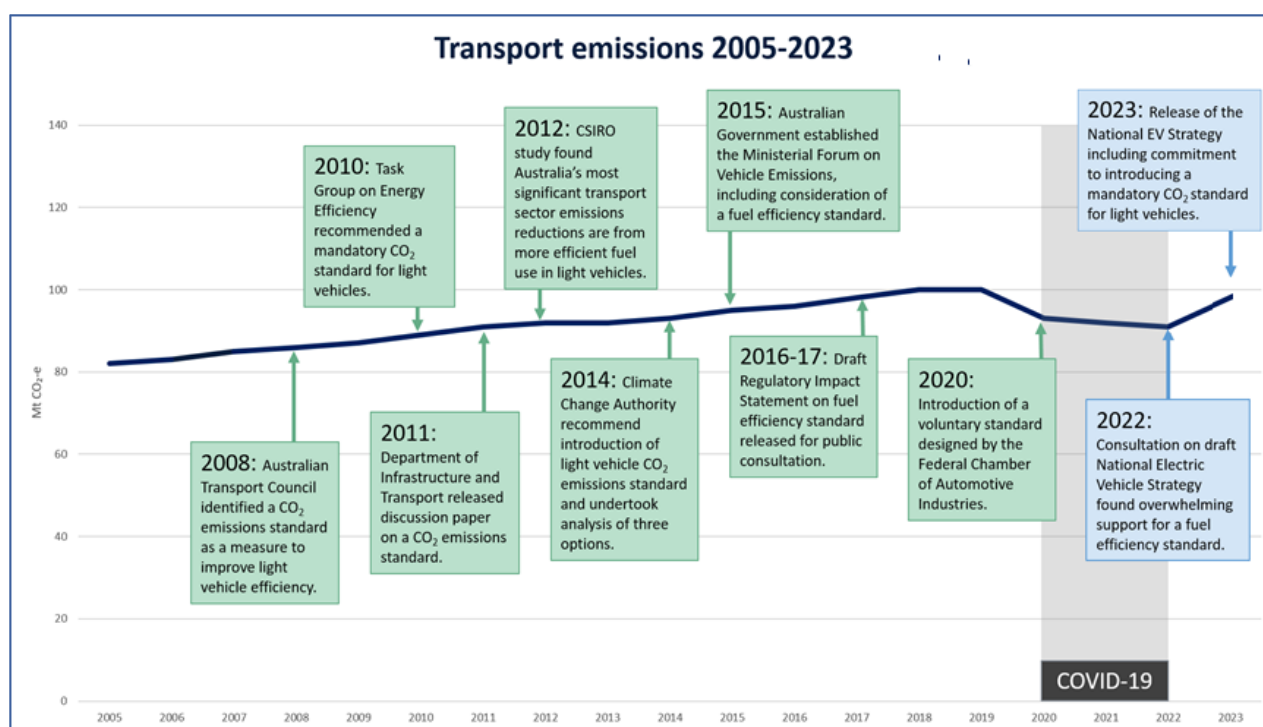


Figure 1 – Actions to consider a new vehicle efficiency standard (referred to above as a fuel efficiency standard) and CO₂ equivalent emissions, over time.

In September 2022, the Government consulted the Australian community on the proposed goals, objectives and actions for the National Electric Vehicle Strategy (NEVS), which included questions about the introduction of a New Vehicle Efficiency Standard. That consultation process received over 500 submissions from more than 200 organisations and over 1,500 individuals. The key piece of feedback we heard was that an Australian standard is critical to making sure that Australians are able to get access to the cleaner and cheaper vehicles we need, without undue barriers and costs.

More recently, in April 2023, the Government committed to implementing a standard. This was the central Commonwealth action of Australia's first NEVS and followed the overwhelming feedback from stakeholders that Australia needs a mandatory standard. The NEVS seeks to increase the supply of affordable and accessible electric vehicles, and establish the resources, systems and infrastructure to enable rapid EV uptake.

At the same time the Government released the NEVS, it also released a consultation paper (*Fuel Efficiency Standard – Cleaner, Cheaper to Run Cars for Australia*) (the Cleaner Cars consultation paper) asking for input on how the Government should design a standard suitable for Australia.ⁱⁱⁱ Around 2,700 submissions were received and the response was clear. Figure 2 provides a snapshot of that consultation process.

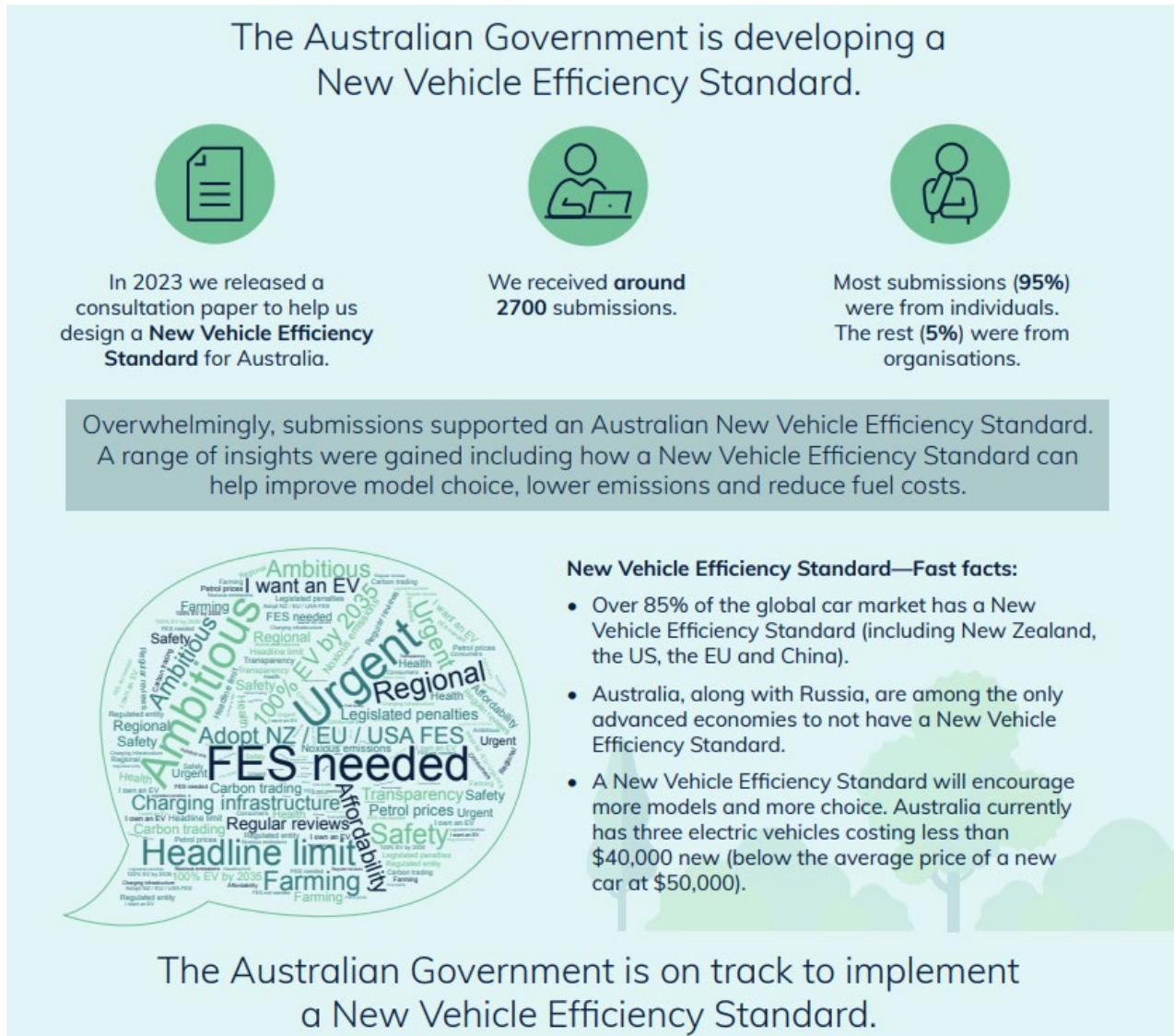


Figure 2 – Snapshot of the results of the Cleaner Cars consultation paper

Many submissions to the NVES consultation paper indicated that they could be published. As a result, around 1,200 submissions were published on the cleanercars.gov.au website.

This document represents the next, and final, consultation process to inform the Government's policy prior to the legislation process, as set out in Figure 3.

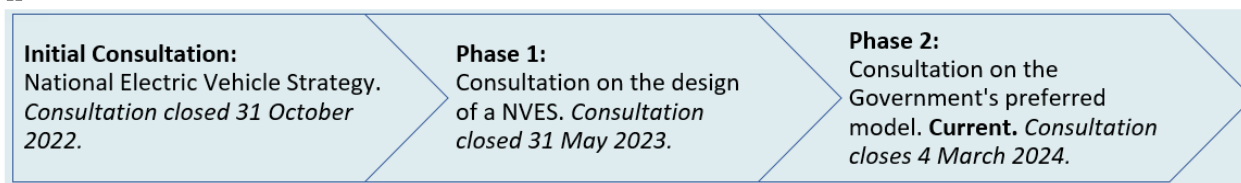


Figure 3 – Steps in developing the new vehicle efficiency standard

Following consultation on the Government's preferred option (as outlined in Chapter 7 of this paper), the Government will make an announcement on its final position, with a view to introduce legislation in 2024. Our preferred position (see Chapter 7), is that an Australian NVES would commence from 1 January 2025.

We are interested in your views. In this phase of our consultation, we have tried to streamline the process. Consequently, we have developed a questionnaire for the community to respond to. The questionnaire is on our website at cleanercars.gov.au. If you wish, there is also the option of lodging a full written submission. We request responses by 4 March 2024 and we are not able to provide any extensions.

We propose to publish all submissions and responses to the questionnaire. We have a strong preference to publish submissions, although will allow submissions from individuals to be anonymous. If you would like to include confidential information in your submission not for publication, please provide the confidential material in a separate annex to the body of your submission, and clearly mark it as confidential.

In the questionnaire, we ask questions of both the broad community and organisations. You can access the questionnaire at cleanercars.gov.au.

Questions for individuals	Questions for organisations
<ol style="list-style-type: none"> 1. What is your name? (optional) 2. Please rank the proposed options in order of preference. (optional) 3. Briefly, what are your reasons for your choice? (optional) 4. Do you support the Government's preferred option (Option B)? (optional) 5. If you wish to provide any further information, you can upload a submission using the button below. (optional) 	<ol style="list-style-type: none"> 1. What is your name? (required) 2. What organisation do you represent? (required) 3. What is your position at the organisation? (required) 4. Please rank the proposed options in order of preference. (optional) 5. Briefly, what are your reasons for your choice? (optional) 6. Do you support the Government's preferred option (Option B)? (optional) 7. Do you have any feedback on the analysis approach and key assumptions used? (optional) 8. Briefly, describe how the NVES might impact your organisation. (optional) 9. Who should the regulated entity be? See section 7.2 (optional) 10. If you wish to provide any further information, you can upload a submission using the button below. (optional)

Chapter 2: What is the policy problem you are trying to solve and what data is available?

The primary problem that Government is trying to solve is how to save Australians money on fuel, stimulate the provision of more efficient vehicles into the Australian market and reduce CO₂ emissions from new cars.

The Government is seeking to maximise access to the best vehicle technology and to reduce consumer fuel costs. An intended outcome is reducing how much Australian consumers pay at the bowser by improving the efficiency of the vehicle fleet over time.

This will support achievement of the emissions reduction targets established under the *Climate Change Act 2022* and Australia's updated Nationally Determined Contribution under Article 4 of the Paris Agreement.

Secondary considerations are improvements to the air that Australians breathe, and to improve fuel security.

This analysis considers options within the bounds of what we think is possible. The analysis we present below is on the basis that it is not feasible to 'mandate' the use of certain types of cars.

This chapter seeks to outline:

- The level of carbon pollution from new Australian cars, in the context of the transport sector overall;
- The lack of zero or low emissions vehicle choices in Australia, compared to other markets;
- The impact that high fuel prices are having on everyday Australians; and
- The data that is available about vehicle use and emissions in Australia and around the world.

2.1 Australian cars are highly polluting

Increasing concentrations of greenhouse gases in the atmosphere are warming our climate, and will continue to impact on Australia over coming decades. Land and ocean temperatures are rising, and rainfall is declining in southern Australia and increasing in northern Australia. Droughts and periods of extreme fire weather are expected to become more common, as are more intense rainfall events. The Australian Government's 2021 State of the Environment (SOE) report found that:

'long-term changes in the climate, particularly the changed incidence of extreme events such as cyclones and bushfires, place pressure on many aspects of the Australian environment. Further changes in the climate, driven by past and future emissions of greenhouse gases, will continue to make climate a major pressure on the Australian environment and communities for the foreseeable future'.

The need to reduce greenhouse gases is clear, and every sector of the economy, including the transport sector, has a role to play.

Transport is Australia's third largest source of greenhouse gas emissions^{iv} and will soon become the largest source if nothing is done. In 2023, transport emitted 98 Mt CO₂-e of greenhouse gases, representing 21% of Australia's total greenhouse gas emissions. Passenger cars emitted 41 Mt CO₂-e (42% of all transport emissions) and light commercial vehicles emitted 18 Mt CO₂-e (18% of all transport emissions). Overall, cars make up about 60% of transport emissions.

The 2023 Emissions Projections Report (Figure 4) found that while restrictions during the early period of the COVID-19 pandemic resulted in a measurable decrease in transport emissions, the pre-2019 emissions trajectory has largely resumed and is projected to increase from 98 Mt in 2023 to a peak of 103 Mt in 2027.

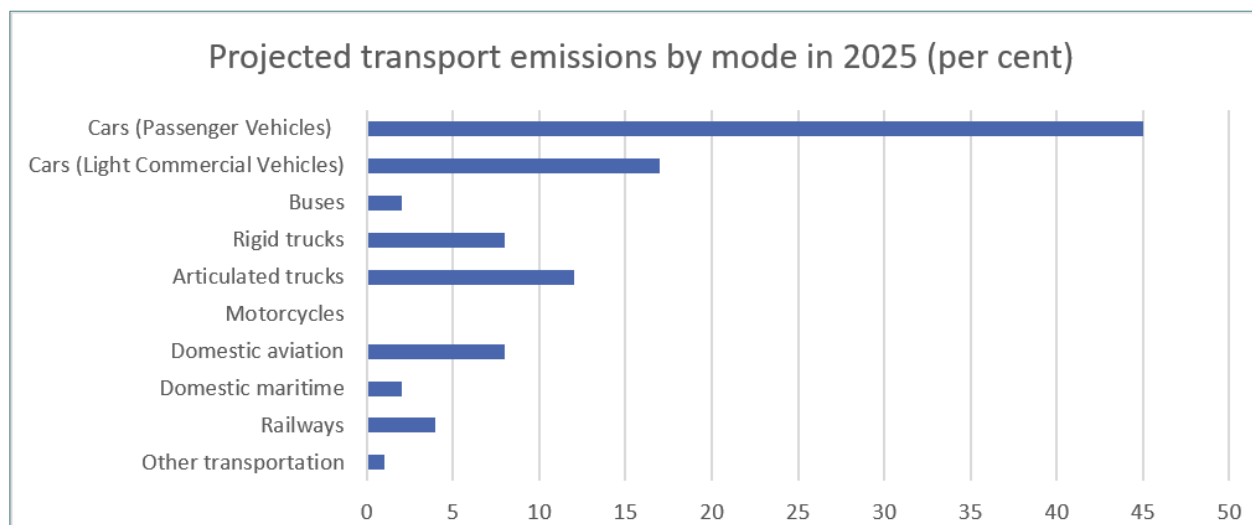


Figure 4 – Transport emissions sources – Australia’s emissions projections, DCCEEW 2023

What is a car (light vehicle)?

In this document, we use the word ‘car’ to refer to ‘light vehicle’, which (with some exceptions) are generally cars that are less than 3.5 tonnes in gross vehicle mass (GVM). We refer to two different categories of cars in this document – **passenger vehicles** (or PVs) and **light commercial vehicles** (or LCVs).

- Passenger vehicles are sedans, hatch backs, SUVs and most 4WDs. Under Australian legislation (see *Vehicle Standard (Australian Design Rule – Definitions and Vehicle Categories) 2005*) cars are further sub-categorised. Using the legislative categories, we put MA (passenger cars), MB (forward-control passenger vehicles) and MC (off-road passenger vehicles) categories in the passenger vehicle category.
- Light commercial vehicles are utes and vans. Under the legislative framework we place NA (light goods vehicles with a GVM not exceeding 3.5 tonnes) and NB1 (medium goods vehicles with GVM over 3.5 tonnes up to 4.5 tonnes) in the light commercial vehicle category.

As part of developing primary and secondary legislation, detailed work will be done to identify those vehicle types that should be exempted from a NVES. For the purposes of this document, readers should assume that heavy vehicles and vehicles subject to heavy vehicle emissions tests (i.e. large freight trucks), military vehicles, law enforcement vehicles, emergency service vehicles, agricultural, construction or mining equipment, motorhomes, horse trucks and motorcycles, would be exempt. Note that it is our intention to capture vehicles sold to the general public. We intend that any vehicle that would require a special licence (such as a heavy vehicle licence) would not be captured. Note that our focus has been on vehicles entered into the Register of Approved Vehicles through the type approval pathway. See Chapter 7 for more detail.

Growth in car emissions is driven by two factors – the number of vehicles on our roads, and the amount of emissions from each car. Over the last few decades, both have increased:

- The number of cars on Australian roads has increased from 11.9 million in 2002^v to 18.3 million in 2021.^{vi}
- Despite technological advances to increase the emissions efficiency^{vii} of new vehicles, the voluntary new vehicle efficiency standard adopted by the Federal Chamber of Automotive Industries (FCAI) and its members in 2020, and the more recent increases in the uptake of low and zero emissions

vehicles in Australia, Australia's overall vehicle emissions have not decreased, instead remaining relatively steady in recent years. In 2019 (for instance), the average new light vehicle sold in Australia produced 181 grams of CO₂ per kilometre (g/km).^{viii}

Cars in Australia are more emissions intensive compared to many other countries. In 2022, the average CO₂ intensity for new passenger vehicles (cars) in Australia was 179.1g CO₂/km, made up of 161.9g CO₂/km for passenger vehicles³ and 230.3g CO₂/km for light commercial vehicles.⁴ As Figure 5 shows, this compares to 169 g CO₂/km in the United States.

Australia's fleet-average CO₂ emissions for new vehicles in 2020 on the New European Driving Cycle (NEDC) are higher than the US by 31% for cars and 24% for LCVs (utes, light trucks and vans).^{ix}

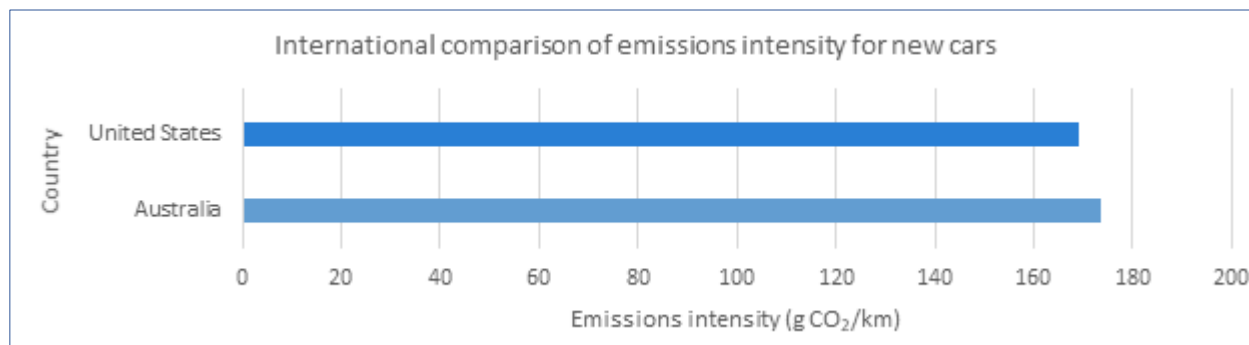


Figure 5 – International comparison of emissions intensity for new passenger vehicles

2.1.1 Australians don't currently have access to the same fuel-efficient cars as other jurisdictions...

Globally, and for decades, car manufacturers have been developing new technologies and materials designed to improve the fuel efficiency of cars. However, the type of vehicles and technologies vary depending on where the vehicle is manufactured and to which market the cars are supplied.

Compared to cars in other jurisdictions, new cars supplied to Australia use more fuel per kilometre. As outlined above, manufacturers supply cars to the Australian market that aren't as fuel-efficient as the cars they supply to other markets. Global vehicle manufacturers are not currently offering the same range of fuel-efficient vehicles, including plug-in hybrid electric vehicles (PHEV), hybrid electric vehicle (HEV) models, and electric vehicles (EVs), for distribution in Australia. In 2022, there were 500 EV models available globally, compared to 45 EV models available for sale in Australia. The US, NZ, the EU, the UK, and China all had higher numbers of EV models available than Australia. Compared to other markets, Australia also lacks access to more efficient ICE vehicles (as the average CO₂ g/km of different jurisdictions is testament to).

Stakeholders have made clear that the driver for this lack of supply is the absence of a mandatory NVES in Australia, placing Australian consumers at a disadvantage compared to those overseas. For example, in 2021, the former head of VW Group Australia, Michael Bartsch stated that “unless a CO₂ target is set [in Australia], manufacturers will continue to prioritise modern markets both for zero emission vehicles and the most efficient conventional engines”^x and that “markets where there are punitive fines if they don't are naturally first in line for zero emission vehicles”.^{xi,xii}

³ MA (passenger cars), MB (forward-control passenger vehicles) and MC (off-road passenger vehicles).

⁴ NA (light goods vehicles with a GVM not exceeding 3.5 tonnes) and NB1 (medium goods vehicles with GVM over 3.5 tonnes up to 4.5 tonnes), with exemptions as detailed in this paper

Light Vehicles Options to Increase Fuel Efficiency

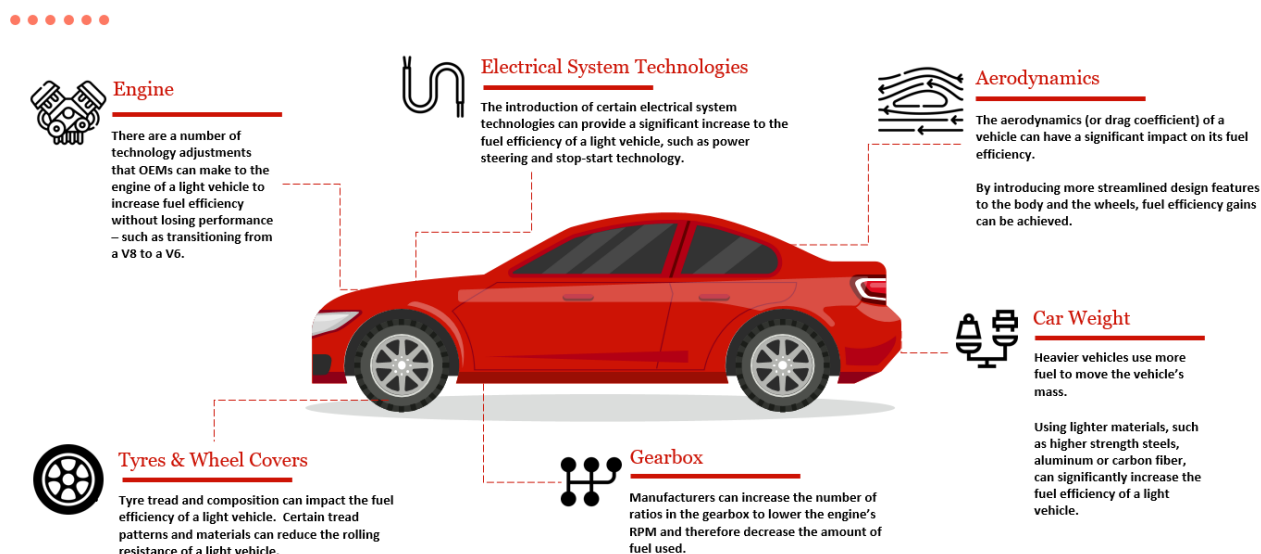


Figure 6 – How to improve the fuel efficiency of cars

The lack of improvement at the same rate as other jurisdictions is not for technical reasons. On the contrary, the fuel efficiency of a vehicle with an internal combustion engine can be improved in a number of ways, from engine design to a vehicle's weight, the type of tyres and its aerodynamics. Figure 6 demonstrates some of the technological options available to improve fuel efficiency. There are two other possibilities for why the fuel efficiency of new vehicles being sold into Australia has not improved:

- Demand side:** Over time, consumers have come to prefer larger, less fuel-efficient vehicles. Consumers tend to undervalue fuel cost savings when purchasing. In order to make a choice, individuals may rely on pertinent information such as relying on a brand or model they have previously purchased; accepting personal recommendations from friends or family; or focussing on simplified choice criteria on a subset of features.^{xiii} Similarly, the Australian Competition and Consumer Commission finds that purchase price and vehicle type have the strongest influence on purchasing decisions, and fuel efficiency is regarded as just a consideration.^{xiv}
- Supply side:** Suppliers preference other markets with effective mandatory CO₂ reduction regimes and may seek more time to recoup the production and development costs of existing ICE vehicles in markets where there are no standards, such as Australia.^{xv} Suppliers to the Australian car market have acknowledged that the lack of a federally regulated mechanism to reduce tailpipe CO₂ emissions is a strong driver of their inability to secure a greater supply of fuel saving technology, hybrids and EVs for Australian consumers.^{xvi,xvii} We can see in our own analysis that it can be advantageous financially for suppliers to preference jurisdictions with regulations in place over Australia (i.e. if a supplier fails to meet its obligations in the EU, it faces substantial financial penalties). On top of this, vehicle suppliers have told us that they place a very high value on being compliant with jurisdictions' CO₂ emissions standards (far beyond the financial cost of penalties) because of the reputational harm of having penalties applied against them.

