Executive summary

Improving the fuel efficiency of Australia’s light vehicle fleet can deliver substantial environmental and broader economic benefits.

This briefing paper builds on the significant amount of work already undertaken on this issue over the past decade by government, industry, consumer groups and others.

Despite these efforts, Australia lags behind most other developed economies in introducing regulated vehicle fuel efficiency standards, commonly referred to as CO₂ emission standards because of the direct correlation between reducing fuel use and reducing CO₂ emissions.

International experience shows that in order to capture the broad range of benefits from improved fuel efficiency, a suite of measures needs to be developed and implemented in collaboration with all stakeholders.

Best practice light vehicle CO₂ emission standards and relevant complementary measures must be designed with a focus on maximising a range of positive outcomes - financial savings for vehicle owners, improved energy security, and least cost emissions reductions. Best Practice standards could see the fuel efficiency of Australia’s new light vehicle fleet improved by over 50% within 10 years.

ClimateWorks Australia is calling on the Federal Government within the next two years to work with industry and consumer groups to design and introduce best practice light vehicle CO₂ emission standards and supporting complementary measures that maximise the economic and environmental benefits available.

This Briefing Paper highlights that:

> Australian new light vehicles have improved in efficiency by 20% since 2002. However, at an average of 199 gCO₂/km our cars and light commercial vehicles are still far less efficient than those in most developed economies.

> Three-quarters of all new cars sold globally each year are regulated under some form of CO₂ emissions standard, and without standards in place, Australia will fall further behind other developed economies.

> The financial benefit to light vehicle owners of introducing best practice standards is significant. If efforts in the European Union are targeted with a 4 year lag, by 2020 an average driver could pay up to $170 per year less for fuel than they do today, and within 10 years they would pay up to $410 less than they pay today, even factoring in rising fuel prices.

> While improving fuel efficiency means higher upfront costs for car buyers, with a conservative estimate of $2,500 per vehicle for a 50% efficiency gain in 2024, our analysis indicates that average car owners would recover these additional costs within 3 years through fuel savings, well within the average length of vehicle ownership of about 5 years. This results in net annual savings of $352 for average drivers over this 5 year ownership period.

> The broader economic benefits are also tangible. Within 10 years, we could save up to $7.9 billion per year across our economy through reduced fuel use.

> Further, fuel efficiency helps to enhance Australia’s fuel security, with fuel demand reducing under best practice standards by between 40 and 66 million barrels per annum in 2024, equivalent to 30%-50% of all automotive fuel used in Australia in 2012.

> Of all the opportunities identified in ClimateWorks’ Low Carbon Growth Plan for Australia, reducing emissions from cars and light commercial vehicles through improved fuel efficiency presents the lowest cost opportunity to reduce emissions across our economy, and could deliver reductions of 4 Mt CO₂e in 2020 and 8.7 Mt CO₂e in 2024, equivalent to taking 2.2 million cars off the road in 2024.

> A partnership approach is required to ensure a robust solution is developed that delivers the optimal benefits to consumers and the environment, and current inertia can be overcome.
Improving Australia’s vehicle fuel efficiency
How adopting light vehicle CO₂ emission standards can cut fuel use and save households and businesses money

There is a direct correlation between improving fuel efficiency and reducing carbon (CO₂) emissions. Australia currently lags behind most of the developed world in introducing light vehicle CO₂ emissions standards, with ¼ of all new cars sold globally covered by standards.

OUR CURRENT/PROJECTED PERFORMANCE & OPPORTUNITY

Without standards in place, Australia will fall further behind other developed economies, at substantial cost to consumers. Introducing standards that adopt international best practice will address this gap.

130 gCO₂/km emissions level
- 2011
- 2020 business-as-usual

Our modelling shows that introducing best practice targets for 2020 (130gCO₂/km) and 2024 (95gCO₂/km) would deliver significant benefits across the Australian economy. Achieving this standard is technologically feasible and cost effective.

