FCAI Response to Vehicle Emissions Discussion Paper

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KEY MESSAGES

Overview:

- The Australian automotive industry is committed to continuing to make a strong contribution to national efforts to reduce the impact of global climate change.
- Australia is a small market comprising only 1.5% of global production. To offer vehicles with world-class pollutant emission standards, Australia must harmonise pollutant emission and fuel standards with leading overseas markets.
- CO_2 standards or targets need to be considered together with pollutant emission standards and fuel quality standards as they are all interrelated. This position is shared by many governments, research organisations and the global automotive industry
- The anticipated environmental benefits of adopting Euro 6 pollutant emission standards for petrol engined light vehicles will not be realised until such time as 10 ppm sulphur petrol is widely available in Australia.

Integrated approach:

- A whole of government approach that includes on-road operation of light vehicles must be taken to achieve real world CO_2 and pollutant emission reductions:
    - Fuel quality standards, which must match the emission technology in our vehicles and how to encourage/ensure consumers use the correct fuel grade.
    - The Australian consumer preference for heavier vehicles with larger and more powerful engines and automatic transmissions.
    - The use of light vehicles in Australia; in particular, how to relieve congestion in our major cities. There is significant potential benefit, a reduction of up to 10% of fuel use, from vehicle-to-infrastructure (V2).
    - Driver behaviour and how eco-driving can reduce fuel use.
    - Vehicle technology and the refueling infrastructure required to support new technologies such as electric vehicles, hybrid electrics and hydrogen fuel cells.
    - Increasing consumer demand through raising awareness and creating incentives for people to adopt new technology.
    - Steps to reduce the age of the vehicle fleet, as newer vehicles are more fuel efficient.
- To focus on only one area will increase the overall cost to the community without delivering the expected CO_2 and pollutant emission reduction benefits.

CO2 standard:

- The FCAI/industry supports introduction of a mandated CO_2 standard.

- The standard must be relevant to the Australian market conditions and contribute to the Government's overall post-2020 GHG reduction targets.

- The FCAI would support a mandated 2030 CO_2 target that commenced in 2020, with interim targets and a mid-term review.

- Extensive modelling is required by the Government to:

    - Determine appropriate CO_2 value for 2020 start date, annual rate of reduction and 2030 target(s).

    - What level of intervention will the government introduce in terms of credits, incentives and other complementary measures?

    - Mechanisms for measuring and reporting CO_2 values.

    - Vehicle categories and corresponding targets. (Note: Europe and the US have different definitions and separate targets for passenger cars and light commercial vehicles).

- Australia cannot simply adopt an overseas CO_2 standard. Australia is different to Europe and the US as we have our own unique market (fleet mix), consumer and driving needs.

- The FCAI offers to work with the government to work through the issues and develop a CO_2 standard that is relevant to Australia and delivers the Government's objective of reducing CO_2 from light vehicles without constraining consumer choice.

Pollutant Emission Standards:

- Adoption of Euro 6 standards in Australia will be most efficiently achieved by applying United Nations Regulation 83 (UN R83). The FCAI therefore welcomes the recent advice from DIRD that Australia intends to apply UN R83.

- If the government is determined to mandate Euro 6, the introduction date for "new models" should not be before 2020 and must be linked to the widespread availability of 10 ppm sulphur 95 RON petrol.

    - As there are multiple stages of Euro 6, there needs to be a staged implementation with an introduction date for "all vehicles" at least 4 years later than the corresponding "new models" date.

- The costs to move from Euro 5 to Euro 6 comprise:

    - An increased cost per vehicle; resulting in an increased annual cost across sales of all new light vehicles of (approx.) $495 million.

    - Increased cost of petrol (passed as an increased operating cost for owners to purchase 95 RON 10 ppm sulphur petrol).

Fuel Standards:

- Vehicles are designed and developed to meet CO_2 standards and/or pollutant emission standards with an expectation of appropriate/compatible market fuel quality.

- The anticipated environmental benefits of adopting Euro 6 pollutant emission standards for petrol engined light vehicles will not be realised until such time as 10 ppm sulphur petrol is widely available in Australia.

- The automotive industry would welcome a discussion on improving the quality of Australian market fuels, including incentives to encourage greater uptake of low sulphur fuel by consumers. This will have the additional effect of unlocking environmental benefits across the national carparc.

- It should also be noted that the Indian Government's rulemaking process recognised that the availability of 10 ppm sulphur petrol is a pre-requisite to mandating Euro 6.

On-road testing:

- If on-road testing is introduced, it must be to a recognised standard, be robust, realistic, and relevant to Australia and address the key environmental issues.

- Light vehicle emissions (both CO_2 and pollutant emissions) are measured in laboratory tests and do not always translate to on-road conditions due to real world variabilities.

- Two important activities to address the difference between the current drive cycle, the New European Drive Cycle (NEDC) and real-world results are:

    - Development of a new test cycle, the Worldwide Harmonised Light Vehicles Test Procedure (WLTP); and

    - Development and introduction in Europe of the Real Driving Emissions (RDE) test.

- The WLTP drive cycle is longer, has a higher maximum speed, higher average speed and higher acceleration than the NEDC.

- The RDE will be introduced as part of the European type approval of a new model passenger vehicle to measure pollutants (NOx and particulates). The RDE will also be able to be used as an audit test throughout the life of the vehicle.

Conclusion:

- A real and sustained reduction in vehicle emissions (both CO_2 and pollutants) will only be achieved through an integrated approach that takes a whole-of-government approach to CO_2 standards, vehicle pollutant emission standards, fuel quality standards and on-road vehicle operation.

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1.0 INTRODUCTION

The FCAI welcomes the opportunity to respond to the Federal Government's "Vehicle Emissions" Issues Paper[1]. The Federal Chamber of Automotive Industries (FCAI) is the peak industry organisation representing the manufacturers and importers of passenger vehicles, light commercial vehicles and motorcycles in Australia.

The Australian automotive industry is committed to continuing to make a strong contribution to national efforts to reduce the impact of global climate change. To achieve a reduction in CO_2 emissions from private road transport an "Integrated Approach" is required. The Integrated Approach includes vehicle technology, alternative fuels, driver behaviour, infrastructure measures and price signals.

With continual significant investment in product development, the automotive industry has reduced average CO_2 emissions of new light vehicles by more than 27 per cent since 2000, at an average annual reduction of 2.4 per cent. This means that the on-road light vehicle fleet is now more than 25 per cent more fuel efficient than it was in 2000. When comparing on a like-for-like basis (i.e. using results of drive cycle tests across the same market segments) the annual reduction in Australia is comparable to the annual improvements in the EU and also the OECD average.

The FCAI welcomes the establishment of the Ministerial Forum on Vehicle Emissions as vehicle pollutant emission standards, CO_2 emissions and fuel quality standards are interrelated and must be considered as a single system to deliver improvements in both CO_2 emissions and vehicle pollutant emissions. This linkage is recognised in many government reports and policy initiatives currently underway including the Review of the Fuel Quality Standards Act and the National Clean Air Agreement.

[1] Australian Government, Department of Infrastructure and Regional Development, "Vehicle Emissions", Discussion Paper, February 2016

2.0 AN INTEGRATED APPROACH

Main Points from Section 2.0: An Integrated Approach:

- The Australian automotive industry is committed to making a strong contribution to national efforts to reduce the impact of global climate change.
- On-road operation of light vehicles must be considered to achieve CO_2 and pollutant emission reductions.
- An "Integrated Approach" that covers the following aspects is required:
    - Vehicle technology
    - Fuel quality standards
    - Alternative fuels and energy platforms
    - Driver behaviour
    - Infrastructure measures
    - Price signals
    - Average fleet age

2.1 Background

The Australian automotive industry is committed to making a strong contribution to national efforts to reduce the impact of global climate change but it must be recognised that the on-road operation of light vehicles[2] also needs to be considered. For example, due to increasing congestion in our major cities owners of passenger cars, SUVs and light commercial vehicles are experiencing increasing travel times and consequently are using more fuel, and emitting more CO_2 emissions year-on-year without increases in travel distance.

As at 31 January 2015 there were (approx.) 18 million motor vehicles registered in Australia, of which (approx.) 16.5 million were light vehicles[3]. In 2015, more than 1.1 million new passenger cars, SUVs and light commercial vehicles were sold.[4] Therefore, annual sales of new light vehicles are equivalent to 1/16th or 6.75 per cent of the light vehicle in-service fleet.

The Australian Government's, *Australia's emissions projections 2014-2015*[5], states (pp.19-20) that transport emissions were 17 per cent of the National Greenhouse Gas Inventory in 2013-14 and that private road transport accounted for 46 per cent of transport emissions in 2013-14. Light vehicles accounted for 10.4 per cent of the National Greenhouse Gas (GHG) Inventory in 2013-14 and sales of new passenger cars, SUVs and light commercial vehicles can influence only around 1/16th of the private road transport annual GHG emissions. This equates to less than one per cent (i.e. 1/16th of 7.8 per cent) of the National Greenhouse Gas Inventory.

In 2014 the Bureau of Infrastructure, Transport and Regional Economics (BITRE) released a study on the fuel consumption trends of new passenger vehicles sold from 1979 to 2013.[6] The BITRE found

[2] Light vehicles in this submission refers to passenger cars, sport utility vehicles (SUVs) and light commercial vehicles up to 3.5 tonne GVM (LCVs)
[3] Australian Bureau of Statistics, 9309.0 – Motor Vehicle Census, Australia, 31 Jan 2015.
[4] Vfacts National Report, New Vehicle Sales, December 2015.
[5] Commonwealth of Australian (Department of Environment) 2015, Australia's emissions projections 2014-15, p. 19.
[6] Australian Government, Bureau of Infrastructure and Regional Economics (BITRE), 2014, New *passenger vehicle fuel consumption trends, 1979 to 2013, Information* Sheet 66, BITE, Canberra.

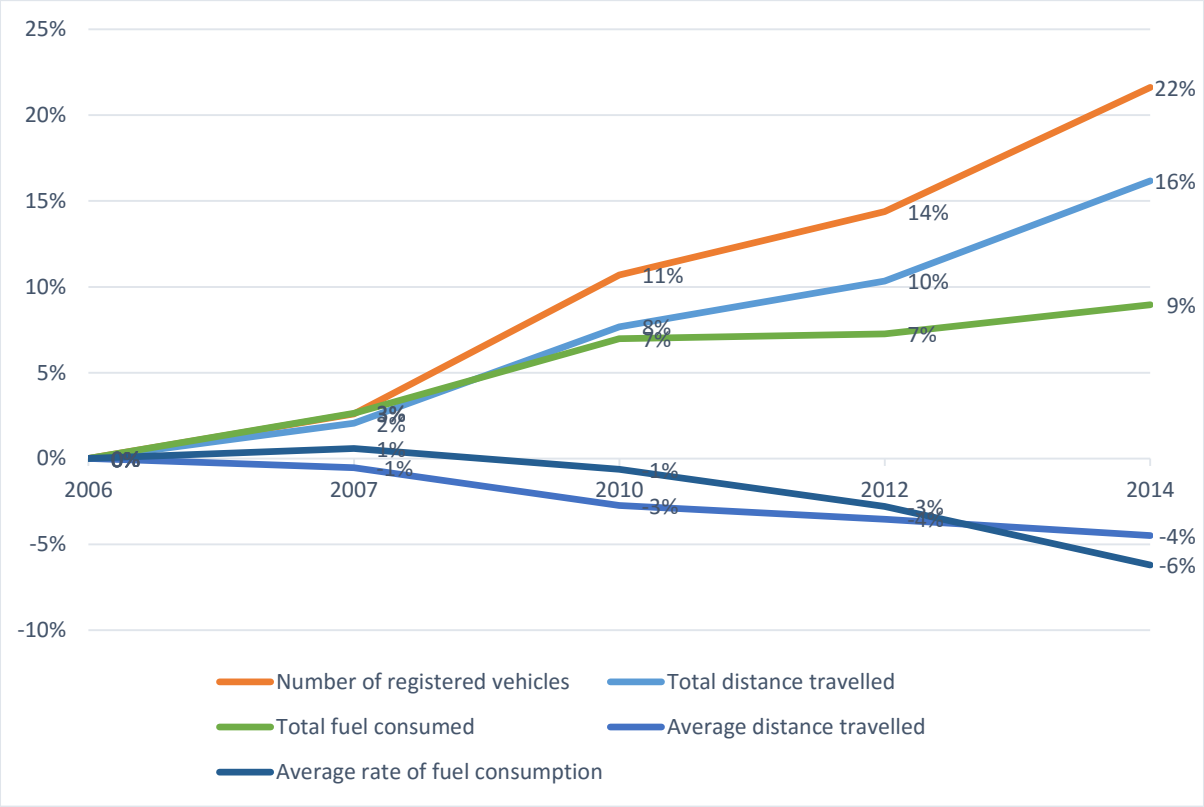
that before 2005, the improvements in vehicle technology that produced improved fuel consumption were somewhat offset by a change in the market to increases in power, weight and four wheel drive vehicles. The BITRE also reviewed the performance of the entire light vehicle fleet and found that since 1980;

> *"…the fuel intensity of entire light vehicle fleet has decreased a total of about 12.8 per cent"*

This is supported by the ABS Survey of Motor Vehicle Use.[7] When considering the percentage change in use of light vehicles over the period 2006 to 2014 (see Figure 2.1):

- The numbers of registered light vehicles increased by 22%.
- The total distance travelled by light vehicles increased by 16% and the average distance travelled by each light vehicle decreased by 4%.
- The total fuel consumed increased by 9% while the average fuel consumption of a light vehicle improved by 6%.

Figure 2.1 – Changes in Light Vehicle Use: 2006-2016



Despite the yearly improvements in fuel consumption of new light vehicles (i.e. reduction in CO_2 emissions) and also the improvement in the overall light vehicle fleet, the Department of Environment found that transport GHG emissions have steadily increased since 1990 and are projected to continue to increase.[8]

[7] Australian Bureau of Statistics (ABS), 9208.0 – Survey of Motor Vehicle Use, Australia, 12 months ended 31 October 2014, 15 October 2015, ww.abs.gov.au

[8] Commonwealth of Australian (Department of Environment) 2015, Australia's emissions projections 2014-15, pp. 19-20.

Consumer purchasing choice, vehicle use, road infrastructure and fuel quality will continue to be major influences on the rate of growth of private transport related GHG emissions. Therefore, to achieve a reduction in both CO_2 and pollutant emissions from private road transport an "Integrated Approach" is needed.

2.2 Integrated Approach

The "Integrated Approach" includes;

- Vehicle Technology – Improve the performance of new light vehicles (passenger cars, SUVs and light commercial vehicles) to reduce their average CO_2 emissions.
- Fuel Quality Standards – Compatible market fuel must be available to support the vehicle technology and deliver the expected CO_2 (and pollutant) emission reductions.
- Alternative Fuels and Energy Platforms – Support of alternative fuels and energy platforms and the infrastructure to deliver them.
- Driver Behaviour – Educate drivers on techniques to reduce fuel consumption and CO_2 emissions, which can also improve road safety (see the golden rules of eco-driving at www.ecodrive.org).
- Infrastructure Measures – Improve traffic flow and avoid wasteful congestion. Emerging Cooperative Intelligent Transport Systems (C-ITS) technology has the potential to deliver significant reductions in traffic congestion.
- Price signals – Influence consumer choice to produce driving behaviour and purchase decisions for lower CO_2 emissions.
- Average fleet age – Incentives to increase the uptake of newer light vehicles and reduce the average age of the in-service fleet.

Focusing on just a single area, (e.g. vehicle technology) could increase overall cost to the community without delivering the expected benefits in the real world.

2.2.1 Vehicle Technology

The industry will continue to deliver new vehicle technology to reduce the CO_2 and pollutant emissions of new light vehicles (passenger cars, SUVs and light commercial vehicles).

Section 4.0 Light Vehicle CO_2 Targets provides more information on the historical performance of light vehicles and the challenges to vehicle brands to continue to deliver continued improvements. The issues surrounding the introduction of a mandated CO_2 target is also outlined.

Section 5.0 Pollutant Emission Standards provides more information on the costs and issues surrounding the introduction of Euro 6 pollutant emission standards.

2.2.2 Fuel Quality Standards.

To deliver the expected CO_2 and pollutant emission reductions, compatible market fuel must be available. While 95 RON, Premium Unleaded Petrol (PULP) is widely available it comes at a price

premium over Unleaded Petrol (ULP). To encourage consumers to use PULP and consequently receive the CO_2 benefits from advanced vehicle technologies the price of PULP will need to be comparable to ULP and ideally there would be no price difference.

The other significant issue with Australia's market fuel is the level of sulphur in petrol. Many new engine and emission technologies require a maximum of 10 ppm sulphur for full utilisation and to deliver the anticipated environmental benefits. However, Australia's fuel quality standard for petrol still allows up to 150 ppm sulphur for 91 RON petrol and up to 50 ppm sulphur for 95 RON petrol. [9]

In contrast, the diesel fuel quality standard has specified a maximum of 10 ppm sulphur since 2009.[10] Diesel fuel refined in Australia meets this standard.

The high sulphur content in petrol currently supplied to the Australian market limits the adoption/import of some existing petrol engines that meets Euro 6. The situation will continue until such time that 10 ppm sulphur petrol is widely available in the Australian market.

It should also be noted that the Indian Government's recent rulemaking process recognised that 10 ppm sulphur petrol is a pre-requisite to mandating Euro 6.

Section 6.0 Fuel Quality Standards provides a summary of the existing international and Australian research that supports the need for 95 RON 10 ppm sulphur petrol to deliver advanced market CO_2 targets and pollution emission standards.

2.2.3 Alternative Fuels and Energy Platforms

An important part of an Integrated Approach is support of alternative fuel sources and the infrastructure required to deliver vehicles with alternative energy platforms, e.g. electric vehicles (EVs), plug-in hybrid electric vehicles (PHEV), hybrid electric vehicles (HEV) and hydrogen fuel cell vehicles (HFCV).