What is clear is that demand side and supply side measures need to work together to deliver a real reduction in fuel costs and car emissions, and to get the best technology for Australian consumers. The Government has already put in place programs to address demand side failures by improving consumer knowledge of fuel efficiency of vehicles. In particular, there are already regulatory obligations for suppliers to put in place fuel consumption labels, the Green Vehicle Guide has been updated and is functioning well (see www.greenvehicleguide.gov.au) and the Government has recently put in place a Real-World Testing (RWT) program (see www.aaa.asn.au/realworld).^{xviii} As these programs are already in place, and in the case of the RWT program, nascent, it would be premature to consider their effectiveness. Therefore, we proceed in this document mostly focussed on supply side failures.

2.1.2 ...and we're spending more on fuel than ever before

The price Australian households pay for fuel has been steadily increasing for decades, and we're driving more kilometres each year than ever before. According to the ABS Survey of Motor Vehicle Use, Australians drove 215,212 million kilometres in 2020.^{xix} Even allowing for population and car number increases, the fact remains, Australia is a country that relies on cars.

Australian Institute of Petroleum figures show that in September 2023, the national average fuel price hit a high of 204.4 cents a litre, putting pressure on the budgets of households and businesses alike. Figure 7 demonstrates that prices have risen sharply since the COVID-19-induced downturn.

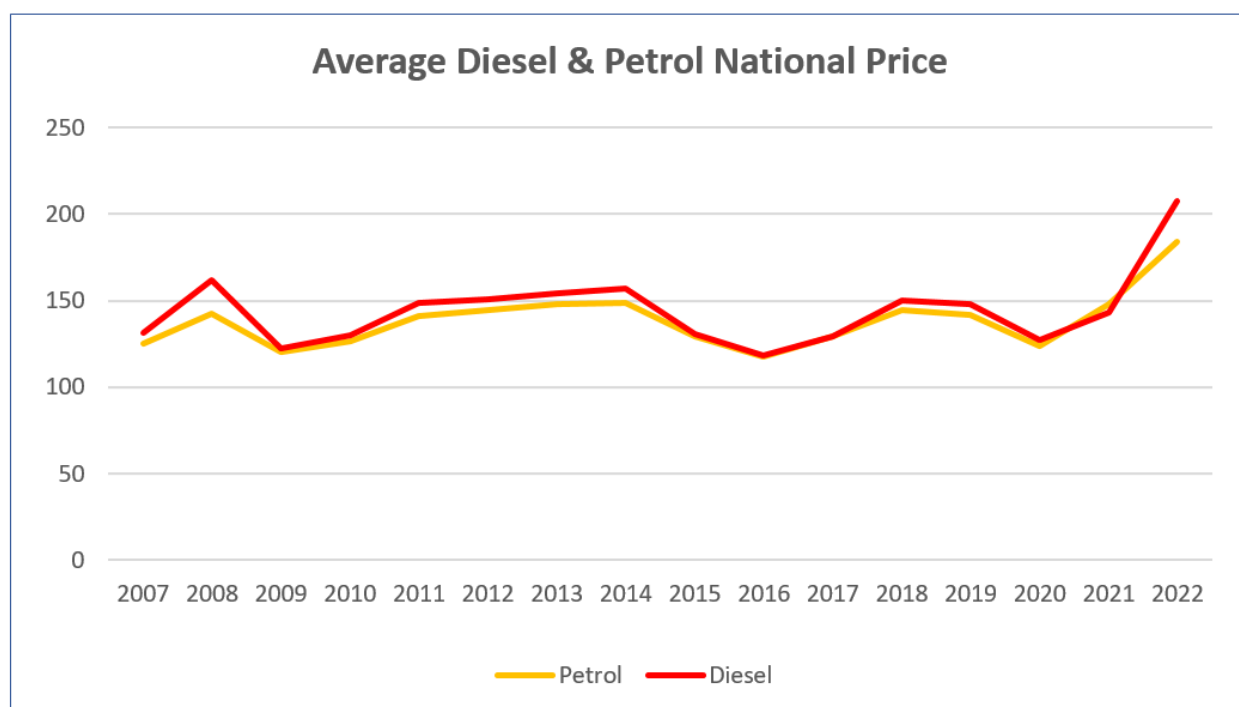


Figure 7 – Petrol and diesel price over time

Fuel prices can be influenced by a myriad of global and local factors; most recently, Australian fuel prices have been affected by the COVID-19 pandemic and global supply issues because of the war in Ukraine and events in the Middle East. Domestically, location also plays a part, with fuel prices in regional locations being more stable. But automotive fuel expenses in regional areas are also affected by other factors that increase the cost of fuel and do not apply to city locations, such as:

- less competition and discounting due to smaller demand
- higher storage and transportation costs
- less demand for convenience sales (which act to keep fuel prices down)
- highway locations of outlets.^{xx}

The Australian Automobile Association publishes a transport affordability index. The most recent results for that index show that on average, motorists in capital cities are paying around \$100 a week in fuel costs or around \$5,215 per year. The regional average is around \$103 per week or \$5,380 per year.^{xxi} According to this index fuel is the second largest expense faced by motorists, behind car loan payments.

Reducing Australia's exposure to the volatile international liquid fuel market not only provides monetary benefits to consumers as identified above, but also reinforces the Government's commitment to ensuring Australia's fuel security. The Government's existing fuel security measures largely relate to ensuring Australia has a resilient supply, storage and refining capacity.^{xxii} Despite these measures, Australia is not immune to the price shocks caused by the actions of international actors or events including the Russian

invasion of Ukraine or instability in the Middle East.^{xxiii} Over time, a NVES could reduce consumer demand for imported oil as the supply of more fuel-efficient vehicles increases.

Will a NVES make cars more expensive?

Some stakeholders have asked if a NVES will make cars more expensive. The intention of the NVES is to require vehicle suppliers to include more modern fuel-saving technology in the new cars sold to Australian consumers, and for suppliers to provide an increasing range of hybrid variants and EVs. Evidence to date consistently finds no purchase price impact, or a negligible purchase price impact, for consumers.

The experience in the US and the EU, which have long standing fuel efficiency regulations, and New Zealand, which implemented an ambitious fuel efficiency standard in 2023, doesn't show a vehicle purchase price increase. A 2023 study in the US by the consumer organization Consumer Reports found "After adjusting for inflation, vehicle prices didn't increase during the time period studied – model years 2003 through to 2021 – even as average fuel economy increased 30% and proven lifesaving technologies became common."^{xxiv}

Similarly, a 2017 report by the International Council on Clean Transportation found "Fuel economy standards in the United States – a technology forcer – do not appear to have had any significant effect on real vehicle prices faced by consumers."^{xxv} A report to the European Union of the actual performance of EU Regulations 443/2009 and 510/2011 in 2015 found that comparing car retail prices is challenging because consumers are offered numerous features and discounts.

This report also stated "It is difficult to find evidence that legislation has actually led to real-world increases in end user prices, and indeed data from ICCT (2014c) suggests that retail prices adjusted for inflation have remained the same or slightly decreased for most segments, with the exception of sports cars (which are unlikely to be relevant to low-income consumers). In addition, when assessed in terms of maximum engine power output (a measure of vehicle performance), there does not appear to have been any compromise in consumer utility."^{xxvi}

The same study found that the technology costs to manufacturers were much lower than anticipated. The empirical costs of meeting the standard were estimated at EU€183 per car for passenger vehicles (approximately AUD \$300), and EU€115 (approximately AUD \$190) for light commercial vehicles. As noted above, this study did not find evidence that even this very small cost was passed on to consumers in the form of higher prices.

Chapter 3: What are the objectives, why is government intervention needed to achieve them, and how will success be measured?

In this chapter we seek to explain:

- the context of the Government's commitment to act on climate change
- alternatives to Government action
- the ability for Government to act
- the objectives of Government's actions;
- the barriers to action; and
- how success against the Guiding Principles will be measured.⁵

3.1 Government is committed to cut CO₂ emissions

Australia's policy is to reach net zero by 2050. The Government is committed to reducing greenhouse gas emissions and is party to a number of international partnerships and agreements, such as the Paris Agreement and the Kyoto Protocol. The Paris Agreement aims to strengthen the global response to the threat of climate change by holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit temperature increase to 1.5°C.

Australia needed to act, and in June 2022 the Australian Government updated its Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC), committing to reduce greenhouse gas emissions to 43% below 2005 levels by 2030. In September 2022, the passage of the *Climate Change Act 2022* enshrined this in law, as well as our most significant commitment yet—net zero by 2050.

To achieve these objectives, the Government must pursue emissions reductions across every sector, including from light passenger and light commercial vehicles. According to *Australia's Emissions Projections 2023* (DCCEEW, November 2023), transport represents the third largest source of emissions in Australia, behind electricity generation (35%) and stationary energy (20%) and is projected to be Australia's largest source of emissions by 2030.

⁵ Refer to Chapter 8 for more detail on implementation, including how success will be measured.

3.1.1 Alternatives to Government action – such as a voluntary scheme – will not deliver more fuel-efficient new cars

Over time, manufacturers of cars have made incremental improvements that provide some increases to fuel efficiency. However, the rate of these business-as-usual improvements has been modest and projections suggest they will fall significantly short of achieving whole of economy legislated emissions targets. In 2020, car manufacturers adopted a voluntary new vehicle efficiency standard (voluntary standard) designed by the (Australian) Federal Chamber of Automotive Industries (FCAI). Under the FCAI's voluntary standard, its members have agreed to meet year-on-year CO₂ emissions reduction targets.

Because it is voluntary, and the absence of monetary consequence if the standards are not met, the voluntary standard has not provided sufficient incentive to introduce more effective fuel efficiency technology to cars supplied to the Australian market.^{xxvii, xxviii} The FCAI noted in its release of 2022 results for its voluntary standard that *“the 2022 results demonstrated the challenges of transitioning to a zero-emission light vehicle sector in Australia, especially in the absence of a Government mandated CO₂ standard.”*^{xxix} The voluntary standard has not been effective at substantially reducing emissions. Table 1 below shows average emissions from new passenger vehicles has only marginally decreased since the introduction of the voluntary standard, and gone up for light commercial vehicles.

	Average tailpipe emissions (g CO ₂ /km)	
	2019 (pre-voluntary NVES)	2022
Passenger vehicles (MA category)	158	150
Light commercial vehicles (MC+NA)	219	220

Table 1 – Performance of the voluntary standard

As demonstrated, the existing industry voluntary standard is not providing sufficient incentive for global car manufacturers to provide the best fuel saving technology to the cars Australians buy. While the incremental rate of technological improvements and business as usual increases to EV uptake is modestly reducing emissions intensity in the passenger vehicle category, it is also not providing sufficient abatement to support the Government's economy wide emissions reduction targets. The rate at which electric vehicles are supplied to the Australian market is improving with time (8.4% in the first three quarters of 2023, up from 3.4% of total vehicle sales in the same period of 2022),^{xxx} but this also remains well below the necessary rate to achieve substantive emissions reduction. Consequently, we conclude that the New Vehicle Emissions Standard is the most effective available action to encourage the supply of fuel saving technology.

3.1.2 The Government can build on an existing framework to regulate CO₂ emissions

The Australian Government does not currently regulate the CO₂ emissions of cars directly. The *Road Vehicle Standards Act 2018* (RVSA) was put in place in 2018, and replaces the *Motor Vehicle Standards Act 1989*. Under the RVSA, a range of vehicle standards can be established, covering:^{xxxi}

- safety;
- the control of the emission of gas, particles or noise from road vehicles;
- security against theft;
- security markings; and
- energy savings.

In particular, while the department does not regulate CO₂ emissions, it does regulate other emissions including sulfur, particulates and other noxious emissions through the RVSA. The department also operates the Green Vehicle Guide website, which provides consumers up to date information about CO₂ emissions from new cars. The department's established role as a regulator of light vehicles demonstrates the capacity for Government to intervene successfully in regulating emissions from cars. NVESs are also in

place around the world, including the EU, US, UK and New Zealand, and the department engages with counterparts around the world on NVES policy design and implementation. Work is underway to develop the relevant regulatory schema, and additional information on this aspect is available in Chapter 7.

3.1.3 Success measures were established through the Cleaner Cars consultation paper

As outlined in Chapter 2, the Government's key objective is to reduce CO₂ emissions from new cars. The secondary problem we are considering is how to maximise access to the best vehicle technology to reduce consumer fuel costs. In the Cleaner Cars consultation paper, we set out a range of principles, and sought feedback on those principles. We propose, along with standard cost benefit analysis outputs, to use those principles to assist us in assessing the merits, or otherwise, of the proposed option. An outline of those principles, and how we measure success against those measures is set out in Table 2 below.

Guiding Principle	Guiding Principle success measure
Effective: Effective in reducing CO ₂ transport emissions from new cars.	The percentage reduction in average CO ₂ emissions and fuel costs from Australia's new cars, out to 2050.
Equitable: All Australians can access the vehicles they need for work and leisure. Intervention needs to be equitable, and not unduly negatively impact any particular group of people or part of Australia.	A design which does not disadvantage small or affordable vehicles, to protect the continued supply of these vehicles to the Australian market. Ensure that people generally, and specific cohorts, have access to fuel-efficient vehicles.
Simple and transparent: Intervention emphasises simplicity and transparency in design and operation.	Design and implement a process which leverages existing regulatory frameworks and touch points with Government, while providing accessible information to both consumers and industry stakeholders. A streamlined NVES design which avoids design features which add complexity, increase administrative complexity, and reduce transparency.
Credible and robust: Intervention should be designed with the latest and best analysis available, drawing on the expertise of industry, the environmental community, academia and others.	Analysis is of a high quality, and is accepted by the Office of Impact Analysis. Consultation is broad and includes all key stakeholders. Ongoing opportunity for stakeholders to provide feedback on operational matters, and ability to influence policy settings through reviews.
Enabling: Vehicles with the best emissions and safety technology to be available to Australians. Avoid increasing the average age of vehicles in the fleet so there are no inadvertent safety impacts.	Consider scrappage rates, and whether the average age of the car parc ⁶ will increase.

Table 2 – Principles against which the Government’s option is assessed

⁶ ‘Car parc’ is a term used by to all of the vehicles in operation at a given time.

3.1.4 There are a range of other factors, that could cause barriers to achieving our objectives

Beyond the issues outlined in this paper to date, there are also a range of other barriers that could give rise to challenges in achieving the Government's policy objectives.

- **Infrastructure limitations:** Improving the take up of fuel-efficient vehicles may be hindered by inadequate infrastructure, including the lack of charging infrastructure for electric vehicles and the limited availability of alternative fuels.
- **Supply chain complexities:** Manufacturers may encounter supply chain challenges in relation to the critical minerals and other resources needed for the manufacture of zero emissions vehicles. As all new cars sold in Australia (that are registered on the Register of Approved Vehicles (RAV)) are manufactured outside of Australia, any global instability can have an adverse impact on supply to Australia overall, and not just for fuel-efficient vehicles.
- **Consumer awareness and education:** A lack of awareness and understanding about the fuel efficiency of cars as well as new zero emissions technology, could mean that consumers are hesitant to take up new technology such as hybrids or electric vehicles.
- **Technological advancements:** Rapid technological advancements can both help and hinder progress. While new innovations provide opportunities for fuel efficiency, they can also render existing technologies obsolete.

Chapter 4: What policy options are you considering?

As outlined in chapters 1 and 2, the primary objective of Government action is to reduce CO₂ emissions from new cars. This chapter sets out:

- The key mechanism under review - a NVES, and how that mechanism works;
- How we developed the options; and
- What the baseline, or business as usual/do nothing, scenario is.

4.1 What is a new vehicle efficiency standard?

NVESs have been used across the globe as a way of reducing emissions while also improving consumer outcomes through fuel savings, better vehicle technology and better vehicle choice. The US, the UK, Canada, Japan, South Korea, the EU, NZ and China all have a NVES in place. Australia, along with Russia, is one of the only advanced economies to not have a NVES in place.

A NVES works by imposing a limit on CO₂ (measured in grams per kilometre or CO₂ g/km) each year across the fleet of vehicles that a supplier brings into the country. Each year the limit is reduced, so the standard becomes more stringent. Suppliers can still sell any vehicle they like, but will need to sell more clean cars to offset higher emission cars they sell. If suppliers sell more fuel-efficient cars than the target, they get credits. If they sell more polluting cars than the target, they need to buy credits from a different supplier or, eventually, pay a penalty. Unlike some other regulated requirements in the vehicle sector which are binary (i.e. either the vehicle meets the standard or it does not), the settings and stringency of a NVES can be set at a range of different stringency levels.

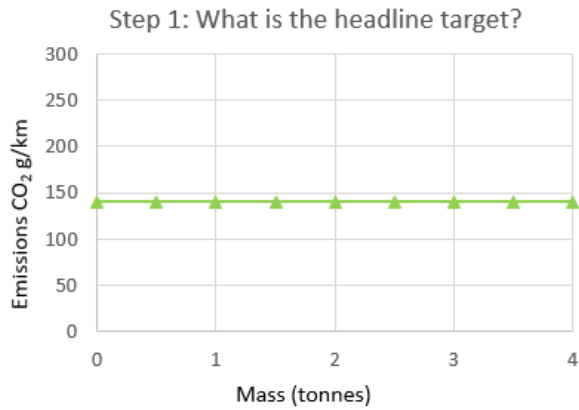
4.1.1 How does a NVES work?

It is important there is a sufficient working understanding of NVES basics, so we have confidence in how it will be regulated fairly, to achieve Australia's emissions targets. First, some key definitions:

- **Mass:** Mass refers to the weight of a vehicle. For the purposes of this analysis we generally refer to the concept of 'mass in running order' or MIRO, which is the weight of a vehicle with fluids, accessories, plus the weight of a person in the vehicle.
- **CO₂ g/km:** This is the number of grams of carbon dioxide emitted by a vehicle per kilometre. For example, a car with 150 CO₂ g/km emits 150 grams of CO₂ for every kilometre it is driven, in the laboratory emissions test.
- **Headline target:** The headline target is the CO₂ g/km target that a NVES sets for a supplier. Usually, a standard sets a target beyond which more (or less) of a thing is not permitted. For example, in Australia we have fuel quality standards that require there to be up to 150 parts per million of sulphur in regular unleaded petrol. Unlike the fuel quality standard, a NVES is an attribute-based standard, in that the target for each vehicle supplier (the permitted level of CO₂ g/km) is adjusted by the average mass of the vehicles sold (so a higher target generally applies to a heavier vehicle fleet). There are penalties applied for a fleet being above the target. No car is prohibited.
- **Passenger vehicle/light commercial vehicle:** In Australia and around the world, cars are categorised. There are two basic categories (we explore a greater number of categories below) – passenger vehicles (PVs) and light commercial vehicles (LCVs) (see explanatory box on page 17).

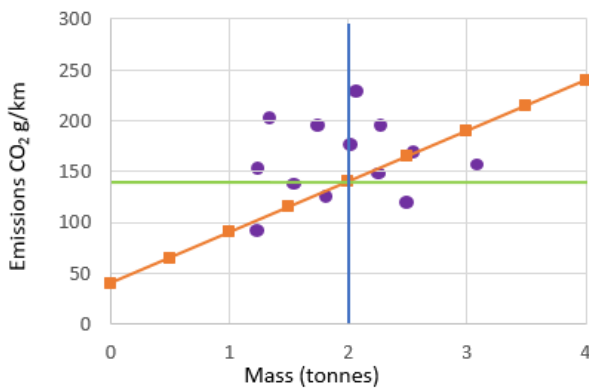
With that terminology understood, the development of the technical NVES settings needs to be undertaken in steps. We have sought to break down how a NVES applies into the four steps below. This same process can be undertaken every year, or at each regulated review – usually so that the standard becomes more stringent over time and suppliers need to continually improve the efficiency of the

vehicles that they sell. Note that the diagram below is simplified. In particular, the diagram does not show the application of break points (explained in section 4.1.2) and the process in step 4 is undertaken continuously over a given year (in the Australian context, when a supplier places a vehicle on the Register of Approved Vehicles (RAV)).

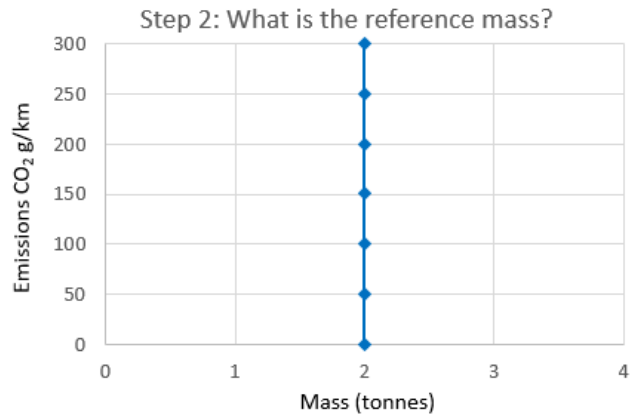


A key policy setting is to select the headline target. The headline target determines, in general, how stringent the NVES is. A new headline target is used each year, and is usually reduced. In this example, we've picked 140 g/km.

Step 3: Draw the fleet curve

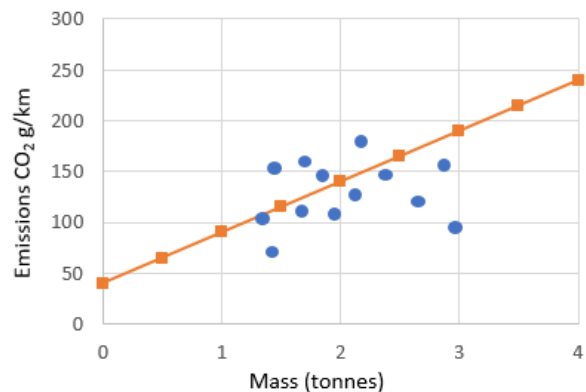


With these two lines in place, we then overlay the results of vehicles two years prior (purple dots in diagram above). This data is used to draw a line of best fit of the scatter plot of vehicles, that intersects at the point that headline target and reference mass lines cross (the orange line in the diagram above).