THE BENEFITS ACHIEVED IN 10 YEARS

$7.9 billion p.a fuel savings across Australian economy
Take $850 per year off the average driver’s fuel bill and achieve minimal annual net savings of $350
Reduce CO₂e emissions by 8.7 Mt equivalent to taking 2.2 million cars off the road
Eliminate up to 66 million barrels of imported oil equivalent to 50% of all automotive fuel used in Australia in 2012

Each year we delay the implementation of best practice standards is another year we miss out on these benefits and the task to catch up becomes harder. The time to act is now.

THE ROADMAP: HOW WE GET THERE

Work with industry and consumer groups to design and implement best practice standards that maximises consumer and environmental benefit
Introduce complementary measures to drive consumer demand for the most efficient vehicles
Develop partnership approach to overcome inertia and ensure effective outcomes

CLIMATEWORKS AUSTRALIA
Australia’s transport emissions are continuing to grow, with passenger and light commercial vehicles contributing the largest overall share.

The transport sector accounts for 17% (92 MtCO\textsubscript{2}e) of Australia’s emissions, with Passenger and Light Commercial vehicles contributing 62% of the sector’s emissions [DIICCSRTE, 2013].

The transport sector is one of the fastest growing sources of emissions within Australia, increasing by 47.5% since 1990 [DIICCSRTE, 2013].

The sector’s emissions are projected to rise by a further 6% to 2020, to reach 97 MtCO\textsubscript{2}e [DCCEE, 2010]. This continued increase in emissions is driven primarily by population and income growth for passenger travel and economic growth for freight transport (DCCEE, 2010).

The Low Carbon Growth Plan for Australia [ClimateWorks Australia, 2010], identified that the transport sector could contribute the most financially attractive opportunity identified across the economy through improving the fuel efficiency of conventional internal combustion engine (ICE) light vehicles; the cars, sports utility vehicles (SUVs), utes and vans most commonly seen on our roads.

As part of this previous analysis, a range of policy approaches were compared, which showed that mandatory fuel efficiency standards (also known as CO\textsubscript{2} emission standards because of the direct correlation between improved fuel efficiency and reduced CO\textsubscript{2} emissions) had the largest impact on reducing emissions, even after taking account of the increase in kilometres driven when fuel savings are achieved (known as the ‘rebound effect’).

Mandatory standards set the average acceptable emissions across the new vehicle fleet. Each vehicle manufacturer would be required to meet these standards, averaged across the mix of vehicles they sell in the Australian market. This ensures that the same variety of vehicles Australians currently enjoy would still be available, but overall they would be more fuel efficient.
Exhibit 2 – Opportunities to reduce emissions in Australia in 2020

Exhibit 3 – Comparison of policy measures to reduce emissions in cars and light commercial vehicles

<table>
<thead>
<tr>
<th>Policy measure</th>
<th>GHG emissions reduction MtCO₂e per annum</th>
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<tr>
<td>Mandatory fuel efficiency standards</td>
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<td></td>
<td>-1.7</td>
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<td>Encourage demand for low emission vehicles</td>
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Note: These projections for emission reductions from fuel efficiency standards were based on standards being implemented in 2010, and a 2020 target of 140 gCO₂/km.

Source: Adapted from Low Carbon Growth Plan for Australia: Impact of the carbon price package, ClimateWorks, 2011

Source: Low Carbon Growth Plan for Australia, ClimateWorks, 2010
Australia has the 11th largest new car market globally, with over 1 million new vehicles sold annually

Over 1 million new vehicles were sold in Australia in 2012 (NTC, 2013), making ours the 11th largest vehicle market globally (Bandivadekar, 2013).

Over the last decade, there has been a 40% increase in the total number of cars sold in Australia (from approximately 750,000 in 2001 to over 1,000,000 in 2012). These new sales are comprised of approximately 80% passenger vehicles (e.g. cars, people movers and SUVs), and 20% light commercial vehicles (e.g. utes and vans) (NTC, 2013).