Australia needs to be aware of all these technologies and facilitate the entry into the market of all technologies, rather than locking the country into one approach.

EVs, PHEVs, HEVs and also HFCVs can potentially have significant impact on energy saving and deliver light vehicle CO_2 reduction. However, there are still a number of issues that need to be addressed[11]:

- HFCV: System cost reduction and development of hydrogen infrastructure are required.
- EV:
    - Recharging infrastructure is necessary for expansion.
    - Improved battery performance and cost reduction.
    - Consumers are still concerned about range, performance, recharge time and return on investment (i.e. resale value of car).

[9] Department of Environment, Petrol Fuel Quality Standard, www.environment.gov.au [accessed 4 April 2016]
[10] Department of Environment, Diesel Fuel Quality Standard, www.environment.gov.au [accessed 4 April 2016]
[11] IHS Consulting, Feb 2016, Global Automotive Regulatory Requirements: Regulatory Environment and Technology Roadmaps

- PHEVs: Additional models, including light commercial vehicles, are likely to be introduced in the US post 2020/25 to meet the US CO_2 targets.

The Australian Government needs to consider what role it will play in this area. Approaches that are used in other countries to encourage the uptake of these alternative energy platform vehicles include:[12]

- Japan: Government-led consumer incentives and infrastructure investment played significant roles in the uptake of vehicles with these technologies. Japan has an official government target to deploy 2 million slow charging and 5,000 fast charging points for EVs by 2020.
- US: The mandated CO_2 targets include credits for hybrid, electric and hydrogen fuel cell vehicles ranging from 4.3% (in 2015) to 12.2% (in 2025). The US Government provided up to $7500 electric car tax credit and many US states also provide financial incentives.
- Canada: Some Canadian Provinces have rebates for purchasing EVs or PHEVs and also for installing home recharging.
- Norway: Owners of EVs and PHEVs have been exempt from paying road tax. This has helped Norway become the largest EV fleet per capita in the world with around 55,000 EVs in 2015. Incentives are being wound back with owners of EVs needing to pay half of the road tax from 2018 and the full road tax from 2020.
- Netherlands: Had financial incentives for purchasing PHEVs. The incentive expired in January 2014 and sales dropped from 9,000 in December 2013 to a little more than 500 in January 2014. This demonstrates the need for long term financial incentives to create price parity of EVs, PHEVs and HEVs with conventional engine vehicles.
- China: The Chinese government offer a nationwide subsidy of RMB3,000 to consumers who purchase any passenger vehicle with an engine capacity of under 1.6 litre and that consume 20% or less fuel than government standards.

2.2.4 Driver Behaviour

Vehicle engine technology and performance has improved rapidly, while most drivers have not adapted their driving style. Educating drivers on techniques to reduce fuel consumption and CO_2 emissions (which can also improve road safety) can reduce fuel consumption from road transport so that less fuel is used to travel the same distance.

Ecodriving[13] is a term used to describe energy efficient use of vehicles and represents a driving culture to makes best use of advanced vehicle technologies. Ecodriving offers numerous benefits, including GHG emissions reductions, fuel cost savings, as well as greater safety and comfort. Many organisations, including some Australian motoring clubs, promote “eco-driving.”

Following are the “Golden Rules of Eco-driving as promoted by Ecodrive.org:

1. Anticipate Traffic Flow: Read the road as far ahead as possible and anticipate the flow of traffic. Act instead of react – increase your scope of action with an appropriate distance between vehicles to use momentum (an increased safety distance equivalent of about 3

[12] IHS Consulting, Feb 2016, Global Automotive Regulatory Requirements: Regulatory Environment and Technology Roadmaps
[13] Ecodriving.org, What is Ecodriving?, www.ecodriving.org [downloaded 25 March 2016]

seconds to the car in front optimises the options to balance speed fluctuations in traffic flow – enabling steady driving with constant speed).

2. Maintain a steady speed at low RPM: Drive smoothly, using the highest possible gear at low RPM.

3. Shift up early: Shift to higher gear at approximately 2,000 RPM. Consider the traffic situation, safety needs and vehicle specifics.

4. Check tyre pressures frequently (at least once a month) and before driving at high speed. Keep tyres properly inflated as low tyre pressure is a safety risk and wastes fuel. For correct tyre pressure (acc. To loading, highest pressure and speed driven), check the car's manual or tyre placard.

5. Any extra energy used costs fuel and money: Use air conditioning and electrical equipment wisely and switch it off if not needed. Electrical energy is converted from extra fuel burnt in a combustion engine, so electrical equipment doesn't work "for free" – it always costs extra energy and money. Avoid unnecessary weight and aerodynamic drag.

2.2.5 Infrastructure Measures

Improvements to infrastructure to improve traffic flow and avoid wasteful congestion.

Emerging Cooperative Intelligent Transport Systems (C-ITS) technology has the potential to deliver significant reductions in traffic congestion. In 2008 Austroads estimated the use of C-ITS systems to improve traffic management systems and reduce congestion could reduce GHG emissions by 5.5 million tonnes in 2020, which is approximately 5 per cent of the estimated annual transport related GHG emissions[14].

During the 2015 ITS World Congress, papers presented in the Technical Sessions estimated up to 10% of fuel savings through vehicle-to-infrastructure (V2I) C-ITS through technology such as 'green-wave' traffic signals. Similar data was presented to the Driverless Vehicle Conference held in Adelaide in November 2015.

While the vehicle industry can (and will) supply C-ITS equipped vehicles there is a significant role for Federal and State/Territory governments including;

- A standardised interface harmonised with the European standards as Australian vehicle safety and environmental regulatory standards are harmonised with the European standards.
- A regulatory model that ensures vehicles fitted with C-ITS being delivered to Australia meet the European standards and will operate within the specified spectrum.
- Roll out of infrastructure to enable vehicle-to-infrastructure (V2I) communications.

[14] Austroads, 2008, Intelligent Vehicles and Infrastructure: The Case for Securing 5.9 GHz

2.2.6 Price Signals

Price signals can influence consumer choice to change driving behaviour and purchase decisions resulting in lower CO_2 emissions. For example, the BITRE found that when petrol prices are relatively high buyers shifted to more fuel efficient vehicles.[15]

An existing Government policy that is an example of providing a price signal to increase the rate of CO_2 emission reductions is the Government's Emission Reduction Fund (ERF). However, light vehicles have effectively been excluded from the Government's signature climate change policy, the Emissions Reduction Fund (ERF), at this stage.

The proposal that initially appeared to be most likely to be taken up by FCAI members and subsequently allow light vehicles to be part of the ERF is not open to light vehicles. The proposal was being able to aggregate sales of low emission vehicles (e.g. electric vehicles, hybrids or alternative fuel vehicles) across many owners for the purpose of calculating emission reductions. The Government advised the proposal is no longer open to light vehicles due to:

- Concerns over how to establish a baseline rate of improvement and light vehicle turnover.
- Acknowledgment that light vehicles currently have a rate of improvement that is among the highest of any sectors.
- CO_2 reductions in light vehicles is high-cost (i.e. doesn't meet the Government's objective of lowest cost abatement).

A discussion on the opportunities for price signals using taxation (both Federal and State/Territory) is included in Section 9.3.

2.2.7 Average Fleet Age

The average age of registered passenger vehicles in Australia (as at 31 January 2015) is 9.8 years and has slightly increased from 9.7 years in 2010. The average age of light commercial vehicles is slightly older at 10.4 years and has remained steady since 2010 while the average age of the entire Australian registered vehicle fleet is 10.1 years.[16]

It is widely acknowledged that newer vehicles are more environmentally friendly in terms of both reduced CO2 and pollutant emissions as demonstrated by the National Average Fuel Consumption (NACE) figures presented in Section 4.2.

An important consideration of improving the fleet environmental performance is to continue to reduce the average fleet age. Recognising that due to the large number of vehicles already in-service policies to reduce the fleet age will require a number of years to be effective.

[15] Australian Government, Bureau of Infrastructure and Regional Economics (BITRE), 2014, *New passenger vehicle fuel consumption trends, 1979 to 2013,* Information Sheet 66, (p. 7) BITRE, Canberra.
[16] Australian Bureau of Statistics (ABS), 9309.0 - Motor Vehicle Census, Australia, 31 Jan 2015

The government also needs to be aware of policies or legislative changes which have the unintended effect of increasing the average age of the national fleet that will put at risk the broader policy objective of improved environmental outcomes.

2.3 Summary

A whole-of-Government approach is required that incorporates all associated issues, including fuel quality standards, that have a significant impact on vehicles' ability to meet both CO_2 targets and air pollution emission standards. The FCAI and member brands are willing to participate with the Government to develop an approach that meets government policy objectives.

3.0 CO2, POLLUTANT EMISSIONS AND FUEL QUALITY STANDARDS

Main Points from Section 3.0 CO_2, Pollutant Emissions and Fuel Quality Standards:

- CO_2 standards or targets, pollutant emission standards and fuel quality standards all need to be considered together, as they are all interrelated.
- This position is not unique and is shared by the global automotive industry, regulators and research organisations alike.

The FCAI's longstanding position is that CO_2 standards or targets, pollutant emission standards and fuel quality standards all need to be considered together, as they are all interrelated. This position is not unique and is shared by the global automotive industry, regulators and research organisations alike.

The Government has recognised the inter-relationship between fuel consumption (CO2), pollutant emissions and fuel quality standards by the formation of the Ministerial Forum on Vehicle Emissions. The Terms of Reference of the Ministerial Forum require the Government's working group to examine:

- Implementation of Euro 6 or equivalent for new light vehicles;
- Fuel efficiency (CO_2) measures for new light vehicles
- Fuel quality standards;
- Emissions testing arrangements for vehicles in conjunction with international regulatory agencies to ensure robust testing;
- Australian Government measures under the National Clean Air Agreement;
- Emissions Reduction Fund and Safeguard Mechanism – transport measures;
- Future infrastructure to support new vehicles, including funding through the Clean Energy Finance Corporation and Australian Renewable Energy Agency; and
- National Energy Productivity Plan.

The FCAI notes that this interrelationship has been recognised by the Australian Government for a significant period of time and was instrumental in the development of the Fuel Quality Standards Act 2000:[17]

> *"The objects of this Act are to:*
>
> *(a) regulate the quality of fuel supplied in Australia in order to:*
>
> *(i) reduce the level of pollutants and emissions arising from the use of fuel that may cause environmental and health problems; and*
>
> *(ii) facilitate the adoption of better engine technology and emission control technology; and*
>
> *(iii) allow the more effective operation of engines;"*

[17] Commonwealth of Australia, Fuel Quality Standards Act 2000 No, 153, compilation as at 24 June 2014, www.legislation.gov.au [accessed 4 April 2016.

The opening statement in the government's 2000 paper, Setting National Fuel Quality Standards, Proposed Standards for Fuel Parameters (Petrol and Diesel), Revised Government Position[18] is;

> *"Fuel quality has been identified as having a significant influence on emissions from the transport sector and has been a key constraint to the introduction of new vehicle emission standards in Australia."*

This position has been confirmed in the Government's *Independent Review of the Fuel Quality Standards Act 2000 Issues Paper*[19] which also highlights the need for improved fuel quality standards to deliver the environmental benefits from improved vehicle emission equipment:

> "… vehicles and fuel work together to reduce vehicle emissions that impact on air quality. Without fuel of appropriate quality, vehicle emissions reduction systems will not be as effective. Likewise, without appropriate vehicle technologies, improving fuel quality will not be as effective in reducing vehicle emission as it would otherwise be." [20]

In the recently released draft report into the *Review of the Fuel Quality Standards Act 2000*,[21] the interrelationship is confirmed. For example, the opening statement of *Key Finding 1*:

> *"There are significant market failures associated with use of road transport fuels, notably negative externalities in the form of pollutants and greenhouse gas emissions."*

And *Recommendation 4* includes:

> *"Amendments should be made to the Fuel Quality Standards Act 2000 to ensure that the process of regulating fuel quality standards and vehicle emission standards (established through the ADRs) is better coordinated in the future. Amendments to the Motor Vehicle Standards Act 1998 may able be required to link this Act to the Fuel Quality Standards Act 2000."*

To continue to deliver reduced CO_2 emissions and corresponding expected air quality benefits (i.e. reduction in pollutant emissions) with the introduction of advanced vehicle emission standards, market fuel of the relevant standard (i.e. consistent with the certification fuel standard) must be available. If market fuel of the necessary standard is not available, higher exhausts emissions (both CO_2 and pollutants) will be generated during a vehicles' operation with lower than expected improvements to air quality and health outcomes.

Vehicles are designed and developed to meet GHG emissions (CO_2) targets and air pollutant emission standards with an expectation of fuel quality in a particular market. While air pollution emission standards (Euro 5 as ADR 79/03 and ADR 79/04) have been introduced into Australian

[18] Commonwealth of Australia, National Heritage Trust, *Setting National Fuel Quality Standards, Proposed Standards for Fuel Parameters (Petrol and Diesel), Revised Government Position,* September 2000
[19] Marsden Jacob Associates and Pacific Environment, "Independent Review of the Fuel Quality Standards Act 2000" Issues Paper, June 2015
[20] ibid, p.3
[21] Marsden Jacob Associates and Pacific Environment, "February 2016, Draft report into the Review of the Fuel Quality Standards Act 2000", Report prepared for the Department of the Environment.

legislation, the Government has not mandated the concomitant petrol fuel quality standards (95 RON 10 ppm sulphur). However, the Government has mandated 10 ppm sulphur diesel.

A whole-of-Government approach is required to incorporate all associated issues, including fuel quality standards, which have a significant impact on vehicles' ability to meet both GHG (CO_2) and air pollution emission standards. In the absence of such an approach, Australians will not receive the full benefit of the additional cost for improved emission technology in new cars.

4.0 LIGHT VEHICLE CO2 TARGETS

Main Points from Section 4.0: Light Vehicle CO_2 Targets

- The FCAI supports introduction of a mandated CO_2 Light Vehicle Emissions standard for Australia.
- The standard must be relevant to the Australian market conditions and contribute to the Government's overall post-2020 GHG reduction targets.
- Australia cannot simply adopt an overseas CO_2 standard. Australia is different to Europe and the US as we have our own unique market (fleet mix), consumer and driving needs.
- The FCAI supports a mandated 2030 CO_2 target that commenced in 2020, with interim targets or measurement points and a mid-term review.
- Extensive modelling is required by the Government to:
    - Determine appropriate CO_2 value for 2020 start date.
    - Annual rate of reduction.
    - What level of intervention will the government introduce in terms of credits, incentives and other complementary measures?
    - Mechanisms for measuring and reporting CO_2 values including individual company/brand targets.
    - Vehicle categories and corresponding targets (Note: Europe and the US have different definitions and separate targets for passenger cars and light commercial vehicles).
- The FCAI offers to work with the government to work through the issues and develop a CO_2 standard that is relevant to Australia and delivers the Government's objective of reducing CO_2 from light vehicles without constraining consumer choice.

4.1 CO_2 Targets

The FCAI supports a mandated CO_2 target and is prepared to work with the Government to develop a CO_2 target that is relevant to the Australian car market. This has been a long-standing FCAI position and the industry cooperated with the (previous) government during 2011-2013 to consider mandatory CO_2 targets.

Australia cannot simply adopt an overseas CO_2 standard. Australia is different to Europe and the US as we have our own unique market (fleet mix), consumer and driving needs. There are different operating and economic factors in Australian than in other major markets.[22]

Similarly, there are significantly different operating and economic factors in Europe. Table 4.1, taken from the National Transport Commissions' recent publication, *Carbon Dioxide Emissions Intensity for New Australian Vehicles Light Vehicles 2015,* summarises many of the European government initiatives and the resulting effect on the market.

[22] IHS Consulting, Feb 2016, Global Automotive Regulatory Requirements: Regulatory Environment and Technology Roadmaps

Table 4.1: European Measures that have reduced carbon dioxide emissions intensity from motor vehicles[23]

European Measure	Effect of Measure
Higher fuel prices through higher fuel taxes.	Encourages consumers to purchase fuel-efficient vehicles to lower running costs. European consumers purchase more small vehicles compared with Australian consumers. European consumers prefer manual transmission vehicles, whereas Australian consumers prefer automatic transmissions.
Low diesel taxes compared with petrol taxes.	Encourages consumers to purchase diesel vehicles to reduce running costs.
Regulating carbon dioxide emissions from motor vehicles (passenger vehicle standards are being phased in from 2012, with full implementation from 2015).	Provides manufacturers with targets for emissions reductions.
Vehicle excise duties.	Encourages consumers to purchase low carbon dioxide– emitting vehicles.
Direct cash incentives for consumers to purchase low carbon dioxide vehicles.	Encourages consumers to purchase low carbon dioxide vehicles as it lowers the purchase price of the vehicle.
Consumer information on vehicles.	Provides information to consumers about relative carbon dioxide efficiency and the annual running costs of new vehicles.
Consumer information in printed advertisements.	Provides information to consumers about relative carbon dioxide efficiency and the annual running costs of new vehicles.

While the US new vehicle fleet mix is more similar to Australia in terms of:

- Approximately half of all light vehicle sales are SUVs or LCVs.
- Australians and Americans tend to favour light vehicles with automatic transmissions and petrol engines over diesel engines.

There are significant market differences including:

- Market fuel quality (see Section 6.2).

[23] National Transport Commission, March 2015 Information Paper, "Carbon Dioxide Emissions Intensity for New Australian Vehicles Light Vehicles 2015".

- Demand-side financial incentives for EVs, PHEVs and HEVs (as outlined in Section 2.2). This has resulted in a significantly higher uptake of EVs, PHEVs and HEVS in the US than in Australia; e.g. the hybrid vehicles account for 2.8% of the US market while only half of that (1.4%) of the Australian market.
- Off-cycle credits (e.g. CO_2 credits for use of low GWP air conditioning gas) in the US vehicle CO_2 targets.