Next we need to determine the reference mass. This is the average mass of all vehicles sold two years prior, in each category (PV and LCV). In this example we've picked two tonnes.

Step 4: Using the curve



With the fleet curve drawn, the curve can be used. The emissions and mass of the current fleet are plotted on the graph (blue dots in the diagram above). For every vehicle below the fleet curve, a supplier gets a credit. For every vehicle above the line a supplier gets a debit.

Figure 8 – How a NVES applies

Because they are not policy settings per se, the department has already calculated the reference mass, along with the slope of the line of best fit for the fleet curve. The results are in the table below.

Element	Passenger vehicles	Light commercial vehicles
Slope	0.0663	0.0324
Reference mass (Mass In Running Order)	1,723 kg	2,155 kg

Table 3 – Slope and reference mass

4.1.2 Common features of a NVES

While the settings can be complex, what a NVES seeks to do is straightforward – reduce the average level of emissions from cars over time. NVESs across the globe share a range of different additional features, and there are some assumptions which we think are suitable in the Australian context.

- **A NVES only applies to new cars:** A NVES only applies to new cars – so once sold for the first time a car would no longer be captured. In the Australian context, a NVES would apply at the point at which a vehicle is entered onto the RAV which is a register of vehicles imported and manufactured in Australia, through the type approval pathway under paragraph 15(2)(a) of the RVSA⁷.
- **Exceptions apply:** As part of developing legislation, detailed work will be done to identify those vehicle categories that should be exempted from a NVES. For the purposes of this document, readers should assume that heavy vehicles and vehicles subject to heavy vehicle emissions tests (i.e. large cargo trucks), military vehicles, law enforcement vehicles, emergency service vehicles, agricultural, construction or mining equipment, motorhomes, horse trucks and motorcycles, would be exempt.
- **A target is set each year:** In each year of a NVES, a target is set. In the options identified, five years of targets are set (from 2025-2029), with a review in 2026 to confirm targets. Headline targets are established for both Passenger Vehicles (PVs) and for Light Commercial Vehicles (LCVs)
- **Suppliers that beat the target get credits which can be traded and suppliers that do not meet the target get debits, and credits and debits can be banked for a limited period:** When a supplier sells a car that beats the standard, it gets a credit. When a supplier sells a car that fails the standard, it gets a debit. A supplier can use credits to pay for debits (or, eventually, pay for penalty), and credits can be traded between suppliers or banked for a limited period. This means that suppliers can still sell cars with emissions levels above the target – but they need to sell more less-polluting cars, buy credits or (eventually) pay a penalty to make up the difference. In some markets, suppliers can ‘pool’ their fleets together. For example, supplier 1 and supplier 2, might decide to form a pool together such that the weights and emissions of their fleets are calculated together. Eventually, a debit will expire and become a penalty that will need to be paid. This process is explained in more detail in Chapter 7.
- **Supercredits can apply for certain types of vehicles:** Sometimes NVESs give a ‘supercredit’ for certain types of cars to incentivise those sorts of vehicles. For example, in Option A below, there is consideration of a supercredit (which counts as multiple credits) for every EV supplied (three times multiplier), plug in hybrid (two times multiplier) and efficient ICE (likely hybrid) (1.5 times multiplier). Supercredits can help encourage the supply of particular vehicles, but also dilute the effectiveness of the scheme – the more credits in the system, the less abatement occurs.
- **Concessions are made to heavier cars:** A NVES gives heavier cars a relatively higher CO₂ target because it is recognised that some consumers (such as small businesses and trades people) legitimately need a bigger car for their work. The fleet target (described in Figure 8 above) reduces the disadvantage that heavier (or larger) vehicles have, because heavier vehicles naturally use more fuel. In other words, the fleet limit curve is a way of adjusting the headline limit for a specific car to account for its weight, as a proxy for the use for which the vehicle is required. For example, the headline target might be set at 141 g/km (as in Option B in 2025) but for a car that weighs 1,950 kg, the effective target for that vehicle would be 156 g/km, or a 1,500 kg car would have an effective individual target of 126 g/km.

⁷ A mechanism will be available to expand the scheme to vehicles in the concessional RAV entry approval pathway (and other pathways if created) if necessary in the future (see sections 15(2)(b) and (c) of the RVSA).

- **...but the concessions for very heavy and very light vehicles have a cap:** 'Break points' are points on the fleet limit curve that are flattened out. They are used in the US NVES to place a cap on how much the fleet limit curve helps heavier cars (or in the US, larger cars) and vice versa for lighter cars. For example, in the Option B presented below the break points for passenger vehicles (PVs) are at 1,500 kg and 2,000 kg. This means that in 2025 in Option B, all cars below 1,500kg have a target of 126g CO₂/km, rather than have a target that continues to reduce as the vehicle gets lighter. Conversely, all cars in the passenger vehicle category that weigh over 2,000kg have a target of 159g CO₂/km. The light commercial vehicle category has a higher break point of 2,200kg, accounting for the larger and heavier vehicles in this category. Again, under Option B, in 2025, all vehicles above 2,200kg have a target of 200g CO₂/km.
- **Off-cycle credits can apply for certain technologies fitted to vehicles:** In some markets additional credits are provided to vehicles fitted with technologies such as active aerodynamics, engine stop-start or ventilated seats, that ostensibly reduce the emissions of the vehicle in a way not measured in the emissions test. A similar credit is available in some markets for cars that use low global warming potential air conditioning refrigerant.

Do EVs release more emissions than ICE vehicles over their lifetime?

We have heard concerns that EVs don't add up environmentally over the life of the vehicle. NVESs focus on vehicle tailpipe emissions, encouraging the sales of vehicles that use less fuel per kilometre to increase the sale of cleaner, cheaper to run cars. This includes EVs, but also more fuel-efficient ICE vehicles. The operation of NVESs in other global markets do not generally consider the emissions that may be generated in the manufacturing of the vehicle, charging an EV or at the end of a vehicle's life. There are a number of reputable sources that provide good evidence that EVs have much lower emission than ICE vehicles over their whole lifecycle:

- Modelling by the Bureau of Infrastructure and Transport Research Economics finds that while manufacturing a new EV may produce more GHG emissions than an internal combustion engine vehicle, this is more than offset after about one year if the vehicle is charged entirely from renewably-sourced electricity (e.g. home solar) and two years if charged from the grid (using a mix of electricity generation sources).
- International studies also find EVs purchased today produce far fewer emissions over their lifetime than ICE vehicles, even when factoring in battery and car manufacturing emissions, electricity grid emissions from charging, and the emissions from comparable fuel production. This was found in countries with a range of NVES settings, including 66–69% lower in Europe, 65% lower in the UK, 60–69% lower in the United States, 37–45% lower in China, and 19–34% lower in India.^{xxxii,xxxiii,xxxiv}
- Fully electric vehicles also reduce emissions more than hybrids. Battery electric vehicles reduced CO₂ emissions on average by 69% compared to a petrol engine, while hybrids only reduced CO₂ emissions on average by 21% and plug-in hybrids saw on average a 26% reduction in CO₂ emissions over their lifecycle.^{xxxv} ICCT's analysis of Europe, US, China and India found that of all vehicle types, battery electric vehicles provided the highest certainty for emissions reduction over the lifetime of vehicles.
- Australian research in 2018 found CO₂ emissions were 29-41% lower for an EV than for a petrol car.^{xxxvii} The analysis found emissions vary depending on your location – for example, the greener Tasmanian energy grid, saw 70-77% less emissions per kilometre driven. As the Australian electricity grid further transitions to renewable energy, the emissions from charging a vehicle will continue to reduce. Future improvements in battery technology, battery manufacturing and end-of-life treatment are also expected to continue to reduce the emissions.
- In 2023, the UN established a working group to develop global standards for measuring the carbon footprint of different vehicles.^{xxxviii} The latest EU regulations also include a requirement that a lifecycle assessment methodology is developed for manufactures to use by January 2026. While questions have been raised about the emissions from making vehicles, particularly battery production and recycling, as well as charging an EV using fossil-fuel powered sources, it is clear there are environmental benefits to be gained today, and even more to be gained in the future.
- The IPCC and IEA have both identified that EVs powered by renewable electricity as having the largest emissions reduction potential for land transport. This technology will be crucial for achieving Australian and global emissions reduction targets.^{xlxi}

4.2 What options are we considering?

In the Cleaner Cars consultation paper, we asked what NVES options we should consider. The responses we received discussed individual design features, and in some cases offered a comprehensive model. We considered the merits of each design feature individually, and collectively, based on stakeholder feedback and analysis of the best international research on NEVs to inform the options we developed.

Based on submissions received, along with our own analysis, we have developed three options set out below: slow start (Option A), a fast but flexible start (Option B), and a fast start (Option C). None of the

options precisely mirror any particular stakeholder's views, but represent groups of positions. Based on our analysis of stakeholder positions:

- Baseline is the do-nothing scenario which is the forecast of a scenario without a NVES. There are no additional benefits or costs associated with this scenario, and the options below are measured as change against this scenario.
- Option A is an amalgamation of views of stakeholders that would prefer a more modest and cautious approach.
- Option B is the Government's preferred position based on the arguments presented in the phase 1 consultation, seeking to balance ambition and achievability.
- Option C is an amalgamation of views of stakeholders that would prefer the most stringent and ambitious approach possible.

4.3 What is the baseline scenario?

The Government requires all impact analyses to include an analysis of a business-as-usual (BAU) option to act as a benchmark. The cost benefit analysis (CBA) for any remaining options is then calculated relative to this, so what would have happened under existing policy settings is not attributed to any proposed intervention.

Under a BAU option, the Government would not intervene further and instead rely on existing policies to improve abatement from new cars. There is no existing policy to require any form of CO₂ performance by vehicle manufacturers, or their Australian suppliers. As such, all reduction in emission intensity in the BAU scenario is due to a modest improvement in ICE efficiency and organic increased LZEV uptake as Australia follows (but lags) global movement to low emissions, cheaper to run transport.

Under the BAU scenario, a growing proportion of vehicles entering the Australian market will be hybrids and EVs by virtue of their adoption in overseas markets. However, this would occur at a much slower rate than under a mandated standard, as pressures encourage manufacturers to direct their most efficient vehicles to countries with NVESSs.

EV uptake under BAU is constrained by the limited supply of these vehicles to Australia and the fact that suppliers have strong incentives to divert any supply of EVs and ZEVs into markets with NVESSs. In the absence of a NVES, Figure 9 below represents the total amount of emissions expected under BAU.

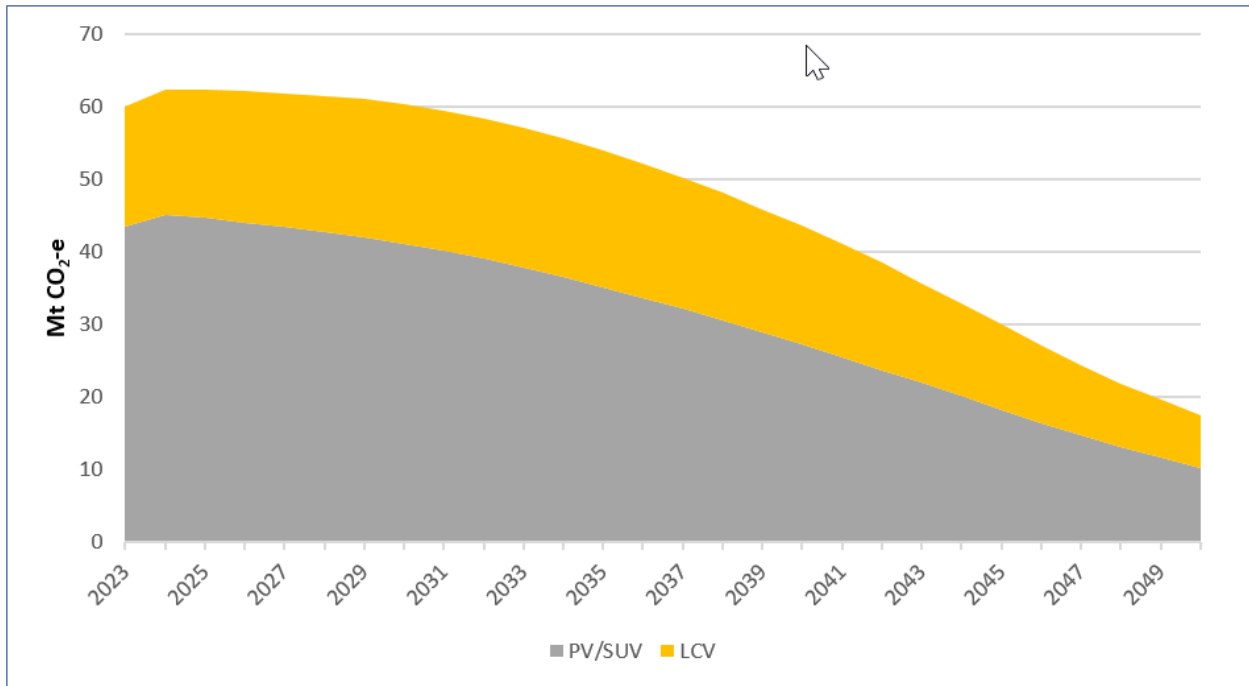


Figure 9 – Total amount of emissions expected from BAU

In the chart, we have plotted what we think the total emissions from PVs and LCVs are out to 2050. This shows that emissions do reduce over time, as consumers gradually take up more efficient vehicles. Given its importance, we have also plotted the BAU take up of EVs in Figure 10 below. This forecast is based on a synthesis of projections from Bloomberg New Energy Finance and the Department of Climate Change, Energy, the Environment and Water (see Appendix B for a full list of assumptions). Assumptions that lead to a higher take up of lower emissions vehicles, would lead to higher benefits and lower costs.

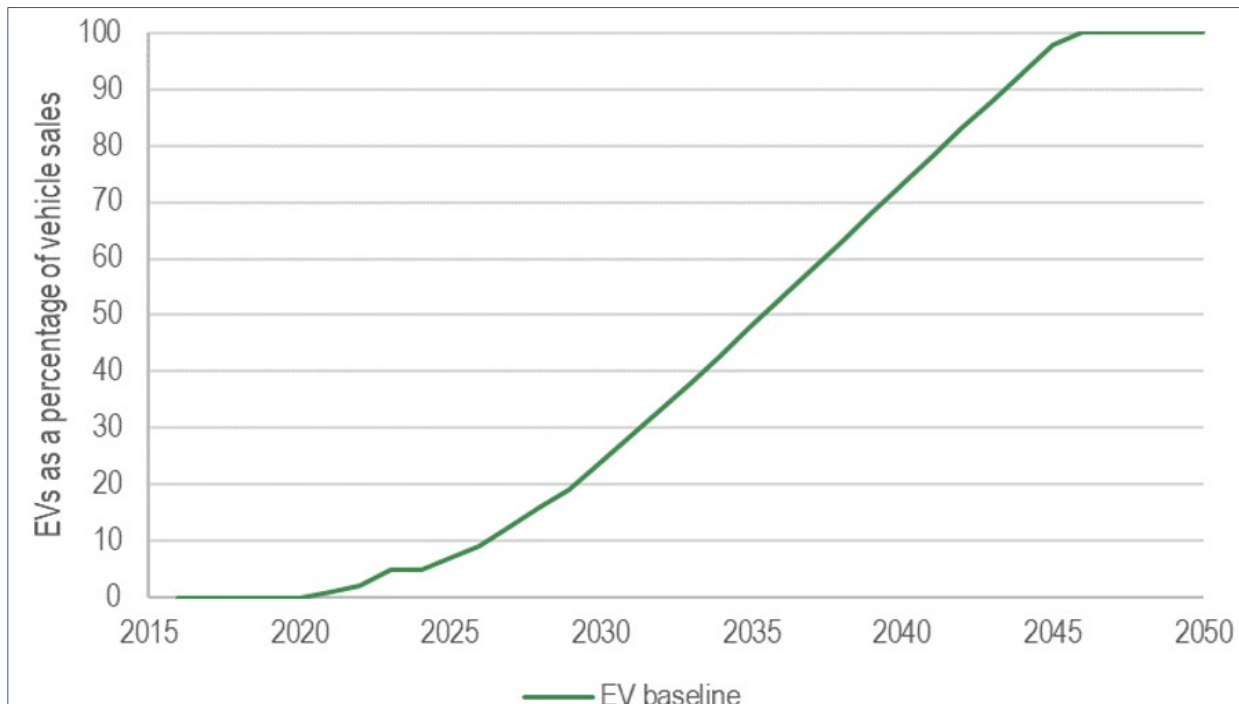


Figure 10 – BAU EV uptake

It is important to note that cars can have a relatively long asset life. In the projections we present in this analysis, we do not assume the scrappage rate changes over time. Our analysis assumes that approximately 64% of PVs and 49% of LCVs are removed from the fleet before they are 20 years old, and

that 87% of PVs and 71% of LCVs are removed from the fleet before they are 25 years old. Around half of all cars are scrapped before they are 21 years old.

There are no additional benefits or costs associated with this as the baseline proposes no change to existing policy settings. Note that all costs and benefits, including abatement, is calculated relative to the baseline.

ELEMENT	Option A	Option B	Option C																																																																								
<p>Headline target</p> <p>The headline CO₂ target and how it should change over time.⁸ The headline target is one of the key parameters to develop a NVES, and the key parameter stakeholders focus on in assessing the ambition of a NVES.</p> <p>US current average reduction rate: ~9% per annum.</p> <p>Australia baseline forecast reduction rate: ~4% per annum (PVs), 2% per annum (LCVs).</p>	<p>Slow start and broadly equivalent rate of decline as the US NVES.</p> <p>Two CO₂ targets, one for passenger vehicles and a higher target for light commercial vehicles, but includes many SUVs in the light commercial vehicle class, along with utes and vans.</p> <p>No catch up.</p> <table border="1"> <thead> <tr> <th>Year</th> <th>PV CO₂ (g/KM)</th> <th>LCV CO₂ (g/KM)</th> </tr> </thead> <tbody> <tr> <td>2025</td> <td>141</td> <td>199</td> </tr> <tr> <td>2026</td> <td>137</td> <td>190</td> </tr> <tr> <td>2027</td> <td>127</td> <td>183</td> </tr> <tr> <td>2028</td> <td>115</td> <td>176</td> </tr> <tr> <td>2029</td> <td>99</td> <td>172</td> </tr> <tr> <td>Total CO₂ intensity reduction 2024-2029</td> <td>34%</td> <td>14%</td> </tr> <tr> <td>Average annual CO₂ intensity reduction for new sales</td> <td>6.8%</td> <td>3.8%</td> </tr> </tbody> </table>	Year	PV CO ₂ (g/KM)	LCV CO ₂ (g/KM)	2025	141	199	2026	137	190	2027	127	183	2028	115	176	2029	99	172	Total CO ₂ intensity reduction 2024-2029	34%	14%	Average annual CO ₂ intensity reduction for new sales	6.8%	3.8%	<p>A strong, ambitious and achievable NVES that seeks to catch up with the US around 2028 and then match the stringency of these standards, while not seeking to go beyond these standards.</p> <p>Two CO₂ targets, one for passenger vehicles and SUVs, and a higher target for utes and vans (including large pick-ups) in the light commercial vehicle category.</p> <table border="1"> <thead> <tr> <th>Year</th> <th>PV CO₂ (g/KM)</th> <th>LCV CO₂ (g/KM)</th> </tr> </thead> <tbody> <tr> <td>2025</td> <td>141</td> <td>199</td> </tr> <tr> <td>2026</td> <td>117</td> <td>164</td> </tr> <tr> <td>2027</td> <td>92</td> <td>129</td> </tr> <tr> <td>2028</td> <td>68</td> <td>94</td> </tr> <tr> <td>2029</td> <td>58</td> <td>81</td> </tr> <tr> <td>Total CO₂ intensity reduction 2024-2029</td> <td>61%</td> <td>62%</td> </tr> <tr> <td>Average annual CO₂ intensity reduction for new sales</td> <td>12.2%</td> <td>12.4%</td> </tr> </tbody> </table>	Year	PV CO ₂ (g/KM)	LCV CO ₂ (g/KM)	2025	141	199	2026	117	164	2027	92	129	2028	68	94	2029	58	81	Total CO ₂ intensity reduction 2024-2029	61%	62%	Average annual CO ₂ intensity reduction for new sales	12.2%	12.4%	<p>An aggressive NVES that catches up with the US around 2026 and then brings forward US targets for 2029-2031 to the Australian NVES in 2028 and 2029.</p> <p>Two CO₂ targets, one for passenger vehicles and SUVs and a higher target for utes and vans (including large pick-ups) in the light commercial vehicle category.</p> <table border="1"> <thead> <tr> <th>Year</th> <th>PV CO₂ (g/KM)</th> <th>LCV CO₂ (g/KM)</th> </tr> </thead> <tbody> <tr> <td>2025</td> <td>141</td> <td>199</td> </tr> <tr> <td>2026</td> <td>103</td> <td>150</td> </tr> <tr> <td>2027</td> <td>66</td> <td>101</td> </tr> <tr> <td>2028</td> <td>51</td> <td>63</td> </tr> <tr> <td>2029</td> <td>34</td> <td>56</td> </tr> <tr> <td>Total CO₂ intensity reduction 2024-2029</td> <td>77%</td> <td>74%</td> </tr> <tr> <td>Average annual CO₂ intensity reduction for new sales</td> <td>15.5%</td> <td>14.7%</td> </tr> </tbody> </table>	Year	PV CO ₂ (g/KM)	LCV CO ₂ (g/KM)	2025	141	199	2026	103	150	2027	66	101	2028	51	63	2029	34	56	Total CO ₂ intensity reduction 2024-2029	77%	74%	Average annual CO ₂ intensity reduction for new sales	15.5%	14.7%
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⁸ The headline numbers here are expressed under the NEDC test cycle.

ELEMENT	Option A	Option B	Option C
<p>Fleet limit curve</p> <p>The fleet limit curve reduces the disadvantage that heavier (or larger) vehicles have, because heavier vehicles naturally use more fuel.</p> <p>A break point is a vehicle weight above, or below, which the limit curve is flattened.</p>	<p>Limit curve and reference mass derived based on fleet of vehicles sold in 2022 and updated during scheduled reviews of the NVES. No break points.</p>	<p>Limit curve and reference mass derived based on fleet of vehicles sold in 2022 and updated on a rolling basis annually during the operation of the NVES.</p> <p>The 2022 limit curve settings in this Impact Analysis are applied to NVES in 2025 and 2026. After 2025, rolling updates to the limit curve and reference mass, with 2025 vehicle data used in 2026 to set new limit curve slope for 2027, and so on for future years.</p> <p>Break points:</p> <ul style="list-style-type: none"> ▪ PV: lower break point at 1,500 kg, upper break point at 2,000kg. ▪ LCV: lower break point at 1,500 kg, upper break point at 2,200 kg. 	<p>Flattened limit curve to reduce allowance for heavier vehicles with break points included (30% reduction on 2022 measured slope).</p> <p>Break points:</p> <ul style="list-style-type: none"> ▪ PV: lower break point at 1,500 kg, upper break point at 2,000kg. ▪ LCV: lower break point at 1,500 kg, upper break point at 2,200 kg.
<p>Vehicle categories</p> <p>What types of vehicle are in which category under the NVES.</p>	<p>Vehicle categories:</p> <ul style="list-style-type: none"> ▪ PV class is passenger vehicles, light SUVs and two-wheel drive versions of four-wheel drive vehicles (MA and MB categories). ▪ LCVs class is larger SUVs, four-wheel drives, and utes and vans GVM up to 4.5 tonnes (MC, NA and NB1 vehicles, with some exceptions). 	<p>Vehicle categories:</p> <ul style="list-style-type: none"> ▪ PVs class is passenger vehicles, light and heavier SUVs and 4WDs (MA, MB and MC categories). ▪ LCVs class is utes and vans GVM up to 4.5 tonnes (NA and NB1 vehicles with some exceptions). 	<p>Vehicle categories:</p> <ul style="list-style-type: none"> ▪ PVs class is passenger vehicles, light and heavier SUVs and 4WDs (MA, MB and MC categories). ▪ LCVs class is utes and vans GVM up to 4.5 tonnes (NA and NB1 vehicles with some exceptions).