As seen in Exhibit 4, over this same period there has been an overall decline in sales from local vehicle manufacturers, driven by the high Australian dollar (which has both reduced export demand and made imported vehicles cheaper), reduced import tariffs (which has increased the range of brands and models available), and a shift in consumer preferences towards smaller vehicles and SUVs (sports utility vehicles), which has also benefited the import market.

These factors have resulted in a significant increase in imported vehicles and a decline in local vehicle manufacturing, culminating in recent announcements from Ford, General Motors Holden and Toyota to cease manufacturing vehicles in Australia post 2017.

Whilst fuel efficiency from Australia’s new light vehicle fleet has been improving, we continue to lag behind most of the developed world, providing an opportunity for significant efficiency gains

Reducing emissions in vehicles is typically achieved through technology improvements that also reduce fuel use. The less petrol, diesel or natural gas consumed per kilometre driven, the less emissions produced, while also delivering a decrease in vehicle operating costs. There is in fact a direct correlation between a reduction in fuel use and a reduction in emissions and ‘fuel efficiency standards’ are often also referred to as ‘vehicle CO₂ emissions standards’.

Between 2002 and 2012, average CO₂ emissions for new passenger and light commercial vehicles in Australia reduced by over 20% (NTC, 2013). In 2012 alone, average CO₂ emissions reduced by almost 4%, to reach 199 gCO₂/km (NTC, 2013). Breaking this down further, the NTC (2013) reports that passenger vehicles averaged 190 gCO₂/km (a 4% improvement on 2011), while light commercial vehicles averaged 238 gCO₂/km (a 2.7% improvement on 2011).

This progress, which has occurred without any Australian regulatory driver, has been driven by improved vehicle technology, an increase in the share of more efficient imported vehicles, and shifting consumer preferences towards smaller vehicles and compact SUVs (Rare, 2012).

Without standards in place, business as usual (BAU) projections for Australia’s light vehicle fleet (including both passenger and light commercial vehicles) estimate average emissions of approximately 175 gCO₂/km in 2020, and 165 gCO₂/km in 2024 (Rare, 2013).

Exhibit 4 – Breakdown of domestic sales and exports 2001-2012

Source: DoI, 2012
Exhibit 6 compares the historic and business as usual (BAU) performance of Australia’s light vehicle fleet, comprising passenger vehicles (approximately 80% of new light vehicle sales) and light commercial vehicles (approximately 20% of new light vehicle sales).

Despite these efficiency gains, Australia still lags behind a number of other developed nations in terms of the average fuel efficiency (and therefore the CO₂ emissions performance) of the vehicles we drive, and the required regulatory structure to drive further efficiency improvements.

In fact, three quarters of all new cars sold globally each year are regulated under some form of CO₂ emissions standard (ICCT, 2012). For example, the US has committed to achieving the equivalent of 121 gCO₂/km by 2020 and 93 gCO₂/km by 2025 for passenger vehicles.

On a like for like comparison (excluding the various credits available in the US system and normalization of the testing methods), this equates to US cars being up to 30% more fuel efficient than the average Australian car by 2020, and even further ahead by 2025.

The United States expects an annual rate of improvement of 4.6% over the period 2012–2020 for passenger vehicles (and 4.4% for LCVs), and 5.1% per annum from 2020-2025 for passenger vehicles (and 5.5% for LCVs) with current standards in place, leading to an overall gain of 47% for passenger vehicles and LCVs out to 2025.

The EU, which has had strong standards in place for a number of years, is aiming to achieve a passenger vehicle target of 95 gCO₂/km by 2020 and approximately 73 gCO₂/km by 2025 (standards for 2025 are currently being debated in the EU) – over 40% more fuel efficient than the average car sold in Australia by 2020, and even further ahead by 2025.