Recognising that understanding the different regulatory regimes operating around the work is important to an effective CO_2 standard, the FCAI recently commissioned international experts, IHS Consulting to provide additional information. On 2 February 2016, IHS Consulting provided a detailed briefing to the Government and departmental officials on the differences in the CO_2 standards regulations in major markets including off-cycle credits, incentives, program flexibilities and roadmaps showing the engine technology that IHS Consulting expect to be delivered to various markets out to 2025 to meet emissions targets.

The presentation by IHS Consulting demonstrated:

- The complexities in developing CO_2 targets, and their inter-relationship with pollutant emission standards and fuel quality standards.
- That the internal combustion engine (ICE) will be the dominant source of power for light vehicles through to 2030.
- Hybrid vehicles (and PHEVs) will expand (from a low base presently).
- Regulatory reform will drive the change, but industry needs a clear path to allow planning for investment.
- Australia is not Europe or the US and has its own unique market, consumers and driving needs.
- Most importantly, Australia cannot directly transplant an overseas standard.

Consequently, the FCAI encourages the Government to seek the support of international experts, such as IHS Consulting, which has a detailed knowledge of the automotive industry and will be able to undertake detailed modelling to assist with the development of an Australian specific CO_2 standard.

4.2 National Average Carbon Emissions

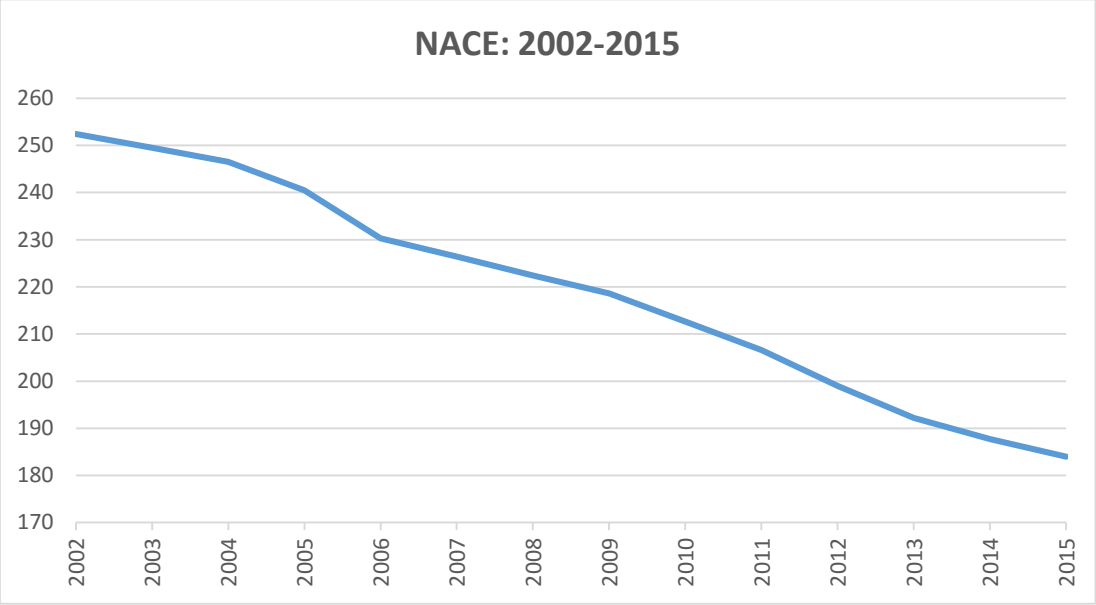
New light vehicles sold in Australia have provided a year-on-year reduction in CO_2 (or fuel consumption) as demonstrated by the National Road Transport Commission's (NTC) annual update.[24]

All new passenger cars, SUVs and light commercial utilities, vans and buses (up to 3.5 tonnes) are included in calculating the National Average Carbon Emissions (NACE) figure. The Australian NACE is a broader measure than in most other advanced markets (including the US and Europe) as it includes many more vehicle types than CO_2 measures used in other markets. As such, face value comparisons of CO_2 data from other markets will be misleading unless appropriate adjustments are made.

[24] NTC Australia, Carbon Dioxide Emissions Intensity for New Australian Light Vehicles 2015, Information Paper, March 2016

The National Average Carbon Emissions (NACE) for all new light vehicles (including passenger cars, SUVs and light commercial vehicles) sold in Australia for each calendar year from 2002 to 2015 (Figure 4.1) reduced from 252.4 gCO_2/km to 184 gCO_2/km. This is an overall reduction of (approx.) 27 per cent with an average annual reduction of (approx.) 2.4 per cent. It is highly unlikely that this annual rate of reduction will continue without government intervention as vehicle brands have already introduced to the Australian market much of the accessible technology that delivers improved fuel economy.

Figure 4.1 – NACE 2002-2014



As the Australian new vehicle market is one of the most competitive in the world, with more than 50 light vehicle brands offering more than 400 models, it is expected that there will continue to be an overall annual reduction in CO_2 as brands continue to introduce state of the art fuel efficient vehicles. However, the rate of reduction is unknown and will depend on a range of economic, market and technology factors both within Australia and internationally.

4.3 The Australian Car Market

If the Government considers the introduction of fuel consumption targets, it must acknowledge that the Australian car market is different to other major automotive (especially European) markets. In 2014, the National Transport Commission (NTC) released a Case Study comparing the Australian and UK markets.[25] The NTC found that:

- Australians have a preference for larger cars, SUVs and light commercial vehicles when compared to Europeans.
- Australians purchase vehicles with larger engines than Europeans.

[25] National Transport Commission, 2014, Carbon Dioxide Emissions from New Australian Vehicles 2013; Information paper, May 2014

- Australians purchase a higher proportion of vehicles with automatic transmissions than Europeans.

The NTC concluded that consumer preference was an important factor influencing the national average new vehicle carbon emissions and included in its key findings that:

> *"Consumer preferences are an important factor affecting the national average of carbon emission for new vehicles. If all Australians who purchased new vehicles in 2013 had purchased vehicles with best-in-class emissions, the national average would be 34 per cent lower (126 g/km) than the actual national average that was achieved in 2013."*

The NTC report also acknowledged that consumer preferences can be influenced by government policies and found that compared to Australia, the UK had:

- More policies aimed at reducing the average CO_2 emissions from vehicles,
- Policies encouraging lower CO_2 vehicles (and consequently had more lower CO_2 vehicles available for purchase), and
- More expensive fuel.

On 2 April 2016, the National Transport Commission (NTC) released their update on new light vehicle CO_2 emissions[26] that included an analysis of the CO_2 emissions intensity of new light vehicles over the period, 2002 to 2015. The NTC again highlighted consumer choice as a significant factor in light vehicle emissions and a key findings of the report was;

> *"There are many reasons why Australian light vehicle emission intensity are higher than in Europe. Some of the reasons are:*
>
> - *Australian consumer preferences for heavier vehicles with larger and more powerful engines, for example SUV Medium, SUV Large and SUV Upper Large segments made up 30% of all passenger vehicle sales in 2015.*
> - *A lower proportion of diesel-powered engines*
> - *Fewer government incentives for lower emission vehicles*
> - *Lower fuel prices."*

The Climate Change Authority (CCA) also recognised that consumer preference has been a factor in reducing CO_2 emissions. The CCA consider that shifts between vehicle class, within vehicle class and also technology improvements have contributed to CO_2 emission reduction.[27]

To continue to make CO_2 improvements, vehicles increasingly need access to lower sulphur content fuels to bring certain engine technologies to market—equivalent to those already available overseas. Maintaining multiple fuels (E10, E85, ULP & PULP, LPG, diesel, etc.) across all states (and metro/rural) creates additional complexity and costs to fuel suppliers that will be passed onto the consumer.

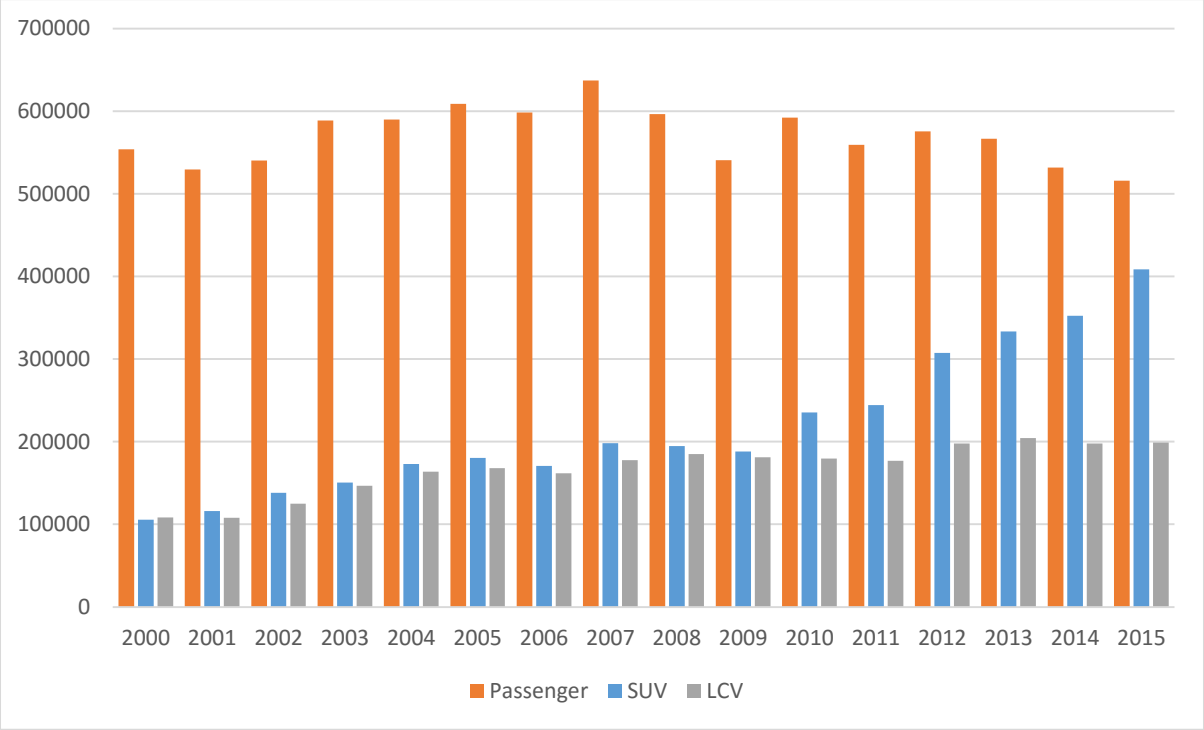
[26] National Transport Commission, 2016, Carbon Dioxide Emissions Intensity for New Australian Vehicles 2015; Information paper, March 2015

[27] Climate Change Authority (CCA), 2014, Light Vehicle Emissions Standards for Australia Research Report, June 2014

The consumer preferences in the new Australian light vehicle market have changed significantly from 2000 to 2014 (see figure 4.2). This includes significant growth in the SUV segment, a large proportion of which are diesel vehicles.

Over the five year period from 2009 to 2013, there was a significant change in the number of diesel engine passenger vehicles (cars and SUVs) and light commercial vehicles (LCVs) registered, increasing by 103.6 per cent and 65.4 per cent, respectively. Diesel engine passenger vehicles comprise (approx.) 7 per cent of all registered light vehicles, while diesel engine light commercials make up (approx.) 17.5 per cent of all registered light vehicles.[28]

Figure 4.2 Light Vehicle Sales 2000-2015



This growth in the particulate intensive diesel segment has implications for air quality. Any Government policy aimed at influencing light vehicle CO_2 emissions, must also consider the implications for vehicle pollutant emissions.

4.4 International Comparison

The average annual reduction in NACE of 2.4 per cent (for all light vehicles) from 2002 to 2015 is comparable to the annual CO_2 reduction of passenger cars in other developed countries.

Importantly, Figure 7 in the Discussion Paper is an inaccurate comparison of future trends. The limitations and inaccuracies include:

[28] Australian Bureau of Statistics, 9309.0 Motor Vehicle Census, Australia, 31 Jan 2014. http://www.abs.gov.au/ausstats/abs%40.nsf/mf/9309.0 [accessed 17 April 2015]

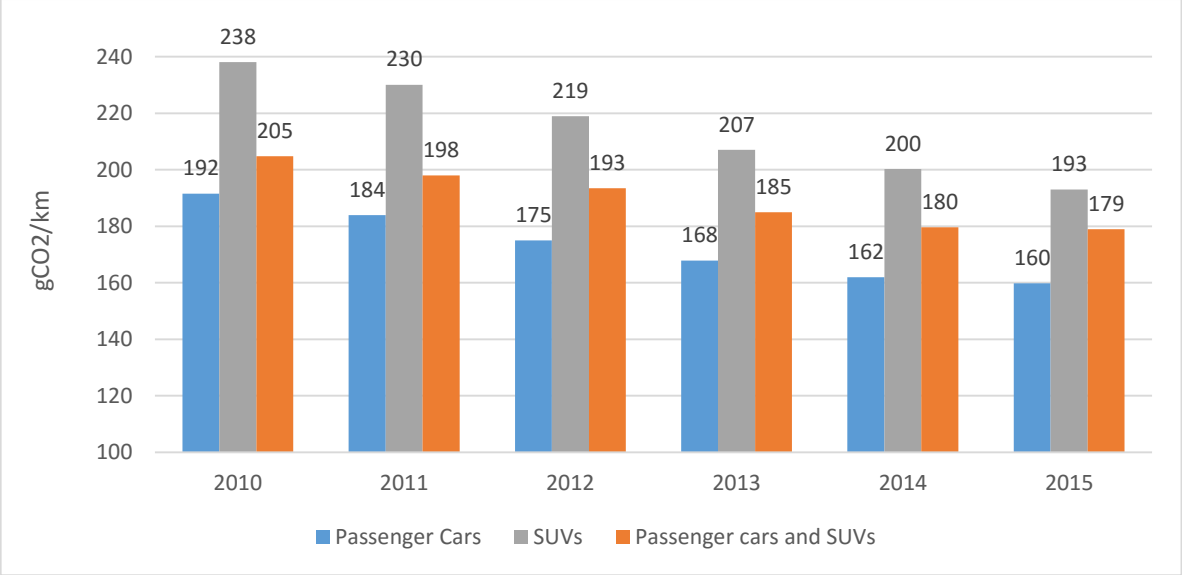
- US fleet estimated tailpipe targets-NEDC comparison line: does not exclude the significant (up to 14%) of credits in the US light vehicles targets.
- EU light vehicles-NEDC test and EU fleet targets-EU test line:
    - Are the EU passenger car targets.
    - The EU has a separate target for Light Commercial Vehicles and does not have an "all light vehicles" target.
    - The EU targets also include credits of up to 10 gCO_2.

Important additional information on both the EU and US CO2 standards is contained in **Appendix B**.

It is not valid to directly compare the Australian NACE with the either of these standards. A more valid and accurate assessment of the average annual CO_2 reduction in the Australian new light vehicle market will be achieved by comparing only passenger cars or passenger cars and SUVs to provide a like-for-like comparison.

Using the data presented by the NTC in their Information Papers in 2011[29], 2012[30], 2013[31], 2014[32] and 2015[33] the CO_2 reductions from 2010 to 2014 for all new passenger cars and SUVs sold in each calendar year can be calculated (Figure 4.3 and Table 4.1).

Figure 4.3 – Sales Weighted CO_2 for Cars and SUVs; 2010-2015



[29] National Transport Commission, 2012, Carbon Dioxide Emissions from New Australian Vehicles 2011; Information paper, March 2012
[30] National Transport Commission, 2013, Carbon Dioxide Emissions from New Australian Vehicles 2012; Information paper, March 2013
[31] National Transport Commission, 2014, Carbon Dioxide Emissions from New Australian Vehicles 2013; Information paper, May 2014
[32] National Transport Commission, 2015, Carbon Dioxide Emissions Intensity for New Australian Light Vehicles 2014; Information paper, April 2015
[33] National Transport Commission, 2016, Carbon Dioxide Emissions Intensity for New Australian Vehicles 2015; Information paper, March 2016

Table 4.1 – Annual CO_2 Reductions (%) for Cars and SUVs; 2010-2015

CO2 Reduction (%) from Previous Year	Cars	SUVs	Cars & SUVs
2011	3.99	3.34	3.34
2012	4.85	4.86	3.91
2013	4.10	5.44	4.13
2014	3.50	3.26	2.81
2015	1.35	3.60	1.65
Total reduction (%)	16.60	18.91	18.77
Average annual reduction (%)	3.45	4.29	4.20

Notes to Figure 4.3 and Table 4.1:

- The 2015 NACE figure had a lower annual rate of reduction of 2% compared to the long term average of 2.4%.
- All passenger cars and SUVs as recorded by Vfacts are included in the calculations to produce the results in Figure 4.3 and Table 4.1.

The European Commission reported that new cars sold in the EU in 2014 emit on average 2.6 per cent less CO_2 than those sold in 2013, when using the results from the European drive cycle (the same test as used for the NACE). Over the period from 2010 to 2014, CO_2 emissions from new cars have decreased by 12 per cent, which is an average annual reduction of 3 per cent.[34] Over the same period CO2 emissions from new passenger cars in Australia decreased by more than 15 per cent and by more than 13 per cent for cars and SUVs combined (see Table 4.1).

The ICCT reported that the average CO_2 emission levels for cars in Europe reduced by 17 per cent between 2006 and 2012; an average annual reduction of 2.8 per cent.[35]

The Global Fuel Economy Initiative (GFEI) analysed the global fuel economy trends in OECD and non-OECD countries. The GFEI found that during the 8 year period of 2005 to 2013 the annual improvement rates were:[36]

- For OECD countries; 2.6 per cent.
- For non-OECD countries; 0.2 per cent.
- Global average; 2.0 per cent.