ELEMENT	Option A	Option B	Option C
<p>Credit banking, pooling and trading Banking, pooling and trading provide flexibility for regulated entities that overachieve to sell credits to those that may not have met their targets, or to bank credits for a later year. Pooling allows a group of regulated entities to form a collective entity whose emissions results are considered collectively.</p>	<p>Credit banking, pooling and trading available. Credits last 5 years after the year of issuance, debits must be acquitted after no more than 5 years after the year of issuance.</p>	<p>Credit banking and trading are available. No pooling. Credits last 3 years after the year of issuance, debits must be acquitted after no more than 2 years after the year of issuance.</p>	<p>Credit banking and trading are available. No pooling. Credits last 2 years after the year of issuance, debits must be acquitted after no more than 2 years after the year of issuance.</p>

ELEMENT	Option A	Option B	Option C
<p>Technology credits Supercredits provide additional credits when an eligible vehicle (typically EV or plug in hybrids) is sold by allowing them to be counted more than once. Off-cycle credits awarded for including particular types of technology (i.e. heat reflective paint). Air conditioning credits are credits for including low global warming potential air conditioning refrigerant.</p>	<p>Adopt generous supercredits for a wide range of emissions reduction technologies.</p> <ul style="list-style-type: none"> ▪ Supercredits for: <ul style="list-style-type: none"> ▪ Efficient vehicles (60% of limit curve for the vehicle mass level and/or hybrid) (1.5). ▪ Plug in hybrids (2) (defined as vehicles with CO₂ emissions of 1-50g CO₂/km). ▪ Zero emission vehicles (3). ▪ Off-cycle credits available and all technologies on European and United States technology menu eligible. Credit available for off-cycle credits capped at 10g CO₂/km. ▪ Air-conditioning credits available and included in off cycle credit cap. ▪ All technology credits to be phased out from 2029. 	<p>Maximise simplicity and transparency.</p> <ul style="list-style-type: none"> ▪ No supercredits. ▪ No off-cycle credits. ▪ No air conditioning credits. 	<p>Maximise simplicity and transparency.</p> <ul style="list-style-type: none"> ▪ No supercredits. ▪ No off-cycle credits. ▪ No air conditioning credits.
<p>Penalties The amount of money that a supplier would need to pay for failing to meet the NVES CO₂ target.</p>	<p>Low penalty rate of \$40 per g/km. NVES commences in 2025 but offers a 2-year grace period with binding targets commencing in 2027.</p>	<p>Moderate penalty rate of \$100 per g/km. Fastest practical commencement. NVES commences in full on 1 January 2025.</p>	<p>High penalty rate of \$200 per g/km. Fastest practical commencement. NVES commences in full 1 January 2025.</p>
<p>Cumulative abatement 2030 / 2035 / 2050</p>	<p>0.97 Mt / 0.97 Mt / 0.97 Mt</p>	<p>25.77 Mt / 97.13 Mt / 369.18 Mt</p>	<p>33.6 Mt / 125.1 Mt / 443.4 Mt</p>

Table 4 – Options for NVES policy settings

Other features of the proposed standard are:

- **A NVES will be mandatory:** The Australian NVES will be set out in primary legislation, will be mandatory, and have the force of law behind it. The NVES will be enforced by the regulator (see Chapter 7).
- **The NVES needs to be reviewed early and then regularly:** Many stakeholders highlighted to us that NVES settings are important and that regular checks are required to make sure that the policy is operating as intended. The NVES will be reviewed in 2026. This will allow the Government to assess the relevant headline targets, the administration of the scheme, the number of credits in the ‘system’, amongst other things (see Chapter 8). We will closely monitor potential impacts to vehicle supply, ensuring that consumers can still access a range of affordable vehicles that meet Australian consumer needs.
- **A NVES will apply to light vehicles:** The Australian NVES will apply to light vehicles, light goods vehicles and some medium goods vehicles for the purposes of the *Road Vehicle Standards Act 2018*. Some exemptions will apply. Heavy vehicles and vehicles subject to heavy vehicle emissions tests (i.e. large cargo trucks), military vehicles, law enforcement vehicles, emergency service vehicles, agricultural, construction or mining equipment, motorhomes, horse trucks and motorcycles, would be exempt. Some vehicles above 3.5 tonnes Gross Vehicle Mass will be caught, particularly those that are intended and marketed to be driven by consumers, but for which a heavy vehicle licence is not required (i.e. ‘pickup’ style utes). A low volume importer/manufacturer exemption would apply. Anti-avoidance and tracing rules are being considered to stop manufacturers from splitting up their fleets across multiple corporate vehicles to defeat the standard.
- **Mass is preferred over footprint:** An attribute-based standard is proposed, and in the Australian context, mass (specifically mass in running order or MIRO) is the preferred attribute to adjust the headline limit.
- **Testing under Worldwide Harmonized Light Vehicle Test Procedure (WLTP):** WLTP is the latest laboratory test used to determine how much emissions a light vehicle produces. Most stakeholders prefer the WLTP over the older New European Driving Cycle (NEDC) test adopted in Australian Design Rule 81/02 as it is more representative of real-world driving conditions and will need to be eventually adopted when Australia adopts Euro 6 noxious emissions standards. However, it is not feasible to mandate WLTP testing for all new vehicles until Euro 6d noxious emissions standards (which also use the WLTP) are fully implemented for new vehicles.

The Government has recently announced Euro 6d standards will be mandated for all newly approved light vehicle models supplied from December 2025 and all new light vehicles supplied from July 2028. The department proposes to enable a smooth transition over this period by setting final CO₂ targets to the WLTP test cycle and working with industry to develop a robust, reliable, consistent and Australian specific procedure to convert NEDC fuel consumption and CO₂ emissions test results to a WLTP equivalent for the purposes of the NVES. As an approximation, a conversion factor from NEDC to WLTP of 1.2421 for headline targets, based on ICCT analysis of EU targets is used in this impact analysis.

The headline targets for the Government’s proposed Option A, Option B and Option C, and international comparators are in Figure 11 and Figure 12 below:

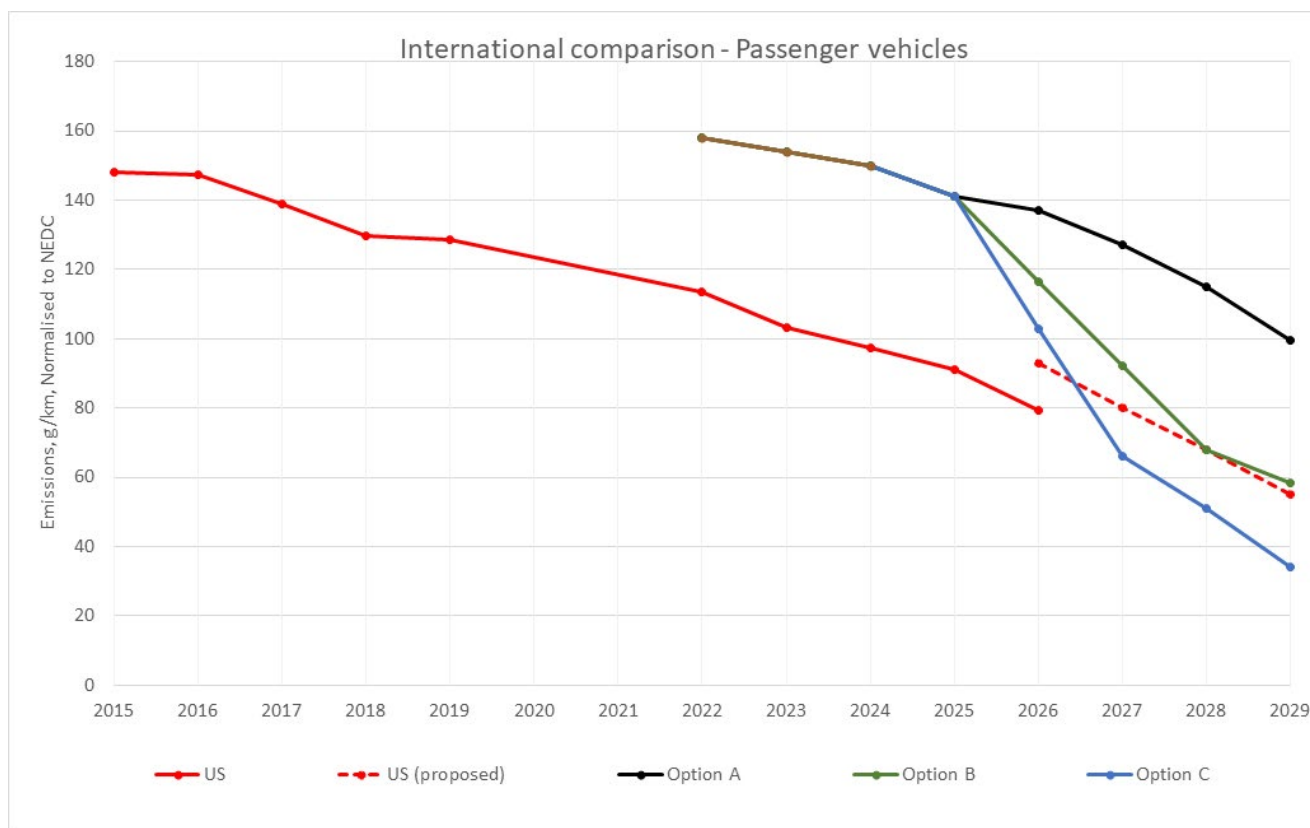


Figure 11⁹ – Passenger vehicle headline targets for options relative to other country’s targets

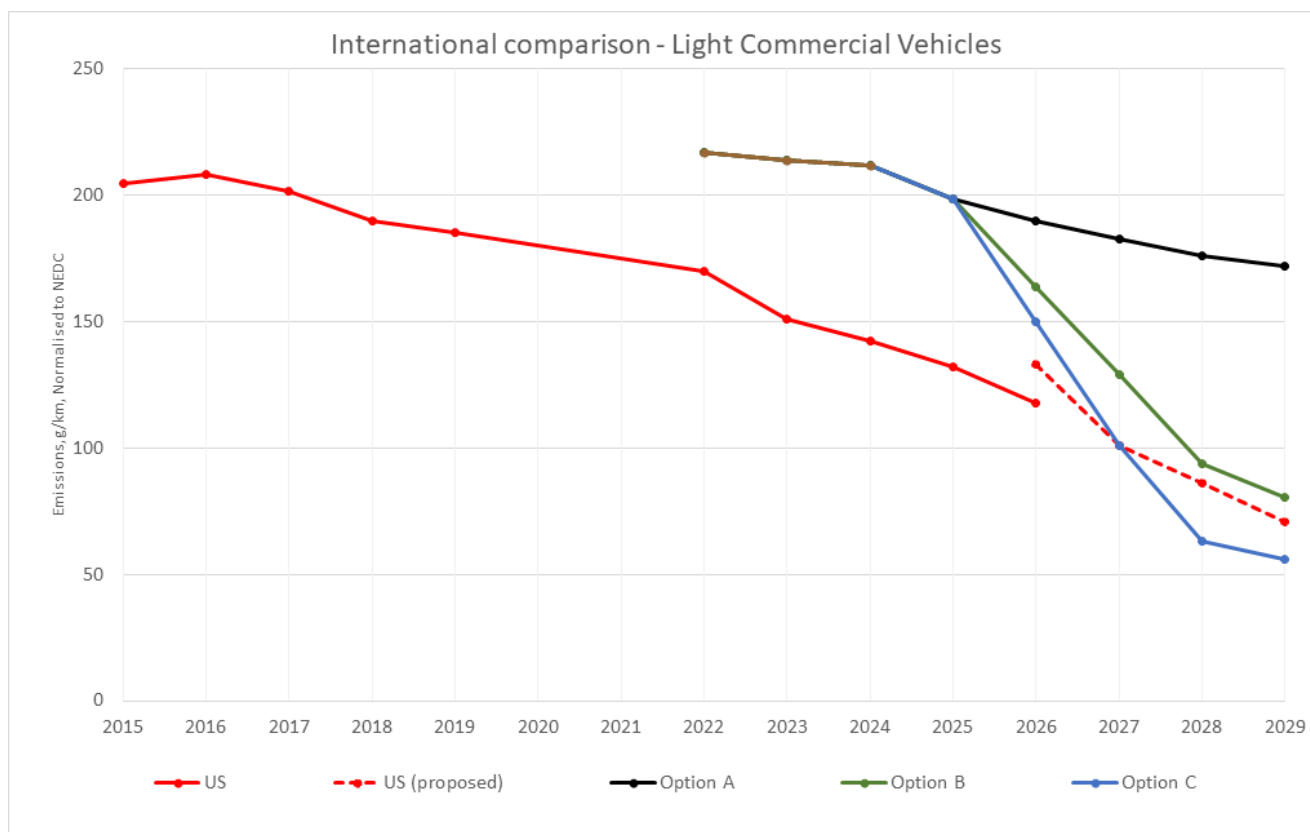


Figure 12¹⁰ – Light commercial vehicle headline targets for options relative to other country’s targets

The cumulative abatement for the three options is set out in Figure 13 below.

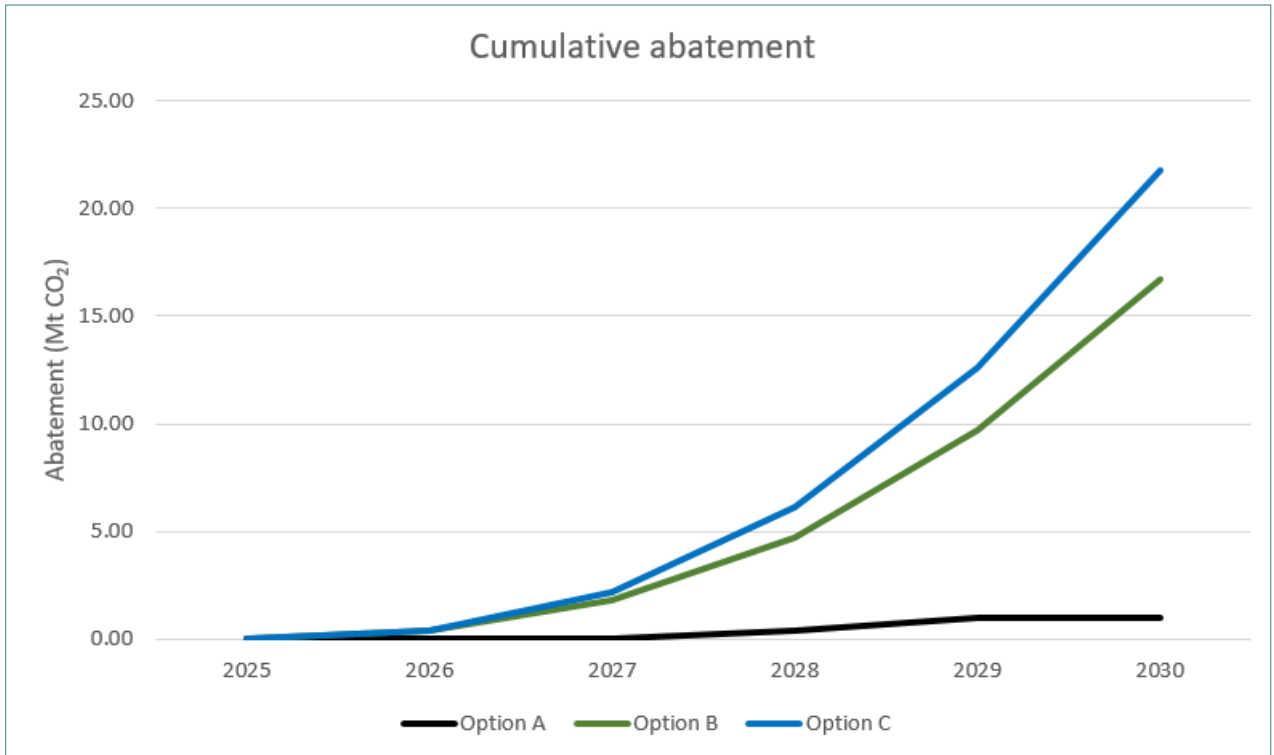


Figure 13 – Cumulative abatement of all options to 2030

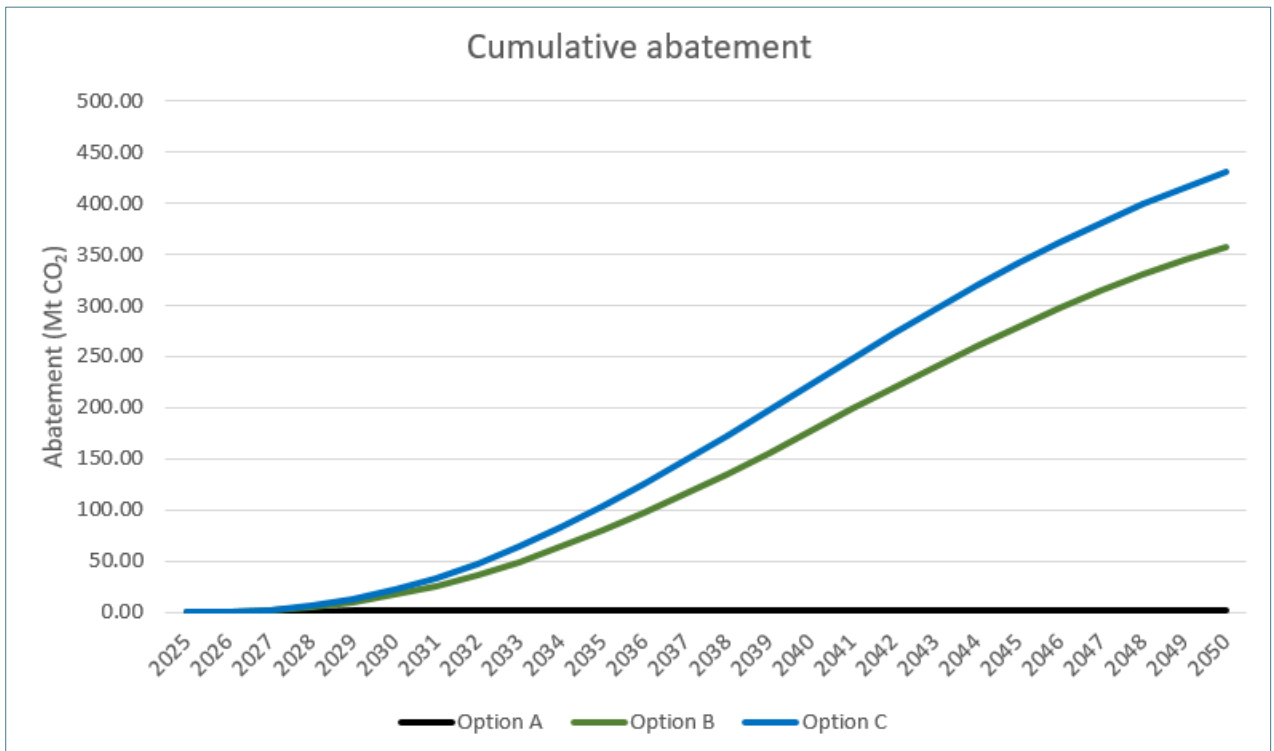


Figure 14 – Cumulative abatement of all options to 2050

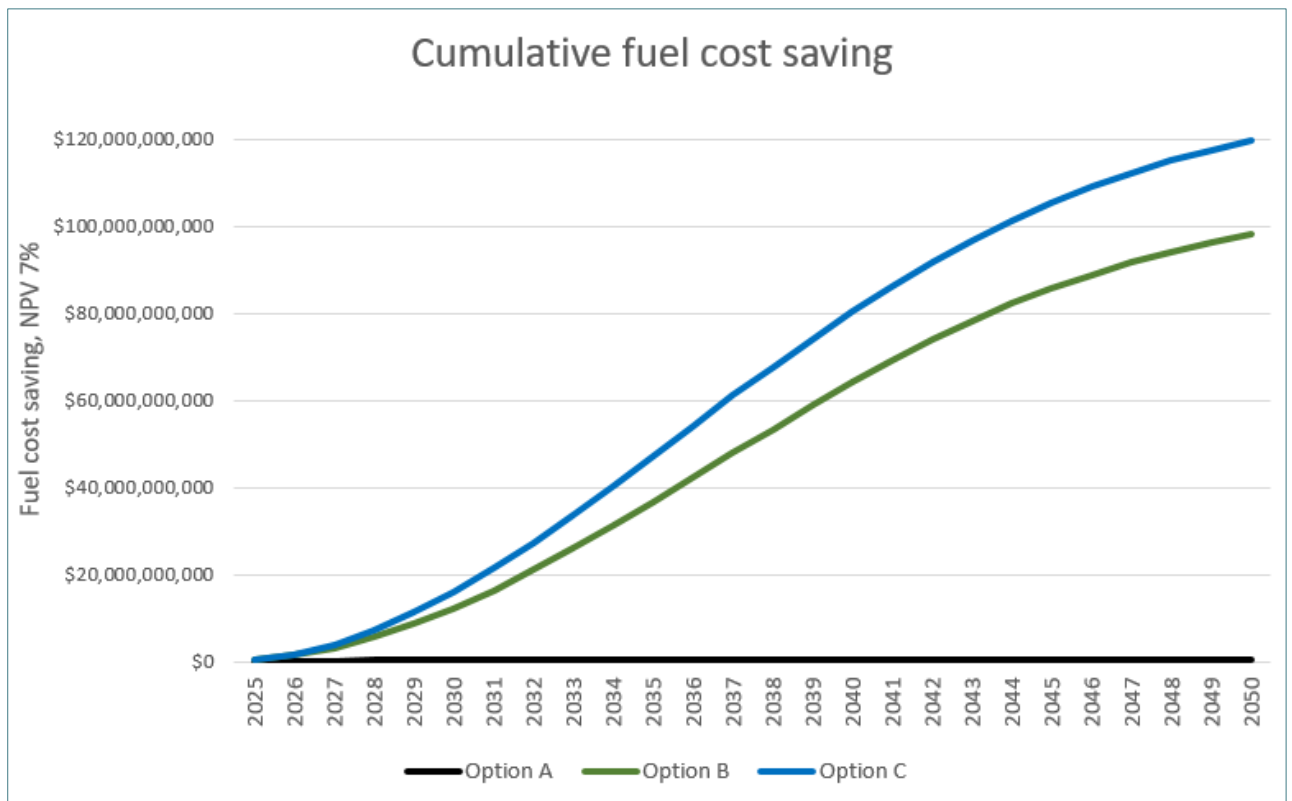


Figure 15 – Cumulative fuel cost saving of all options to 2050¹¹

Under all options, targets are only proposed to be set from 2025 to 2029 inclusive, with NVES settings and targets after 2029 to be set following a review in 2026. However, we can forecast what abatement and fuel cost savings might look like on a longer timescale by projecting the modelling further into the future (in this case to 2050). The way that we do this in this figure is by tracking the option against the expected BAU changes.

What this shows (per the abatement results for options B and C) is that effort to achieve abatement in the short-term, results in a large abatement payoff over the long term. In more technical terms, the abatement after 2029 is partly driven by the inferred CO₂ targets, which assumes the headline targets track parallel with the BAU trajectory in any years in which targets are not set, to a cap of 20g CO₂/km (see Appendix B for a full set of assumptions). Note that Option A generates minimal abatement and fuel cost saving. This is because the targets under this option involve marginal changes from what we estimate the BAU would deliver.

¹¹ Note that the 2050 total fuel cost saving is different to the total NVES forecast fuel cost savings. Fuel cost savings continue to accumulate out to 2080 as cars purchased in the 2040s reduce fuel consumption for the life of the vehicle. Due to the 7% discount rate, and the BAU forecast of very high EV uptake in the 2040s, the magnitude of this saving is a relatively modest.