In Europe, new passenger vehicle standards target a 3.8% improvement per annum from 2011-2020 (and 2.2% for LCVs), and a further 5.1% annual improvement between 2020-2025 (and 5.2% for LCVs), for an overall gain of 46% (and 37% for LCVs).

China is currently considering an ambitious 6.2% per annum improvement in passenger vehicles between 2015–2020, to improve their overall performance by 27% over this 5 year period (and is yet to set standards out to 2025).

It also demonstrates that for Australia, there is potential to achieve significant efficiency gains above BAU through the adoption of technologies that are already available in international markets.

Exhibit 6 - Historic and projected performance of average emissions of Australian light vehicle fleet

Source: NTC, 2013 and Rare, 2013
The time is right for Australia to match international efforts and further encourage the adoption of the latest technologies

Light vehicle fuel efficiency standards have been proposed in Australia previously, but due to a number of factors have stalled in their introduction.

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

Rather than rely on higher fuel prices to encourage new vehicle buyers to choose more fuel-efficient vehicles (with evidence suggesting a high degree of price inelasticity, therefore requiring significant fuel price increases to drive a shift in consumer preferences), most countries have used a combination of regulatory standards, voluntary targets, financial incentives and consumer information to achieve fuel efficiency improvements.

Whilst fuel efficiency standards vary in their ambition and design by country, in general they set average CO₂ emission levels (in gCO₂/km or equivalent) which a manufacturer must meet across its annual fleet of new vehicle sales (see Appendix A for various elements of standard design).

Emissions are calculated using a range of vehicle test cycles (i.e. vehicle running patterns to mimic actual driver behaviour), and policy design may include exemptions for manufacturers who sell small volumes, and credits for certain very low emissions vehicle technologies, such as electric vehicles. If a manufacturer does not achieve the standard, they may be penalised.

It is important to note that consumers influence the average CO₂ for a manufacturer, based on their vehicle purchase choice, and hence the need for complementary measures to inform consumer decision making. ClimateWorks Australia and Rare Consulting (a division of pitt&sherry) collaborated to model the costs and benefits of various scenarios for emissions standards based on international best practice.

Our analysis shows that if Australia were to adopt new light vehicle emission standards up to the best practice passenger vehicle standards adopted in the EU, with a four year delay - 130 gCO₂/km in 2020, and 95 gCO₂/km in 2024, we could potentially achieve significant savings on emissions and fuel use.

The degree of these savings will depend on the emission level targeted and above BAU. Details on the appropriate target, whether they are combined for the entire fleet or separated based on vehicle type.
segments (passenger and LCVs), and other such technical issues, should be worked through by Government with relevant industry and consumer groups to ensure an effective outcome that delivers the broadest benefits to the Australian economy and environment.

Achieving the targets up to those in the Best Practice Scenario, which covers both passenger vehicles and light commercial vehicles, is considered realistic because it acknowledges three important issues in relation to the difference between the Australian and other markets:

1. An easier starting point [low hanging fruit] in the Australian fleet;

2. The potential to adopt vehicle technologies that have already been developed and commercialised in other markets; and

3. The changing preferences of Australian buyers (adopting more small, diesel and European vehicles).

Overall, such a best practice scenario would require up to a 52% improvement in the performance of Australia’s light vehicle fleet to 2024. Breaking the required performance of the passenger vehicle and light commercial vehicle segments of the fleet out under such a scenario reveals that there are a variety of ranges for improvement between these two segments out to 2024, as shown in Exhibit 9.
This analysis assumes the new vehicle fleet is comprised of a constant mix of passenger vehicles (80%) and LCVs (20%), based on today’s current mix ratios.

As can be seen, if an equal rate of annual improvement is assumed across passenger vehicles and LCVs to achieve a target of 95 gCO₂/km by 2024, this would require passengers vehicles to average 91 gCO₂/km, and LCVs to average 114 gCO₂/km.

For passenger vehicles, this level is still well above the 73 gCO₂/km proposed for the EU in 2025, whilst for LCVs it is significantly below present day levels and may restrict the types of LCVs that can be offered, which is not desirable.