[34] European Commission, Climate Action, Reducing CO2 emissions from cars, www.ec.europa.eu/clima/policies/transport/vehicles/cars [accessed 22 April 2015]
[35] International Council on Clean Transport (ICCT), 2014, Policy Update, *EU CO_2 Emission Standards for Passenger Cars and Light-Commercial Vehicles,* January 2014
[36] Korner, A., Cazzola. P, Cuenot, F., (2014), International Comparison of light-duty vehicle fuel economy; Evolution over 8 years from 2005 to 2013, Working Paper 11

The annual reduction of CO_2 emissions from new light vehicles in Australia is comparable to other developed countries when compared on a like-for-like basis, i.e. exhaust emissions measured in a drive cycle test across the same market segments.

4.4 Proposed Approach for Australia

The FCAI supports the introduction of a mandated CO_2 Light Vehicle Emissions standard for Australia. The standard must be relevant to the Australian market conditions and contribute to the Government's overall post-2020 GHG reduction targets.

The parameters of such a mandated target could be:

- To commence in 2020 with starting target(s) to be determined:
    - A 2020 start date will align with the Government's current timetable for the Vehicle Emissions Ministerial Forum, i.e. an implementation plan in March 2017.
    - If the required enabling legislation is completed by the end of 2017 the industry and government will have 2 years to finalise the administrative arrangements for the introduction of the standard.
    - FCAI member brands will require up to 60 months to make significant changes to products offered for sale. Therefore, a lead-in period of up to 5 years (from finalisation of standard) with CO_2 reductions at current trends will be required.
- 2030 target: A 2030 target will align with the Government's post-2020 GHG target of 26-28% reduction by 2030.
- Interim targets or measurement points at regular intervals between 2020 and 2030 that will provide a continuing assessment of the industry's ability (and changes in consumer preference that contributes) to achieve the 2030 target.
- A mid-term review is required to determine if targets need to be adjusted based on any changes to the market.
- Adoption of vehicle grouping similar to the US/Canada, i.e. separate targets for passenger cars (MA Category) and LCV/SUVs (NA and MC Categories).

To establish the targets the government will need to undertake extensive modelling to determine:

- Appropriate 2020 starting CO_2 standard/target(s) based on what is currently achieved in the Australian market and what (if any) changes are expected in the short term (i.e. 2015/17 to 2020).
- Model cycle timing (5 to 7 years) and product commitments already made.
- What would be the expected annual rate of reduction of CO_2 over this period:
    - Without government intervention
    - With various levels of government intervention.
- What levels of incentives/credits would be provided to increase the rate of CO_2 reduction?
- What complementary measures would the government introduce, e.g. introduction of Euro 6 and changes to fuel quality standards?
- What mechanisms for measuring and reporting CO_2 in the light vehicle fleet will be used including:

    - How to define and group vehicle categories, e.g. would passenger cars, SUVs and light commercial vehicles all have separate targets, a single combined target and/or another combination?
        - (Note: The EU and US have different definitions and separate targets for passenger cars and light commercial vehicles.)
    - In the development of a standard for Australia, if it is decided to have separate targets for vehicle groups, the FCAI recommends Australia adopts a US/Canada type grouping of vehicles as the Australian consumer preference more closely resembles US/Canada than Europe (i.e. preference for SUVs and LCVs). This would mean separate targets for passenger cars (MA Category) and LCVs (NA Category), with off-road passenger SUVs (MC category) included with LCVs.
        - (Note: This does not mean the FCAI supports adopting other aspects of the US CO2 standard, i.e. test cycle, footprint attribute or targets.)
    - What attribute (if any) would be used?
        - (Note: The EU use mass while the US use footprint).
- How will low volume importers (of both new and used vehicles) be treated?
    - Most overseas regimes have specific provisions for low volume importers.
    - In the interests of equity, low volume importers of used vehicles cannot be excluded from meeting any CO_2 emission standard.
- How will other parallel imports via the various concession and personal importation schemes be treated?
    - Excluding parallel import schemes runs the risk of undermining the overall industry achievements.

Australia has harmonized vehicle regulatory standards with the UN Regulations which has resulted in adopting the European vehicle emission standards and testing regime. However, directly adopting the European CO_2 standards would not be relevant to Australia as the new vehicle market and operational environment is substantially different to that in Europe (as noted in Section 4.3). The Australian new car market, with consumer preference for SUVs and LCVs, as well as petrol engine and automatic transmissions is more similar to the US market.

The FCAI offers to work with the government to work though these issues and develop a CO_2 standard that is relevant to Australia and delivers the Government's objective of reducing CO_2 from light vehicles without constraining consumer choice.

5.0 POLLUTANT EMISSION STANDARDS

Main Points from Section 5.0: Pollutant Emission Standards

- Through the Australian Design Rules, the Government has introduced successively more stringent air quality standards (pollutant emission standards) for vehicles.
- Adoption of Euro 6 standards in Australia will be most efficiently achieved by applying United Nations Regulation 83 (UN R83).
    - By applying UN R83 makes it is not necessary to mandate Euro 6.
    - The FCAI therefore welcomes the recent advice from DIRD that Australia intends to apply UN R83.
- If the government is determined to mandate Euro 6, the introduction date for "new models" should not be before 2020 and must be linked to the widespread availability of 10 ppm sulphur 95 RON petrol.
    - As there are multiple stages of Euro 6, there needs to be a staged implementation with an introduction date for "all vehicles" at least 4 years later than the corresponding "new models" date.
- If the Government wants to encourage the purchase and supply of petrol engine vehicles that meet Euro 6 emissions standards, 10 ppm sulphur petrol must be widely available in the Australian market otherwise, the benefits estimated using the results of the regulation certification laboratory testing will not be delivered on the road
- The costs to move from Euro 5 to Euro 6 comprise;
    - An increased cost per vehicle; resulting in an increased annual cost across sales of all new light vehicles of (approx.) $495 million.
    - Increased cost of fuel (passed as an increased operating cost for owners to purchase 95 RON 10 ppm sulphur petrol.)

5.1 Benefits of Vehicle Pollutant Emission Standards

Through the Australian Design Rules, the Government has introduced successively more stringent air quality standards (pollutant emission standards) for vehicles. New light vehicles (passenger cars, SUVs and light commercial vehicles) introduced into Australia need to meet the Euro 5 pollutant emission standards (ADR 79/03 introduced from 1 November 2013 and ADR 79/04 introduced from 1 November 2016).[37]

(Note: Euro 5 pollutant emission standards set maximum allowable exhaust emissions for carbon monoxide, hydrocarbons, oxides of nitrogen and particulate matter. It does not include a standard for CO_2 emissions.)

The progressive tightening of vehicle pollutant emissions standards, especially over the last 10+ years as Australia has progressed from Euro 2, through Euro 3 to Euro 4 and now Euro 5 standards, has contributed to improvements in air quality in Australian cities. For example, a 2013 study by the CSIRO for the Victorian EPA found that by 2030 total motor vehicle exhaust emissions will have

[37] DIRD Vehicle Emission Standards, www.infrastructure.gov.au [accessed 3 March 2015]

significantly reduced and that improved technology is entering the vehicle fleet at a faster rate than the growth of vehicle use.[38]

Adoption of Euro 6 standards will be most efficiently achieved by "applying" United Nations Regulation 83 (UN R83). This will allow those brands whose vehicles can operate effectively on the current market fuel (including diesel engine vehicles) to be offered to the market.

However, the full anticipated environmental benefits of encouraging the purchase and supply of petrol engine vehicles that meet Euro 6 will not be realised until such time as 10 ppm sulphur petrol is widely available in the Australian market.

5.2 Fuel Quality Standard: Reducing Sulphur

The successful introduction of the next step in light vehicle pollutant emission standards, Euro 6, is dependent on suitable fuel quality standards:

- Petrol: 95 RON, 10 ppm sulphur.[39] 95 RON petrol is currently available in the market, as Premium Unleaded Petrol (PULP). However, the standard currently allows up to 50 ppm sulphur.
- Diesel: 10 ppm sulphur diesel is the current diesel standard and all diesel market fuel (both locally refined and imported) must meet this standard.

Note: the current Australian fuel standard for petrol[40] is:

- ULP: 91 Ron (minimum) and 150 ppm sulphur (maximum).
- PULP: 95 RON (minimum) and 50 ppm sulphur (maximum).

The Australian transport fuel standards (especially for petrol) are lower than other major markets, especially the EU, Japan and the USA. A report prepared for the Australian Government in 2014 by Hart Energy, *International Fuel Quality Standards and Their Implications for Australian Standards*[41], demonstrates where Australian fuel quality standards are behind international levels and provides a series of recommendations where Australian fuel quality specifications need to be reviewed and upgraded in line with international standards.

The first recommendation for gasoline (petrol) in the Hart Energy Report[42] is:

> *For gasoline, Hart Energy Research & Consulting suggest alignment for two parameter (sulfur and aromatics) including …. ;*
>
> - *Sulfur: Align with the EU, Japan and South Korea by reducing the limit for the current 150 ppm for all grades and 50 ppm for premium-grade gasoline (PULP) to 10 ppm for all grades to enable advanced emission controls that are being produced and driven in markets such as Australia today;*

The lack of appropriate market fuel quality restricts the introduction of some engine variants by some brands and it also inhibits the performance of the latest generation of engines (i.e. Euro 6

[38] EPA Victoria, Future air quality in Victoria-Final Report, Publication 1535 July 2013
[39] Note: 95 RON 10 ppm sulphur is the certification fuel standard for both Euro 5 and Euro 6.
[40] Australian Government, Department of Environment, Petrol Fuel Quality Standard, www.environment.gov.au [accessed 6 April 2016]
[41] Hart Energy Research and Consulting, October2014, International Fuel Quality Standards and Their Implications for Australian Standards, Final Report
[42] Ibid; p.2

compliant), particularly due to higher sulphur concentration in petrol. This is highlighted by Hart Energy:[43]

> *Sulfur impacts engine life and it can lead to corrosion and wear of the engine systems. … the EU reduced sulfur content in fuels .. among the following sectors:*
>
> - *Automotive sector; vehicles' ability to conform with vehicle emission standards – e.g. NOx technologies – enables them to upgrade vehicles with new emissions capturing systems."*

Lower fuel quality (i.e. high Sulphur) can lead to increased operating and maintenance costs for consumers. For example, high sulphur petrol can lead to increased fuel consumption from the engine needing to run rich more often to increase the exhaust gas temperature to de-sulphurise the catalyst. More frequent de-sulphurisation cycles will also reduce the service life of the catalyst leading to the need for more frequent replacement.

5.3 Costs and Benefits of Moving from Euro 5 to Euro 6

5.3.1 Costs

The costs to move from Euro 5 to Euro 6 comprise:

- Increased cost per vehicle.
- Increased cost of fuel (passed as an increased operating cost for owners to purchase 95 RON 10 ppm sulphur petrol over 91 RON petrol).

The FCAI estimates that the (typical) additional cost of supplying a Euro 6 compliant vehicle over a Euro 5 compliant vehicle ranges from $300 to $800 per vehicle (and up to $1800 for some models), depending on vehicle type and engine. Using 2015 light vehicle sales figures[44] with an (approx.) 70/30 split between petrol and diesel engine light vehicles, the introduction of Euro 6 would equate to an annual cost across all light vehicle sales of (approx.) $495 million.[45]

In addition to the cost impost on each new vehicle, there will also be an ongoing operating cost to vehicle owners of purchasing PULP (with 10 ppm sulphur). Currently, the bowser price for PULP is (approx.) 9 to 10% (11 to 12c/litre) more than for ULP.[46] Using the ABS Survey of Motor Vehicle use data[47]:

- Average distance travelled for a light vehicle =13,700km;
- Average rate of fuel consumption = 13.3 l/100km;
- Gives average fuel use per year = 1,822 litres;
- Resulting in an annual increase in cost of (approx.) $200 to $220 (over purchase of ULP and assuming no additional cost for refining to 10 ppm sulphur).[48]

To achieve the benefits of improved pollutant emission standards, the government must consider initiatives to ensure consumers purchase the higher grade fuel.

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[43] Ibid; p. 14
[44] FCAI Vfacts December 2015
[45] This figure is based on work conducted by the FCAI in 2014 and a more detailed modelling would need to be undertaken to develop the costs for any Regulation Impact Statement.
[46] Interpolated data from NRMA Weekly Fuel Report, Monday 28 March 2016, www.mynrma.com.au [accessed 3 April 2016]. ULP price range: 105 to 124 c/litre and PULP price range: 116 to 136 c/litre.
[47] Australian Bureau of Statistics (ABS), 9208.0 – Survey of Motor Vehicle Use, Australia, 12 months ended 31 October 2014, 15 October 2015, ww.abs.gov.au
[48] There should also be a fuel consumption reduction in moving from 91 to 95 RON petrol of up to 3% (see Section 6.2.4)

5.3.2 Benefits

UN Regulation 93/07 (Euro 6) introduces some changes to emission limits over Euro 5.

Petrol engine light vehicles. The only, but very significant, change in the emission limits from Euro 5 to Euro 6 for petrol engine light vehicles is the introduction of a Particulate Number (PN) limit of:

- 6x1012 with Euro 6b.
- 6x1011 with Euro 6c.

There is no change to limits for total mass of hydrocarbons (THC), mass of non-methane and hydrocarbon (NMHC), oxides of nitrogen (NOx), carbon monoxide (CO) or particulate mass (PM) limits for petrol engine light vehicles.

Diesel engine light vehicles. The changes for diesel engine light vehicles with the introduction of Euro 6 are:

- Reductions for mass of oxides of nitrogen (NOx)
- Reduction in combined mass of total hydrocarbon and oxides of nitrogen (THC+NOx).
- No change for other emission limits; carbon monoxide (CO) and particulates (PM).

Euro 6 also introduces OBD threshold limits and in-use performance requirements (IUPR) which tighten from Euro 5 to Euro 6b and then again with Euro 6c and includes an in-service conformity requirement of 100,000 km or 5 years. This means that vehicles need to operate to closer tolerances throughout their service life up to a period of 100,000 km or 5 years which makes the need for wide availability of the correct grade of market fuel more critical.

5.4 Introduction of Euro 6

The FCAI considers that the adoption of Euro 6 standards in Australia will be most efficiently achieved by "applying"[49] United Nations Regulation 83 (UN R83).[50] By applying UN R83 makes it is not necessary to mandate Euro 6. The FCAI therefore welcomes the recent advice from DIRD that Australia intends to apply UN R83.

However, if the government is determined to mandate Euro 6, the introduction date for "new models" should not be before 2020 and must be linked to the widespread availability of 10 ppm sulphur 95 RON petrol. As there are multiple stages of Euro 6, there needs to be a staged implementation with an introduction date for "all vehicles" at least 4 years later than the corresponding "new models" date.

[49] Once a UN Regulation has been "applied" Australia has an obligation (under the "Mutual Recognition" provisions of the 1958 Agreement) to accept UN Approvals issued by any other Contracting Party (CP). The basic principle is that when a CP agrees to "apply" a UN Regulation, the Regulation is regarded as being consistent with that country's national legislation. Therefore a vehicle that conforms to an "applied" Regulation must be allowed free access to that country's market, without the imposition of additional mandatory requirements.
The benefit of Australia "applying" a UN Regulation is that Australia will have access to vehicles that comply with later (than specified in the ADR "Alternative Standards" clause) versions of UN Regulations without the need for additional certification approval. That is, vehicles meeting later safety or environmental standards will be certified without additional administrative workload for either the Government or industry.

[50] UN R83 is the international vehicle emissions regulation. Euro 6 is the '07 series'.

However, as noted previously, the anticipated environmental benefits of adopting Euro 6 emission standards for petrol engine light vehicles will not be realised until such time as 10 ppm sulphur petrol is widely available in Australia.

6.0 FUEL QUALITY STANDARDS

Main Points from Section 6.0: Fuel Quality Standards

- Vehicles are designed and developed to meet air pollutant emission standards and/or CO_2 targets with an expectation of fuel quality in a particular market.
- Fuel quality standards, CO_2 standards and pollutant emission standards all need to be considered together, as they are all interrelated.
- The anticipated environmental benefits of adopting Euro 6 pollutant emission standards for petrol engined light vehicles will not be realised until such time as 10 ppm sulphur petrol is widely available in Australia.
- 95 RON petrol (available in the market as PULP) is required to deliver CO_2 reductions in-service.
- For correct operation of vehicles with advanced pollution emission equipment (i.e. meeting Euro 6b and Euro 6c) PULP with a maximum 10 ppm sulphur is required in the market.
- All advanced markets recognise the need for 10 ppm sulphur fuel to implement advanced emission standards such as Euro 6;
    - Australia ranks second last in the OECD in terms of fuel quality based on sulphur limits.
    - The Indian Government's recent rulemaking process recognised that the availability of 10 ppm sulphur petrol is a pre-requisite to mandating Euro 6.

6.1 Introduction

Vehicles are designed and developed to meet air pollutant emission standards and/or CO_2 targets with an expectation of compatible fuel quality in a particular market. While the Government has mandated Euro 5 (through ADR 79/03 and ADR 79/04), the Government has not mandated the concomitant fuel quality standards for petrol (ie 95RON 10 ppm sulphur petrol).

Improving the quality of Australian market fuel will deliver improvements for the entire motor vehicle fleet, not just new motor vehicles.

With the growth in imports of Australia's automotive fuel (from 7% to 36% over 2000 to 2013),[51] the decline of local refining and the introduction of international vehicle emission standards, Australia's fuel quality standards need to align with higher global fuel quality standards (e.g. 10 ppm sulphur limit in petrol).

If Australia does not align to higher global fuel quality standards, it risks the possibility of future vehicle models shifting Australia's vehicle fleet towards lower grade offerings than other advanced markets. This potentially degrades Australia's progress towards more technologically advanced and efficient vehicles.