Chapter 5: What is the likely net benefit of each option?

This chapter considers the net benefits of the Government's proposed policy. In this chapter we consider:

- The Government's options compared to each of the principles set out in Chapter 3. This analysis is qualitative in nature, and draws on the submissions that were provided in our April consultation process.
- The economic costs and benefits of the options against the baseline.
- The regulatory burden of the options.

5.1 Any viable option must compare well against the principles established

As we established in Chapter 3, the department developed a series of principles to inform policy design. In the table below, we have used colors and symbols to assess each option against the baseline and depict if the option, in our analysis, is:

-  Superior  GREEN
-  Moderate  AMBER
-  Inferior  RED

In summary, the principles are:

- **Effective:** Effective in reducing CO₂ transport emissions from new cars.
- **Equitable:** All Australians can access the vehicles they need for work and leisure. Intervention needs to be equitable, and not unduly negatively impact any particular group of people or part of Australia.
- **Simple and transparent:** Intervention emphasises simplicity and transparency, in design and operation.
- **Credible and robust:** By drawing on expert analysis and experience. Intervention should be designed with the latest and best analysis available, drawing on the expertise of industry, the environmental community, academia and others.

Enabling: Vehicles with the best emissions and safety technology to be available to Australians. Avoid increasing the average age of vehicles in the fleet so there are no inadvertent safety impacts.

Principle	Baseline	Option A	Option B	Option C
<p>Effective: Reduce the average amount of CO₂ emitted by Australia’s new light vehicle fleet over time, consistent with the government’s emissions reduction and net zero targets and broadly consistent with the NVES in place and fuel savings achieved in other major advanced markets.</p>	<p>↓ Zero abatement</p>	<p>↓ 2030: 0.97 Mt 2035: 0.97 Mt 2050: 0.97 Mt</p>	<p>↑ 2030: 25.77 Mt 2035: 97.13 Mt 2050: 369.18 Mt</p>	<p>↑ 2030: 33.60 Mt 2035: 125.09 Mt 2050: 443.44 Mt</p>
<p>Equitable: Ensure equitable access to the vehicles Australians need for work and leisure.</p>	<p>↓ Reduced access to EVs, advanced ICE and hybrids.</p>	<p>↓ Reduced access to EVs, advanced ICE and hybrids.</p>	<p>↑ Improved access to EVs, advanced ICE and hybrids. Access to at risk affordable vehicles protected by ‘break point’ providing higher CO₂ target to many small and medium vehicles.</p>	<p>■ Potential withdrawal or limited sales volumes of some ICE vehicles. Improved access to EVs, advanced ICE and hybrids.</p>
<p>Simple and transparent: the Australian NVES will emphasise simplicity and transparency in design and operation. The operation and administration of NVESs are complex, which risks greater compliance costs, reduced transparency and unpredictable outcomes, particularly where credit trading markets are established.</p>	<p>■ No change. There is no reliable source of the emissions from fleets of vehicles.</p>	<p>■ Public reporting and complete transparency on the number of credits and abatement that is achieved. Complex arrangements in relation to credits risks reduced transparency.</p>	<p>↑ Public reporting and complete transparency on the number of credits and abatement that is achieved. Absence of technology credits allows the NVES to be predictable and transparent.</p>	<p>↑ Public reporting and complete transparency on the number of credits and abatement that is achieved. Absence of technology credits allows the NVES to be predictable and transparent.</p>









Principle	Baseline	Option A	Option B	Option C
Credible and robust: Draws on expert analysis and experience. Intervention should be designed with the latest and best analysis available.	 No change.	 Limited abatement impacts on this option's credibility. ¹²	 The proposed option has been developed after extensive consultation. Consistent with international arrangements.	 Exceeds the stringency of international NVEs.
Enabling: vehicles with the best emissions and safety technology to be available to Australians, as good as or better than what is available internationally.	 Reduced access to EVs, advanced ICE and hybrids.	 Reduced access to EVs, advanced ICE and hybrids.	 Improved access to EVs, advanced ICE and hybrids.	 Potential reduced access to affordable new vehicles, partially offset by greater availability of relatively affordable low and zero emissions vehicles.

Table 5 – Assessment of options vs principles

¹² The dominant risk with this option is that the abatement is lower than forecast due to greater than forecast use of technology credits, and the negative abatement (i.e. above BAU emissions) in the passenger vehicle category being used to offset the small amount of positive abatement forecast in the LCV category.

5.2 The options analysed all have a net benefit

A benefit-cost analysis is undertaken to estimate how each option performs when we set out all of the costs and benefits. The key indicators of the economic viability of a proposed option are its net benefits and the benefit cost ratio (BCR). If the net benefits are positive, the BCR will be greater than one. In order to assess the net benefits of each option, a range of benefits and costs are quantified based on the best available evidence. The Government then considers this quantitative analysis, alongside the qualitative assessment of the options against the policy principles, to determine the 'best' option in line with the *Australian Government Guide to Policy Impact Analysis*.^{xliii} The best option will have the highest net benefit while also adequately addressing the principles and Government objectives.

The department undertook a detailed benefit-cost analysis of the three proposed options. The analysis found that over the evaluation period of 2025 to 2050 at a discount rate of 7% (a common method which accounts for people placing a greater weight on consumption (i.e. spending) occurring closer to the present), all options have a BCR greater than 1, meaning the policy options have a net benefit to the community. Option B provides the higher BCR with just over \$3 of net benefit for every dollar spent.

A detailed breakdown of the costs and benefits is in Table 6, using the central case assumption of a 7% discount rate:

Impacts (AUD billions) Net Present Value Discount Rate 7% - 2025 to 2050			
Option:	Option A	Option B	Option C
Total costs	\$0.41	\$46.49	\$58.75
Total benefits	\$0.58	\$142.95	\$173.65
Net benefits	\$0.17	\$96.46	\$114.90
Benefits cost ratio:	1.42	3.08	2.96

Table 6 – Benefits and costs of options

The key benefits that we have considered are:

- **Fuel savings:** The amount in dollars that consumers save in fuel when they switch to electric vehicles, hybrids and more efficient ICE vehicles. This benefit accrues to consumers.
- **Reduced vehicle maintenance:** EVs require less maintenance than traditional ICE vehicles.
- **Health benefits:** The health benefits of cleaner air. This benefit accrues to all of society. This benefit is in addition to other changes (e.g., the implementation of Euro 6 and Euro VI noxious emissions standards).
- **Emissions reductions:** Emissions reduction has a societal benefit in assisting to combat climate change. This is forecast at \$60 per tonne from 2025, inflated at 3% per annum.

The key costs that we have considered are:

- **Government and compliance costs:** The costs on businesses to comply with the regulatory system. This includes setting up a new system internally to interface between government and OEMs.
- **Technology costs:** The costs to suppliers to adjust production to bring advanced ICE cars, hybrids and EVs to the Australian market. We assume that equivalent ICE and EVs reach price parity by 2030 (note that this is one of the sensitivity tests that we undertook).
- **Electricity costs:** The costs to charge an EV/plug-in hybrid for consumers.
- **Battery replacement:** The cost of replacing batteries for EVs. We note current projections that contemporary EV battery life may lie between 10-18 years, and that some believe the figure to be 20+ years. The analysis assumes that batteries will require replacement every 12 years, 1½ times

the average battery warranty period. Given uncertainties and the rapidly evolving battery technology this may overstate the need and inflate the battery replacement costs in the analysis.

Key assumptions used in our analysis are at Appendix B.

5.2.1 Option A – slow start

Provides the slowest start, does not seek to catch up to other jurisdictions but looks to keep pace. This causes the least disruption of all the options, with the lowest benefits and also the lowest costs. This option generates negligible abatement and does not support achievement of the Government's legislated 2030 emissions reduction targets.¹³

Impacts (AUD billions) Net Present Value Discount Rate 7% - 2025 to 2050			
Benefits (\$ billion):		Costs (\$ billion):	
Fuel savings	\$0.50	Government and Compliance	\$0.21
Reduced vehicle maintenance	\$0.001	Vehicle Technology Costs	\$0.19
Health benefits	\$0.02	Electricity costs	\$0.004
GHG emissions	\$0.05	Battery replacement costs	\$0.00
Total benefits	\$0.58	Total costs	\$0.41
Net benefits:	\$0.17 billion		
Benefits cost ratio:	1.42		

Table 7 –

Benefits and costs of Option A

¹³ Note, totals in tables 7-10 may not sum due to rounding.

5.2.2 Option B – fast but flexible

Provides a strong, ambitious and achievable policy. The policy settings provide enough flexibility to avoid extremely high costs, with an opportunity for suppliers to invest to support the transition, and delivers considerable abatement and fuel cost savings to Australians. By omitting technology credits (super-credits and off-cycle credits), this option reduces the risk of the NVES not meeting its emissions reduction or fuel cost saving targets, and reduces administrative costs.

Impacts (AUD billions) Net Present Value Discount Rate 7% - 2025 to 2050			
Benefits (\$ billion):		Costs (\$ billion):	
Fuel savings	\$107.6	Government and compliance	\$0.18
Reduced vehicle maintenance	\$15.46	Vehicle technology costs	\$7.69
Health benefits	\$5.52	Electricity costs	\$29.38
GHG emissions	\$14.38	Battery replacement costs	\$9.23
Total benefits	\$142.95	Total costs	\$46.49
Net benefits:	\$96.46 billion		
Benefits cost ratio:	3.08		

Table 8 – Benefits and costs of Option B

5.2.3 Option C – fast start

Provides the fastest transition, with an accelerated trajectory to catch up to the US in 2027 and then pulls forward CO₂ targets for 2030-32 in US into Australia in 2028-29. This results in both a high net benefit and greater abatement, but also higher technology costs. By adopting an aggressive emissions reduction trajectory and more stringent targets than the US, this option risks unavailability of technology and undesirable consumer outcomes.

Impacts (AUD billions) Net Present Value Discount Rate 7% - 2025 to 2050			
Benefits (\$ billion):		Costs (\$ billion):	
Fuel savings	\$129.96	Government and compliance	\$0.17
Health benefits	\$19.65	Vehicle technology costs	\$9.49
Reduced vehicle maintenance	\$6.75	Electricity costs	\$37.37
GHG emissions	\$17.29	Battery replacement costs	\$11.72
Total benefits	\$173.65	Total costs	\$58.75
Net benefits:	\$114.90 billion		
Benefits cost ratio:	2.96		

Table 9 – Benefits and costs of Option C

5.2.4 How do the different options impact stakeholders?

The options being considered impact different groups in different ways, but some trends are clear.

Fuel savings to motorists are the dominant benefit, accounting for around three quarters of the benefits under Options B and C, and most of the benefit in Option A. This is partly offset by electricity costs as the fleet is electrified, but for example, under Option B, the increased electricity costs are less than one third of the fuel cost savings. Under Option A electricity costs are negligible at \$40 million because under this option our analysis indicates that almost all the emissions reduction required to deliver the targets is provided by advanced ICE technology and hybrids. The health benefits are limited under Option A, at about \$23 million, but are far greater under options B and C, and \$5.5 billion and \$6.7 billion respectively. A similar trend occurs for the value of GHG emissions reduction and reduced vehicle maintenance. All of these benefits accrue to motorists or the general community.

The largest forecast cost is electricity costs which is the electricity used to charge electrified vehicles. As noted above, this affects motorists, but offsets only between a third and a sixth of the fuel cost savings. For example, Option B forecasts \$107.6 billion in fuel cost savings and \$29.38 billion in electricity costs offsetting some of the fuel saving. The other main costs are vehicle technology costs (which affect vehicle suppliers) and battery replacement costs (which affect motorists). Both of these are substantially higher under options B and C as a result of these options requiring more significant and rapid changes from business as usual activities. Option A has no material battery replacement cost because this option is achievable with only a few thousand additional EV sales above business as usual.

Benefits and costs of implementation, and affected stakeholders				
Benefits:	Stakeholder affected	Costs (by 2050) (\$ billion)		
		Option A	Option B	Option C
Fuel savings	Motorists	\$0.50	\$107.6	\$129.96
Reduced vehicle maintenance	Motorists	\$0.01	\$15.46	\$19.65
Health benefits	Community	\$0.02	\$5.53	\$6.75
GHG emissions	Community	\$0.05	\$14.37	\$17.29
Total benefits:		\$0.58	\$142.95	\$173.65
Costs:	Stakeholder affected	Costs (by 2050) (\$ billion)		
		Option A	Option B	Option C
Government and compliance	Tax payers and suppliers	\$0.21	\$0.18	\$0.17
Vehicle technology costs	Suppliers	\$0.19	\$7.69	\$9.49
Electricity costs (offset by fuel saving)	Motorists	\$0.04	\$29.38	\$37.37
Battery replacement costs	Motorists	\$0.0	\$9.23	\$11.72
Total costs:		\$0.41	\$46.49	\$58.75
Net benefits:		\$0.17	\$96.46	\$114.9
Benefits cost ratio:		1.42	3.08	2.96

Table 10 – Stakeholder impacts of options

This illustrates that very significant benefits flow to the community and motorists, a result of reduced fuel costs, reduced health costs as a result of vehicle emissions, and greenhouse gas emissions savings. For motorists, fuel savings and reduced vehicle maintenance more than offset electricity costs and battery replacement, even with our conservative assumption about EV battery life. Our analysis assumes

technology costs for more efficient internal combustion engine technology, hybrid technology and EV technology are applied efficiently to comply with the NVES target, i.e. that the lowest cost option is taken where practical. These costs are not inconsiderable, ranging from \$0.19 billion for Option A, to \$9.49 billion for Option C, but are heavily outweighed by the fuel and maintenance cost savings of \$0.51 billion for Option A to \$149.61 billion for Option C.

Distributional analysis

To test the impacts of the NVES on different parts of the country, we undertook a distributional analysis based on state and territory, and on remoteness. This examines the costs and benefits of the NVES for people in different parts of the country.

The state and territory analysis finds that all jurisdictions see a strong positive benefit-to-cost ratio under all options. The largest benefit-to-cost ratio is in the Northern Territory and Tasmania, with the Australian Capital Territory, New South Wales, Victoria and Western Australia having BCRs slightly below the national average, but all still above 3 for Option B.

Benefits and costs for states or territories	Option A	Option B	Option C
Reference BCR	1.42	3.08	2.96
ACT	1.34	3.02	2.90
NSW	1.41	3.06	2.94
NT	1.75	3.57	3.38
QLD	1.44	3.11	2.99
SA	1.43	3.06	2.94
TAS	1.58	3.27	3.13
VIC	1.38	3.06	2.94
WA	1.43	3.06	2.95

Table 11 – Benefits and costs for states and territories

The regional analysis similarly finds that the benefit-to-cost ratio increases as the region becomes more remote. Different parts of Australia reflect different car purchasing and driving behaviours, with more remote areas driving greater distances, having higher rates of vehicle ownership and purchasing larger cars, more 4WDs and utes. Our analysis finds that for all options there are higher BCR outcomes for regional and rural locations. In other words, rural, regional and remote areas have a better return on each dollar spent. This is driven by larger fuel cost savings expected for people in areas that drive greater distances and higher rates of vehicle ownership. This isn't to say there aren't benefits for major cities – this is where the majority of Australians live and drive, and we see that all motorists will benefit from more fuel-efficient technology.

Benefits and costs for each location ^{xliii}	Option A	Option B	Option C
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Reference BCR	1.42	3.08	2.96
Major Cities	1.37	2.99	2.88
Inner Regional	1.45	3.27	3.13
Outer Regional	1.61	3.43	3.26
Remote	1.90	3.75	3.52
Very Remote	2.06	3.79	3.55

Table 12 – Benefits and costs for different locations

5.2.5 What sensitivity tests were considered?

Sensitivity testing was undertaken across key variables, in particular in relation to discount rates assumed. The Table below sets out the net benefits and BCRs for the sensitivity tests that we performed. We have undertaken sensitivity tests on the preferred Option B in this case.

Sensitivity test	Net Benefit (\$m)	Benefit Cost Ratio	Directional impact (upwards is an improvement)
Preferred option (Option B/reference)	\$96,460	3.08	■
Undiscounted (as opposed to 7%)	\$352,059	3.32	↑
Low Discount Rate (3%) (as opposed to 7%)	\$192,485	3.23	↑
High Discount Rate (10%) (as opposed to 7%)	\$61,379	2.94	↓
Price parity between ICE and EVs at 2035 (as opposed to 2030)	\$102,832	2.89	↓
\$120-unit cost for CO ₂ (as opposed to \$60/tonne)	\$110,837	3.38	↑
CO ₂ reduction benefits excluded (as opposed to \$60/tonne)	\$82,090	2.77	↓

Table 13 – Sensitivity analysis

Possible consumer welfare loss

We also considered the possibility of consumer welfare loss as a sensitivity in our modelling. Consumer welfare loss occurs if a policy intervention would give rise to consumers making different decisions to what they normally would, that gives rise (from the consumer's perspective) to a loss in enjoyment or utility (i.e. welfare loss). For example, if the Government were to encourage or incentivise consumers to

eat apples rather than oranges, consumers that naturally enjoyed oranges would experience loss in welfare when subjected to that intervention.

Consumer welfare loss seeks to capture and quantify the individual preferences of consumers even if we, or the consumer, are not able to precisely identify their preferences. In our analysis we sought to estimate the potential welfare loss in both ways – the welfare loss that consumers experience because they can't presently buy the EV or more efficient ICE vehicle they want because of lack of supply, and the welfare loss that consumers that prefer less efficient ICE vehicles might experience.

The concept of consumer welfare losses is most relevant to simple transactions where consumers cannot find an equivalent product or service. In practice, countries like the US that have NVEs in place still have a full range of vehicle offerings that are designed to meet the full range of consumer needs while being more efficient on average. The myriad of choices available means that consumers benefit from improved efficiency, but do not have to forgo their preferred vehicle type or model.

In doing so we estimated consumer welfare loss as a counterfactual. Using the adoption rate that we estimate for our option, the consumers that don't purchase cost effective EVs or hybrid vehicles must be doing so for a reason despite all of the financial benefits (i.e. fuel savings, lower maintenance costs etc) because of some quality in ICE vehicles that they particularly value. For our calculation of consumer welfare loss for EVs, we estimated the wait times and higher prices that consumers are presently paying for EVs, and projected that down as EV availability improves over time. Table 14 (below) presents our analysis found for the preferred option (Option B).

We consider the consumer welfare loss calculation to be subject to a whole range of variables that may not come to pass, and in particular, that the baseline adoption rate might be exceeded, or that consumers underinvest in fuel efficiency (partly due to incomplete information). However, importantly, even if our highest calculation of consumer welfare loss is included, the BCR is greater than 1, and thus is a net positive option.

	Full consumer loss (\$ bn)	50% welfare loss (\$ bn)	No consumer loss (\$ bn)
Total benefits	\$142.95	\$142.95	\$142.95
Other costs	\$46.49	\$46.49	\$46.49
Consumer welfare loss estimate	\$45.94	\$22.97	\$0
Total costs	\$92.43	\$69.46	\$46.49
Net benefits	\$50.53	\$73.49	\$96.46
BCR	1.55	2.06	3.08

Table 14 – Consumer welfare loss analysis

5.3 Regulatory burden estimate (RBE) table

The *Australian Government Guide to Policy Impact Analysis* requires that all new regulatory options are costed in accordance with the Government's *Regulatory burden measurement framework: guidance note*. The RBE is a different measure to the full BCA, as it does not capture the benefits of reduced fuel use or CO₂ emissions, for example. The average annual regulatory costs were established by calculating the average undiscounted costs over the first year.

Individuals	Business	Community organisations	Total change in yearly cost
Nil	Small brands (27): \$4 million Large brands (26): \$10.4 million	Nil	\$14.4 million across all suppliers across the whole system.

Table 15 – Regulatory burden estimate

Chapter 6: Who did you consult and how did you incorporate their feedback?

6.1 Extensive public consultation has informed the design of an Australian NVES

In designing the best possible NVES for Australia, it was important to provide the Australian community and industry with a number of opportunities to help shape this landmark reform. Cars are important to Australians, we drive them for work, personal use and leisure, and over one million new vehicles across a range of different car types and brands are sold in Australia every year.

The Government has sought feedback from a wide range of community members, including:

- The general public
- All types of car manufacturers
- The broader automotive sector
- Non-government organisations focused on the environment, climate change, health and social services
- Research institutes, think tanks and other professional organisations
- Motoring associations
- Businesses and consumer groups
- The energy sector.

In order to ensure that the Government's consultation on the NVES was thorough and effective, three consultation processes were planned, including the consultation for the National Electric Vehicle Strategy. Figure 15 demonstrates the timeline of the three consultation periods.

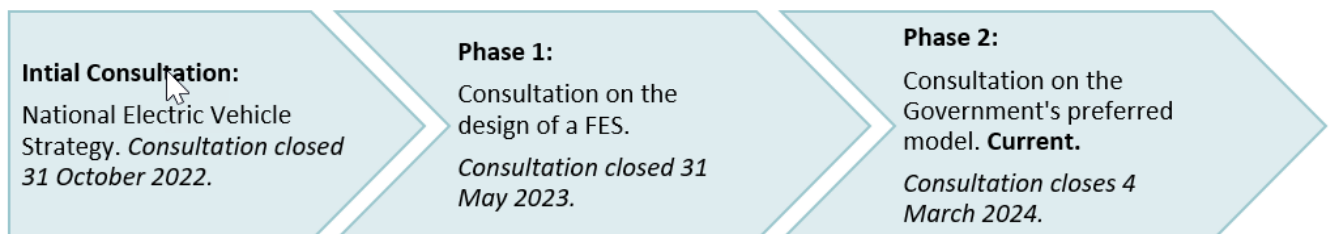


Figure 16 – NVES consultation timeline

Initial Consultation

Consultation on an Australian NVES was conducted as a part of the National Electric Vehicle Strategy, which found broad support for an Australian NVES, and a majority of stakeholders expressed support for the Government taking immediate steps to mandate a robust NVES.

Phase 1 – 19 April to 31 May 2023

On 19 April, the Government released the *Fuel Efficiency Standard—Cleaner and Cheaper-to-run Cars for Australia Consultation Paper* (the consultation paper)^{xiv}. This paper is available to read via cleanercars.gov.au. The consultation paper sought views on the guiding principles, design assumptions for the NVES, and included general and technical questions.

Around 2,700 submissions were received, including submissions from around 120 organisations. The organisations included car manufacturers, climate, environment, health and social service groups, motoring associations, the energy and petroleum industry, unions, research institutions and a range of entities across all levels of government. Figure 16 provides an overview of the categorical spread of organisation responses.

In addition to the release of the consultation paper, a series of individual consultation meetings were held with key stakeholders as well as a face-to-face round table on 1 June.