Alternatively, if LCVs were to continue to achieve their current 2.7% p.a. rate of improvement, this would mean that passenger vehicles would need to average 76 gCO₂/km by 2024, which is in line with the level targeted in the EU.

The final scenario shows that if LCVs were to improve at the rate targeted in the US (~5% p.a.), this would mean they achieve a 2024 level of 129 gCO₂/km, requiring passenger vehicles to average 87 gCO₂/km, still above the 73gCO₂/km targeted in the EU.

Being a technology taker and with a large proportion of our fleet sourced from markets with standards already in place, Australia can expect to achieve more rapid rates of improvement than markets such as the EU and US, and our Best Practice Scenario reflects this, delivering these benefits to Australian consumers in a realistic timeframe.

Best practice standards can deliver a range of economy-wide benefits

Our research found that emission standards can provide benefits to consumers and the broader economy by reducing emissions, providing financial savings for businesses and households, and increasing energy security.

However, there are also costs associated with implementing standards such as program administration, reduced taxation revenue through decreased fuel use, and additional upfront costs for more efficient vehicles.

The International Energy Agency estimates that within the EU, achieving a 50% improvement in fuel efficiency will cost in the range of $2,500 per vehicle by 2020 in today’s dollars, with costs decreasing further over time (IEA, 2012).

Other assessments estimate that the additional vehicle technology required to achieve the EU’s 2020 target, compared to the average 2010 manufactured car, is approximately $1,500-$1,660 (€1,000-€1,100) (Ricardo-AEA, 2013).

In the EU and other leading markets, technological innovation and commercialisation is required in order to achieve new standards in these countries, and this has been factored into the $2,500 additional cost estimate.

In the interests of taking a conservative approach to estimating potential financial benefits in our modelling, we have applied this cost to the implementation of our Best Practice Scenario in the Australian market in 2024 – even though we can expect that the actual costs will be lower, given that these technologies will be fully commercialised approximately four years prior to the time they are applied to the Australian market.
Further, a decline in the upfront cost of new vehicles over this period has not been factored in, even though new vehicle purchase costs have declined by 11% over the past decade, driven by an increase in the number of imported vehicles available in the market, and increased competitiveness (DIISRTE, 2011).

As shown in Exhibit 10, our analysis found that best practice efficiency gains can provide significant fuel cost savings to consumers compared to a BAU scenario. Under our Best Practice Scenario versus BAU, for a vehicle driving average kilometres (14,000 km/yr) (ABS, 2012), annual fuel savings of $500 per year could be achieved in 2020, and over $852\(^1\) per year in 2024.

In 2020 a vehicle owner travelling average kilometers could be paying $170 less per year for fuel than they do today, and as much as $410 less per year for fuel in 2024, even driving the same distances and with increasing fuel prices.

Exhibit 11 shows that for an average vehicle owner driving 14,000 km/yr fuel savings over the 5 year ownership period would total $4,263, which means that even our conservative estimate of additional upfront costs would still be recouped within 3 years, well within the 10 year average age of a vehicle (ABS, 2013) and the 5 year average ownership period. This results in a minimum savings of $1,763 over this 5 year period, or $352 minimum net annual savings.

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\(^1\) Assumes fuel price of $2.10/litre in 2024
As shown in Exhibit 12, the fuel savings could be even greater for fleet owners with higher annual kilometres (for example 20,000 km/yr), with fuel savings of over $710 per year in 2020 and $1,218 in 2024 compared with BAU.

Exhibit 13 shows that for a fleet vehicle owner driving 20,000 km/yr fuel savings over the 3 year ownership period would total $3,654, which means that even our conservative estimate of additional upfront costs would still be recouped within 2 years, within the 3 year average ownership period.