[51] Review of the Fuel Quality Standards Act 2000, Issues Paper, p. 8 Table 2: Australia: Population, vehicle and fuel statistics in 2000 and 2013.

6.2 Australian Fuel Quality Standards

The Discussion Paper (p.13) notes that Australia is ranked second last, only above Mexico, in terms of fuel quality based on sulphur limits. The Discussion Paper explains that is based on regulated sulphur limits rather than actual sulphur content of market fuel.[52]

The current Australian market fuel quality standards are lower than the WWFC recommendations. The Australian fuel quality standards, set under the authority of the Commonwealth Fuel Quality Standards Act and consequential Fuel Standard determinations. Tables 6.1, 6.2 and 6.3 are taken from the Department of Environments' fuel monitoring program (results from 2011 and 2012) and show parameters tested, the average limits and the standard limits:[53]

When comparing the Australian fuel quality standard against the international World Wide Fuel Charter (WWFC) recommendations the Australian fuel quality standards are lower in the following:

- Premium unleaded petrol (PULP): with a 50 ppm sulphur (max) limit compared to WWFC recommendation of 10 ppm (max).
- Diesel: with a cetane index of 46 (min) compared to WWFC recommendation of 55 (min).

See Section 6.3.4 for details of the WWFC and recommended fuel parameter limits.

Table 6.1 Diesel Testing Results 2011 and 2012

Parameter	Unit	Average value	Diesel standard limit
cetane index	-	54	46 min
density	kg/m^3	838.7	820 min, 850 max
distillation T95	°C	347.3	360 max
PAH	% by mass	3.9	11 max
sulfur	mg/kg	7.2	10 max

Total number of samples = 295

[52] Australian Government, Vehicle Emissions Discussion Paper, February 2016.
[53] Australian government, Department of Environment, National Fuel Sampling Program, www.environment.gov.au [accessed 6 April 2016]

Table 6.2 ULP Testing Results 2011 and 2012

Parameter	Unit	Average value	Petrol standard limit
aromatics	% by volume	25.8	45 max
benzene	% by volume	0.68	1 max
distillation, final boiling point	°C	194.5	210 max
lead	g/L	<0.0025	0.005 max
MON	-	83.2	81.0 min
MTBE	% by volume	<0.20	1 max
olefins	% by volume	13.3	18 max
RON	-	93.2	91.0 min
sulfur	mg/kg	66.1	150 max

Total number of samples = 287

Table 6.2 PULP Testing Results 2011 and 2012

Parameter	Unit	Average value	Petrol standard limit
aromatics	% by volume	35.1	45 max
benzene	% by volume	0.68	1 max
distillation, final boiling point	°C	191.4	210 max
lead	g/L	<0.0025	0.005 max
MON	-	86.1	85.0 min
MTBE	% by volume	<0.20	1 max
olefins	% by volume	10.3	18 max
RON	-	96.9	95.0 min
sulfur	mg/kg	30.5	50 max

Total number of samples = 273

6.3 Interrelationship of Fuel Quality Standards, CO2 and Pollutant Emission Standards

The FCAI's longstanding position that fuel quality standards, CO_2 standards and pollutant emission standards all need to be considered together, as they are all interrelated, is not a unique one. It is shared by the global automotive industry, regulators and research organisations alike.

6.3.1 US EPA

The US EPA stated in their Tier 3 Motor Vehicle Emission and Fuel Standards:[54]

> *"This program includes new standards for both vehicle emissions and the sulfur content of gasoline, considering the vehicle and its fuel as an integrated system."*

and

> *"The systems approach enables emission reductions that are both technologically feasible and cost-effective beyond what would be possible looking at vehicle and fuel standards in isolation."*

and

> *"EPA is not the first regulatory agency to recognize the need for lower-sulfur gasoline. Agencies in Europe and Japan have already imposed gasoline sulfur caps of 10 ppm, and the State of California is already averaging 10 ppm sulfur with a per gallon cap of 20 ppm."*

The US EPA Tier 3 Gasoline Sulfur program sets an in-service gasoline standard of 10ppm sulphur from 1 January 2017:[55]

> *"The final Tier 3 Gasoline Sulfur program is part of a systems approach to addressing the impacts of motor vehicles on air quality and public health, by considering the vehicle and its fuel as an integrated system. The program sets new vehicle emissions standards to reduce both tailpipe and evaporative emissions, and lowers the sulfur content of gasoline to a 10 ppm average sulfur level."*

6.3.2 European Commission

The European Commission (EC) also recognises fuel quality standards are linked to both pollutant and CO_2 standards. On their website page, "Road transport: Reducing CO2 emission from vehicles[56]" the EC state:

> *"Fuel quality is an important element in reducing greenhouse gas emissions from transport."*

[54] US Federal Register Vol. 79 No. 81, 28 April 2014, Part II Environmental Protection Agency 40 CFR Parts 79, 80, 85, et al. Control of Air Pollution from Motor Vehicles: Tier 3 Motor Vehicle Emission and Fuel Standards: Final Rule

[55] United States Environmental Protection Agency, Gasoline, www.epa.gov/otaq/fuels/gasolinefuels/index.htm [accessed 7 July 2015]

[56] European Commission (EC), Climate Action, Road transport: Reducing CO2 emissions from vehicles, http://ec.europa.eu/clima/policies/transport/vehicles/index_en.htm [accessed 21 November 2014]

6.3.3 International Council on Clean Transportation

The non-profit research organisation, the International Council on Clean Transportation (ICCT), also recognises the importance of fuel quality standards.

In their inaugural *State of Clean Transport Policy*[57] report, released in 2014, the ICCT states:

> *"A key requirement to world-class vehicle standards, and thus cleaner vehicles, is the availability of ultralow-sulfur fuels."* (Page 4)

and

> *"Fuel quality, most notably the sulfur content of gasoline and diesel, is key to the implementation of advances emission controls. For optimal function of emission controls, … Euro 6/VI-equivalent vehicles require fuel as low as 10 ppm sulphur."* (Page 18)

6.3.4 World Wide Fuel Charter

The global auto industry position is based on the World Wide Fuel Charter[58] (WWFC) which is an extensive and comprehensive compilation of research and testing of engine, fuel and control systems by a wide group of expert contributors. The objective of the WWFC is to promote global harmonisation of fuel to:

- Reduce the impact of motor vehicles on the environment by enabling reduced vehicle fleet emissions;
- Facilitate the delivery of optimised fuels for each emission control category, which will minimize vehicle equipment complexities and help reduce customer costs (purchase and operation); and,
- Increase customer satisfaction by maintaining vehicle performance for a longer period of time.

The WWFC contains both minimum specifications of necessary fuel quality parameters and a summary of the impact of the various fuel parameters on vehicle operation. In the "Technical Background" section there is an excellent overview of the research conducted on the effects of octane and sulphur, in gasoline. The WWFC includes the following statements on octane:[59]

> *"Vehicles are designed and calibrated for a certain octane rating."*
>
> *"Engines equipped with knock sensors can handle lower octane ratings by retarding the spark timing, but this will increase fuel consumption, impair drivability and reduce power; and knock may still occur."*
>
> *"Increasing the minimum octane rating available in the marketplace has the potential to help vehicles significantly improve fuel economy and, consequently, reduce vehicle CO2 emissions. While the improvement will vary by powertrain design, load factor and calibration strategy,*

[57] Miller, Joshua D., Facanha, Cristiano, The International Council on Clean Transportation (ICCT), the State of Clean Transport Policy: A 2014 synthesis of vehicle and fuel policy development, 2014.
[58] ACEA, Auto Alliance, EMA and JAMA, World Wide Fuel Charter, September 2013, 5th Edition, www.acea.be [accessed 9 October 2010]
[59] WWFC 5th Edition, p.17

among other factors, vehicles currently designed for 91 RON gasoline could improve their efficiency by up to three percent if manufacturers could design them for 95 RON instead."

In relation to Sulphur, the WWFC[60] states:

"Sulphur has a significant impact on vehicle emissions by reducing the efficiency of catalysts."

"Sulphur also adversely affect heated exhaust gas oxygen sensors"

"Reductions in Sulphur will provide immediate reductions of emission from all catalyst-equipped vehicles on the road."

"Sulphur removal requires prolonged rich operating conditions…"

Relevant to the consideration of a gasoline octane rating and level of sulphur for Australia, the WWFC outlines the required parameters for various fuel categories. The ones of specific relevance to Australia are (Page 1):

Category 4:
Markets with advanced requirements for emission control, for example, markets requiring US Tier 2, US Tier 3 (pending), US 2007 / 2010 Heavy Duty On-Highway, US Non-Road Tier 4, California LEV II, EURO 4/IV, EURO 5/V, EURO 6/VI, JP 2009 or equivalent emission standards. Category 4 fuels enable sophisticated NOx and particulate matter after-treatment technologies.

Category 5:
Markets with highly advanced requirements for emission control and fuel efficiency, for example, those markets that require US 2017 light duty fuel economy, US heavy duty fuel economy, California LEV III or equivalent emission

The maximum sulphur level for both Category 4 and Category 5 gasoline is 10 ppm and Category 5 gasoline specifies a minimum of 95 RON (refer pages 6 and 7).

Cetane is a measure of the compression ignition of a diesel fuel and as such is a significant fuel quality parameter in diesel. In the Technical Background (page 41), the WWFC outlines:

"Higher cetane generally enables improved control of ignition delay and combustion stability, especially with modern diesels which use high amounts of exhaust gas recirculation (EGR)."

and

"Cetane influence on NOx is very significant … particularly at low speeds where reductions of up to 9% are achieved"

and

"The cetane increase also reduced HC emissions by 30-40%."

[60] WWFC, 5th edition, pp.17-19

The WWFC specifies a minimum Cetane Index of 55.0 for both Category 4 and Category 5 diesel.

6.3.5 Department of Environment

The Department of Environment is currently reviewing the Fuel Quality Standards Act 2000. As part of the review two reports were released:

- A report prepared by Orbital Australia in 2013, "Review of Sulphur Limits in Petrol." [61]
- A 2014 report by Hart Energy, International Fuel Quality Standards and Their Implications for Australian Standards.[62]

Orbital Australia reviewed existing standards and research on the impacts of sulphur levels in petrol and similar conclusions to the WWFC extracts above;

- Fuel standards work in partnership with vehicle emission standards to reduce emissions.
- Exhaust emissions will be higher with existing Australia market fuels (150 ppm or 50 ppm sulphur) than if low sulphur (10 ppm) petrol is introduced.
- Reducing sulphur levels (to 10 ppm) would allow use of some specific technologies and also reduce fuel consumption through the reduction of frequency of catalyst regeneration.

The Orbital report also acknowledges the potential for degraded performance, operability and durability of some vehicle technologies due to low quality market fuel.

The 2014 Hart Energy report, *International Fuel Quality Standards and Their Implications for Australian Standards*, demonstrates where Australian fuel quality standards are behind international levels and provides a series of recommendations where Australian fuel quality specifications need to be reviewed and upgraded in line with international standards. In the Section 1.2 Key Findings, Hart stated:

> *"In Hart Energy Research and Consulting's view, there are a number of specifications in Australian gasoline, diesel and E85 that may require changes."*

Hart then recommended that for sulphur in gasoline (petrol):

> *"Align with the EU, Japan and South Korea by reducing the limit from the current 150 ppm for all grades and 50 ppm for premium-grade (PULP) to 10 ppm max for all grades to enable advanced emission controls on the vehicles that are being produced and driven in markets such as Australia today."*

[61] Orbital Australia Pty Ltd, 2013, Review of Sulphur Limits in Petrol, Produced for Fuel Policy Section, Department of Sustainability, Environment, Water, Population and Communities, 10 Jun 2013.
[62] Hart Energy Research and Consulting, October2014, International Fuel Quality Standards and Their Implications for Australian Standards, Final Report

(Note: in their recent rulemaking process, the Indian Government has recognised that availability of 10 ppm sulphur petrol is a pre-requisite to the introduction of Euro 6 vehicle pollutant emission standards.[63])

6.3.6 Climate Change Authority

The FCAI considers that the analysis undertaken by the Climate Change Authority when developing its cost/benefit analysis of mandatory CO_2 targets[64] did not address the implications of in-service fuel and subsequent in-field vehicle performance. In particular, the Climate Change Authority paper uses certification results to develop its benefit analysis. The certification fuel is 95 RON 10 ppm sulphur petrol.

If the equivalent fuel is not available in the market, it cannot be guaranteed that the same result will be delivered in service, especially if a vehicle owner is likely to use ULP which, in Australia, is currently regulated to be 91 RON 150 ppm (max) sulphur. Therefore, the FCAI questions whether the full benefit as calculated will be delivered and considers that this cost/benefit analysis cannot form the basis for any rigorous regulatory analysis without additional testing to confirm in-service operation on market fuel will deliver the same result. Otherwise, to deliver the estimated benefits, the market fuel would have to be consistent with the certification fuel (i.e. 10 ppm sulphur, 95RON) to fully deliver a continued reduction in CO_2 emissions.

6.3.7 Australian Institute of Petroleum

In their 2013 publication, *Downstream Petroleum 2013*,[65] the Australian Institute of Petroleum acknowledged the benefits of cleaner fuels in reducing vehicle pollutant emissions (p.12):

> *"Government regulated fuel quality standards facilitate the introduction of advanced engine technologies. Benefits include improved urban quality (through reduced smog and particulates from motor vehicles), reduced greenhouse gas emissions, and improved fuel efficiency."*

6.4 FCAI Position

The FCAI has been consistent in its call for concomitant market fuel since 2010 in the FCAI's submission to the 2010 Regulatory Impact Statement (RIS) considering the introduction of Euro 5/6 emission standards. The Australian Design Rules for mandating Euro 5 vehicle emission standards (ADR 79/03 and ADR 79/04) specifies 95 RON 10 ppm sulphur petrol as the test fuel.

If the Government wants to introduce light vehicle CO_2 standards as the next step in light vehicle pollutant emissions standards (i.e. Euro 6), compatible market fuel must be available, otherwise the

[63] Shakun & Company (Services) Private Limited, Copy of Notification, Motor Vehicles Act, G.S.R 18(E), (published in the Gazette of India on 22nd Febuary 2016).
[64] Australian Government Climate Change Authority (CCA), Light Vehicle Emission Standards for Australia: Research Report, June 2014
[65] Australian Institute of Petroleum (AIP), Downstream Petroleum 2013, www.aip.com.au [downloaded 25 March 2016]

benefits estimated using the results of the regulation certification laboratory testing will not be delivered on the road.

While 95 RON is available as Premium Unleaded Petrol (PULP) the Australian fuel quality standard allows up to 50 ppm sulphur in premium (95 or 98 RON). For correct operation of vehicles with advanced pollution emission equipment (i.e. meeting Euro 6b and Euro 6c) PULP with a maximum 10 ppm sulphur is required in the market.

The diesel fuel quality standard has specified a maximum of 10 ppm sulphur since 2009. Diesel fuel refined in Australia meets this standard.

7.0 MOTORCYCLES

Main Points from Section 7.0: Motorcycles

- The FCAI does not support the introduction of either CO_2 or pollutant emission standards for motorcycles due to;
    - Motorcycles make up less than 4.5% of the registered vehicle fleet with (approx.) 57,000 new road motorcycles sold per year.
    - A large percentage of motorcycles already meet Euro 3 emission standards.
    - Australia is a small motorcycle market and will receive new motorcycles that meet the latest version of emission standards.
    - Motorcycles are used predominately for recreational transport and as such account for less than 1% of VKT.
    - Motorcycles, on average use significantly less fuel per km travelled than a light vehicle and would therefore emit significantly less CO_2 and/or pollutant emissions.

The Australian motorcycle market is made up of road, off-road motorcycles, ATV and scooters. In 2015 a total of 108,711 new motorcycles were sold. Of these only 41.4% (45,013) were road motorcycles, while 35% (37,982) were off-road motorcycles, 18.7% (20,327) ATVs were sold and scooters made up the remaining 5% (5,389) of new motorcycle sales. As around 30% of off-road motorcycles are registered (to be able to legally ride on bush tracks, there are (approx.) 57,000 new road motorcycles entering the market each year[66].

According to the ABS 2015 Motor Vehicle Census[67] there are (approx.) 800,000 motorcycles registered out of a total of more than 18 million registered vehicles. Motorcycles represents less than 4.5% of the total registered vehicle fleet.

The Discussion Paper notes that Australia currently has no standards that regulate noxious or greenhouse gas emissions from motorcycles. Advice from FCAI motorcycle brands is that motorcycles imported into Australia predominately meet Euro 3 (motorcycle) emission standards that was introduced from November 2013.

The Euro 4 emissions have only just been introduced from 1st January 2016 for type approvals and from 1 January 2017 for all current approvals. The FCAI expects that brands will continue to import motorcycles that meet these standards upgraded in line with the EU changes.

The Discussion Paper notes that motorcycles account for less than 1% of total vehicle kilometers travelled (VKT) and are estimated to account for a comparable amount of emissions. The ABS Survey of Vehicle Use[68] also shows that motorcycles account for less than 1% of total VKT and consume 0.03% of transport fuel.

[66] FCAI media release, 8 January 2015, "Australia's motorcycle market steady in 2015' www.fcai.com.au [downloaded 20 March 2016]
[67] ABS, 9309.0 – Motor Vehicle Census, Australia, 31 Jan 2015, www.abs.gov [downloaded 20 March 2016]
[68] Note: Australian Bureau of Statistics (ABS), 9208.0 – Survey of Motor Vehicle Use, Australia, 12 months ended 31 October 2014, 15 October 2015,

Accordingly, the CO_2 and other pollutant emissions from a motorcycle would be substantially lower per km travelled than in a light vehicle.