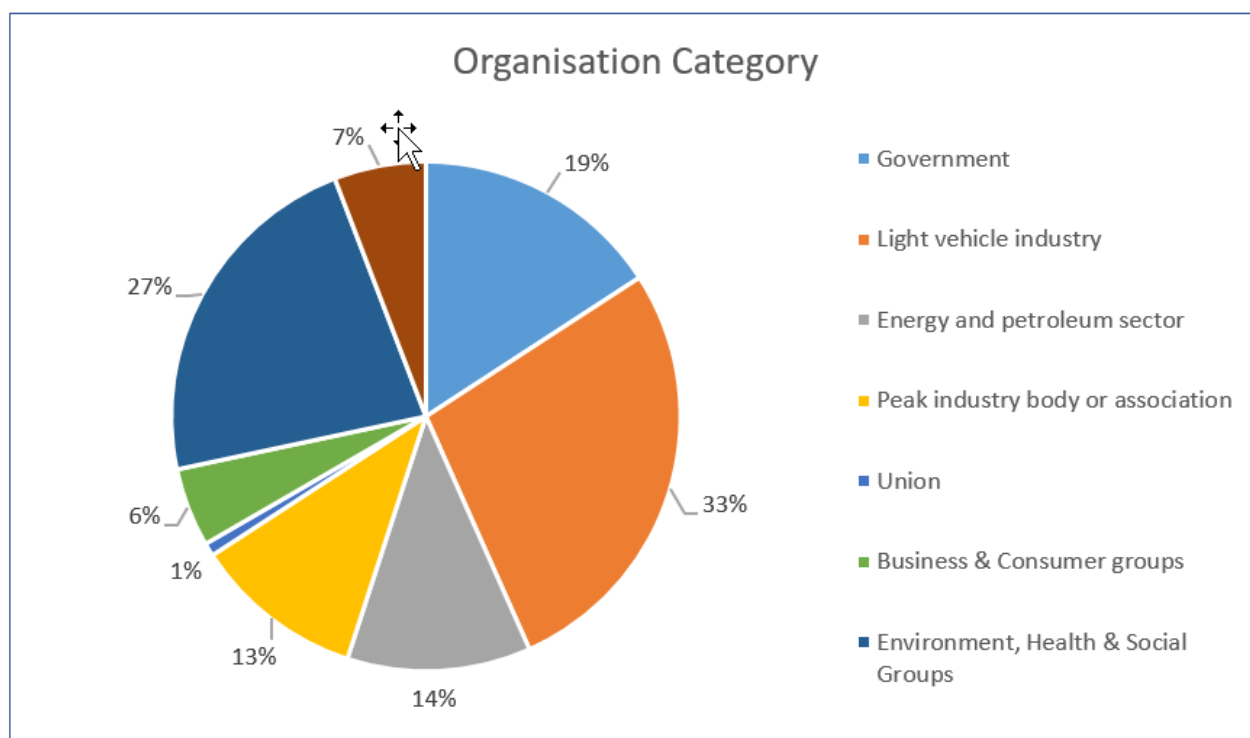


Figure 17 – Organisation category for consultation submissions

Submissions from the Phase 1 consultation supported a standard

Published responses from the NVES consultation are available via cleanercars.gov.au.^{xiv} While some submissions held differing views on the timing, stringency and other technical aspects of the proposed NVES (see below), submissions across the full spectrum of stakeholders were supportive of the introduction of a mandatory Australian NVES. It is important to note, a range of submissions did not respond to, or engage with certain elements of the NVES design. In particular, many individual or community-based submissions did not provide technical comment on the NVES design elements. However, as Figure 18 shows, they did raise a range of other themes which further demonstrate the diverse views of the Phase 1 consultation.



Figure 18 – Key themes from the Phase 1 consultation

The majority of in-depth submissions were received from the light vehicle industry (including motoring associations) and climate or health groups. Their responses were analysed, and have been summarised as follows:

Guiding Principles: Stakeholders broadly supported the proposed guiding principles. Some environment and health groups suggested the guiding principles should reference emissions reductions and EV uptake targets, as well as health outcomes and vulnerable Australians. We have updated the guiding principles in this document to take account of this input, and have used these as part of the assessment of which is the preferred model.

Headline targets: Stakeholder views varied significantly on how headline targets should be designed. The light vehicle industry (with some notable exceptions) generally supported a slow start trajectory, and noted that this would allow it to align its product development cycles to the NVES. Responses from industry bodies varied, ranging from support for a slower start through to a more ambitious NVES that would see Australia catch up to other countries by 2030. The latter sentiment was echoed by environmental and health groups, who also raised concerns with dual targets (for light passenger and light commercial vehicles) resulting in manufacturers adjusting the weight of vehicles in order to shift to a higher target, which would undermine emissions reduction.

Limit curve and break points: A majority of stakeholder responses broadly support the adoption of limit curves based on average mass rather than vehicle footprint (as per the US). Some environmental and health groups supported a vehicle footprint-based limit curve, identifying a risk that vehicle mass may erode emission reduction.

When should the NVES commence: Stakeholders broadly support the NVES commencing quickly, in 2024 or 2025, as soon as the administrative arrangements have been put in place.

When should the NVES targets start requiring changes to business as usual activities: Views in relation to when the NVES should commence were mixed. The vehicle industry was generally supportive of a long lead time (several years) before substantial changes would be required, to account for normal vehicle design and production timeframes. Climate and environment stakeholders called for a short lead time before requiring emissions reductions, pointing to low and zero emissions technologies and vehicles available today in comparable markets that are not in Australia as a way for regulated entities to quickly reduce emissions and fuel costs.

How far into the future should targets be set: The light vehicle industry suggested targets are set at least five years into the future, with an indication of targets 10 years ahead. Environmental and health groups suggested a three-to-five-year frequency, and greater alignment with national and sectoral emission reduction targets. Regular reviews of the NVES to monitor the progress and set or adjust future targets had very strong support from all stakeholders.

Credit banking, pooling and trading: The inclusion of credit banking, pooling and trading was broadly supported across all stakeholder responses. Responses across the light vehicle industry and environmental and health groups varied in terms of the preferred lifespan of a credit, with the former generally proposing a longer lifespan of 10-years, and the latter preferring a shortened lifespan.

Supercredits: While some responses within the light vehicle industry opposed the inclusion of supercredits, a majority supported the inclusion, and agreed that a gradual withdrawal of supercredits over time would be appropriate. Environmental and health groups generally did not support the inclusion of supercredits, except for some exemptions for targeted, time limited, and capped supercredits for certain segments (e.g. electric utes).

Off-cycle and air conditioning credits: Stakeholders were divided over the inclusion of off-cycle and air conditioning credits. The majority of the light vehicle industry supported the inclusion of uncapped credits. The majority of environmental and health groups were against the inclusion, noting the current use of low-global warming potential (GWP) refrigerants, and high-GWP refrigerants can be addressed through other legislative measures.

Penalty settings: Stakeholders acknowledged the need for penalty settings, with the light vehicle industry preferring New Zealand's penalty unit value of around \$50AUD per g CO₂/km over the EU's penalty unit value of around \$200AUD per g CO₂/km, noting that high penalties could result in some vehicles being withdrawn from the market. In contrast, environmental and health groups called for higher penalty unit values in submissions, suggesting Australia should align its penalties unit values with the EU.

Low volume suppliers: While a majority of responses did not include a response on this element, the light vehicle industry was divided in its responses, with varying preference for whether a low volume supplier threshold should be included in the design.

Transparency and accountability: While the light vehicle industry and peak industry bodies supported the use of existing industry reporting methods (VFACTS) for the Australian NVES, environmental and health groups, and research bodies expressed concern with using existing industry-supplied data. Instead there was strong support for an independent, robust and transparent approach with Government collecting data.

Views on the regulator and regulated entity: Stakeholders generally supported the department as the preferred regulator, with some suggestions to adopt the Clean Energy Regulator or Climate Change Authority as possible alternatives. Submissions did not generally address who the regulated entity should be, with the exception of the light vehicle industry which suggested the vehicle supplier should be the regulated entity.

Emissions test results: There was broad preference for transitioning to the Worldwide Harmonised Light Vehicle Test Procedure (WLTP) test results. Stakeholders noted that during transition to WLTP, an interim consistent conversion factor from New European Drive Cycle (NEDC) will be required.

Affordability and access to LZEVs: The light vehicle industry noted an ambitious NVES may lead to an increase in prices of vehicles for consumers, and high penalty costs could result in a withdrawal of some vehicles from the Australian market. Measures to address these issues were suggested in responses from the environmental and health groups.

Chapter 7: What is the best option from those you have considered and how will it be implemented?

In this chapter we set out the Government’s rationale for its preferred option and set out a range of implementations details:

- Preferred option;
- What entities should be regulated?;
- The regulatory apparatus needed to implement a successful NVES;
- Roles and responsibilities in the system;
- A proposed implementation timeline and transitional arrangements; and
- Implementation challenges.

7.1 Preferred option

The decision rule for this analysis is that the recommended option should deliver the NVES guiding principles described in this Impact Analysis *and* consider the results of the cost-benefit analysis.

We considered all options against the quantitative cost-benefit analysis and the qualitative assessment of the options against the guiding principles, to determine the best option. This is consistent with the recommendations of the Australian Government Guide to Policy Impact Analysis (the Guide).^{xlvi} The Guide indicates that all else being equal the option with the highest net benefit will be the recommended option, however the Guide notes that it is rare for all other things to be equal and the recommendation should consider which option is more effective, appropriate, efficient, least costly and has the greatest net benefit for Australia. The Guide also notes that some costs or benefits may not be able to be monetised.

The BCR is positive for all options, at 1.42 for Option A, 3.08 for Option B and 2.96 for Option C. This means that for each dollar of cost, more than one dollar is returned in benefit.

	Option A	Option B	Option C
Total costs	\$0.41 billion	\$46.49 billion	\$58.75 billion
Total benefits	\$0.58 billion	\$142.95 billion	\$173.65 billion
Net benefits	\$0.17 billion	\$96.46 billion	\$114.90 billion
Benefit to cost ratio	1.42	3.08	2.96
Abatement (Mt) 2030/2035/2050	0.97/0.97/0.97	25.77/97.13/369.18	33.60/125.09/443.44

Table 16 – Cost benefit abatement summary

As detailed in Chapter 4, all options adopt a core set of design features that reflect Australian adaptations of global approaches to designing such standards. The difference between the options is the stringency, and existence or otherwise of technology credits.

There is a strong case, and broad support for an Australian NVES to reduce emissions, save consumers money and enable the supply of cleaner, cheaper to run cars for Australia. Our analysis found strong

benefits from all options, but differing levels of success against the principles established for designing the NVES.

Option A: Slow start

Option A returns a BCR above 1, but it also provides negligible abatement above business as usual activities. This fails the guiding principle that the NVES must be *effective* in reducing emissions in line with Australia's commitments under the Paris Agreement and *Climate Change Act 2022*. While it poses no material risk to the continued supply of existing vehicle technology, by failing to require emissions reduction above business as usual activities, it does not provide sufficient incentive for vehicle suppliers to provide the best fuel saving technology and low and zero emissions vehicles to the Australian market. Because of this it also fails to meet the *equitable* and the *enabling* guiding principles. Option A also does not meet the guiding principles of *simple and transparent*, and *credible and robust* due to the inclusion of a wide range of technology credits which obscure the real emissions reduction and fuel cost saving provided by the NVES.

Option A does however establish a NVES framework, and once established it would be possible to ramp up from there.

Option B: Fast start and flexible

Compared to Option A, Option B is an ambitious standard that returns a higher net benefit, a strong positive BCR and very large abatement to support achievement of Australia's commitments under the Paris Agreement and *Climate Change Act 2022*. The strong abatement generated by this option meets the guiding principle that the NVES should be *effective*, with an approximate 61% reduction in average new car emissions from 2024 to 2029 to reach alignment with the US around 2028. The effectiveness of this option is further supported by excluding supercredits and off-cycle credits which erode the real emissions reduction and fuel cost savings provided by the NVES.

A key risk from an ambitious standard is the availability of technology and a vehicle mix to comply with the targets. Australia is predominantly a technology-taker for new vehicles, particularly in the short term (up to 5 years). Vehicle suppliers do have options to adjust technology offerings to supply more fuel saving technology to existing models, adjust marketing strategies and increase the model range of hybrid and EV models from those available in similar markets to Australia. This risk is difficult to reliably monetise, so this analysis is qualitative.

Option B progressively reaches alignment with the stringency of the standards in the US around 2028, and then reflects those standards again in 2029. In this way, Option B seeks to ensure that a full range of technology and vehicle choices are available for Australians. To further protect small cars that are typically the most affordable vehicles, Option B provides a more lenient CO₂ target for vehicles with a mass in running order of less than 1500kg. Taken together, this supports achievement of the *equitable* and *enabling* guiding principles.

Option B excludes technology credits which reduce the transparency, emissions reduction and fuel cost savings provided to consumers by the NVES and Option B supports achievement of the guiding principles of *simple and transparent*, and *credible and robust*.

Option C: Fast start

Option C is a fast and aggressive NVES that would have Australia reach alignment with the US around 2026, and then accelerate beyond those markets by applying targets from the US in 2030/31 to the Australian NVES in 2028 and 2029. It brings the greatest abatement and net benefit of the options considered. The strong abatement

generated by this option supports Australia's commitments under the Paris Agreement and *Climate Change Act 2022*, and supports meets the 'effective' guiding principle.

The very rapid emissions reduction required under Option C risks providing insufficient time for the vehicle industry to adapt the technology offerings and vehicle supply to Australian consumers sufficiently to ensure the continued supply of vehicles Australians need, particularly affordable cars and cars needed by people in rural and regional areas. On this basis this option does not meet the 'equitable' or 'enabling' guiding principles.

The absence of supercredits and off-cycle credits supports the 'simple' and 'transparent' guiding principle. By substantially exceeding the stringency of NVEs in the US in the later years, recommending this option would require confidence that the necessary technology and fleet mix would be available to meet these targets without undue disruption to vehicle model availability. We were not able to establish the evidence base to support that confidence, so consider this option does not meet the enabling guiding principle.

Recommended option: Considering all the available information, analysis and consultation, Option B is the recommended option for an Australian NVEs.

The preferred option will deliver:

- Around 369 million tonnes of abatement.
- Around \$108 billion in fuel savings to Australians:
 - An average new car buyer in 2028 will cut their fuel costs by around 40% compared to what they pay today.
 - An average new car buyer in 2028 will cut their annual fuel costs by around \$1000.
 - EV drivers could also save around \$350 per year in maintenance.
 - An average vehicle purchaser in 2028 will save \$5,710 over 5 years.
 - Over the life of a vehicle, the preferred option will provide around \$17,130 in savings.
- Around \$5.5 billion in health savings.
- Improve Australia's fuel security.

7.2 What entities should be regulated?

Following consideration of responses to the NVEs Consultation Paper, the department has further refined who would be captured as a regulated entity which we would appreciate feedback on. In developing this proposal, we have been guided by two principles:

- The desirability of being integrated into the existing regulatory system, especially the RVSA.
- The desirability of ensuring very good regulatory coverage, and reducing the possibility of avoidance.

The regulated entity that will incur credits and debits under the NVEs legislation is the type approval holder who first enters a particular vehicle onto the Register of Approved Vehicles (RAV). This leverages the current requirement that a type approval holder must either enter vehicle information on the RAV or authorise another person to do so under section 15 of the RVSA and section 9 of the *Road Vehicle Standards Rules 2019*, and ensures that all vehicles are captured at entry. While a limited number of vehicles will undergo a second stage of manufacture and be re-entered on the RAV, it is expected that credits and debits will be applied upon first entry to achieve the policy intent of improving the emissions standards of vehicles being provided to the Australian market. This same entity will also be responsible for ensuring that any debits that apply for each vehicle that is entered onto the RAV under their type approval do not come to fruition (see section 7.4), and will be liable to pay a penalty should they fail to do so.

It is expected that there will be related reporting, record keeping and information obligations, that will need to be complied with by the relevant type approval holder. These may also apply to related entities of the type approval holder, depending on the commercial arrangements that entity has and whether there are related entities who hold information or have a role to play in the type approval holder meeting their obligations under the NVES legislation.

General anti-avoidance provisions, tracing rules and ancillary offences/civil penalty provisions (for example, offences for aiding, abetting, counselling or procuring conduct or otherwise being directly or indirectly knowingly concerned in conduct) are being considered. These measures are aimed at deterring entities from entering into arrangements that seek to defeat the intent of the scheme.

We are interested in views on who is captured as a regulated entity in order to achieve the objectives specified above.

7.3 Regulatory apparatus

To achieve implementation of a NVES, two basic elements need to be established:

- The enabling legislation.
- The regulator, along with the systems and processes to:
 - Encourage compliance and undertake enforcement;
 - Undertake awareness-raising in the community and industry;
 - Accept information from industry, and publish information for industry/the public; and
 - Manage the trading platform, where credits can be transferred.

Implementation will be strongly guided by the outcomes, overall benefits of the NVES and the Government's objectives.

Enabling Legislation

Implementation of the NVES will require a new, enabling legislation to set out the operational principles, technical aspects for setting NVES standards, and oversight mechanisms, with supporting regulations or legislative instruments as required. We expect that the legislation will be a new Act (the Cleaner Cars Act) and will work alongside the RVSA. The enabling legislation will create a regulator, envisaged to be called the Cleaner Car Regulator (CCR; the Regulator), responsible for the day to day management and oversight of the NVES operations. Legislative drafting to implement a NVES is ongoing.

Regulator

We propose that the regulator will be a body operating, at least initially, within the department. As with the any government regulator, the principles of the *Public Governance, Performance and Accountability Act 2013* (PGPA Act)^{xlvii} and the *Public Governance, Performance and Accountability Rule 2014* (PGPA Rule)^{xlviii} will apply.

The regulator will perform its functions using Australian Government best practice principles, as set out in the Department of Finance's *Resource Management Guide for Regulator Performance 128* (RMG 128)^{xlix}. The regulator will also adopt the NVES guiding principles (see Chapter 3, Table 2) and meet the objectives to:

- Ensure and promote the integrity of the Australian NVES;
- Ensure a reasonable compliance burden for the NVES;
- Maximise the abatement achieved under a NVES, while maximising the selection of useful vehicles for Australians; and
- Promote the objectives of the NVES legislation.

The operations of the regulator are further examined below.

On balance, the preferred approach is to house the regulator within the department. However, we note the following drawback:

- Separation of functions – the department’s policy and regulatory functions would need to be clearly delineated in implementing a NVES.

Locating the regulator within the department would, however, support:

- Rapid establishment – the department can be established as the regulator more quickly and cost effectively than stand-alone entities within the Commonwealth, and harness common corporate support;
- Transferable expertise – the department has significant experience and capability in regulating the safety of light vehicles, and administering the RVSA, which it would bring to undertaking the NVES.

While the Government’s preference is for an in-house regulator, the viability of an alternative approach could be revisited in the first review of the NVES, anticipated to be commenced in 2026.

Below, we provide an overview of the roles and relationships within the NVES regulatory system.

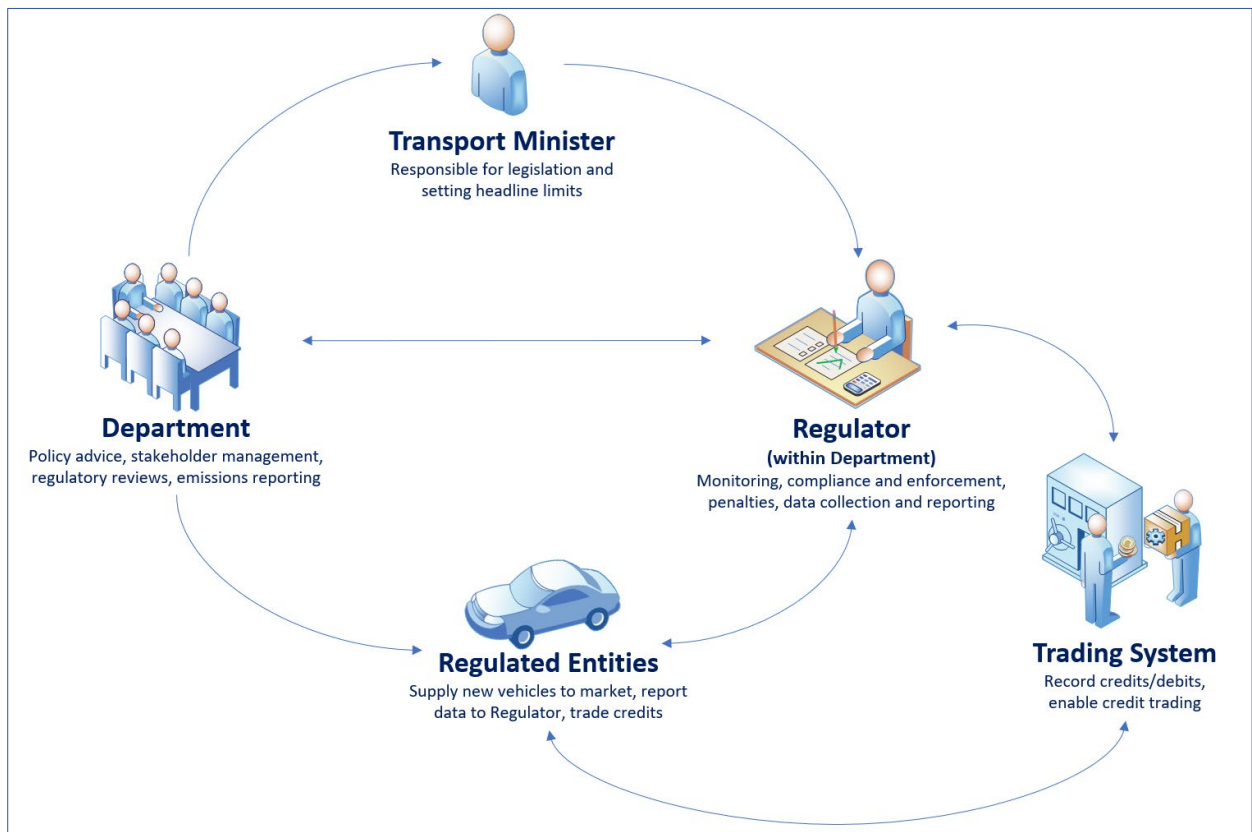


Figure 19 – Roles and relationships of the regulatory system

NVES targets would be set by the Minister¹⁴ on a five-yearly basis, with policy advice provided by the department. The key functions of the regulator would be to assess supplier performance against the NVES targets, and ensure compliance. The regulator activities will be supported by:

- Regulatory data and projections;
- Engagement with industry, the Minister and the department’s policy officials;
- Governance; and

¹⁴ The Minister responsible for the legislation in the Administrative Arrangement Orders – the Transport Minister.

- Operational systems.

The regulator would calculate compliance for each identified regulated entity by:

- Calculating the sales weighted average mass of all vehicles sold by that entity.
- Calculating the sales weighted average CO₂ emissions of all vehicles sold by that entity.
- Comparing the mass and CO₂ level to the limit curve.
- If the regulated entity results are above the limit curve, the entity has not met the target for that year. If the results are below the curve, the entity has met the target for that year. The regulator would alert the relevant supplier (and would make publicly available) the credits and debits generated at specified times.

The regulator would have the standard regulatory abilities as specified in the *Regulatory Powers (Standard Provisions) Act 2014*.¹ The functions and powers of the Regulator would include:

- Monitoring powers;
- Investigation powers;
- The power to issue written notice to entities requiring them to produce information;
- The power to apply to the court for an order that a person who has contravened any relevant civil penalty provisions pay a pecuniary penalty;
- Issuing infringement notices to entities;
- Issuing warning notices to entities;
- Accepting enforceable undertakings; and
- The power to apply for performance and prohibition injunctions.

Consideration is being had as to whether the Regulator will have obligations to publish information on its website regarding performance against the NVES and the performance of the overall standard.

There are a number of options being considered for final design of the penalty regime, which are still to be confirmed and will need to align with relevant guidelines and legislative drafting practices. The regulator will also have obligations to maintain the integrity and security of the credit trading platform.

Figure 20 (over) explains the proposed regulatory timeframes, based on the preferred Option B.

The diagram below explains what a typical regulatory year would involve in general (top portion) and what the first four years of operation would entail at a more detailed level (bottom portion).