This results in a minimum savings of $1,154 over this 3 year period, or $384 minimum net annual savings. Given that upfront costs could be significantly less than the $2,500 conservative estimate adopted, due to the 4 year lag in adoption of technologies from overseas markets and the trend in decreasing costs for vehicles, it is expected that savings would be greater over both the ownership periods analysed above than the minimum presented.

Exhibit 12 – Annual fuel costs and savings: Best Practice Scenario compared to BAU for a fleet vehicle (20,000km/yr)

Exhibit 13 – 3 year fuel costs and savings: Best Practice Scenario compared to BAU for a fleet vehicle (20,000km/yr)
With best practice standards in place, in 2024 average drivers could recoup the additional upfront costs within 3 years, and be paying 25% less per year for fuel than they do today, even in the face of increasing fuel prices.

Comparing these savings to projected average household electricity bills in 2020, our analysis shows that with best practice standards, the fuel savings achieved for an average driver (14,000 km/yr) could offset one third of the average household electricity bill.

This shows that there are significant financial savings available that can help relieve cost of living pressures for Australian consumers, and also increase business competitiveness.

Assuming a 2% growth in new vehicle sales, the additional upfront costs of new vehicles purchased in 2024 will total approximately $3.2 billion. This is in comparison to the potential annual fuel savings of over $1 billion for these vehicles, showing again that economy wide this upfront investment could be paid off from fuel savings in less than 3 years.

Our analysis shows that avoided fuel use (which will ultimately depend on the fuel mix), could total around 3.7 billion litres of fuel (worth $7.9 billion) every year by 2024 from implementation of these best practice standards.

Given the short pay back period on these efficiency upgrades, and as fuel prices continue to rise, without best practice vehicle emissions standards in place, Australian light vehicle owners will continue to spend substantially more on fuel than they could be, adding to cost of living pressures.

There are several key risks that Australia faces if it does not take advantage of this opportunity

**Energy security**

Australia’s oil self-sufficiency has been declining rapidly over the past decade and is expected to continue to decline over the next 20 years, increasing reliance on imported oil for transport fuels.

Projections suggest that Australia’s annual demand for transport energy could rise by as much as 35% by 2030 to 470 million barrels of oil equivalent [ACIL Tasman, 2008]. This prediction coincides with a projected fall in Australian crude oil production to less than 85 million barrels of oil equivalent by 2030, as seen in Exhibit 14.

**Exhibit 14 – Transport sector oil demand compared to supply (millions barrels oil equivalent)**

<table>
<thead>
<tr>
<th>Transport sector demand (2030)</th>
<th>Domestic Production (2030)</th>
<th>Import requirement (2030)</th>
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<tbody>
<tr>
<td>470</td>
<td>385</td>
<td>85</td>
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Source: ACIL Tasman, 2008, ACIL Tasman et al 2009

As vehicle ownership in emerging economies continues to explode over the next decade and beyond, this will have implications for the cost and availability of transport fuels in the global market, and for Australia’s ongoing energy security.

However by 2024, the impact of best practice emissions standards could reduce oil imports by between 40 and 66 million barrels per annum, equivalent to between 30-50% of Australia’s 2012 domestic demand for automotive fuels [BREE, 2012].

**Lock-in of higher levels of emissions**

The average age of vehicles on Australian roads is 10 years [ABS, 2013], which is higher than the global average. Exhibit 15 shows that in 2024, 30% of all cars and light commercial vehicle kilometres will be from vehicles built prior to 2014. As a result, new vehicles...
introduced after 2013 would account for over 30% of all kilometres driven by 2016 and over 70% in 2024. This means that any delay in improving vehicle emissions standards will lead to a level of emissions lock-in – where a larger proportion of vehicles on our roads will be less efficient than they would be with standards in place – reducing the potential by which vehicle emission standards can contribute to Australia’s 2020 emission reduction target.