The FCAI does not support the introduction of either CO_2 or pollutant emission standards for motorcycles due to:

- Motorcycles make up less than 4.5% of the registered vehicle fleet with (approx.) 57,000 new road motorcycles sold per year.
- A large percentage of motorcycles already meet Euro 3 emission standards.
- Australia is a small motorcycle market and will receive new motorcycles that meet the latest version of emission standards.
- Motorcycles are used predominately for recreational transport and as such account for less than 1% of VKT and consume only 0.03% of transport fuel.
- Motorcycles, on average use significantly less fuel per km travelled than a light vehicle and would therefore emit significantly less CO_2 and/or pollutant emissions.

8.0 ON-ROAD TESTING

Main Points from Section 8.0: On-road Testing

- If on-road testing is introduced, it must be to a recognised standard and be robust and realistic to address the key environmental issues relevant to Australia.
- Light vehicle emissions (both CO_2 and pollutant emissions) are measured in laboratory tests and do not always translate to on-road conditions due to real world variabilities.
- Two important activities to address the difference between the current drive cycle, the New European Drive Cycle (NEDC) and real-world results are:
    - Development of a new test cycle for inclusion in UN Regulations, the Worldwide Harmonised Light Vehicles Test Procedure (WLTP); and
    - Development and introduction in Europe of the Real Driving Emissions Test (RDE).
- The WLTP drive cycle is longer, has a higher maximum speed, higher average speed and higher acceleration than the NEDC.
- The RDE will be introduced as part of the European type approval of a new model passenger vehicle and measure pollutants (NOx and particulates).
- The RDE will also be able to be used as an audit test throughout the life of the vehicle.

8.1 Introduction

The Discussion Paper recognises that light vehicle emissions (both CO_2 and pollutant emissions) are measured in laboratory tests and do not always translate to on-road conditions due to real world variabilities including:

- Temperature: extremes of heat or cold impacts on the driving conditions such as use of air conditioning and/or heating.
- Traffic conditions: vary on time of day, week and year.
- Driver behavior: even on the same road, variation between drivers (e.g. rate of acceleration and braking) provide different results for different drivers.
- Vehicle condition: up-to-date service history/maintenance, tyre specifications and pressure, and additional equipment/accessories fitted, any load being carried.

The emissions tests used as part of the certification process in Euro 5 and currently in Euro 6 are undertaken in a laboratory under controlled conditions using a defined drive cycle the New European Drive Cycle (NEDC). The benefits of conducting a laboratory test include:

- Tests are repeatable, i.e. know that results are representative and can be reproduced at another laboratory using same test conditions.
- Removes (reduces) test variability due to driver (and external environment) input.
- Provides a valid basis for comparison between vehicles to compare performance such as fuel consumption (CO_2).

However, there are also risks associated with laboratory tests including:

- The results are not necessarily representative of real world conditions.
- Vehicle brands could tailor vehicles to pass the test while not producing a similar performance in the real world.

The Australian government, through their membership of Working Part 29 (WP. 29), the World Forum for Harmonization of Vehicle Regulations, have been able to participate in the development of the new drive cycle, Worldwide Harmonised Light Vehicles Test Procedure (WLTP) to address the difference between the current drive cycle, the New European Drive Cycle (NEDC) and real-world results. The focus of the WLTP is to improve CO_2 emissions testing.

The other major activity in emissions testing is the development of the Real Driving Emissions Test (RDE) by the European Commission. The focus of the RDE is to complement the laboratory testing for measurement of NOx emissions.[69]

8.2 WLTP

WP. 29 has developed a new drive cycle, the Worldwide Harmonised Light Vehicles Test Procedure (WLTP) to replace the current driver cycle (NEDC – New European Drive Cycle) in UN Regulation 83 "Uniform provisions concerning the approval of vehicles with regard to the emission of pollutants according to engine fuel requirements."

The WLTP drive cycle is longer, has a higher maximum speed, higher average speed and higher acceleration than the NEDC (see Table 8.1).[70]

Table 8.1 NEDC – WLTP Comparison of main parameters

Parameter	NEDC	WLTP
Length (s)	1,220	1,800
Length (km)	11.06	23.26
Idle time (%)	24	13
V_{max} (km/hr)	120	131.6
$V_{average}$ (km/hr)	31.6	46.3
$Accel_{max}$ (m/sec^2)	1	1.6

.In addition to the more severe test parameters the test conditions for the WLTP have also been changed to be more representative of real world driving conditions including air conditioning and car audio systems being switched on for part of the test.

It is expected that the WLTP will be introduced into UN R83 with the introduction of Euro 6c.

The more severe test parameters are expected to produce higher CO2 results and also higher pollutant emission results. The existing EU CO_2 targets are based on the NEDC drive cycle (see Appendix B) and as many EU member states have taxation systems based on the NEDC derived CO2 figures. Therefore, with the introduction of the WLTP it will be necessary to:

- Continue to use NEDC test results for CO2, and/or
- Develop new CO2 targets that are equivalent to the existing NEDC based targets.

[69] European Commission Fact Sheet; FAQ – Air Pollution Standards, Brussels, 25 September 2015
[70] Delphi, Worldwide Emissions Standards: Passenger Cars and Light Duty Vehicles, 2015/2016, www.dephi.com [accessed 20 March 2016]

8.3 Real Driving Emissions (RDE)

The other major activity to address the inconsistency between the laboratory certification tests and real world emission is the Real Driving Emission's (RDE) test. The RDE was developed by the European Commission and is designed to complement the laboratory test procedure to assess NOx emissions.

The European industry, through the industry association ACEA, has supported the introduction of the RDE test under a two-step approach, as already agreed by the member states. ACEA has continued to stress the need for a timeline and testing conditions that take into account the technical and economic realities of today's markets, allowing for reasonable transition time to apply RDE to all new vehicles.

The RDE will be introduced as an additional test as part of the European type approval for a new model passenger vehicle. It is also expected to be able to be used as an ongoing audit test with the possibility of testing a passenger vehicle on a public road throughout its service life. As such, the initial test as part of the certification process will be paid for by the vehicle brand (as normal for all certification tests) while any in-service audit tests will need to be conducted by a 3rd party and paid for by the government (for a government audit test).

The test conditions are clearly defined to have the test as repeatable as possible:

- The test trip will comprise urban, rural and motorway driving and take between 90 and 120 minutes.
- The test should be driven by a normal driver and extreme conditions (acceleration, braking, excessive high speed for long periods) will be recognised and the test discarded.
- The vehicle mass shall not exceed 90% of GVM
- The ambient temperature must be between 0 and 30° C.
- Portable emissions measurement systems (PEMS) will be used to measure both NOx and PN.

The RDE is being introduced into Europe in two steps or packages:[71,72,73]

RDE Package 1:

- The legislation for RDE package 1 was published on 31 March 2016 as regulation 2016/427/EC. This regulation enters into Force 20th day following publication in the Official Journal of the European Union, i.e. 20 April 2016.
- This legislative package contains the monitoring requirements, test route requirements, boundary conditions and equipment description. It also set out the basis for RDE legislation with 2 steps.
- Step 1 will commence from September 2017 for new models (i.e. new certification approvals) and from 1 September 2019 for all new vehicles.
- The RDE will be introduced with a transitional phase where the test procedures will only be applied for monitoring purposes.
- Step 1 is to commence 4 years after the introduction of Euro 6 (September 2014).

[71] European Council, Vehicle emission in real driving conditions: Council gives green light to second package, www.consilium.europa.eu [accessed 7 April 2016]
[72] Draft Commission regulation on real driving emissions tests (second package), www.consilium.europa.eu [accessed 7 April 2016]
[73] Commission Regulation (EU) 2016/427 of 10 March 2016

- A conformity factor of up to 2.1 will be allowed for exceeding the NOx limit to give manufacturers time to adapt to the new RDE rules.

RDE Package 2:

- It is expected that the legislation for Step 2 to be published in 2nd quarter 2016. This package will contain conformity factors,
- Step 2 will commence from January 2020 for new models and from January 2021 for all new vehicles.
- The conformity factor will be 1 plus the error margin, currently set at 0.5. The error margin reflects the statistical and technical uncertainties of the tests.

8.4 FCAI Position

If on-road testing is introduced, it must be to a recognised standard and be robust and realistic to address the key environmental issues relevant to Australia.

9.0 OTHER COMPLEMENTARY MEASURES

Main Points from Section 9.0: Other Complementary Measures

- The GVG already contains emission data for more than 50% of models in the market.
- Supply side incentives are required to make new energy vehicles (e.g. PHEVs or HEVs) financially attractive to fleet purchasers.
- The LCT imposes additional cost on new energy vehicles and should be abolished for fuel efficient vehicles to encourage their uptake.
- The Government needs to ensure changes to the MVSA do not open loop-holes that will circumvent the intention of any CO_2 standard.

9.1 Information and Education

Provision of factual and robust information and education will assist with consumers purchasing a vehicle make/model that is suitable to their needs while meeting the Government's environmental policy outcomes.

The Government provides information for consumers through the Green Vehicle Guide (GVG) and as noted in the Discussion Paper has information for all models of light vehicles sold since 2004. The GVG data represents more than 50% of the fleet. It may be worthwhile for the Government to review this information and consider the best approach to present data to prospective purchasers of both new and used vehicles.

9.2 Fleet Purchasing Policy

Fleet purchasing policies are a powerful demand side tool, especially with government fleets that purchase 10,000 plus new vehicles per year.

It would be expected that fleets would be interested in purchasing vehicles with lower fuel consumptions (provided the vehicle is suitable for the workload tasks) as there would be operational cost savings. However, as vehicles with new/alternative energy platforms (e.g. PHEVs and HEVs) are often more expensive (and can have a lower residual value) than the ICE option, the overall cost of ownership of the vehicle does not produce a saving for the fleet customer.

To utilise fleet purchasing as a tool to encourage vehicles with lower emissions into the market, the government will need to consider supply side incentives to reduce the purchase price of the lower emission vehicles to around parity with the standard ICE option. Fleet operators are more likely to consider a PHEV or HEV model when the whole of life cost of a PHEV or HEV is on par (or lower) than a traditional ICE model.

9.3 Taxation

Government can play a significant role in influencing consumer behavior. One such way is through the taxation system.

Government taxes and charges comprise approximately 20% of the price of any new vehicle. These taxes/charges are cumulative and include:

- Import duty.
- GST: 10%

- LCT (if applicable)
- Stamp duty: ranging from 2% to 4% depending on state.
- Registration: approximately 2%
- CTP: approximately 2%

The Luxury Car Tax (LCT) is contentious. The FCAI and member brands consider that the LCT is an inequitable and anachronistic tax, and do not support the application of the tax. In the context of advancing and improving vehicle CO2 emissions in Australia, the LCT serves as a tax on technology and sustainability. At a time when Australia is considering a mandatory CO2 target, the LCT acts as a brake on new environment technology, leaving Australian consumers and the environment worse off.

While the industry does not support the LCT, we note that the introduction of a higher LCT threshold for fuel efficient vehicles (7.0 litres/km or below) in 2008 resulted in an increase in the number of fuel efficient vehicles being introduced to the Australian new car market. Changes to the treatment of fuel efficient vehicles under the LCT, by excluding fuel efficient vehicles from the LCT or at least increasing the LCT threshold beyond the current $75,000 would provide and additional incentive to the market to deliver more fuel efficient vehicles to Australian consumers

For effective taxation reform on the purchase of new vehicles, federal and state governments will need to work cooperatively.

9.4 Other Government Policies

The Government should not consider policies or regulatory tools to implement any policies to reduce vehicle emissions (either CO_2 and/or pollutant emissions) in isolation from other government vehicle related initiatives or policies, in particular the proposed changes to the Motor Vehicle Standards Act that will provide additional and/or new parallel import opportunities. In particular:

- Personal import of new vehicles
- Changes to the SEVS criteria and removal of limits on RAWS workshops.

The Government's environmental policy objectives will potentially be at risk, if light vehicles with higher CO_2 (or pollutant) emissions were able to be introduced into the market via a parallel import channel.

10.0 CONCLUSION

The Australian automotive industry is committed to making a strong contribution to national efforts to reduce the impact of global climate change, even though light vehicle sales do not have a major influence on Australia's annual GHG emissions as they equate to less than one per cent of the National Greenhouse Gas Inventory.

The FCAI supports improvement of fuel efficiency of motor vehicles through the consistent application of measures at technological, behavioral and regulatory levels. To achieve the Government's policy objective to reduce emissions from road transport an Integrated Approach that includes a combination of measures such as the increasing use of alternative fuels, improved fuel quality, better infrastructure and traffic management, adopting an eco-driving style using price signals and reducing the average age of the in-service fleet is required.

Focusing on a single area, could increase overall cost to the community without delivering the expected benefits in the real world.

If the Government chooses to introduce light vehicle CO_2 standards and encourage the purchase and supply of petrol engine vehicles that meet Euro 6 emissions standards, 10 ppm sulphur petrol must be widely available in the Australian market otherwise, the benefits estimated using the results of the regulation certification laboratory testing will not be delivered.

A real and sustained reduction in vehicle emissions (both CO_2 and pollutants) will only be achieved through an Integrated Approach that takes a whole-of-government approach to CO_2 standards, vehicle pollutant emission standards, fuel quality standards and on-road vehicle operation.

APPENDIX A THE AUSTRALIAN AUTOMOTIVE INDUSTRY

The FCAI is the peak industry organisation representing vehicle manufacturers and importers of passenger vehicles, light commercial vehicles and motor cycles in Australia.

The automotive industry is a major contributor to Australia's lifestyle, economy and community and is Australia's largest manufacturing industry. The industry is wide-ranging—it incorporates importers, manufacturers, component manufacture and distribution, retailers, servicing, logistics and transport, including activity through Australian ports and transport hubs.

The Australian automotive industry employs nearly 280,000 people directly and indirectly throughout Australia. Approximately 66,000 people are employed across more than 4,500 dealerships, and the industry generates around $62 billion in revenue.[74]

Australia is one of the most open and competitive light vehicle markets in the world with more than 50 brands, 400 models and 20 source countries. In 2015 there were 68 brands (51 light vehicle brands) in the Australian market, with (approx.) 1.15 million new vehicle sales and 1.13 million light vehicle sales per year.[75] That is a lot of brands to service a market of our size equating to only 22,162 new vehicles sold per light vehicle brand. The following table provides a comparison of the competitiveness of global markets with double the number of new vehicles sold per brand in Canada, almost three times as many in the United Kingdom and more the 255,000 new vehicles sold per brand in the United States.

Table A.1 Competitiveness of Global Vehicle Markets[76]

	Australia	Canada	UK	USA
No. of brands in market	67	49	53	51
Sales	1,112,032	1,620,221	2,249,483	13,040,632
Market size per brand	16,597	33,066	42,443	255,699

In 2015, only 8 percent of new vehicles sold in Australia were manufactured locally with the remaining 92 per cent of new vehicles imported from many countries and regions of the world including Asia (more than 66 per cent), Europe (18 percent) and North and South America (6 per cent) (see Table A.2).

Table A.2 Country/Region of Origin for New Vehicle Sales in 2015[77]

Country/Region of Origin	% of New Vehicle Sales
Japan	29%
Thailand	22%
Europe	18%
Korea	12%
Australia	8%
Americas	6%
Other Asia (incl China and India)	1%
Other (incl South Africa)	4%

[74] http://www.ibisworld.com.au/industry/default.aspx?indid=434
[75] FCAI, VFACTS National Report, New Vehicle Sales, December 2015.
[76] Australian Government, Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education, March 2013 Automotive Update.
[77] FCAI, VFACTS National Report, New Vehicle Sales, December 2015.

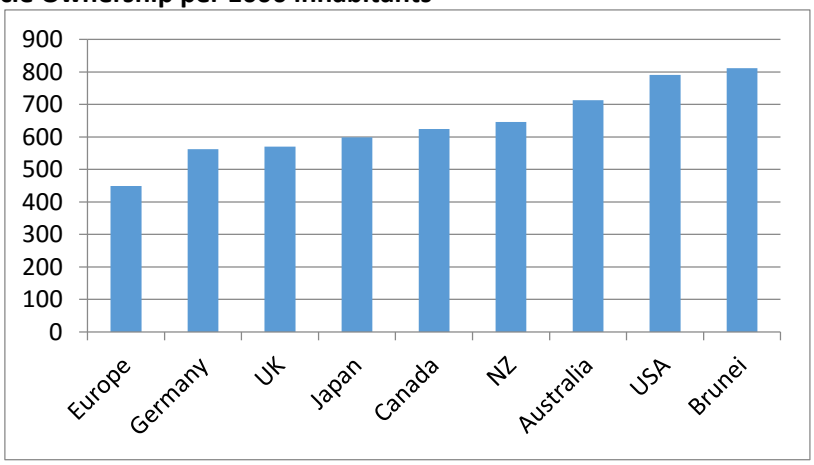
Motor vehicles are more technologically advanced today than ever before. While the structural changes in the Australian market, in terms of lower tariffs and more brands, has resulted in significant consumer benefits with improved affordability and choice it has also greatly increased the knowledge base required of repairers.

The expansion of new and global brands and models into the market has led to the introduction of advanced security, safety and environmental features in motor vehicles. The introduction of these features is in response to increasing environmental regulations and growing demands from consumers for advanced security and safety features.

Vehicle brands face a range of de-facto regulations in the form of safety and environmental star ratings and buyer requirements. They face a range of competitive pressures to continually improve environmental performance and safety standards. For example, around 30–50 percent of vehicle sales are sold to governments and fleets that frequently require a 5 star ANCAP rating and/or 4 star GVG rating.

The FCAI considers that the Australian car market is one of the most competitive in the world. For a relatively small market that comprises only 1.5 per cent of global production Australia has around 67 brands and 350 models competing for around 1.1 million sales. This has come about for a number of reasons. Principally, as the tariff barriers on automotive products have reduced from 57.5 per cent in the 1980s to less than 5 cent (on average) and the number of vehicle brands and models in the Australian market has increased.