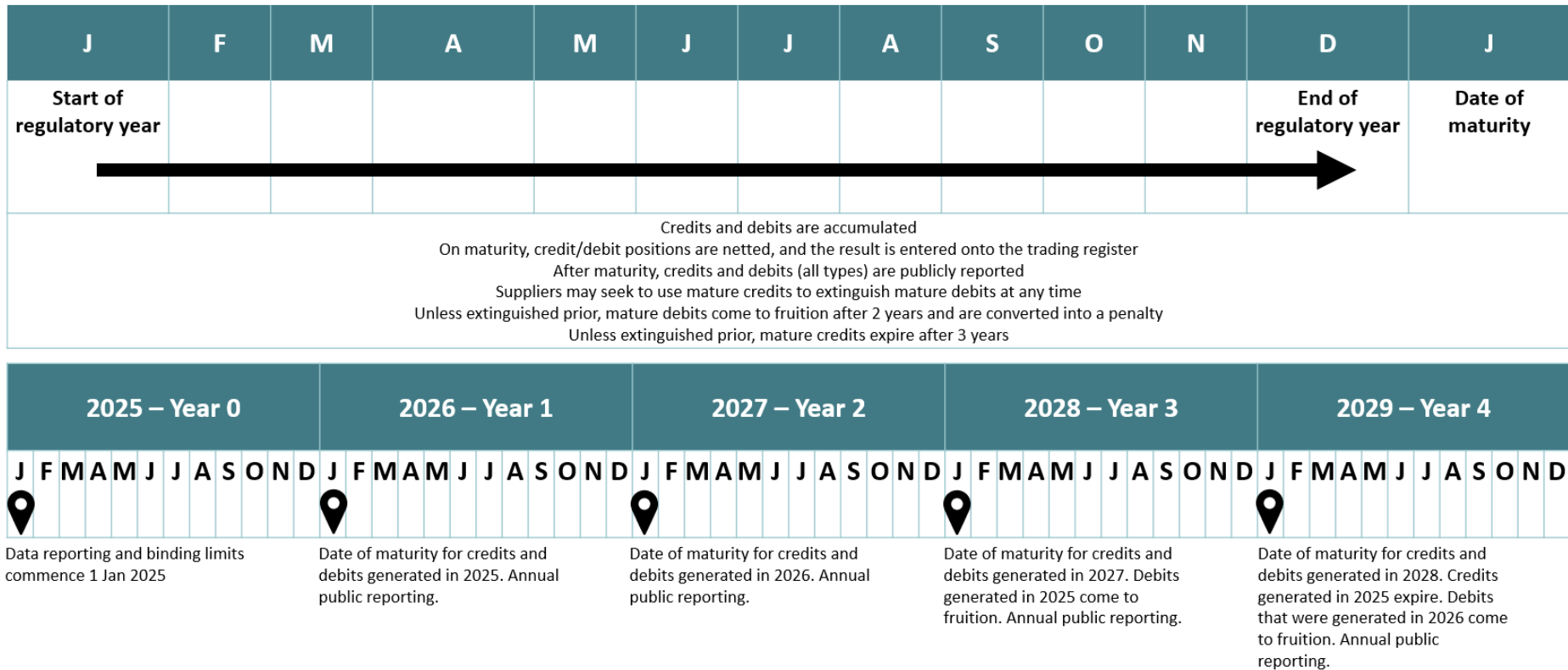


Figure 20 – Proposed regulatory timeframe

The diagram below explains what a typical regulatory year would involve in general (top portion) and what the first four years of operation would entail at a more detailed level (bottom portion).

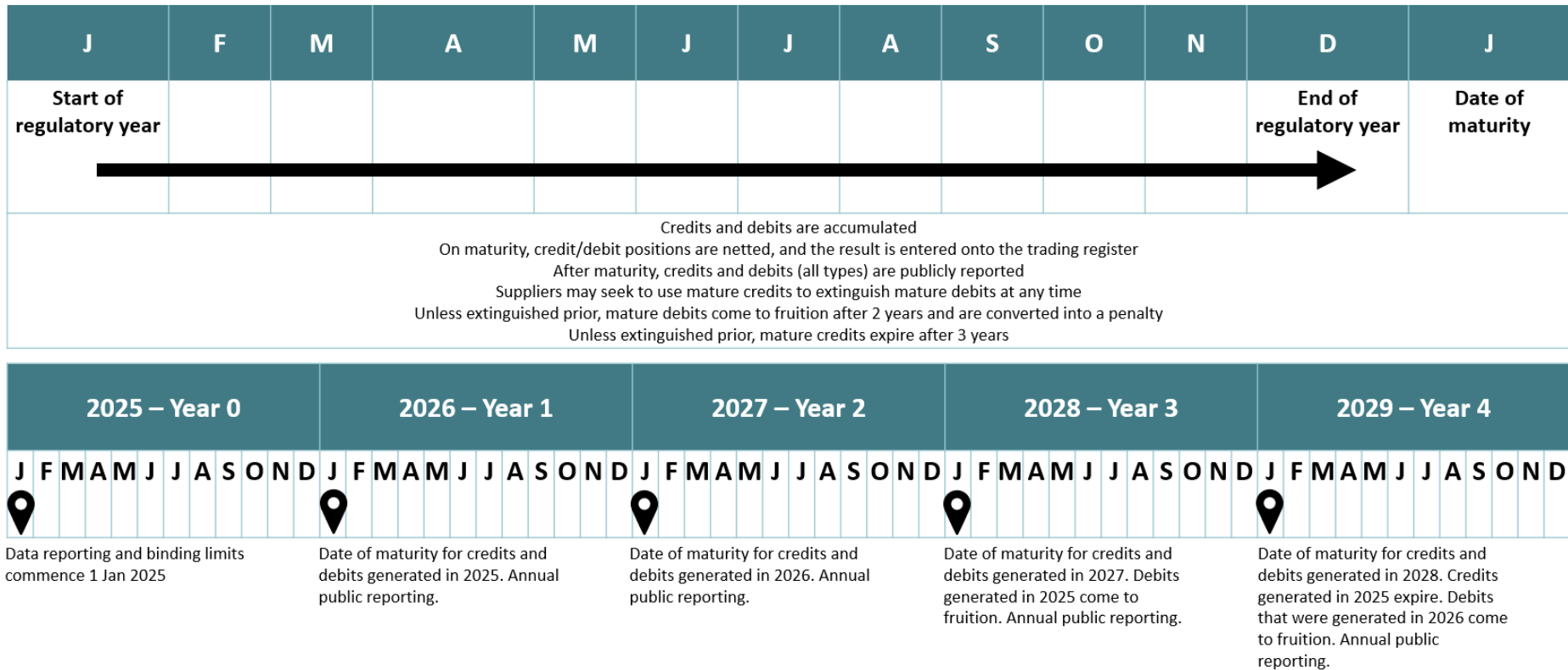


Figure 20 – Proposed regulatory timeframe

7.4 Timeline and transitional arrangements

The department aims to ensure an orderly transition for regulated entities to be regulated against the new standards. The Government’s preferred option proposes commencing binding targets earlier on 1 January 2025, along with NVES reporting requirements. The regulatory year would continue on a calendar year basis.

Some of the rules we are considering in relation to credits, debits, and how debits translate into penalties are important to understand. In summary, these are (assuming Option B):

- Regulated entities will need to register in the designated trading platform. They will be able to check their own balance of credits and debits (of all types) at any time to see a balance.
- Credits and debits will be generated in any given regulatory year, once a vehicle is entered into the Register of Approved Vehicles (RAV). Once generated, nothing can be done with credits and debits until they mature.
- The date of maturity will be early in the next calendar year (i.e. end January/early February). Just prior to maturing, credits and debits are countered off against each other producing a net position for each regulated entity (credits and debits from both PV and LCV will be treated the same). For example, a regulated entity might have 100 (unmatured) credits and 50 (unmatured) debits. This would result in a 50-credit net position for that regulated entity. The net position will be translated into the designated trading platform.
- The number of credits and debits (of all types) will be publicly reported for each regulated entity on, or soon after, the date of maturity.
- Once mature:
 - Credits can be traded (transferred) to another registered regulated entity. Debits cannot. Traded credits can only be used to extinguish a matured debit. Terms of transfer will be a matter for regulated entities and will not be regulated by the Government under the NVES.
 - Credits can be used to extinguish debits at any time (subject to operational constraints).
 - At the end of each year, credits and debits are automatically rolled over into the next year until they expire or come to fruition.
- Credits expire three years after they mature. Once expired, nothing can be done with credits and they are extinguished.
- Debits come to fruition two years after they mature. If a debit comes to fruition, it will convert into a penalty.

The table below sets out the proposed timetable for implementation of the preferred option.

Date	Milestone
June 2024	Setting up the Regulator and the supporting IT systems commences.
~October 2024	3-month voluntary regulatory IT testing trial begins.
January 2025	The NVES-enabling legislation and headline targets commence from 1 January 2025. Regulatory data is collected on an ongoing and continuous basis. Regulated entities can access and view unmatured credit and debit positions, subject to IT implementation.
End December 2025	The first regulatory period ends.
1 January 2026	The second regulatory period commences on 1 January 2026 and performance against targets assessed for each 12-month calendar period after.
1 February 2026	First date of maturity. Unmatured credits and debits are netted off. A report is published showing each supplier’s position across all credit and debit types.

Date	Milestone
End December 2026	Second regulatory period ends.
1 January 2027	Third regulatory period commences 1 January 2027 and performance against targets assessed for the previous 12 months.
1 February 2027	Second date of maturity. Unmatured credits and debits are netted off. A report is published showing each supplier's position across all credit and debit types.
End December 2027	Third regulatory period ends.
1 January 2028	Fourth regulatory period commences 1 January 2028 and performance against targets assessed for the previous 12 months.
1 February 2028	Third date of maturity. Unmatured credits and debits are netted off. A report is published showing each suppliers' position across all credit and debit types. Unless extinguished prior, debits that mature on 1 February 2026 come to fruition and a penalty is issued.
1 February 2029	Unless extinguished prior, credits that mature on 1 February 2026, expire.

Table 17 – Proposed timetable for implementation

The department seeks feedback from industry on this implementation timetable.

7.5 Implementation challenges and impacts

The implementation of a NVES has a number of associated challenges and impacts. These relate to obtaining regulatory data from a diverse range of stakeholders, design of the regulator, and supporting systems. Implementation timing to achieve a 1 January 2025 commencement is a key constraint, and could require staging and other trade-offs. There are also a number of barriers, raised in section 3.1.4, that could give rise to challenges in achieving the Government's policy objectives. The identified transitional, intermediate and ongoing implementation challenges include:

Immediate transitional challenges

- Establishing data needs, appropriate ongoing data collection, storage and access, while minimising burden as much as possible and still meeting NVES requirements;
- Developing new IT systems and redeveloping existing ones, including: integration and testing, integrating them with industry systems, and ensuring their useability – all within a tight timeframe following the passage of legislation;
- Establishing the Regulator with the right settings and functions in a short timeframe after passage of the enabling legislation; and
- Developing solutions to overcome infrastructure limitations that could result in barriers for consumer uptake, including the lack of charging infrastructure for electric vehicles and the limited availability of alternative fuels.

Intermediate and ongoing higher-level challenges

- Achieving positive compliance from regulated entities resulting in improved emissions outcomes;
- Stakeholders trusting the results;
- Regulated entities trusting the fleet limit curve calculations set for them and the Regulator's capabilities;

- Technology advancements and new innovations provide opportunities for fuel efficiency, and have limited hinderance on progress or existing technologies;
- Managing supply chain complexities for manufacturers in relation to the critical minerals and other resources needed for the production of zero emissions vehicles. Contingency planning for any global instability that may have an adverse impact on supply of all vehicle types imported into Australia;
- **The general public has confidence that the program benefits will be realised;**
- Australian consumers are aware and understand the fuel efficiency of cars as well as new zero emissions technology, without hesitation to take up new technology such as hybrids or electric vehicles; and
- Communicating the long-term savings in fuel costs to consumers, despite an upfront and transitional increase in cost to the consumer in adopting fuel-efficient vehicles and technology.

Support for industry

The implementation of a NVES in Australia will require car manufacturing industries to meet new provisions including data supply to government, and compliance with the NVES. Ongoing engagement from the Regulator will be undertaken, particularly to support any changes to processes and systems. The department will engage with industry in co-design of the IT systems, prior to their build and testing in late 2024.

Support for consumers

The implementation of NVES in Australia will create greater choice in new vehicles for consumers. During the implementation of the NVES, the Regulator will work with industry to educate consumers on the changes being introduced. Information on the standards and what they mean for consumers will be made available on the Regulator's website. The department is exploring how other economies assisted consumers in the transition and adoption of low to zero emissions vehicles and technology.

The key risk is that there could be insufficient integration and testing of regulatory and industry systems. A 2025 IT delivery is ambitious, dependent on delivery partners to validate the delivery schedule, and will require contingency options.

Chapter 8: How will you evaluate your chosen option against the success metrics?

In this chapter we set out our proposed plans for program evaluation. To align evaluation metrics against the objectives of the program, these are based on the Success measures outlined in Table 2. A broad overview of the evaluation metrics can be found in the table below.

Success measures	Evaluation Metrics
<p>The percentage reduction in average CO₂ emissions from Australia's new cars, out to 2050.</p>	<p>This is currently difficult to accurately assess based purely on the data made available by a NVES (g CO₂/km for new vehicles). This is because this data is not currently captured (and therefore no data exists to calculate an exact baseline), and accurately calculating a reduction would require data on real-world fuel usage. As such, assessing the impact of a NVES on this measure may require:</p> <ul style="list-style-type: none"> ▪ Undertaking a survey of distances travelled/fuel usage of both new and older vehicles. ▪ Comparing the average g CO₂/km of new vehicles in the years before and after NVES implementation, and using average distance travelled figures to calculate an approximate reduction in CO₂. ▪ Undertaking trend analysis over a longer period of time.
<p>A design which does not disadvantage small or affordable vehicles to protect the continued supply of these vehicles to the Australian market. Ensure that people have access to fuel-efficient vehicles.</p>	<p>This measure may require a number of pieces of evaluation to examine success:</p> <ul style="list-style-type: none"> ▪ Analysis of average sale price of new vehicles before and after the implementation of a NVES. ▪ Analysis of the average vehicle weight before and after the implementation of a NVES. ▪ Analysis of the number of new vehicles added to the RAV in the years before and after implementation of a NVES. ▪ Cross-sectional analysis of the above three metrics against the proportion of new vehicles that are LZEV.

Success measures	Evaluation Metrics
<p>Design and implement a process which leverages existing regulatory frameworks and touch points with Government, while providing accessible information to both consumers and industry stakeholders. A streamlined NVES design which avoids design features which add complexity, increase administrative complexity, and reduced transparency.</p>	<p>This measure may require a number of distinct evaluation metrics to assess data success, including:</p> <ul style="list-style-type: none"> ▪ Comparison of data sharing capacity/volume against pre-implementation baseline. ▪ Evaluation of non-confidential data made public: volumes, percentages, readability, accessibility. ▪ System uptime as compared to pre-implementation. ▪ Success rate of data ingress as compared to pre-implementation. ▪ Success rate of regularly scheduled activities as compared to pre-implementation, e.g. data backups. ▪ Whether processing time meets or exceeds existing departmental (DITRDCA), CER and DCCEEW service level agreements. ▪ Improved data access for state and territory jurisdictions to monitor vehicle information. <p>Data collection before implementation will be required to establish a baseline for IT system performance. IT system performance may change over the course of implementation, as the various phases are progressed through. Tracking this may require a phased approach to data analysis. Additionally, some evaluation will also be used to ensure the NVES design features are effectively meeting administrative requirements:</p> <ul style="list-style-type: none"> ▪ Review of the costs of implementation and ongoing policy cost recovery options. ▪ Public outreach to assess awareness of penalty/credit system function and the underlying policy goals of reducing emissions.
<p>Advice on setting NVES limits is of a high quality, and is accepted by the Office of Impact Analysis as relevant. Consultation is broad and includes all key stakeholders. Ongoing opportunity for stakeholders to provide feedback on operational matters, and ability to influence policy settings through reviews.</p>	<ul style="list-style-type: none"> ▪ Analysis quality will be assessed based on: <ul style="list-style-type: none"> ▪ OIA feedback. ▪ Survey of agency satisfaction with provided data. ▪ Assessment of data accuracy against pre-implementation baseline. ▪ Consultation quality will likely be evaluated based on number of responses, and a comparison of responses to those received during previous consultation phases. ▪ Ongoing opportunity for feedback is difficult to estimate, but will likely be evaluated based on correspondence received regarding a NVES post-implementation.
<p>Consider scrappage rates, and whether the average age of the car parc will increase.</p>	<p>This measure can be evaluated in two key ways:</p> <ul style="list-style-type: none"> ▪ Use vehicle registration data to determine the number of cars that have left the road over the course of a year, compared to the number of new vehicles. (This may require factoring into new data sharing agreements being put in place with jurisdictions). ▪ Use the same data to calculate the average age of the national fleet.

Table 18 – Success Measures and Associated Evaluation Metrics

8.1 Program monitoring and evaluation

A robust monitoring and evaluation framework will be a core component of the ongoing success of the NVES. The framework will support continuous improvement and accountability, and ensure that the policy and legislative requirements are being met. Evaluation will need to consider the overarching policy efficiency, as well as looking at aspects of the policy implementation and whether any adjustments to the NVES regulatory framework may be warranted.

The department is considering periodic reviews of the NVES, starting in 2026, in its implementation plans. There will be a necessary bedding-in period for the new requirements of the NVES, during which time the regulated entities, and the regulator, will be implementing new systems and processes. It is only natural that during this time more effective ways of operating may be identified by the regulator, or by the regulated entities. Reviews offer the opportunity to not only take stock of the policy effectiveness, but also refine the regulatory systems and mechanisms in place to support continuous improvement of the new NVES policy.

8.1.1 Monitoring of ongoing NVES operations

The Regulator will be responsible for undertaking an ongoing regime of quality assurance, monitoring and enforcement for the NVES. See Chapter 7 for the intended powers to underpin these responsibilities.

Key to an effective monitoring regime will also be robust data and reporting and effective use of enabling ICT systems. We anticipate that there will be opportunities to make use of existing technology already in use for reporting for other vehicle compliance purposes, and the department/regulator will aim to create a system with minimal user burden while still ensuring robust data collection. Additionally, the regulator should maintain authority over the key data relevant to assess the implementation and operation of a NVES, rather than requiring other sections or departments to be the primary data holders.

8.1.2 Program evaluation

There are three areas for a review/evaluation to consider: processes, efficiency and impact.

Process evaluation

This will review the policy delivery, and will include examinations of how processes worked for regulatory administrators and interactions of external participants, with communications, staff and systems. This will likely involve a level of stakeholder engagement and feedback.

Efficiency evaluation

This will consider the investment level versus policy outcomes (value for money). This can include comparing the cost of the policy to alternatives or similar initiatives and determining cost-benefit ratios or costs per unit (outcome, participant, group etc.). It can also review whether value for money assumptions made during the policy design process have been borne out.

Methods for efficiency evaluation include social cost effectiveness and ex-post cost-benefit analyses. Social cost effectiveness analysis compares the costs of two or more policies that achieve the same outcome. This method tends to be used where it is difficult to estimate the monetary value of benefits. In contrast, a social cost-benefit analysis values the various costs and benefits of proposed policies to provide a comparison of policies on a cost per unit of change basis. This method is particularly useful for comparing policies that achieve different levels of change.

Impact (effectiveness) evaluation

This will assess the impact of the implemented NVES policy, including the extent of the impact, the achievement of the NVES principles, overall program benefits and outcomes are achieved, and identify any positive or negative unintended consequences. This will be drawn primarily from data gathered through NVES regulatory reporting systems, observing levels of compliance and non-compliance with the NVES targets and assessing the resulting impacts on CO₂ emissions.

The department is proposing a review of the NVEs in year two (2026) and regularly thereafter of the policy being in place. Reviews will be conducted by the department, and to the extent possible, final reports will be made publicly available.

Overarching policy objectives and program benefits

A number of key performance indicators (KPIs) will also help measure and track progress against overarching program benefits, as defined under the program logic. Future evaluations will also consider to what extent the operation of the NVEs is achieving its intended benefits of:

- CO₂ emissions reduction;
- Reduced fuel consumption;
- Availability and affordability of LZEVs; and
- Improved health outcomes for Australians.

Specific KPIs around these program benefits and other program evaluation measures will be developed further refined during program implementation.

Appendix A: The Australian Car Market

New vs used cars in Australia^{li}

70% of Australians buy their car second hand.

Total cars sold in 2023

2023	Number	%
Passenger vehicles (including most SUVs)	890,823	76.46%
Light commercial vehicles (including some utes and vans)	274,185	23.54%
Total	1,165,008	100.00%

Size of Australia's vehicle fleet

In 2022, there were 19.9 million light vehicles and 20.7 million vehicles including heavy vehicles and motorcycles^{lii} in Australia. Australia's fleet is sometimes referred to as the 'car parc.'

Average vehicle age

- 10.7 years for passenger vehicles
- 11.1 years for light commercial vehicles^{liii}

Average price of a car

- \$40,916 (purchase price), source: Canstar^{liv}
- \$50,161 (transaction cost - includes dealer-delivery fees, factory-fitted options and dealer-fitted accessories) source: Drive.com.au^{lv}

Number of cars sold by type

	2017	2018	2019	2020	2021	2022	2023
Passenger cars	449,987	378,470	315,932	221,103	221,556	203,056	211,361
SUVs	465,672	495,243	483,331	454,701	531,700	576,632	679,462
Light commercial vehicles (LCV)	236,608	237,972	225,635	205,597	253,254	256,382	274,185

Top six sellers by brand volume in 2023

Brand	Volume
Toyota	215,240
Mazda	100,008
Ford	87,800
Kia	76,120
Hyundai	75,183
Mitsubishi	63,511

Top sellers by car and by brand in 2023 (total across all variants)

Brand	Type	Volume
Ford Ranger	Ute	63,356
Toyota Hilux	Ute	61,111
Isuzu D-Max	Ute	31,202
Toyota RAV4	SUV	29,627
MG ZS	SUV	29,258
Tesla Model Y	SUV	28,769
Toyota Landcruiser	4WD	26,449
Mitsubishi Outlander	SUV	24,263
Mazda CX-5	SUV	23,083
Hyundai Tucson	SUV	21,224

Top selling models by car body type in 2023

Brand	Type	Volume
Ford Ranger	Ute	63,356
Toyota RAV4	SUV	29,627
Toyota Landcruiser	4WD	26,449
Hyundai I30	Small car	20,626
Tesla Model 3	Sedan	17,347
Toyota Hiace	Van	7,133

The table below outlines the fuel systems that the top 35 brands operating in Australia offer, as of December 2022. Since the release of this market summary, further announcements from suppliers have indicated a range of new models are expected to be released in the future. For example, EV Jeep Wrangler^{lvi}, Volkswagen ID 3^{lvii}.