By setting a 2020 target, this will encourage the gradual improvement (beyond BAU) of average fleet emissions in the lead up to 2020, as demonstrated in international markets which have implemented standards. As the lowest cost opportunity to reduce emissions available in Australia, missing this potential would increase the cost of ‘catching up’ through other emissions reduction opportunities in the future.

Exhibit 15 - Proportion of new light vehicles by total vehicle kilometres driven (2011-2024)

Source: Rare, 2013
The technology already exists to achieve significant efficiency improvements in the vehicles we drive

There are a range of current and emerging technologies that can be, and some which already have been, implemented to improve vehicle efficiency. The majority of these technologies have been developed in response to existing and forthcoming legislative requirements in international markets.

For Australia, this means that we can adopt these technologies at lower cost and faster rates, and importers can sell more efficient vehicles into our market that they already manufacture for other markets. In many cases, less efficient versions of these cars are already sold in Australia.

In addition to technology improvements to traditional internal combustion engines, savings could also be achieved through a range of alternative fuels (e.g. biofuels) and technologies (e.g. electric or hybrid vehicles) that can also reduce emissions from the light vehicle sector.

Widespread penetration of these fuels and technologies will depend on a variety of factors, including the time required to optimise production scales, build fleet operator confidence, and cost.
A range of complementary measures are available to improve light vehicle fuel efficiency

Overseas experience shows that, while mandatory fuel efficiency standards are key to achieving emissions reductions in passenger and light commercial vehicles, they can be enhanced with a range of complementary measures. These may include information measures and incentives to build consumer awareness and drive demand and other measures to minimise the ‘rebound effect’. The ‘rebound effect’ refers to the phenomenon where energy savings from increased efficiency can result in rebounding energy consumption.

For the transport sector, the rebound effect comes into play where savings from reduced fuel consumption are utilised to travel additional kilometres.

Complementary measures are required in addition to standards to ensure that the rebound effect can be minimised if not eliminated. In particular, economic signals that provide clear financial incentives to vehicle owners have been found to work in international markets (ICCT, 2012). These include road access pricing and fuel and vehicle fees.

All countries that have enacted standards have supported them with complementary measures. A range of example complementary measures are discussed below.

### Table 1 - Range and examples of complementary measures introduced in other countries

<table>
<thead>
<tr>
<th>Complementary Measure</th>
<th>Example</th>
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<tr>
<td>Consumer education</td>
<td>The UK Fuel Economy Label shows car buyers the running costs and fuel efficiency of new cars, clearly demonstrating that choosing a car with lower CO$_2$ emissions means lower running costs (UKLCVP, 2013).</td>
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<tr>
<td>Fuel Quality</td>
<td>Australia may require a tightening of petrol standards as many European vehicles require 10 ppm sulphur content to meet air quality standards. Without harmonisation of fuel quality standards there may be some impediment for importing fuel-efficient vehicles or transferring engine technology. Further investigation is required.</td>
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<td>Road access pricing</td>
<td>Congestion plays a significant role in increasing vehicle carbon emissions, while also contributing to health costs. Road access pricing strategies could significantly reduce (or even eliminate) congestion on urban freeways (and reduce congestion elsewhere), which would provide an additional benefit in reducing vehicle carbon emissions. Such measures have been implemented in Singapore and in parts of the EU and US, at the city and national scale.</td>
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<tr>
<td>Fuel and vehicle fees</td>
<td>Annual registration fees based on CO$_2$ emissions have been adopted in France, Germany and the UK. The US has had a ‘gas-guzzler’ tax on cars with a fuel economy rating below 22.5 mpg (280 gCO$_2$/km) since 1991. Research has found that these fuel fees have significantly more impact on fuel economy than purchase-registration fees (ICCT, 2012) The UK has found that progressive CO$_2$ taxation of company cars has been very powerful in driving consumer choice (UKLCVP, 2013) Linking fuel and vehicle fees to emissions rather than attributes such as weight allows for application across a range of technologies (ICCT, 2012)</td>
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Appendix 1 – Elements of best practice standard design