Figure A.3: Vehicle Ownership per 1000 inhabitants[78]

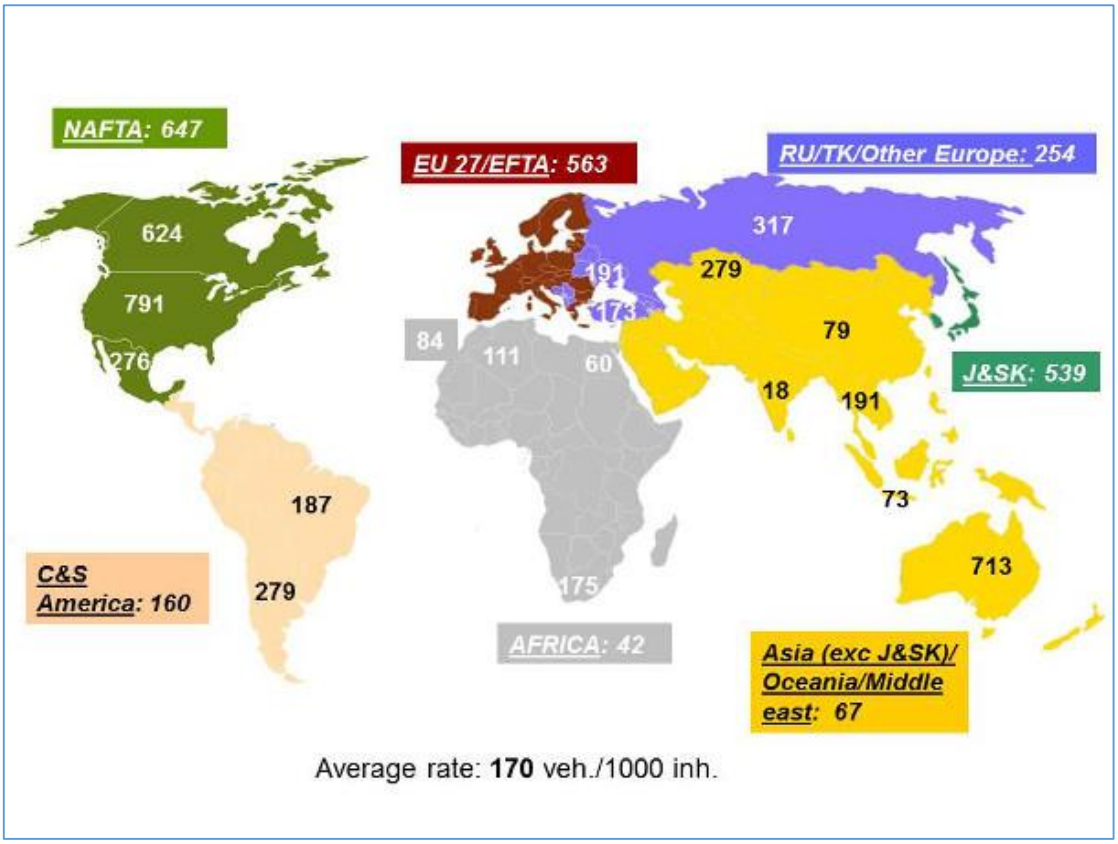


Figures A.3 and A.43 show vehicle ownership among a selection of countries demonstrates that Australia has among the highest ownership levels of vehicles with an ownership concentration of 713 vehicles per 1000 inhabitants. In comparison, the United States has ownership levels of 791 vehicles per 1000 head of population, NZ is at 646, Canada is 624, and Japan, the United Kingdom and Germany are all below 600 vehicles per 1000 head of population.

Therefore, it would appear that the market is effective in Australia through providing a wide range of consumer choice and providing access to vehicles that have resulted in some of the highest vehicle ownership levels in the world.

Figure A.4: Vehicle Ownership Rates for Regions[79]

[78] Organisation Internationale des Constructeurs automobiles (OICA), Total World Vehicles In Use, www.oica.net, [accessed 26 September 2014]
[79] Organisation Internationale des Constructeurs automobiles (OICA), www.oica.net, [accessed 26 September 2014]


NAFTA: 647
624
791
276
187
279
C&S America: 160
EU 27/EFTA: 563
191
173
84
111
60
175
AFRICA: 42
RU/TK/Other Europe: 254
317
279
79
18
191
73
713
J&SK: 539
Asia (exc J&SK)/ Oceania/Middle east: 67
Average rate: 170 veh./1000 inh.

APPENDIX B SUMMARY OF EU AND US CO2 STANARDS

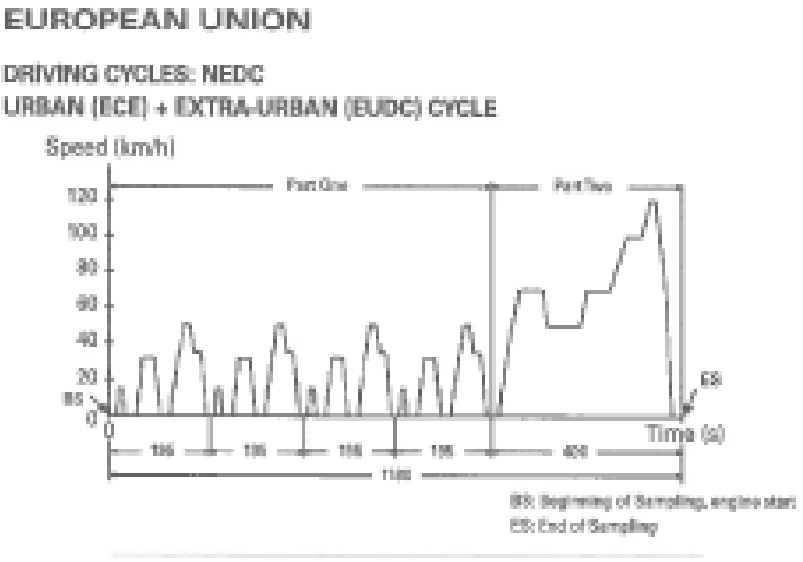
B1.0 Summary of EU and US CO_2 Targets

Following is a summary of the main features of both the EU and the US approaches to evaluating CO_2 targets.

B2.0 Current EU CO2 Targets[80,81,82,83]

The EU uses the New European Drive Cycle (NEDC) to measure the CO_2 emissions of each model/variant as part of the certification process (Figure B.1).

Figure B.1 – New European Drive Cycle[84]



The current (2015) EU CO_2 targets are:

- 130 gCO2/km by 2015 for passenger vehicles:
  - with a phase-in of 65 % in 2012, 75 % in 2013, 80 % in 2014 and 100 % from 2015 to 2019
  - flexibilities (credits and incentives) provide up to 10 gCO_2 and means this target is close to 140 gCO_2/km.[85]
- 175 gCO2/km for light commercial vehicles.

The 2020 EU CO_2 targets were introduced in 2014;

- Cars have a target of 95 gCO_2/km; There is a one year phase in with;
  - 95% of sales need to comply in 2020
  - 100% of sales need to comply in 2021

[80] International Council on Clean Transport (ICCT), 2014, Policy Update, *EU CO_2 Emission Standards for Passenger Cars and Light-Commercial Vehicles,* January 2014
[81] European Commission, Climate Action, Reducing CO2 emissions from cars, www.ec.europa.eu/clima/policies/transport/vehicles/cars [accessed 22 April 2015]
[82] Regulation (EU) No 333/2014 of the European Parliament and of the Council of 11 March 2014
[83] Regulation (EC) No 443/ of the European Parliament and of the Council of 23 April 2009
[84] Delphi, 2015, Worldwide Emissions Standards for Passenger Cars and Light Duty Vehicles
[85] European Federation for Transport and Environment (T&E), 2015, *How clean are Europe's cars? An analysis of carmaker progress towards EU CO2 targets in 2014,* www.transportenvironment.org [accessed 7 July 2015]

- Light commercial vehicles (LCVs) have a target of 147 gCO2/km;
    - Note: LCVs comprise only 5% of EU light vehicle market.

CO_2 targets for each vehicle model are set according to the mass of each vehicle by a limit value curve (figure B.2). The curve is set in such a way that the targets set for new cars fleet average emissions are achieved.

Figure B.2 – EU Passenger Car Limit Value Curve[86]

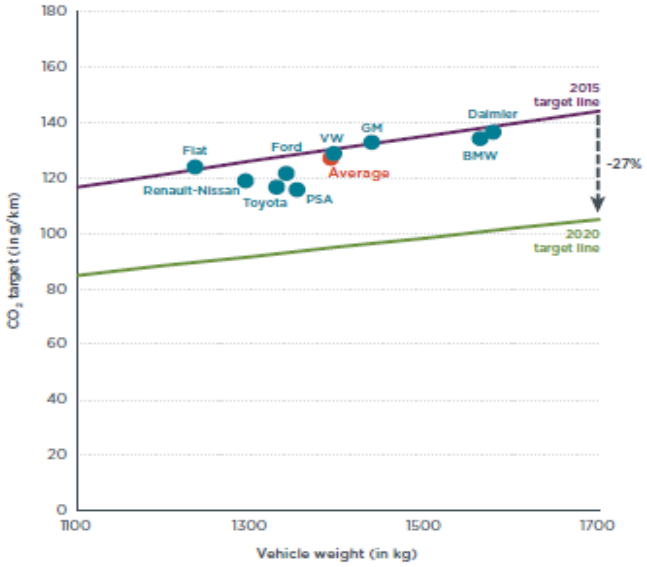


Figure 2: 2013 actual performance of the top-selling EU passenger car manufacturers, including 2015 and 2020 (effectively 2021) target lines.

Individual manufacturer targets (specific emission targets)[87] are calculated for each brand and include credits or incentives, (i.e. 'derogations') as defined in EC 443/2009;

Article 3 Definitions;

(g) 'specific emissions target' means, in relation to a manufacturer, the average of the specific emission of CO2 permitted in accordance with Annex 1 in respect of each new passenger car of which the manufacturer or, where the manufacturer is granted a derogation under Article 11, the specific emissions target determined in accordance with that derogation.

The method for calculating the relevant brand target (Annex 1);

SPECIFIC EMISSIONS TARGETS.

The specific emissions of CO2 for each new passenger car, measured in grams per kilometer, shall, for the purposes of the calculations in this Annex, be determined in accordance with the following formulae:

(a) From 2012 to 2015:

Specific emissions of CO2 = 130 + a × (M – M0)

Where: M = mass of the vehicle in kilograms

M0 = 1 372.0 kg

[86] The International Council on Clean Transportation (ICCT), 2014, CO2 Emissions from New Passenger Cars in the EU: Car Manufacturers Performance in 2013, June 2014

[87] Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23 April 2009

a = 0.0457

The limit value curve means that heavier cars are allowed higher emissions than lighter cars. Only the fleet average is regulated, so manufacturers are still able to make vehicles with emissions above the curve provided these are balanced by vehicles below the curve.

The EU includes flexibilities to encourage the introduction of new technologies;

- Eco-innovations;
    - Innovative technologies can help cut emissions, but in some cases it is not possible to demonstrate the CO2-reducing effects of a new technology during the test procedure used for vehicle type approval.
    - To encourage eco-innovation, manufacturers can be granted emission credits equivalent to a maximum emissions saving of 7g/km per year for their fleet if they equip vehicles with innovative technologies, based on independently verified data.

- Super Credits;
    - The Regulation gives manufacturers additional incentives to produce vehicles with extremely low emissions (below 50g/km). Each low-emitting car is counted as;
        - 3.5 vehicles in 2012 and 2013
        - 2.5 in 2014
        - 1.5 in 2015
        - 1 from 2016 to 2019.
    - Super-credits will also apply in the second stage of emission reductions, from 2020 to 2023.Each low-emitting car will be counted as
        - 2 vehicles in 2020
        - 1.67 in 2021
        - 1.33 in 2022
        - 1 from 2023.
    - For this second step, there will be a cap on the scheme's contribution to the target of 7.5g/km per manufacturer over the three years.

- Pooling;
    - Manufacturers can group together and act jointly to meet the emissions target.
    - In forming a pool, manufacturers must respect the rules of competition law. The information they exchange should be limited to average specific emissions of CO2, their specific emissions targets, and their total number of vehicles registered.

The different operating and economic factors in Europe[88] include:

- The EU has different targets for passenger cars and light commercial vehicles.
- Europeans tend to prefer smaller passenger cars with manual transmissions and smaller engines than Australian new car buyers.

[88] See the National Transport Commission's Information Paper, "Carbon Dioxide Emissions from New Australian Vehicles 2013", Section 5 Case Study; Why do European countries have new cars with lower average carbon dioxide emissions compared with Australia?.

- Vehicles have different specifications for the Australian market, e.g. larger engines and automatic transmissions for longer distance travel and towing under extreme (hot) conditions.

B3.0 US CO_2 Targets for Cars and Light Trucks[89]

The US CO_2 targets for cars and light trucks are a combination rules issued by both the US Environmental Protection Agency (EPA) and the US Department of Transportation's National Highway Traffic Safety Administration (NHTSA);

- The EPA established GHG emission standards
- NHTSA established Corporate Average Fuel Economy (CAFE) standards.

The US has set separate targets for passenger cars and light trucks (note: SUVs are considered to be light trucks). Table B.1 summarises the US targets in both grams of CO_2 per mile (g/mi) and grams of CO2 per km (g/km). The conversion was undertaken using a calculator developed by the ICCT.[90]

Figures B.3 and B.4 below are extracts from the US Rule showing the CO_2 targets for passenger cars and light trucks (note: light trucks include off-road passenger 4 wheel drive vehicles similar to ADR MC Category).

The EPA GHG standard includes provisions for both compliance flexibility and provides incentives for manufacturers to introduce advanced technologies;

- Credit banking and trading. To provide flexibility in planning and introduction of new vehicles, credits may be carried forward for 5 years or back for 3 years to cover a deficit from a prior year.
- Incentives for introduction of New Energy Vehicles, e.g. electric vehicles, plug-in hybrid vehicles, fuel cell vehicles and other advanced fuel/energy platforms.
- Provisions for small volume manufacturers.

[89] US Environmental Protection Agency, 2012, Regulatory Announcement Information Sheet, *EPA and NHTSA Set Standards to Reduce Greenhouse Gases and Improve Fuel Economy for Model Years 2017-2025 Cars and Light Trucks*, EPA-420-f-12-051
[90] ICCT Conversion Tool, available from www.theicct.org/info-tools/global-passenger-vehicle-standards

Figure B.3 – US EPA CO_2 Targets for Passenger Cars[91]

TABLE III–1—EPA PROJECTIONS FOR FLEETWIDE TAILPIPE EMISSIONS COMPLIANCE WITH CO_2 STANDARDS—PASSENGER CARS [401]

[Grams per mile]

Model year	Projected CO_2 compliance target	Incentives [402]		Projected achieved CO_2	Credits			Projected 2-cycle CO_2
		Advanced technology multiplier	Intermediate volume provisions		Off cycle credit	A/C refrigerant	A/C efficiency	
2016 (base)	225 [403]	0	0	225	0.4	5.4	4.8	235
2017	212	0.6	0.1	213	0.5	7.8	5.0	226
2018	202	1.1	0.3	203	0.6	9.3	5.0	218
2019	191	1.6	0.1	193	0.7	10.8	5.0	210
2020	182	1.5	0.1	183	0.8	12.3	5.0	201
2021	172	1.2	0.0	173	0.8	13.8	5.0	193
2022	164	0.0	0.0	164	0.9	13.8	5.0	184
2023	157	0.0	0.0	157	1.0	13.8	5.0	177
2024	150	0.0	0.0	150	1.1	13.8	5.0	170
2025	143	0.0	0.0	143	1.4	13.8	5.0	163

Figure B.4 – US EPA CO_2 Targets for Light Trucks[10]

TABLE III–2—EPA PROJECTIONS FOR FLEETWIDE TAILPIPE EMISSIONS COMPLIANCE WITH CO_2 STANDARDS—LIGHT TRUCKS [404]

[Grams per mile]

Model year	Projected CO_2 compliance target	Incentives [405]		Projected achieved CO_2	Credits			Projected 2-cycle CO_2
		Pickup mild HEV + strong HEV	Intermediate volume provisions		Off cycle credit	A/C refrigerant	A/C efficiency	
2016 (base)	[406] 298	0	0.0	298	0.7	6.6	4.8	310
2017	295	0.1	0.2	295	0.9	7	5	308
2018	286	0.2	0.3	287	1.0	11	5	304
2019	277	0.3	0.2	278	1.2	13.4	7.2	299
2020	269	0.4	0.2	270	1.4	15.3	7.2	294
2021	249	0.5	0.0	250	1.5	17.2	7.2	276
2022	237	0.6	0.0	238	2.2	17.2	7.2	264
2023	225	0.6	0.0	226	2.9	17.2	7.2	253
2024	214	0.7	0.0	214	3.6	17.2	7.2	242
2025	203	0.8	0.0	204	4.3	17.2	7.2	233

Table B.1 US CO_2 2017 and 2025 Targets in g/mi (g/km[92])

	MY 2017	MY 2025	Total %Δ (2017-25)
Passenger cars	212 (135)	143 (86)	-32.5%
Light Trucks	295 (194)	203 (129)	-31%
Combined	243 (157)	163 (101)	-33%

The US CO_2 targets include credits for air-conditioning gas with a low GWP and also incentives from introduction of low emission vehicles. In summary;

- Total credits in 2025 targets (comprise approx. 14% of targets);
  - Cars: 20 g/mi (12.4 g/km)
  - Light Trucks: 30 g/mi (18.6 g/km)
  - Combined: 23 g/mi (14.3 g/km)

- Air conditioning credits included in 2025 targets;
  - Cars: 18.8g/mi (11.7 g/km)
  - Light Trucks: 24.4g/mi (15.2 g/km)

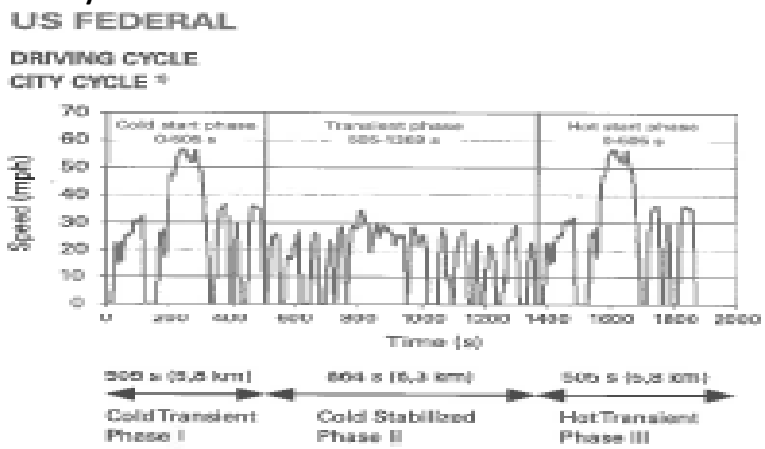
[91] US Federal Register/Vo. 77, No. 199/ Monday, October 15, 2012/ Rules and Regulations, pp. 62623-63200. Environmental Protection Agency 40 CFR Parts 85, 86 and 600, pp. 62771-62772

[92] Conversion undertaken using ICCT calculator available from www.theicct.org/info-tools/global-passenger-vehicle-standards

- Off-cycle credits for technologies that achieve CO_2 reductions, but are not reflected in the test procedures included in 2025 targets;
    - Cars: 1.4 g/mi (0.87 g/km)
    - Light Trucks: 4.3 g/mi (2.67 g/km)

The NTSA CAFE standards (and US EPA standards) are based on the US FMVSS test drive cycle that is substantially different to the drive cycle used in the UN R101 (i.e. used by Australia and the EU).