Original Equipment Manufacturer	Company/brand	ICE	BEV	FCEV	HEV	PHEV
BMW Group	BMW	Yes	Yes			Yes
	MINI	Yes	Yes			Yes
BYD	BYD		Yes			
Daimler	Mercedes-Benz	Yes	Yes		Yes	Yes
Ford	Ford	Yes	Yes			Yes
Geely	Volvo	Yes	Yes		Yes	Yes
	Polestar		Yes			
GWM	GWM	Yes			Yes	
Honda	Honda	Yes			Yes	
Hyundai Motor Group	Kia	Yes	Yes		Yes	Yes
	Hyundai	Yes	Yes	Yes	Yes	Yes
	Genesis	Yes	Yes			
Isuzu	Isuzu	Yes				
Mazda	Mazda	Yes	Yes		Yes	
Renault Nissan Mitsubishi Alliance	Mitsubishi	Yes				Yes
	Nissan	Yes	Yes			
	Renault	Yes	Yes			
SAIC	MG	Yes	Yes			Yes
	LDV	Yes	Yes			
Stellantis	Fiat	Yes	Yes			
	Alfa Romeo	Yes				
	Peugeot	Yes				Yes
	Citroen	Yes				
Subaru	Subaru	Yes				
Suzuki	Suzuki	Yes				

Original Equipment Manufacturer	Company/brand	ICE	BEV	FCEV	HEV	PHEV
Tata Motors	Jaguar	Yes	Yes		Yes	
	Land Rover	Yes			Yes	Yes
Tesla	Tesla		Yes			
Toyota	Toyota	Yes		Yes	Yes	
	Lexus	Yes	Yes		Yes	Yes
Volkswagen	Volkswagen	Yes				
	Audi	Yes	Yes		Yes	
	Porsche	Yes	Yes			Yes
	CUPRA	Yes	Yes			Yes
	Skoda	Yes				

Source: departmental analysis, OEM – Brand relationship derived primarily from [Whichcar.com](https://www.whichcar.com)

Selection of regulated entity commitments:

Vehicle brand	Commitment type	Target year	Details/notes
Full Commitment			
Volvo	Fully electric	2030	Volvo has announced plans to become a fully electric car company by 2030.
MINI	Fully electric	2030	MINI's head company, BMW, has announced intentions to make MINI the first all-electric group brand by 2030.
Fiat	Fully electric	2030	Fiat has announced that between 2025 and 2030, their product line-up will gradually become electric only.
Mercedes Benz	Fully electric	2030	Mercedes-Benz is targeting to become all electric by 2030, where market conditions allow.
Partial Commitment			
Mazda	Partially electric	2030	Mazda has announced that by 2030, 100% of Mazda products will be electrified and pure-electric vehicles will account for 25 to 40% of those.
Toyota	EV unit sales target	2030	Toyota globally plans to release 30 new EVs and lift EV sales to 3.5 million a year by 2030, investing \$87 billion in the shift to zero-carbon vehicles over that period

Vehicle brand	Commitment type	Target year	Details/notes
Kia	EV unit sales target	2030	Kia announced that as part of the EV transition, the company aims to sell 1.2 million BEVs in 2030. Further, Kia is targeting 100% EV line-up in Europe by 2030 and globally by 2035.
Hyundai	EV unit sales target	2030	Hyundai Motors announced that annual BEV sales target is 1.87 million units by 2030, with 560,000 EV units targeted by 2025.
Honda	EV unit sales target	2030	Honda announced that the company is targeting to electrify two-thirds of global automobile unit sales in 2030.
Lexus	EV unit sales target	2030	Lexus will anticipate 1 million units of BEV sales by 2030 and has committed to 100% EV by 2035.
Mitsubishi	EV unit sales target	2035	Mitsubishi is targeting hybrid, plug-in hybrids, and electric vehicles to account for 50% of its sales by 2030, and all its sales by 2035.
Volkswagen	EV unit sales target	2030	Volkswagen informally announced intention to reduce the carbon footprint of its passenger cars and light commercial vehicles by 30% per vehicle (compared with 2018) by 2030. Further, all-electric vehicles are expected to exceed 70% of European and 50% of Chinese and US sales volumes by 2030.

Source: IEA, Global EV Outlook 2022: Securing supplies for an electric future, accessed 1 June 2023, <https://www.iea.org/reports/global-ev-outlook-2022> ; S&P Global, 2023, Electric Vehicle Trends, accessed 1 June 2023. <https://www.spglobal.com/mobility/en/topic/electric-vehicle-trends.html>; GHD desktop review

Appendix B: Key assumptions in CBA

The assumptions and data sources below were used to generate the forecasts used in this analysis. In general, these assumptions were held steady for each of the options, with variations noted below.

#	Assumption	Basis for assumption	Value, where possible
1	Population growth to 2050	ABS and Treasury forecasts (see next cell)	Detailed historical population by gender by age by remoteness region estimates based on ABS 2021 Census and ABS Estimated Resident Population catalogue numbers 3101 (15 June 2023) and 3235 (30 August 2022). Forecasts from Australian Government Centre for Population (Budget 2023-24: State and Territory Population Projections, 2022-23 to 2026-27, and Budget 2023-24: National Population Projections, 2022-23 to 2033-34) and forecasts thereafter.
2	Inflation rate	Did not use explicitly, considered as part of other forecasts.	
3	Scrappage rates	Non-linear function, with survival rate of vehicles declining on an 's curve' (see next cell)	Survival rates based on the static scrappage model in the US CAFÉ Model (Shaulov, M., Baskin, D., Clinton, B., Eilbert, A., Garcia-Israel, K., Green, K., Pickrell, D., Saenz, G., & Vargas, A. (2022, April). CAFÉ model documentation (Report No. DOT HS 813 281). National Highway Traffic Safety Administration) calibrated to match 2022 new vehicle sales.
4	Battery replacement costs	Assumed to be required at 12 years of use.	Cost of \$5,000 for PVs, \$8,000 for LCVs and then reducing at 0.9% per annum in line with technology improvements.
5	Vehicle maintenance costs	Lower maintenance cost of EVs, saving may be up 40% compared to an ICE vehicle, due to fewer moving parts and less brake wear, but this varies considerably between suppliers and models. Sources such as WhichCar ^{lviii} .	\$350 per annum maintenance saving for an EV compared to an ICE vehicle.

#	Assumption	Basis for assumption	Value, where possible
6	Health benefits	Source: Annual estimates for health cost due to emissions based is on assumptions used in GHD Advisory and ACIL Allen, Fuel Quality Standards Implementation, Cost Benefit Analysis, 2022. Accessed 12 October 2023.	The 2022 Fuel Quality Standards Cost Benefit analysis includes estimated health costs of fuel (RON91, RON95, RON98, and diesel) from 2025 to 2040. Arithmetic average of RON91, RON95, and RON98 was used for petrol health cost. 2025 starting point of \$0.1210/km for average petrol and \$0.0684/km for diesel. Projections from 2041 to 2080 is derived using linear trend from estimates between 2025 and 2040 (rate of increase of 0.05% per year).
7	NPV discount rate	In line with Government guidelines	7% for central case; sensitivities at 3% and 10%.
8	Inferred headline limit	Headline limits after the initial period (2025-29) are not set, instead an inferred headline limit was created to track parallel to the BAU (to a floor of 20g CO ₂ /km).	Dynamic adjustment for 25 years, with a floor of 20g CO ₂ /km.
9	Oil and fuel prices	IEA World Energy Outlook data 2022 (https://iea.blob.core.windows.net/assets/830fe099-5530-48f2-a7c1-11f35d510983/WorldEnergyOutlook2022.pdf), Accessed July 2023; Australian Petroleum Statistics, March 2023, Provided by DISR; Fuel Quality Standards Implementation, Cost Benefit Analysis, 2022. Accessed 12 October 2023.	Dynamic adjustment to 2050 2025 petrol \$1.76/l 2025 diesel \$1.75/l 2050 petrol \$3.93/l 2050 diesel \$3.99/l Average rate of change for petrol: 1.59% Average rate of change for diesel 1.62%

#	Assumption	Basis for assumption	Value, where possible
10	Carbon intensity of fuel (petrol and diesel) and forecast changes	DCCEEW, Australia emissions projections and methodology, 2022. Accessed July 2023	Data for Figures 2.31 and 2.32 are from Methodology for the 2022 projections, DCCEEW, 2022, Available at: https://www.dcceew.gov.au/sites/default/files/documents/methodology-for-the-2022-projections.pdf See Appendix, Table 13 and 14 Data for Figure 2.34 is from Australia's emissions projections 2022, DCCEEW, 2022, Available at: https://www.dcceew.gov.au/sites/default/files/documents/ageis-projections-chart-data.xlsx See Tab 15 All data accessed in July 2023
11	Electricity prices	There is additional electricity demand and consumption, impacting prices, assuming a rapid uptake of EVs ^{lix} Source: GHD Advisory and ACIL Allen, Economic and Technical Modelling of the ACT Electricity Network Strategic Report; 26 April 2022. Accessed 12 October 2023.	The Economic and Technical Modelling of the ACT Electricity Network Strategic Report includes estimated residential electricity prices from 2023 to 2045. The 2025 estimate of 27.2 c/kWh is used as the starting value. Estimates for between 2046 and 2080 are derived using exponential smoothing forecasts based on values from 2023 to 2045. The rate of change is estimated to be -0.16% per year.
12	GDP and related macro-economic parameters	Treasury forecasts – 2021 Intergenerational Report (https://treasury.gov.au/publication/2021-intergenerational-report)	Real GDP grows from approximately \$2 trillion in 2021-22 by 2.5% per annum.
13	Value of carbon	Australian Transport Assessment and Planning Guidelines, 2021	\$60 / tonne, increasing by 3% annually.

#	Assumption	Basis for assumption	Value, where possible
14	Light vehicle fleet size	Projections for the number of cars on Australian roads will be driven primarily by population growth, ABS population estimates to 2050 (See #1 for ABS Population reference). Historical vehicle stock (1990-2022) from 2022 BITRE Infrastructure Yearbook (Road) (https://www.bitre.gov.au/sites/default/files/documents/bitre-yearbook-2022-6-road.xlsx)	Total number of light vehicles is 15.064 million in 2022, with dynamic adjustment based on vehicle ownership rate and population growth.
15	Vehicle ownership rate and growth	Historical vehicle stock (1990-2022) from 2022 BITRE Infrastructure Yearbook (Road) (https://www.bitre.gov.au/sites/default/files/documents/bitre-yearbook-2022-6-road.xlsx) . The figure will be relatively constant, with slow growth. Projections from 2023 to 2050 were estimated by developing a logarithmic trendline.	In 2022, passenger motor vehicles per person was 0.58 growing to around 0.59 passenger motor vehicles per person by 2035 and 0.60 in 2050. The rate of adjustment is logarithmic, the shape of which aligns with international research.
16	Kilometres driven per passenger vehicle per year	Projects total vehicle kilometres travelled (1990-2022) from 2022 BITRE Infrastructure Yearbook (Road) (https://www.bitre.gov.au/sites/default/files/documents/bitre-yearbook-2022-6-road.xlsx) .Trends of decrease in kilometres travelled per vehicle per year to 2030 and 2050.	In 2022, annual kilometres driven per passenger motor vehicles per person was 10,443km. In 2030, this figure is projected to be 11,340 km, falling to 10,027 km in 2050.

#	Assumption	Basis for assumption	Value, where possible
17	Shift to larger vehicles/SUVs	Projects VFACTS and S&P sales data (2012 to 2022) to 2050. Growth in line with current trend to 2028 then plateauing.	In 2022 share of sales of new SUVs was 74%, growing to around 80% by 2028 and continues at this level to 2050.
18	EV demand/uptake	The approach adopted is based on Bloomberg 2022 data (https://bnf.turtl.co/story/evo-2022/page/1) and Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2022 projections (https://www.dcceew.gov.au/sites/default/files/documents/australias-emissions-projections-2022.pdf) . Bloomberg projections used a conservative option, more benefits could be expected if uptake exceeds these expectations (noting estimates to date have consistently underestimated uptake and the fast transition pace).	Demand for EVs will continue to grow with uptake projections developed to 2050.
19	EV price parity	EVs currently cost between 20 to 50% more than the equivalent ICE model, however prices are reducing and moving towards price parity.	Linear progression towards price parity in 2030.

#	Assumption	Basis for assumption	Value, where possible
20	EV model choice	ACIL Allen/GHG market analysis found increased consumer choices	Based on VFACTS sales data (2012-2022), the number of EV model variations with positive sales in Australia has increased from 15 in 2012 to 598 in 2022. In August 2021, the EV Council reported (https://electricvehiclecouncil.com.au/wp-content/uploads/2021/08/EVC-State-of-EVs-2021.pdf) that Australians had access to 31 passenger EV models, while in July 2023 (https://electricvehiclecouncil.com.au/wp-content/uploads/2023/07/State-of-EVs_July-2023_.pdf) this number had increased to 74.
21	Vehicle technology costs	Suppliers will bring more efficient vehicles to the Australian market, resulting in additional costs compared to the BAU. Based on the current average new vehicle transaction price of \$50,161 nationally in 2022, the price differential is in the order of \$15,000 to \$20,000. EV prices continue to reduce. CSIRO research suggests EV and ICE vehicle parity pricing will be achieved in 2030 ¹⁵ .	The differential cost of deploying EV technology compared to ICE technology narrows from \$16,000 in 2022 to parity by 2030 and remains equal thereafter. Suppliers can also deploy more efficient ICE vehicles into the Australian market at an additional cost of \$1,625 per vehicle, using current mature technology available in other markets.
22	2022 new vehicle fleet emissions intensity	Analysis based on BITRE supplied 2021 figure and VFACTS data sources (2022 VFACTS sales data)	The fleet emissions intensity for new vehicle sales in the projections/modelling is 179.1 gCO ₂ /km (ADR 81/02, NEDC test) in 2022; equivalent to 248.9 gCO ₂ /km real world: – Passenger vehicles (MA+MC) 161.9 gCO ₂ /km (ADR 81/02, NEDC test) (225.0 gCO ₂ /km real world equivalent) – LCVs (NA + part NB1) 230.3 gCO ₂ /km ADR 81/02, NEDC test) (320.1 gCO ₂ /km real world equivalent)

¹⁵ Graham, P. 2022, Electric vehicle projections 2022. CSIRO, Australia. Accessed 21 September 2023. https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/2023-inputs-assumptions-and-scenarios-consultation/supporting-materials-for-2023/csiro-2022-electric-vehicles-projections-report.pdf

#	Assumption	Basis for assumption	Value, where possible
23	Engine efficiency gains	<p>Small gains projected. Extrapolation of baseline projection used in the Australian Government's 2016 Draft Regulation Impact Statement for <i>Improving the efficiency of new light vehicles</i>.</p> <p>https://www.infrastructure.gov.au/sites/default/files/migrated/vehicles/environment/forum/files/Vehicle_Fuel_Efficiency_RIS.pdf</p> <p>Page 32, Figure 7 Accessed in July 2023.</p>	<p>Passenger vehicle and LCV efficiency gains decrease over time. For passenger vehicles, gains are approximately 2 gCO₂/km year-on-year in 2025, falling to reductions of 0.8 gCO₂/km year-on-year by 2035 (where it remains constant to 2050). For LCV, reductions are 3 gCO₂/km year-on-year in 2025, falling to reductions of 1.6 gCO₂/km year-on-year by 2035 (where it remains constant to 2050).</p>
24	Government costs	<p>Establishing, monitoring and enforcing the NVES, including its ongoing administration incur costs. Assumes NVES regulatory office will be established within the Department with full-time administrative staffing. Costs will be front end loaded.</p>	<p>Varies, depending on complexity of option. Generally, Option A is more complex to administer than Options B and C.</p>
25	Compliance costs	<p>OEMs already have some reporting capabilities in place. Additional costs are assumed for suppliers to monitor their fleet's average emissions intensity to determine and report compliance with the policy. Cost estimates only capture additional reporting effort required over BAU. The cost for each supplier will differ and is proportional to the number of vehicles each sells.</p>	<ul style="list-style-type: none"> - Large brands (more than 5,000 new vehicles sold annually, based on 2022 data; 26 brands identified in S&P data) the cost per OEM is \$400,000 per year from 2025. - Small brands (equal or less than 5,000 new vehicles sold annually, based on 2022 data; 27 brands identified in S&P data) the cost per OEM is \$150,000 per year from 2025.

#	Assumption	Basis for assumption	Value, where possible
26	Light vehicle fleet categorisation	Third Edition Australian Design Rules (ADRs). See page 17.	Passenger vehicles (PVs) include MA vehicle classes; and Light commercial vehicles (LCVs) include MC, NA, NB1 vehicle classes (subject to the option being considered)
27	Fuel quality standards and Euro 6d	Euro 6 RIS. Any assumed emissions changes based on improvements in fuel quality are a result of assumptions in DCCEEW RIS.	Dynamic adjustment of fuel efficiency gains with adoption of fuel quality standards and Euro 6d.
28	Testing requirements	Analysis based on changes to fuel quality standards. Expect introduction of WLTP testing requirements from 2025-28. Conversion (by vehicle class) between NEDC and WLTP in interim based on EU factors ^{lx} .	Where conversions are required to determine real world emissions outcomes, the following headline adjustment factors are used: NEDC to WLTP: 1.2421 NEDC to real world: 1.389

Appendix C: Outcome calculation methodology and examples

Rolling balance

A rolling balance is a way of operating a NVES where each vehicle has its CO₂ performance calculated against the NVES ‘target value’ for that vehicle mass, and the difference (in g/km) between the vehicle actual CO₂ emissions and target value is added as a credit, or debit to the account of the regulated entity on a continuous basis. Sales of vehicles with CO₂ levels over the applicable ‘target value’, accrue a debit per vehicle for each g/km over the target value, and sales of vehicles with CO₂ levels below the target value accrue a credit. This means the operation of the NVES credit system is inverted – a negative number shows overachievement, and a positive number shows underachievement.

For example, if a regulated entity sells;

- 100 vehicles with a CO₂ value of 3g/km under the target value, these would accrue 300g/km of credits; and
- 200 vehicles with a CO₂ value 2g/km above the target value, these would accrue 400g/km of debits.

It would have a net position of a 100g/km debit. This regulated entity would need to purchase credits to cover this debit, bank the debit for a future year, or pay the penalty. If the penalty rate is \$100 per g/km, the penalty would be \$10,000 (penalty = debits that have come to fruition x penalty rate).

Calculating individual vehicle targets is broadly consistent with the approach used in New Zealand, which also captures a stream of data about vehicles entering the market and consequently being covered by the NVES, with a proposed streamlined final result calculation process in Australia.

Formula

The relationship between the headline limits and the mass-based limits curves is defined by the following formula, where each vehicle’s emission limit is defined as:

$$\text{Emissions target}_{i,t} = \text{Headline limit}_{c,t} + \text{Slope}_c(\text{MIRO}_i - \text{MIRO}_0)$$

Where:

i = Vehicle

c = FES Class (Passenger or LCV)

t = Year

*MIRO*_{*i*} = *MIRO* for vehicle *i*

*MIRO*₀ = Reference *MIRO*

For NVES options with breakpoints, and where a vehicle’s *MIRO* is above or below these breakpoints, the emissions limit is simply calculated using the breakpoint *MIRO* instead of the vehicle’s *MIRO*. This means that vehicles with *MIRO* under 1500kg, their *MIRO*_{*i*} in this calculation is 1500kg, and for passenger vehicles over 2,000kg *MIRO*, their *MIRO*_{*i*} is 2,000. For the light commercial vehicle category, all vehicles over 2,200 *MIRO*, their *MIRO*_{*i*} is 2,200kg.

In practice this means that in 2025;

- all type 1 vehicles with a *MIRO* below 1,500kg, have a CO₂ target of 126g CO₂/km
- all type 1 vehicles with a *MIRO* above 2,000kg have a CO₂ target of 159g CO₂/km

- all type 2 vehicles with a MIRO below 1,500kg have a CO₂ target of 178g CO₂/km¹⁶
- all type 2 vehicles with a MIRO above 2,200kg have a CO₂ target of 200 g CO₂/km

The reference MIRO is a sales weighted average MIRO for each class using 2022 sales data provided by S&P Global. The slope term was calculated by a linear regression of the sales weighted average gCO₂/km at each mass category (50kg intervals) for each class of vehicle.

Element	PV	LCV
Slope	0.0663	0.0324
Reference MIRO (kg)	1,723	2,155

Table 19 – Slope and reference mass

¹⁶ We recognize there are no vehicles in this category that meet this criterion, and it is highly unlikely this will occur in future; however, this has been included for completeness.

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- ⁱ ABS (Australian Bureau of Statistics) (2020) [Survey of Motor Vehicle Use, Australia, 12 Months ended 30 June 2020](#), ABS website accessed 10 November 2023
- ⁱⁱ OIA (2023) [Australian Government Guide to Policy Impact Analysis](#), PMC (Department of the Prime Minister and Cabinet) website accessed on 9 October 2023
- ⁱⁱⁱ See DITRDCA (Department of Infrastructure, Transport, Regional Development, Communications and the Arts) (2023) [Fuel Efficiency Standard—Cleaner and Cheaper-to-run Cars for Australia consultation paper](#), DITRDCA website accessed 10 December 2023
- ^{iv} DCCEEW (Department of Climate Change, Energy, the Environment and Water) (2023) [Emissions Projections Report](#), DCCEEW website accessed 12 December 2023
- ^v ABS (2002) [Motor Vehicle Census 2002](#), ABS website accessed 10 November 2023
- ^{vi} ABS (2021) [Motor Vehicle Census 2021](#), ABS website accessed 10 November 2023
- ^{vii} Vehicle emissions intensity is a measure of vehicle efficiency. In this report, that is the carbon dioxide intensity performance of passenger and light commercial vehicles in Australia. Carbon dioxide emissions intensity for vehicles is calculated using the method required by Vehicle Standard (Australian Design Rule 81/02 – fuel consumption labelling for light vehicles) and expressed in grams of carbon dioxide per kilometre (g CO₂/km). The data in this document reflects tailpipe emissions. It does not reflect all aspects of lifecycle emissions for a vehicle, which also include those involved in manufacturing the vehicle, transporting it to the point of sale, and disposing of it.
- ^{viii} See ICCT (International Council on Clean Transportation) (2022) [Working Paper 2022-31 Fuel efficiency standards to decarbonize Australia's light-duty vehicles, ICCT website accessed on 15 November 2023](#)
- ^{viii} NTC (National Transport Commission) (2019), [Carbon Dioxide Emissions Intensity for New Australian Light Vehicles 2019](#), NTC website accessed 16 November 2023
- ^{ix} *ibid*
- ^x Mr Bartsch's successor, Mr Paul Sansom has made similar public statements, e.g., the Australian, *Desire for EVs shifts up a gear, now the law must keep up*, published on 4 June 2022, The [Australian website accessed on 23 November 2023](#)
- ^{xi} Car Sales, *Australia a "dumping ground" for old tech, says VW*, published on 9 April 2021, Car Sales website accessed on 23 November 2023
- ^{xii} ABC News, *Car makers say lack of emissions regulations putting handbrake on electric vehicles in Australia*, published on 10 November 2021, ABC website accessed on 23 November 2023
- ^{xiii} Green, D (2010) [Why the Market for New Passenger Cars Generally Undervalues Fuel Economy](#), OECD/ITF Joint Transport Research Centre Discussion Paper No. 2010-6, Paris
- ^{xiv} ACCC (Australian Competition and Consumer Commission) (2017), [New Car Retailing Industry, a market study by the ACCC](#), ACCC website accessed 4 December 2023
- ^{xv} Climate Change Authority (2017) [Light Vehicle Emissions Standards for Australia: Research Report](#), Climate Change Authority website accessed on 30 November 2023
- ^{xvi} CarExpert, *Hyundai 'excited' by chance to shape Australia's national EV plan*, published on 7 October 2022, CarExpert website accessed on 23 November 2023
- ^{xvii} The Driven, *VW: If we had fuel standards today, we could bring in electric cars tomorrow*, published 19 August 2022, The Driven website accessed on 24 November
- ^{xviii} See AAA (Australian Automobile Association) (2023) [Real-World Testing Program](#), AAA website accessed on 12 December 2023
- ^{xix} For passenger and light commercial vehicles. [Survey of Motor Vehicle Use](#), see <https://www.abs.gov.au/statistics/industry/tourism-and-transport/survey-motor-vehicle-use-australia/latest-release>
- ^{xx} ACCC (Australian Competition and Consumer Commission) (2023) [Fuel Prices in regional locations](#), ACCC website accessed 28 June 2023
- ^{xxi} AAA (Australian Automobile Association) [Transport Affordability index](#), AAA website accessed 10 January 2024
- ^{xxii} DCCEEW (2023) [Australia's fuel security](#), DCCEEW website accessed 4 December 2023
- ^{xxiii} ACCC (2022) [War in Ukraine and OPEC production limits pushed February petrol prices to eight-year highs](#), ACCC website accessed 4 December 2023
- ^{xxiv} Consumer Reports (2023) [Car Safety and Fuel Efficiency Improvements Aren't Driving Up the Cost of Cars](#), Consumer Reports website accessed 25 November 2023
- ^{xxv} ICCT (2017) [Addressing misconceptions surrounding light-vehicle fuel efficiency standards](#), ICCT website accessed on 19 November 2023
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- ^{xxvii} Go Auto, *Unsurprisingly, smaller passenger cars in the black, larger vehicles, LCVs in the red*, published on 4 April 2023, Go Auto website accessed on 30 November 2023
- ^{xxviii} FCAI (Federal Chamber of Automotive Industries) (2023) [Results of 2022 voluntary emissions reduction standard released](#), FCAI website accessed on 21 November 2023
- ^{xxix} *idib*
- ^{xxx} DCCEEW (2023) [Emissions Projections Report](#), DCCEEW website accessed 12 December 2023
- ^{xxxi} See section 12 of the Road Vehicle Standards Act (2018).
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