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<th>Element</th>
<th>Suggested design for discussion</th>
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<tr>
<td><strong>Coverage of standards</strong></td>
<td>There are pros and cons of having a single standard for all light vehicles versus separate standards for passenger cars and light commercial vehicles. A single standard allows manufacturers more flexibility in meeting targets by changing their model mix, it avoids the complexity of separate standards, and minimises leakage of passenger models into a less stringent light commercial vehicle standard. This approach may advantage manufacturers who only sell passenger cars, but this bias could be offset through the application of attribute weightings (e.g. mass, footprint).</td>
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<td><strong>Attribute based targets</strong></td>
<td>Vehicle footprint (size) is the preferred attribute for its greater fairness and its recognition of light weighting opportunities as opposed to vehicle mass (weight) which may unintentionally incentivise a shift to larger vehicles.</td>
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<td><strong>Test cycle</strong></td>
<td>New vehicles are tested in laboratory conditions using a representative test cycle that aims to simulate real-world driving. Different countries use different cycles. It is suggested that the New European Driving Cycle should continue to be used as the fuel consumption test drive cycle. This test cycle is also supported by key countries where many of Australia’s new vehicles originate (e.g. European Union and China).</td>
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<td><strong>Banking</strong></td>
<td>Permitting the transfer of credits between years encourages early effort and allows manufacturers to meet their targets if their sales mix does not meet the target (due to consumer preferences).</td>
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<td><strong>Trading</strong></td>
<td>Transfer between manufacturers of large brands enables advanced technologies to be provided by the manufacturer with least cost (e.g. Toyota hybrid drivetrain development).</td>
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<td><strong>Super credits</strong></td>
<td>Multiplication factors for electric vehicles and alternative fuels are not recommended beyond a short transition period because these can undermine the total emissions benefit achievable. They may also unnaturally favour more expensive technologies and increase the cost of meeting standards.</td>
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<td><strong>Penalties</strong></td>
<td>Penalties should be high enough so that manufacturers invest in improving fuel economy rather than pay a fine, but reasonable enough to not make the Australian market an unattractive place to sell vehicles.</td>
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<td><strong>Target setting</strong></td>
<td>At least a 10-year outlook is necessary. This is consistent with longer term targets established in other markets (United States) and provides a lead time for model planning and technology transfer.</td>
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<td><strong>Eco-innovations</strong></td>
<td>These are non-engine technologies that can still contribute to fuel savings (e.g. low-resistance tyres, gear shift messages). Their effect can be difficult to measure and can have a higher administrative cost. It may be better to support case studies that show the impact of additional fuel saving features to encourage purchase of vehicles that adopt these technologies.</td>
</tr>
<tr>
<td><strong>Exemptions for low volumes</strong></td>
<td>In the European Union, manufacturers registering fewer than 22,000 new vehicles a year can apply for an exemption. A lower threshold is required for Australia because the European threshold would exempt all but the top 15 car brands in Australia.</td>
</tr>
</tbody>
</table>
References


Rare Consulting, (2012), Light vehicle emission standards in Australia - The case for action. Prepared for ClimateWorks Australia.


<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAU</td>
<td>Business as usual</td>
</tr>
<tr>
<td>CAFE</td>
<td>Corporate Average Fuel Economy</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
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<tr>
<td>ICCT</td>
<td>International Council on Clean Transportation</td>
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<tr>
<td>LCV</td>
<td>Light Commercial Vehicle</td>
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<tr>
<td>NEDC</td>
<td>New European Driving Cycle</td>
</tr>
<tr>
<td>SUV</td>
<td>Sports utility vehicle</td>
</tr>
<tr>
<td>US</td>
<td>United States of America</td>
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</tbody>
</table>
This report was authored by Meg Argyriou and Scott Ferraro, with project support by Shane Gladigau and technical input from Pitt & Sherry (incorporating Rare Consulting).

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www.climateworksaustralia.org/vehicle-emissions-standards

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