Figure B.5 – US Drive Cycle[93]



The CAFÉ standards use a footprint based approach where the standards (targets) to be met are based on emissions-footprint curves;

- Each vehicle model has a different CO_2 emission compliance target depending on its footprint value (related to the size of the vehicle). Generally, the larger the footprint, the higher the corresponding vehicle CO_2 emissions target.
- Each brand also has its own target based on the footprint curves and targets for each of their models and their annual sales.

[93] Delphi, 2015, Worldwide Emissions Standards for Passenger Cars and Light Duty Vehicles

Figure B.6 – Footprint curves for Cars[94]

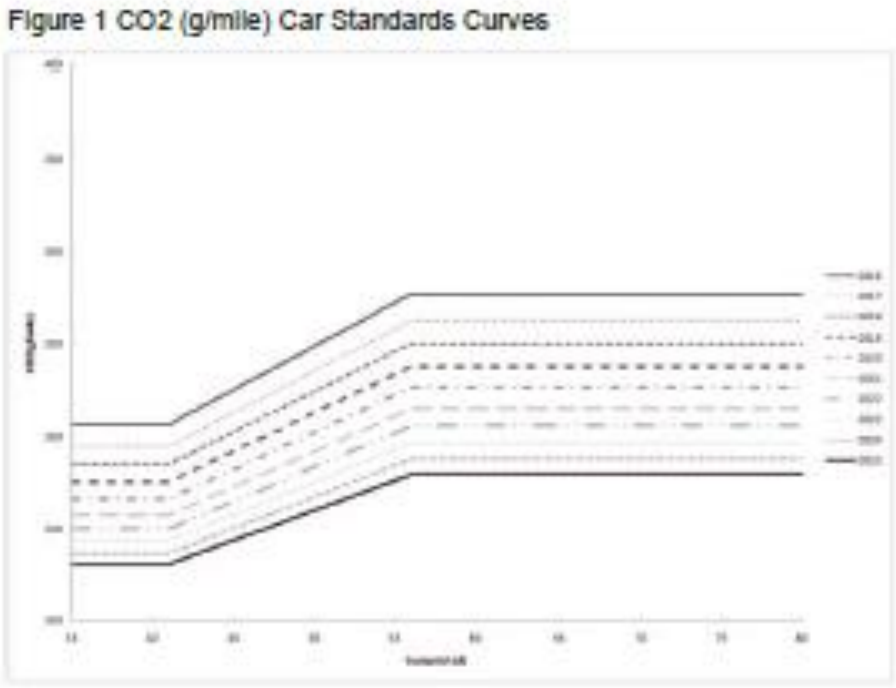
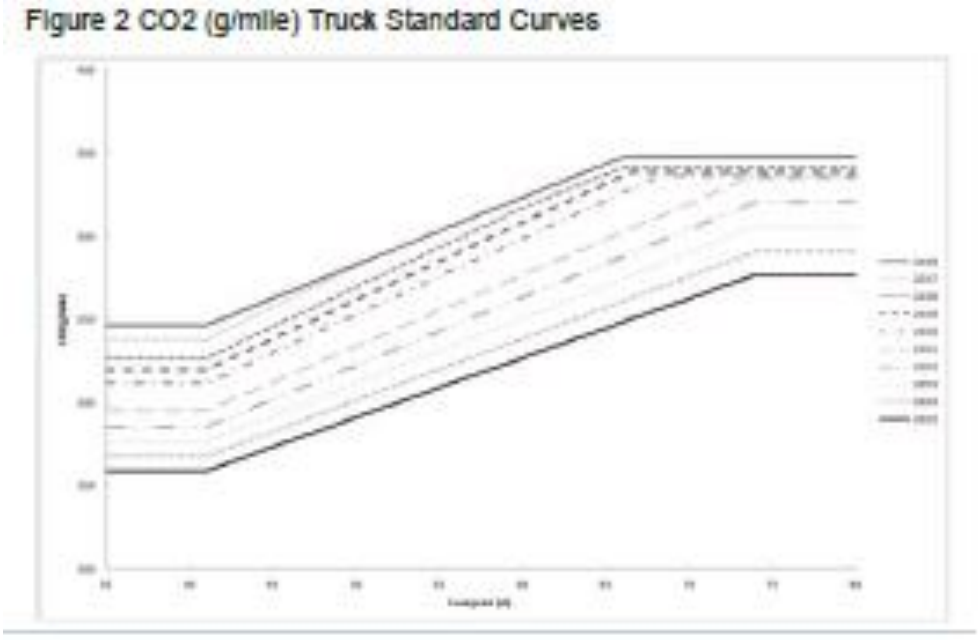


Figure B.7 – Footprint Curves for Light Trucks (and SUVs)[12]



[94] US Federal Register/Vo. 77, No. 199/ Monday, October 15, 2012/ Rules and Regulations, pp. 62623-63200. Environmental Protection Agency 40 CFR Parts 85, 86 and 600, pp. 62644-62647

APPENDIX C ANSWERS TO DISCUSSION PAPER QUESTIONS

No.	Discussion Paper Question	FCAI Answer
Options to reduce vehicle emissions		
1.	What are the likely costs and benefits of adopting Euro 6 emission standards for light vehicles and/or Euro IV emission standards for heavy vehicles?	The anticipated environmental benefits of adopting Euro 6 emission standards for petrol engine light vehicles will not be realised until such time as 10 ppm sulphur petrol is widely available in the Australian market. See section 5.3 of FCAI response for information regarding the costs of adopting Euro 6 emission standards for light vehicles.
2.	If Euro 6/VI standards were adopted, when would be an appropriate start date and why?	The adoption of Euro 6/VI standards in Australia will be most efficiently achieved by applying United Nations Regulation R83 (UN R83). The FCAI welcomes the recent advice from DIRD that Australia intends to apply UN R83. The FCAI believes that by taking this action, i.e. applying UN R83, it is not necessary to mandate Euro 6/VI. However, if the Government is determined to mandate Euro 6/VI standards, the introduction date for "New Models" should not be before 2020 and must be linked to the widespread availability of 10 ppm sulphur petrol. As there are multiple stages of Euro 6, there needs to be a staged implementation with an introduction date for "all vehicles" at least 4 years later than the corresponding "new models" date.

No.	Discussion Paper Question	FCAI Answer
3.	To what extent do current Australian fuel quality standards limit the adoption/import of existing technologies and models that meet Euro 6 specifications?	The high sulphur content in petrol currently supplied to the Australian market limits the adoption/import of certain petrol engines (available in other markets) that meet Euro 6. This situation will continue until such time that 10 ppm sulphur petrol is widely available in the Australian market. Australia risks falling further behind other developed markets as engine and emission technology are further developed based on use of 10 ppm sulphur petrol. It should also be noted that the Indian Government's rulemaking process recognised that 10 ppm sulphur petrol is a pre-requisite to mandating Euro 6. See section 6.0 of the FCAI response for further information regarding fuel quality.
4.	Are there other ways governments could encourage the purchase and supply of vehicles that meet Euro 6/VI emissions standards?	The adoption of Euro 6/VI standards in Australia will be most efficiently achieved by applying United Nations Regulation R83 (UN R83). Fleet purchasing policies are a powerful demand side tool, especially with government fleets that purchase 10,000 plus new vehicles per year. There are also non-financial incentives such as allowing low emission vehicles to use HOV lanes and have preferential parking.
5.	What measures could governments adopt to ensure vehicles continue to comply with noxious emission requirements beyond the point of supply to the market?	The Government already has the ability to conduct audits of certification results. To ensure vehicles in-service continue to comply with the relevant ADRs, the Government will need to undertake testing in accordance with the regulatory test programs (i.e. ADR 79/0x).

No.	Discussion Paper Question	FCAI Answer
6.	Should the Australian Government conduct a review to consider whether noxious emissions standards for motorcycles should be adopted in Australia?	The FCAI does not support the introduction of noxious emission standards for motorcycles. As motorcycles consume only 0.03% of transport fuel, the cost of implementing and administering a noxious emission standard would outweigh any benefit. See Section 7.0 of FCAI response for further information regarding motorcycle use data.
Develop fuel efficiency (CO2) Standards		
7.	What are the costs and benefits of adopting a fleet average standard for fuel efficiency (CO_2)?	Detailed modelling of the impact of a fleet average CO_2 standard is required to calculate the full costs and benefit. See Section 4.0 of FCAI response for further information on CO_2 standards for light vehicles.
8.	If standards were adopted, what would be an appropriate fleet average target for 2020 and why? What would be an appropriate target for 2025 and why?	Detailed modelling of the impact of a fleet average CO_2 standard is required to calculate appropriate fleet average CO_2 targets for 2020, 2025 and 2030. See Section 4.0 of FCAI response for further information on CO_2 standards for light vehicles.
9.	How would standards affect the range of vehicles offered in Australia?	Detailed modelling of the impact of a fleet average CO_2 standard is required to determine the effect on the range of vehicles offered in Australia. See Section 4.0 of FCAI response for further information on CO_2 standards for light vehicles.

No.	Discussion Paper Question	FCAI Answer
10.	Apart from standards, are there any complementary or alternative measures that could be adopted to encourage the purchase and supply of more fuel efficient vehicles?	Supply side incentives are required to make New Energy Vehicles (e.g. PHEVs or HEVs) financially attractive to fleet purchasers. The LCT imposes additional cost on new energy vehicles and should be abolished or changed to reduce the price and consequently encourage the uptake of low emission vehicles. See Section 9.0 of the FCAI submission for additional information on incentives and taxation impacts. Also, Section 2.2.3 provides examples of various incentives from overseas markets that encouraged the purchase and supply of more fuel efficient vehicles.
11.	What would be the most efficient and effective measures to improve the fuel efficiency of heavy vehicles in Australia?	The FCAI does not have a position on this issue.
12.	Should the Australian Government conduct a review to consider whether fuel efficiency measures for motorcycles should be adopted in Australia?	The FCAI does not support the introduction of fuel efficiency standards for motorcycles. As motorcycles consume only 0.03% of transport fuel, the cost of implementing and administering a fuel efficiency standard would outweigh any benefit. See Section 7.0 of FCAI response for further information regarding motorcycle use data.
Other complementary measures: Fuel quality standards		
13.	Are there changes to fuel quality standards that could assist with reducing noxious emissions and/or CO_2 emissions?	The anticipated environmental benefits of adopting Euro 6 pollutant emission standards for petrol engined light vehicles will not be realised until such time as 10 ppm sulphur petrol is widely available in Australia. See Section 6.0 outlining the need for 10 ppm sulphur in PULP (95 RON) fuel.
14.	Do you have new information that could assist with the assessment of costs and benefits of adopting more stringent fuel quality standards, in particular for petrol?	The FCAI has no specific information on the costs/benefits of supplying 10 ppm sulphur PULP.

No.	Discussion Paper Question	FCAI Answer
15.	To what extent, if any, do current fuel quality standards limit the choices of vehicles/technologies in Australia and why?	The high sulphur content in petrol currently supplied to the Australian market limits the adoption/import of some existing petrol engines that meets Euro 6. The situation will continue until such time that 10 ppm sulphur petrol is widely available in the Australian market. Section 6.0 outlines the need for 10 ppm sulphur in PULP.
16.	Are there other measures that governments could adopt to encourage the supply and purchase of higher quality fuels?	To deliver the expected CO2 and pollutant emission reductions, compatible market fuel must be available. While 95 RON, Premium Unleaded Petrol (PULP) is widely available it comes at a price premium over Unleaded Petrol (ULP). To encourage consumers to use PULP and consequently receive the CO_2 benefits from advanced vehicle technologies the price of PULP will need to be comparable to ULP and ideally there would be no price difference.
Other complementary measures: Information and education		
17.	Have you found the information provided on the fuel consumption label and the Green Vehicle Guide website useful in considering the purchase of a new vehicle?	The FCAI has no specific comment.
18.	How could the information provided on the fuel consumption label and the Green Vehicle Guide be improved to encourage the purchase of more efficient vehicles?	The FCAI has no specific comment.
19.	Have manufacturers and dealers found the information provided on the fuel consumption label and the Green Vehicle Guide useful for product planning and marketing?	The FCAI has no specific comment.
20.	At what point in the decision making process is information on vehicle efficiency most effective in influencing purchasing decisions and what information mediums are most effective?	The FCAI has no specific comment.

No.	Discussion Paper Question	FCAI Answer
21.	What could governments do to improve the availability of data on fuel efficiency of used vehicles?	The FCAI has no specific comment.
22.	How could governments encourage more efficient driver behaviour?	Educating drivers on techniques to reduce fuel consumption and CO_2 emissions can reduce fuel consumption from road transport. See Section 2.2.4 for further information on eco-driving.
Other complementary measures: Fleet purchasing policy		
23.	What role, if any, should the Government fleet purchasing policy play in encouraging the supply and purchase of more efficient vehicles?	To utilise fleet purchasing as a tool to encourage vehicles with lower emissions into the market, the government will need to consider supply side incentives to reduce the purchase price of the lower emission vehicles to around parity with the standard ICE option. Fleet operators are more likely to consider a PHEV or HEV model when the whole of life cost of a PHEV or HEV is on par (or lower) than a traditional ICE model.
Other complementary measures: Tax policy		
24.	How could taxes and charges for motor vehicle purchase and/or use be reformed to encourage the purchase and supply of more efficient vehicles?	Government can play a significant role in influencing consumer behavior. One such way is through the taxation system. For example, the LCT imposes additional cost on new energy vehicles and should be abolished for fuel efficient vehicles to encourage their uptake. See Section 9.3 for further discussion on taxation.
25.	To ensure incentives do not have any unintended consequences on air quality, should incentives include noxious emissions requirements as well as CO_2 requirements, or do current noxious emissions standards sufficiently mitigate this risk?	Any policy or incentives for fuel consumption ($_{CO2}$) standards, pollutant emission standards and fuel quality standards need to be considered together as they are linked.

No.	Discussion Paper Question	FCAI Answer
Other complementary measures: Alternative Fuels and electric vehicles		
26.	What measures could be adopted to improve consumer awareness of the benefits of alternative fuelled and electric vehicles, particularly where they complement environmental benefits?	The Australian government needs to consider the role it will undertake to improve consumer awareness and should review the approaches that have been used in other countries. A series of examples of government activities is outlined in Section 2.2.3 Alternative Fuels and Energy Platforms
27.	What measures could be adopted to encourage the supply of alternative fuelled vehicles and supporting infrastructure, to reduce emissions from road transport?	An important part of an Integrated Approach is support of alternative fuel sources and the infrastructure required to deliver vehicles with alternative energy platforms, e.g. electric vehicles (EVs), plug-in hybrid electric vehicles (PHEV), hybrid electric vehicles (HEV) and hydrogen fuel cell vehicles (HFCV). Australia needs to be aware of all these technologies and facilitate the entry into the market of all technologies, rather than locking the country into one approach. See Section 2.2.3 for further information on Alternative Fuels and Energy Platforms
28.	How might fuel standards need to be adapted to accommodate alternative fuels?	Fuel quality standards should be developed under the Federal Fuel Quality Standards Act.
Other complementary measures: Vehicle Emissions Testing		
29.	Should the Australian Government conduct a testing program to assess the effectiveness of UN Regulations in reducing real-world emissions?	The Australian Government has the responsibility to ensure any regulation is effective, cost efficient and provides community benefit. Any testing program must be to a recognised standard, be robust and realistic to address key environmental issues relevant to Australia. Section 8.0 provides additional information on on-road testing.

No.	Discussion Paper Question	FCAI Answer
30.	How should the costs of a testing program be met?	If the government wishes to undertake an audit program, the government should meet the costs. The industry already contributes in excess of $6million per year through identification plate fees that should fund the costs of any auditing or compliance activities undertaken by the government.
31.	How could UN Regulations for vehicle emissions testing be improved?	The Australian government is part of the process to develop UN Regulations. Any proposal to change or improve UN Regulations should be conducted through the existing processes in WP. 29.